Reference = AABOUD 18N; PRL 121 081801
Verifier code = ATLAS

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Pierre Savard

EMAIL: savard@physics.utoronto.ca

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON JET-JET RESONANCES

NODE=S015420

Heavy Particle Production Cross Section

NODE=S015HP

Limits are for a particle decaying to two hadronic jets.

NODE=S015HP
NODE=S015HP

Units(pb)	CL%	Mass(GeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
			[1] SIRUNYAN	19B	CMS	$pp \to jA$, $A \to b\overline{b}$
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			[5] AABOUD	18N	ATLS	$pp \to jj$ resonance
			[6] SIRUNYAN	18DJ	CMS	$pp \to ZZ$ or $WZ \to l\overline{l}jj$
			[7] SIRUNYAN	18DY	CMS	$pp \to RR$; $R \to jj$
			[8] KHACHATRY...	17W	CMS	$pp \to jj$ resonance
			[9] KHACHATRY...	17Y	CMS	$pp \to$ (8–10) $j+\not{E}_T$
			[10] SIRUNYAN	17F	CMS	$pp \to jj$ angular distribution
			[11] AABOUD	16	ATLS	$pp \to b$ + jet
			[12] AAD	16N	ATLS	$pp \to$ 3 high E_T jets
			[13] AAD	16S	ATLS	$pp \to jj$ resonance
			[14] KHACHATRY...	16K	CMS	$pp \to jj$ resonance
			[15] KHACHATRY...	16L	CMS	$pp \to jj$ resonance
			[16] AAD	13D	ATLS	7 TeV $pp \to$ 2 jets
			[17] AALTONEN	13R	CDF	1.96 TeV $p\overline{p} \to$ 4 jets
			[18] CHATRCHYAN	13A	CMS	7 TeV $pp \to$ 2 jets
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			[20] AAD	12S	ATLS	7 TeV $pp \to$ 2 jets
			[21] CHATRCHYAN	12BL	CMS	7 TeV $pp \to t\overline{t}X$
			[22] AAD	11AG	ATLS	7 TeV $pp \to$ 2 jets
			[23] AALTONEN	11M	CDF	1.96 TeV $p\overline{p} \to W+$ 2 jets
			[24] ABAZOV	11I	D0	1.96 TeV $p\overline{p} \to W+$ 2 jets
			[25] AAD	10	ATLS	7 TeV $pp \to$ 2 jets
			[26] KHACHATRY...	10	CMS	7 TeV $pp \to$ 2 jets
			[27] ABE	99F	CDF	1.8 TeV $p\overline{p} \to b\overline{b}+$ anything
			[28] ABE	97G	CDF	1.8 TeV $p\overline{p} \to$ 2 jets
<2603	95	200	[29] ABE	93G	CDF	1.8 TeV $p\overline{p} \to$ 2 jets
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< 7	95	600	[29] ABE	93G	CDF	1.8 TeV $p\overline{p} \to$ 2 jets

YOUR DATA

OCCUR=2

OCCUR=2
OCCUR=3

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NODE=S015HP;LINKAGE=R

[2] AABOUD 18AD search for new heavy particle $Y \to HX \to (bb) + (qq)$. No signal observed. Limits set on m(Y) vs. m(X) in the ranges of m(Y) in 1–4 TeV and m(X) in 50–1000 GeV.

NODE=S015HP;LINKAGE=L

[3] AABOUD 18CK search for SUSY Higgsinos in gauge-mediation via $pp \to bbb+\not{E}_T$ at 13 TeV using two complementary analyses with 24.3/36.1 fb^{-1}; no signal is found and Higgsinos with masses between 130 and 230 GeV and between 290 and 880 GeV are excluded at the 95confidence level.

NODE=S015HP;LINKAGE=N

[4] AABOUD 18CL search for $pp \to$ vector-like quarks $\to$ jets at 13 TeV with 36 fb^{-1}; no signal seen; limits set on various VLQ scenarios. For pure $B \to Hb$ or $T \to Ht$, set the mass limit m $>$ 1010 GeV.

NODE=S015HP;LINKAGE=O

YOUR NOTE

[5] AABOUD 18N search for dijet resonance at Atlas with 13 TeV and 29.3 fb^{-1}; limits set on m(Z') in the mass range of 450–1800 GeV.

NODE=S015HP;LINKAGE=M

[6] SIRUNYAN 18DJ search for $pp \to ZZ$ or $WZ \to l\overline{l}jj$ resonance at 13 TeV, 35.9 fb^{-1}; no signal; limits set in the 400-4500 GeV mass range, exclusion of W' up to 2270 GeV in the HVT model A, and up to 2330 for HVT model B. WED bulk graviton exclusion up to 925 GeV.

NODE=S015HP;LINKAGE=P

[7] SIRUNYAN 18DY search for $pp \to RR$; $R \to jj$ two dijet resonances at 13 TeV 35.9 fb^{-1}; no signal; limits placed on RPV top-squark pair production

NODE=S015HP;LINKAGE=Q

[8] KHACHATRYAN 17W search for dijet resonance in 12.9 fb^{-1} data at 13 TeV; see Fig. 2 for limits on axigluons, diquarks, dark matter mediators etc. NODE=S015HP;LINKAGE=I

[9] KHACHATRYAN 17Y search for $pp \rightarrow$ (8–10) j in 19.7 fb^{-1} at 8 TeV. No signal seen. Limits set on colorons, axigluons, RPV, and SUSY. NODE=S015HP;LINKAGE=J

[10] SIRUNYAN 17F measure $pp \rightarrow jj$ angular distribution in 2.6 fb^{-1} at 13 TeV; limits set on LEDs and quantum black holes. NODE=S015HP;LINKAGE=K

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[12] AAD 16N search for ≥ 3 jets with 3.6 fb^{-1} at 13 TeV; limits placed on micro black holes (Fig. 10) and string balls (Fig. 11). NODE=S015HP;LINKAGE=D

[13] AAD 16S search for high mass jet-jet resonance with 3.6 fb^{-1} at 13 TeV; exclude portions of excited quarks, W', Z' and contact interaction parameter space. NODE=S015HP;LINKAGE=E

[14] KHACHATRYAN 16K search for dijet resonance in 2.4 fb^{-1} data at 13 TeV; see Fig. 3 for limits on axigluons, diquarks etc. NODE=S015HP;LINKAGE=G

[15] KHACHATRYAN 16L use data scouting technique to search for jj resonance on 18.8 fb^{-1} of data at 8 TeV. Limits on the coupling of a leptophobic Z' to quarks are set, improving on the results by other experiments in the mass range between 500–800 GeV. NODE=S015HP;LINKAGE=H

[16] AAD 13D search for dijet resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 4.8 fb^{-1}. The observed events are compatible with Standard Model expectation. See their Fig. 6 and Table 2 for limits on resonance cross section in the range m = 1.0–4.0 TeV. NODE=S015HP;LINKAGE=GA

[17] AALTONEN 13R search for production of a pair of jet-jet resonances in $p\overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV with L = 6.6 fb^{-1}. See their Fig. 5 and Tables I, II for cross section limits. NODE=S015HP;LINKAGE=C

[18] CHATRCHYAN 13A search for qq, qg, and gg resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 4.8 fb^{-1}. See their Fig. 3 and Table 1 for limits on resonance cross section in the range m = 1.0–4.3 TeV. NODE=S015HP;LINKAGE=CA

[19] CHATRCHYAN 13A search for $b\overline{b}$ resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 4.8 fb^{-1}. See their Fig. 8 and Table 4 for limits on resonance cross section in the range m = 1.0–4.0 TeV. NODE=S015HP;LINKAGE=CT

[20] AAD 12S search for dijet resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 1.0 fb^{-1}. See their Fig. 3 and Table 2 for limits on resonance cross section in the range m = 0.9–4.0 TeV. NODE=S015HP;LINKAGE=DA

[21] CHATRCHYAN 12BL search for $t\overline{t}$ resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 4.4 fb^{-1}. See their Fig. 4 for limits on resonance cross section in the range m = 0.5–3.0 TeV. NODE=S015HP;LINKAGE=CH

[22] AAD 11AG search for dijet resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 36 pb^{-1}. Limits on number of events for m = 0.6–4 TeV are given in their Table 3. NODE=S015HP;LINKAGE=AD

[23] AALTONEN 11M find a peak in two jet invariant mass distribution around 140 GeV in W + 2 jet events in $p\overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV with L = 4.3 fb^{-1}. NODE=S015HP;LINKAGE=AL

[24] ABAZOV 11I search for two-jet resonances in W + 2 jet events in $p\overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV with L = 4.3 fb^{-1} and give limits $\sigma <$ (2.6–1.3) pb (95% CL) for m = 110–170 GeV. The result is incompatible with AALTONEN 11M. NODE=S015HP;LINKAGE=AZ

[25] AAD 10 search for narrow dijet resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 315 nb^{-1}. Limits on the cross section in the range 10–10^3 pb is given for m = 0.3–1.7 TeV. NODE=S015HP;LINKAGE=AA

[26] KHACHATRYAN 10 search for narrow dijet resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 2.9 pb^{-1}. Limits on the cross section in the range 1–300 pb is given for m = 0.5–2.6 TeV separately in the final states qq, qg, and gg. NODE=S015HP;LINKAGE=KH

[27] ABE 99F search for narrow $b\overline{b}$ resonances in $p\overline{p}$ collisions at $E_{\rm cm}$=1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X+$ anything)$\times$B($X \rightarrow b\overline{b}$) in the range 3–10^3 pb (95%CL) are given for m_X=200–750 GeV. See their Table I. NODE=S015HP;LINKAGE=FH

[28] ABE 97G search for narrow dijet resonances in $p\overline{p}$ collisions with 106 pb^{-1} of data at $E_{\rm cm}$ = 1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X+$ anything)$\cdot$B($X \rightarrow jj$) in the range 10^4–10^{-1} pb (95%CL) are given for dijet mass m=200–1150 GeV with both jets having $|\eta| < 2.0$ and the dijet system having $|\cos\theta^*| < 0.67$. See their Table I for the list of limits. Supersedes ABE 93G. NODE=S015HP;LINKAGE=B

[29] ABE 93G give cross section times branching ratio into light (d, u, s, c, b) quarks for Γ = 0.02 M. Their Table II gives limits for M = 200–900 GeV and Γ = (0.02–0.2) M. NODE=S015HP;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	SIRUNYAN	19B	PR D99 012005	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59516
	AABOUD	18AD	PL B779 24	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58998
	AABOUD	18CK	PR D98 092002	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59470
	AABOUD	18CL	PR D98 092005	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59472
YOUR PAPER	AABOUD	18N	PRL 121 081801	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58866
	SIRUNYAN	18DJ	JHEP 1809 101	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59341
	SIRUNYAN	18DY	PR D98 112014	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59504
	KHACHATRY...	17W	PL B769 520	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57899
	KHACHATRY...	17Y	PL B770 257	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57904
	SIRUNYAN	17F	JHEP 1707 013	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=57820
	AABOUD	16	PL B759 229	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57233

AAD	16N	JHEP 1603 026	G. Aad *et al.*	(ATLAS Collab.)	REFID=57168
AAD	16S	PL B754 302	G. Aad *et al.*	(ATLAS Collab.)	REFID=57206
KHACHATRY...	16K	PRL 116 071801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57181
KHACHATRY...	16L	PRL 117 031802	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57195
AAD	13D	JHEP 1301 029	G. Aad *et al.*	(ATLAS Collab.)	REFID=54792
AALTONEN	13R	PRL 111 031802	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55220
CHATRCHYAN	13A	JHEP 1301 013	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54770
AAD	12S	PL B708 37	G. Aad *et al.*	(ATLAS Collab.)	REFID=54152
CHATRCHYAN	12BL	JHEP 1212 015	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54776
AAD	11AG	NJP 13 053044	G. Aad *et al.*	(ATLAS Collab.)	REFID=54009
AALTONEN	11M	PRL 106 171801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=16445
ABAZOV	11I	PRL 107 011804	V.M. Abazov *et al.*	(D0 Collab.)	REFID=16475
AAD	10	PRL 105 161801	G. Aad *et al.*	(ATLAS Collab.)	REFID=53477
KHACHATRY...	10	PRL 105 211801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53465
Also		PRL 106 029902	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53629
ABE	99F	PRL 82 2038	F. Abe *et al.*	(CDF Collab.)	REFID=46728
ABE	97G	PR D55 5263	F. Abe *et al.*	(CDF Collab.)	REFID=45343
ABE	93G	PRL 71 2542	F. Abe *et al.*	(CDF Collab.)	REFID=43512

Reference = AABOUD 18AD; PL B779 24
Verifier code = ATLAS

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USA

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SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

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YOUR DATA

OCCUR=2

OCCUR=2

OCCUR=3

YOUR NOTE

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NODE=S015HP;LINKAGE=R

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[13] AAD 16S search for high mass jet-jet resonance with 3.6 fb^{-1} at 13 TeV; exclude portions of excited quarks, W', Z' and contact interaction parameter space. NODE=S015HP;LINKAGE=E

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[19] CHATRCHYAN 13A search for $b\overline{b}$ resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 4.8 fb^{-1}. See their Fig. 8 and Table 4 for limits on resonance cross section in the range m = 1.0–4.0 TeV. NODE=S015HP;LINKAGE=CT

[20] AAD 12S search for dijet resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 1.0 fb^{-1}. See their Fig. 3 and Table 2 for limits on resonance cross section in the range m = 0.9–4.0 TeV. NODE=S015HP;LINKAGE=DA

[21] CHATRCHYAN 12BL search for $t\overline{t}$ resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 4.4 fb^{-1}. See their Fig. 4 for limits on resonance cross section in the range m = 0.5–3.0 TeV. NODE=S015HP;LINKAGE=CH

[22] AAD 11AG search for dijet resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 36 pb^{-1}. Limits on number of events for m = 0.6–4 TeV are given in their Table 3. NODE=S015HP;LINKAGE=AD

[23] AALTONEN 11M find a peak in two jet invariant mass distribution around 140 GeV in W + 2 jet events in $p\overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV with L = 4.3 fb^{-1}. NODE=S015HP;LINKAGE=AL

[24] ABAZOV 11I search for two-jet resonances in W + 2 jet events in $p\overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV with L = 4.3 fb^{-1} and give limits $\sigma <$ (2.6–1.3) pb (95% CL) for m = 110–170 GeV. The result is incompatible with AALTONEN 11M. NODE=S015HP;LINKAGE=AZ

[25] AAD 10 search for narrow dijet resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 315 nb^{-1}. Limits on the cross section in the range 10–10^3 pb is given for m = 0.3–1.7 TeV. NODE=S015HP;LINKAGE=AA

[26] KHACHATRYAN 10 search for narrow dijet resonances in pp collisions at $E_{\rm cm}$ = 7 TeV with L = 2.9 pb^{-1}. Limits on the cross section in the range 1–300 pb is given for m = 0.5–2.6 TeV separately in the final states qq, qg, and gg. NODE=S015HP;LINKAGE=KH

[27] ABE 99F search for narrow $b\overline{b}$ resonances in $p\overline{p}$ collisions at $E_{\rm cm}$=1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X+$ anything)$\times$B($X \rightarrow b\overline{b}$) in the range 3–10^3 pb (95%CL) are given for m_X=200–750 GeV. See their Table I. NODE=S015HP;LINKAGE=FH

[28] ABE 97G search for narrow dijet resonances in $p\overline{p}$ collisions with 106 pb^{-1} of data at $E_{\rm cm}$ = 1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X+$ anything)$\cdot$B($X \rightarrow jj$) in the range 10^4–10^{-1} pb (95%CL) are given for dijet mass m=200–1150 GeV with both jets having $|\eta| <$ 2.0 and the dijet system having $|\cos\theta^*| <$ 0.67. See their Table I for the list of limits. Supersedes ABE 93G. NODE=S015HP;LINKAGE=B

[29] ABE 93G give cross section times branching ratio into light (d, u, s, c, b) quarks for Γ = 0.02 M. Their Table II gives limits for M = 200–900 GeV and Γ = (0.02–0.2) M. NODE=S015HP;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	SIRUNYAN	19B	PR D99 012005	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59516
YOUR PAPER	AABOUD	18AD	PL B779 24	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58998
	AABOUD	18CK	PR D98 092002	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59470
	AABOUD	18CL	PR D98 092005	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59472
	AABOUD	18N	PRL 121 081801	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58866
	SIRUNYAN	18DJ	JHEP 1809 101	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59341
	SIRUNYAN	18DY	PR D98 112014	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59504
	KHACHATRY...	17W	PL B769 520	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57899
	KHACHATRY...	17Y	PL B770 257	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57904
	SIRUNYAN	17F	JHEP 1707 013	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=57820
	AABOUD	16	PL B759 229	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57233

AAD	16N	JHEP 1603 026	G. Aad *et al.*	(ATLAS Collab.)	REFID=57168
AAD	16S	PL B754 302	G. Aad *et al.*	(ATLAS Collab.)	REFID=57206
KHACHATRY...	16K	PRL 116 071801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57181
KHACHATRY...	16L	PRL 117 031802	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57195
AAD	13D	JHEP 1301 029	G. Aad *et al.*	(ATLAS Collab.)	REFID=54792
AALTONEN	13R	PRL 111 031802	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55220
CHATRCHYAN	13A	JHEP 1301 013	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54770
AAD	12S	PL B708 37	G. Aad *et al.*	(ATLAS Collab.)	REFID=54152
CHATRCHYAN	12BL	JHEP 1212 015	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54776
AAD	11AG	NJP 13 053044	G. Aad *et al.*	(ATLAS Collab.)	REFID=54009
AALTONEN	11M	PRL 106 171801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=16445
ABAZOV	11I	PRL 107 011804	V.M. Abazov *et al.*	(D0 Collab.)	REFID=16475
AAD	10	PRL 105 161801	G. Aad *et al.*	(ATLAS Collab.)	REFID=53477
KHACHATRY...	10	PRL 105 211801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53465
Also		PRL 106 029902	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53629
ABE	99F	PRL 82 2038	F. Abe *et al.*	(CDF Collab.)	REFID=46728
ABE	97G	PR D55 5263	F. Abe *et al.*	(CDF Collab.)	REFID=45343
ABE	93G	PRL 71 2542	F. Abe *et al.*	(CDF Collab.)	REFID=43512

Reference = AABOUD 18BY; JHEP 1810 047
Verifier code = ATLAS

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Pierre Savard

EMAIL: savard@physics.utoronto.ca

April 5, 2019

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(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
($B = \pm 1$)

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^{\pm}$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

POLARIZATION IN B^0 DECAY

NODE=S042223

In decays involving two vector mesons, one can distinguish among the states in which meson polarizations are both longitudinal (L) or both are transverse and parallel ($\parallel$) or perpendicular ($\perp$) to each other with the parameters Γ_L/Γ, $\Gamma_\perp/\Gamma$, and the relative phases $\phi_\parallel$ and $\phi_\perp$. See the definitions in the note on "Polarization in B Decays" review in the B^0 Particle Listings.

NODE=S042223

Γ_L/Γ in $B^0 \to K^*(892)^0 \mu^+ \mu^-$ $(0.04 < q^2 < 6.0\ \mathrm{GeV}^2/c^4)$

NODE=S042A08

NODE=S042A08

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.50±0.06±0.04**	[1] AABOUD	18BY	ATLA	pp at 8 TeV

YOUR NOTE [1] A set of angular parameters obtained for this decay are also presented.

NODE=S042A08;LINKAGE=A

B^0 REFERENCES

NODE=S042

YOUR PAPER AABOUD 18BY JHEP 1810 047 M. Aaboud *et al.* (ATLAS Collab.)

REFID=59350

Reference = AABOUD 18CJ; PR D98 052008
Verifier code = ATLAS

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EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Heavy Particle Production Cross Section

NODE=S015CS
NODE=S015CS

VALUE (cm^2/N)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] AABOUD	18CJ	ATLS	$pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$
		[2] AABOUD	18CM	ATLS	$pp \to e\mu/e\tau/\mu\tau$
		[3] AAIJ	18AJ	LHCB	$pp \to A' \to \mu^+\mu^-$; dark photon
		[4] BANERJEE	18	NA64	$eZ \to eZX(A')$
		[5] BANERJEE	18A	NA64	$eZ \to eZA'$, $A' \to \chi\chi$
		[6] MARSICANO	18	E137	$e^+e^- \to A'(\gamma)$ visible decay
		[7] SIRUNYAN	18BB	CMS	$pp \to Z' \to \ell^+\ell^-$ at 13 TeV
		[8] SIRUNYAN	18DA	CMS	$pp \to$ Black Hole, string ball, sphaleron
		[9] SIRUNYAN	18DD	CMS	$pp \to jj$
		[10] SIRUNYAN	18DR	CMS	$pp \to b\mu\overline{\mu}$
		[11] SIRUNYAN	18DU	CMS	$pp \to \gamma\gamma$
		[12] SIRUNYAN	18ED	CMS	$pp \to V \to Wh$; $h \to b\overline{b}$; $W \to l\nu$
		[13] AABOUD	17B	ATLS	WH, ZH resonance
		[14] AAIJ	17BR	LHCB	$pp \to \pi_v\pi_v$, $\pi_v \to jj$
		[15] AAD	16O	ATLS	$\ell +$ (ℓs or jets)
		[16] AAD	16R	ATLS	WW ,WZ ,ZZ resonance
		[17] KRASZNAHO...	16		$p^7\text{Li} \to {}^8\text{Be} \to X(17)N$, $X(17) \to e^+e^-$
		[18] LEES	15E	BABR	e^+e^- collisions
		[19] ADAMS	97B	KTEV	$m=$ 1.2–5 GeV
$< 10^{-36}$–10^{-33}	90	[20] GALLAS	95	TOF	$m=$ 0.5–20 GeV
$<(4$–$0.3) \times 10^{-31}$	95	[21] AKESSON	91	CNTR	$m =$ 0–5 GeV
$<2 \times 10^{-36}$	90	[22] BADIER	86	BDMP	$\tau = (0.05$–$1.) \times 10^{-8}$s
$<2.5 \times 10^{-35}$		[23] GUSTAFSON	76	CNTR	$\tau > 10^{-7}$ s

[1] AABOUD 18CJ make multichannel search for $pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$ at 13 TeV, 36.1 fb^{-1}; no signal found; limits placed for several BSM models.
NODE=S015CS;LINKAGE=R

[2] AABOUD 18CM search for lepton-flavor violating resonance in $pp \to e\mu/e\tau/\mu\tau$ at 13 TeV, 36.1 fb^{-1}; no signal is found and limits placed for various BSM models.
NODE=S015CS;LINKAGE=S

[3] AAIJ 18AJ search for prompt and delayed dark photon decay $A' \to \mu^+\mu^-$ at LHCb detector using 1.6 fb^{-1} of pp collisions at 13 TeV; limits on m(A') vs. kinetic mixing are set.
NODE=S015CS;LINKAGE=K

[4] BANERJEE 18 search for dark photon A'/16.7 MeV boson X at NA64 via $eZ \to eZX(A')$; no signal found and limits set on the X-e^- coupling ϵ_e in the range $1.3 \times 10^{-4} \leq \epsilon_e \leq 4.2 \times 10^{-4}$ excluding part of the allowed parameter space.
NODE=S015CS;LINKAGE=L

[5] BANERJEE 18A search for invisibly decaying dark photons in $eZ \to eZA'$, $A' \to$ invisible; no signal found and limits set on mixing for m(A') $<$ 1 GeV.
NODE=S015CS;LINKAGE=M

[6] MARSICANO 18 search for dark photon $e^+e^- \to A'(\gamma)$ visible decay in SLAC E137 e beam dump data. No signal observed and limits set in ϵ coupling vs m(A') plane, see their figure 7.
NODE=S015CS;LINKAGE=P

[7] SIRUNYAN 18BB search for high mass dilepton resonance; no signal found and exclude portions of p-space of Z', KK graviton models.
NODE=S015CS;LINKAGE=O

[8] SIRUNYAN 18DA search for $pp \to$ Black Hole, string ball, sphaleron via high multiplicity events at 13 TeV, 35.9 fb^{-1}; no signal, require e.g. m(BH)¿10.1 TeV
NODE=S015CS;LINKAGE=T

[9] SIRUNYAN 18DD search for $pp \to jj$ deviations in dijet angular distribution. No signal observed. Set limits on large extra dimensions, black holes and DM mediators e.g. m(BH) $>$ 5.9–8.2 TeV.
NODE=S015CS;LINKAGE=U

[10] SIRUNYAN 18DR search for dimuon resonance in $pp \to b\mu\overline{\mu}$ at 8 and 13 TeV. Slight excess seen at m($\mu\overline{\mu}$) $\sim$ 28 GeV in some channels.
NODE=S015CS;LINKAGE=V

[11] SIRUNYAN 18DU search for high mass diphoton resonance in $pp \rightarrow \gamma\gamma$ at 13 TeV using 35.9 fb^{-1}; no signal; limits placed on RS Graviton, LED, and clockwork. NODE=S015CS;LINKAGE=W

[12] SIRUNYAN 18ED search for $pp \rightarrow V \rightarrow Wh$; $h \rightarrow b\overline{b}$; $W \rightarrow l\nu$ at 13 TeV with 35.9 fb^{-1}; no signal; limits set on m($W^{'}$)¿2.9 TeV. NODE=S015CS;LINKAGE=X

[13] AABOUD 17B exclude m(W', Z') $<$ 1.49–2.31 TeV depending on the couplings and W'/Z' degeneracy assumptions via WH, ZH search in pp collisions at 13 TeV with 3.2 fb^{-1} of data. NODE=S015CS;LINKAGE=I

[14] AAIJ 17BR search for long-lived hidden valley pions from Higgs decay. Limits are set on the signal strength as a function of the mass and lifetime of the long-lived particle in their Fig. 4 and Tab. 4. NODE=S015CS;LINKAGE=J

[15] AAD 16O search for high E_T ℓ + (ℓs or jets) with 3.2 fb^{-1} at 13 TeV; exclude micro black holes mass $<$ 8 TeV (Fig. 3) for models with two extra dimensions. NODE=S015CS;LINKAGE=G

[16] AAD 16R search for WW, WZ, ZZ resonance in 20.3 fb^{-1} at 8 TeV data; limits placed on massive RS graviton (Fig. 4). NODE=S015CS;LINKAGE=H

[17] KRASZNAHORKAY 16 report pLi $\rightarrow$ Be $\rightarrow$ $e\overline{e}N$ 5σ resonance at 16.7 MeV– possible evidence for nuclear interference or new light boson . However, such nuclear interference was ruled out already by ZANG 17. NODE=S015CS;LINKAGE=Q

[18] LEES 15E search for long-lived neutral particles produced in e^+e^- collisions in the Upsilon region, which decays into e^+e^-, $\mu^+\mu^-$, $e^\pm\mu^\mp$, $\pi^+\pi^-$, K^+K^-, or $\pi^\pm K^\mp$. See their Fig. 2 for cross section limits. NODE=S015CS;LINKAGE=F

[19] ADAMS 97B search for a hadron-like neutral particle produced in pN interactions, which decays into a ρ^0 and a weakly interacting massive particle. Upper limits are given for the ratio to K_L production for the mass range 1.2–5 GeV and lifetime 10^{-9}–10^{-4} s. See also our Light Gluino Section. NODE=S015CS;LINKAGE=E

[20] GALLAS 95 limit is for a weakly interacting neutral particle produced in 800 GeV/c pN interactions decaying with a lifetime of 10^{-4}–10^{-8} s. See their Figs. 8 and 9. Similar limits are obtained for a stable particle with interaction cross section 10^{-29}–10^{-33} cm^2. See Fig. 10. NODE=S015CS;LINKAGE=C

[21] AKESSON 91 limit is from weakly interacting neutral long-lived particles produced in pN reaction at 450 GeV/c performed at CERN SPS. Bourquin-Gaillard formula is used as the production model. The above limit is for $\tau > 10^{-7}$ s. For $\tau > 10^{-9}$ s, $\sigma < 10^{-30}$ cm^{-2}/nucleon is obtained. NODE=S015CS;LINKAGE=B

[22] BADIER 86 looked for long-lived particles at 300 GeV π^- beam dump. The limit applies for nonstrongly interacting neutral or charged particles with mass >2 GeV. The limit applies for particle modes, $\mu^+\pi^-$, $\mu^+\mu^-$, $\pi^+\pi^-$X, $\pi^+\pi^-\pi^\pm$ etc. See their figure 5 for the contours of limits in the mass-τ plane for each mode. NODE=S015CS;LINKAGE=D

[23] GUSTAFSON 76 is a 300 GeV FNAL experiment looking for heavy (m >2 GeV) long-lived neutral hadrons in the M4 neutral beam. The above typical value is for m = 3 GeV and assumes an interaction cross section of 1 mb. Values as a function of mass and interaction cross section are given in figure 2. NODE=S015CS;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

YOUR PAPER	AABOUD	18CJ	PR D98 052008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59441
	AABOUD	18CM	PR D98 092008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59474
	AAIJ	18AJ	PRL 120 061801	R. Aaij *et al.*	(LHCb Collab.)	REFID=59199
	BANERJEE	18	PRL 120 231802	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58838
	BANERJEE	18A	PR D97 072002	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58916
	MARSICANO	18	PR D98 015031	L. Marsicano *et al.*		REFID=58967
	SIRUNYAN	18BB	JHEP 1806 120	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59112
	SIRUNYAN	18DA	JHEP 1811 042	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59306
	SIRUNYAN	18DD	EPJ C78 789	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59318
	SIRUNYAN	18DR	JHEP 1811 161	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59367
	SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
	SIRUNYAN	18ED	JHEP 1811 172	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59566
	AABOUD	17B	PL B765 32	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57706
	AAIJ	17BR	EPJ C77 812	R. Aaij *et al.*	(LHCb Collab.)	REFID=58366
	ZANG	17	PL B773 159	X. Zang, G.A. Miller	(WASH)	REFID=59311
	AAD	16O	PL B760 520	G. Aad *et al.*	(ATLAS Collab.)	REFID=57169
	AAD	16R	PL B755 285	G. Aad *et al.*	(ATLAS Collab.)	REFID=57172
	KRASZNAHO...	16	PRL 116 042501	A.J. Krasznahorkay *et al.*	(HINR, ANIK+)	REFID=59302
	LEES	15E	PRL 114 171801	J.P. Lees *et al.*	(BABAR Collab.)	REFID=56467
	ADAMS	97B	PRL 79 4083	J. Adams *et al.*	(FNAL KTeV Collab.)	REFID=45722
	GALLAS	95	PR D52 6	E. Gallas *et al.*	(MSU, FNAL, MIT, FLOR)	REFID=44291
	AKESSON	91	ZPHY C52 219	T. Akesson *et al.*	(HELIOS Collab.)	REFID=41739
	BADIER	86	ZPHY C31 21	J. Badier *et al.*	(NA3 Collab.)	REFID=10622
	GUSTAFSON	76	PRL 37 474	H.R. Gustafson *et al.*	(MICH)	REFID=12580

Reference = AABOUD 18CK; PR D98 092002
Verifier code = ATLAS

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EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

OMITTED FROM SUMMARY TABLE

NODE=S015

LIMITS ON JET-JET RESONANCES

NODE=S015420

Heavy Particle Production Cross Section

NODE=S015HP

Limits are for a particle decaying to two hadronic jets.

NODE=S015HP
NODE=S015HP

• • • We do not use the following data for averages, fits, limits, etc. • • •

YOUR DATA

Units(pb)	CL%	Mass(GeV)	DOCUMENT ID		TECN	COMMENT	
			[1] SIRUNYAN	19B	CMS	$pp \to jA$, $A \to b\overline{b}$	
			[2] AABOUD	18AD	ATLS	$pp \to Y \to HX \to (bb) + (qq)$	
			[3] AABOUD	18CK	ATLS	$pp \to bbb+\not{E}_T$	
			[4] AABOUD	18CL	ATLS	$pp \to$ vector-like quarks	
			[5] AABOUD	18N	ATLS	$pp \to jj$ resonance	
			[6] SIRUNYAN	18DJ	CMS	$pp \to ZZ$ or $WZ \to l\bar{l}jj$	
			[7] SIRUNYAN	18DY	CMS	$pp \to RR$; $R \to jj$	
			[8] KHACHATRY...	17W	CMS	$pp \to jj$ resonance	
			[9] KHACHATRY...	17Y	CMS	$pp \to$ (8–10) $j+\not{E}_T$	
			[10] SIRUNYAN	17F	CMS	$pp \to jj$ angular distribution	
			[11] AABOUD	16	ATLS	$pp \to b$ + jet	
			[12] AAD	16N	ATLS	$pp \to$ 3 high E_T jets	
			[13] AAD	16S	ATLS	$pp \to jj$ resonance	
			[14] KHACHATRY...	16K	CMS	$pp \to jj$ resonance	
			[15] KHACHATRY...	16L	CMS	$pp \to jj$ resonance	
			[16] AAD	13D	ATLS	7 TeV $pp \to$ 2 jets	
			[17] AALTONEN	13R	CDF	1.96 TeV $p\overline{p} \to$ 4 jets	
			[18] CHATRCHYAN	13A	CMS	7 TeV $pp \to$ 2 jets	
			[19] CHATRCHYAN	13A	CMS	7 TeV $pp \to b\overline{b}X$	OCCUR=2
			[20] AAD	12S	ATLS	7 TeV $pp \to$ 2 jets	
			[21] CHATRCHYAN	12BL	CMS	7 TeV $pp \to t\overline{t}X$	
			[22] AAD	11AG	ATLS	7 TeV $pp \to$ 2 jets	
			[23] AALTONEN	11M	CDF	1.96 TeV $p\overline{p} \to W+$ 2 jets	
			[24] ABAZOV	11I	D0	1.96 TeV $p\overline{p} \to W+$ 2 jets	
			[25] AAD	10	ATLS	7 TeV $pp \to$ 2 jets	
			[26] KHACHATRY...	10	CMS	7 TeV $pp \to$ 2 jets	
			[27] ABE	99F	CDF	1.8 TeV $p\overline{p} \to b\overline{b}+$ anything	
			[28] ABE	97G	CDF	1.8 TeV $p\overline{p} \to$ 2 jets	
<2603	95	200	[29] ABE	93G	CDF	1.8 TeV $p\overline{p} \to$ 2 jets	
< 44	95	400	[29] ABE	93G	CDF	1.8 TeV $p\overline{p} \to$ 2 jets	OCCUR=2
< 7	95	600	[29] ABE	93G	CDF	1.8 TeV $p\overline{p} \to$ 2 jets	OCCUR=3

YOUR NOTE

[1] SIRUNYAN 19B search for low mass resonance $pp \to jA$, $A \to b\overline{b}$ at 13 TeV using 35.9 fb^{-1}; no signal; exclude resonances 50-350 GeV depending on production and decay. NODE=S015HP;LINKAGE=R

[2] AABOUD 18AD search for new heavy particle $Y \to HX \to (bb) + (qq)$. No signal observed. Limits set on m(Y) vs. m(X) in the ranges of m(Y) in 1–4 TeV and m(X) in 50–1000 GeV. NODE=S015HP;LINKAGE=L

[3] AABOUD 18CK search for SUSY Higgsinos in gauge-mediation via $pp \to bbb+\not{E}_T$ at 13 TeV using two complementary analyses with 24.3/36.1 fb^{-1}; no signal is found and Higgsinos with masses between 130 and 230 GeV and between 290 and 880 GeV are excluded at the 95confidence level. NODE=S015HP;LINKAGE=N

[4] AABOUD 18CL search for $pp \to$ vector-like quarks $\to$ jets at 13 TeV with 36 fb^{-1}; no signal seen; limits set on various VLQ scenarios. For pure $B \to Hb$ or $T \to Ht$, set the mass limit m > 1010 GeV. NODE=S015HP;LINKAGE=O

[5] AABOUD 18N search for dijet resonance at Atlas with 13 TeV and 29.3 fb^{-1}; limits set on m(Z') in the mass range of 450–1800 GeV. NODE=S015HP;LINKAGE=M

[6] SIRUNYAN 18DJ search for $pp \to ZZ$ or $WZ \to l\bar{l}jj$ resonance at 13 TeV, 35.9 fb^{-1}; no signal; limits set in the 400-4500 GeV mass range, exclusion of W' up to 2270 GeV in the HVT model A, and up to 2330 for HVT model B. WED bulk graviton exclusion up to 925 GeV. NODE=S015HP;LINKAGE=P

[7] SIRUNYAN 18DY search for $pp \to RR$; $R \to jj$ two dijet resonances at 13 TeV 35.9 fb^{-1}; no signal; limits placed on RPV top-squark pair production NODE=S015HP;LINKAGE=Q

[8] KHACHATRYAN 17W search for dijet resonance in 12.9 fb^{-1} data at 13 TeV; see Fig. 2 for limits on axigluons, diquarks, dark matter mediators etc. NODE=S015HP;LINKAGE=I

[9] KHACHATRYAN 17Y search for $pp \rightarrow$ (8–10) j in 19.7 fb^{-1} at 8 TeV. No signal seen. Limits set on colorons, axigluons, RPV, and SUSY. NODE=S015HP;LINKAGE=J

[10] SIRUNYAN 17F measure $pp \rightarrow jj$ angular distribution in 2.6 fb^{-1} at 13 TeV; limits set on LEDs and quantum black holes. NODE=S015HP;LINKAGE=K

[11] AABOUD 16 search for resonant dijets including one or two b-jets with 3.2 fb^{-1} at 13 TeV; exclude excited b^* quark from 1.1–2.1 TeV; exclude leptophilic Z' with SM couplings from 1.1–1.5 TeV. NODE=S015HP;LINKAGE=F

[12] AAD 16N search for ≥ 3 jets with 3.6 fb^{-1} at 13 TeV; limits placed on micro black holes (Fig. 10) and string balls (Fig. 11). NODE=S015HP;LINKAGE=D

[13] AAD 16S search for high mass jet-jet resonance with 3.6 fb^{-1} at 13 TeV; exclude portions of excited quarks, W', Z' and contact interaction parameter space. NODE=S015HP;LINKAGE=E

[14] KHACHATRYAN 16K search for dijet resonance in 2.4 fb^{-1} data at 13 TeV; see Fig. 3 for limits on axigluons, diquarks etc. NODE=S015HP;LINKAGE=G

[15] KHACHATRYAN 16L use data scouting technique to search for jj resonance on 18.8 fb^{-1} of data at 8 TeV. Limits on the coupling of a leptophobic Z' to quarks are set, improving on the results by other experiments in the mass range between 500–800 GeV. NODE=S015HP;LINKAGE=H

[16] AAD 13D search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. The observed events are compatible with Standard Model expectation. See their Fig. 6 and Table 2 for limits on resonance cross section in the range m = 1.0–4.0 TeV. NODE=S015HP;LINKAGE=GA

[17] AALTONEN 13R search for production of a pair of jet-jet resonances in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 6.6 fb^{-1}. See their Fig. 5 and Tables I, II for cross section limits. NODE=S015HP;LINKAGE=C

[18] CHATRCHYAN 13A search for qq, qg, and gg resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. See their Fig. 3 and Table 1 for limits on resonance cross section in the range m = 1.0–4.3 TeV. NODE=S015HP;LINKAGE=CA

[19] CHATRCHYAN 13A search for $b\overline{b}$ resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. See their Fig. 8 and Table 4 for limits on resonance cross section in the range m = 1.0–4.0 TeV. NODE=S015HP;LINKAGE=CT

[20] AAD 12S search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 1.0 fb^{-1}. See their Fig. 3 and Table 2 for limits on resonance cross section in the range m = 0.9–4.0 TeV. NODE=S015HP;LINKAGE=DA

[21] CHATRCHYAN 12BL search for $t\overline{t}$ resonances in pp collisions at E_{cm} = 7 TeV with L = 4.4 fb^{-1}. See their Fig. 4 for limits on resonance cross section in the range m = 0.5–3.0 TeV. NODE=S015HP;LINKAGE=CH

[22] AAD 11AG search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 36 pb^{-1}. Limits on number of events for m = 0.6–4 TeV are given in their Table 3. NODE=S015HP;LINKAGE=AD

[23] AALTONEN 11M find a peak in two jet invariant mass distribution around 140 GeV in W + 2 jet events in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 4.3 fb^{-1}. NODE=S015HP;LINKAGE=AL

[24] ABAZOV 11I search for two-jet resonances in W + 2 jet events in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 4.3 fb^{-1} and give limits $\sigma <$ (2.6–1.3) pb (95% CL) for m = 110–170 GeV. The result is incompatible with AALTONEN 11M. NODE=S015HP;LINKAGE=AZ

[25] AAD 10 search for narrow dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 315 nb^{-1}. Limits on the cross section in the range 10–10^3 pb is given for m = 0.3–1.7 TeV. NODE=S015HP;LINKAGE=AA

[26] KHACHATRYAN 10 search for narrow dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 2.9 pb^{-1}. Limits on the cross section in the range 1–300 pb is given for m = 0.5–2.6 TeV separately in the final states qq, qg, and gg. NODE=S015HP;LINKAGE=KH

[27] ABE 99F search for narrow $b\overline{b}$ resonances in $p\overline{p}$ collisions at E_{cm}=1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X + \text{anything})\times\text{B}(X \rightarrow b\overline{b})$ in the range 3–10^3 pb (95%CL) are given for m_X=200–750 GeV. See their Table I. NODE=S015HP;LINKAGE=FH

[28] ABE 97G search for narrow dijet resonances in $p\overline{p}$ collisions with 106 pb^{-1} of data at E_{cm} = 1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X + \text{anything})\cdot\text{B}(X \rightarrow jj)$ in the range 10^4–10^{-1} pb (95%CL) are given for dijet mass m=200–1150 GeV with both jets having $|\eta| < 2.0$ and the dijet system having $|\cos\theta^*| < 0.67$. See their Table I for the list of limits. Supersedes ABE 93G. NODE=S015HP;LINKAGE=B

[29] ABE 93G give cross section times branching ratio into light (d, u, s, c, b) quarks for Γ = 0.02 M. Their Table II gives limits for M = 200–900 GeV and Γ = (0.02–0.2) M. NODE=S015HP;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	SIRUNYAN	19B	PR D99 012005	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59516
	AABOUD	18AD	PL B779 24	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58998
YOUR PAPER	AABOUD	18CK	PR D98 092002	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59470
	AABOUD	18CL	PR D98 092005	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59472
	AABOUD	18N	PRL 121 081801	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58866
	SIRUNYAN	18DJ	JHEP 1809 101	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59341
	SIRUNYAN	18DY	PR D98 112014	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59504
	KHACHATRY...	17W	PL B769 520	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57899
	KHACHATRY...	17Y	PL B770 257	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57904
	SIRUNYAN	17F	JHEP 1707 013	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=57820
	AABOUD	16	PL B759 229	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57233

AAD	16N	JHEP 1603 026	G. Aad *et al.*	(ATLAS Collab.)	REFID=57168
AAD	16S	PL B754 302	G. Aad *et al.*	(ATLAS Collab.)	REFID=57206
KHACHATRY...	16K	PRL 116 071801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57181
KHACHATRY...	16L	PRL 117 031802	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57195
AAD	13D	JHEP 1301 029	G. Aad *et al.*	(ATLAS Collab.)	REFID=54792
AALTONEN	13R	PRL 111 031802	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55220
CHATRCHYAN	13A	JHEP 1301 013	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54770
AAD	12S	PL B708 37	G. Aad *et al.*	(ATLAS Collab.)	REFID=54152
CHATRCHYAN	12BL	JHEP 1212 015	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54776
AAD	11AG	NJP 13 053044	G. Aad *et al.*	(ATLAS Collab.)	REFID=54009
AALTONEN	11M	PRL 106 171801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=16445
ABAZOV	11I	PRL 107 011804	V.M. Abazov *et al.*	(D0 Collab.)	REFID=16475
AAD	10	PRL 105 161801	G. Aad *et al.*	(ATLAS Collab.)	REFID=53477
KHACHATRY...	10	PRL 105 211801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53465
Also		PRL 106 029902	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53629
ABE	99F	PRL 82 2038	F. Abe *et al.*	(CDF Collab.)	REFID=46728
ABE	97G	PR D55 5263	F. Abe *et al.*	(CDF Collab.)	REFID=45343
ABE	93G	PRL 71 2542	F. Abe *et al.*	(CDF Collab.)	REFID=43512

Reference = AABOUD 18CL; PR D98 092005
Verifier code = ATLAS

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Pierre Savard

EMAIL: savard@physics.utoronto.ca

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON JET-JET RESONANCES

NODE=S015420

Heavy Particle Production Cross Section

NODE=S015HP

Limits are for a particle decaying to two hadronic jets.

NODE=S015HP
NODE=S015HP

Units(pb)	CL%	Mass(GeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
			[1] SIRUNYAN	19B	CMS	$pp \to jA$, $A \to b\bar{b}$
			[2] AABOUD	18AD	ATLS	$pp \to Y \to HX \to (bb) + (qq)$
			[3] AABOUD	18CK	ATLS	$pp \to bbb + \not{E}_T$
			[4] AABOUD	18CL	ATLS	$pp \to$ vector-like quarks
			[5] AABOUD	18N	ATLS	$pp \to jj$ resonance
			[6] SIRUNYAN	18DJ	CMS	$pp \to ZZ$ or $WZ \to l\bar{l}jj$
			[7] SIRUNYAN	18DY	CMS	$pp \to RR$; $R \to jj$
			[8] KHACHATRY...	17W	CMS	$pp \to jj$ resonance
			[9] KHACHATRY...	17Y	CMS	$pp \to$ (8–10) $j + \not{E}_T$
			[10] SIRUNYAN	17F	CMS	$pp \to jj$ angular distribution
			[11] AABOUD	16	ATLS	$pp \to b +$ jet
			[12] AAD	16N	ATLS	$pp \to$ 3 high E_T jets
			[13] AAD	16S	ATLS	$pp \to jj$ resonance
			[14] KHACHATRY...	16K	CMS	$pp \to jj$ resonance
			[15] KHACHATRY...	16L	CMS	$pp \to jj$ resonance
			[16] AAD	13D	ATLS	7 TeV $pp \to$ 2 jets
			[17] AALTONEN	13R	CDF	1.96 TeV $p\bar{p} \to$ 4 jets
			[18] CHATRCHYAN	13A	CMS	7 TeV $pp \to$ 2 jets
			[19] CHATRCHYAN	13A	CMS	7 TeV $pp \to b\bar{b}X$
			[20] AAD	12S	ATLS	7 TeV $pp \to$ 2 jets
			[21] CHATRCHYAN	12BL	CMS	7 TeV $pp \to t\bar{t}X$
			[22] AAD	11AG	ATLS	7 TeV $pp \to$ 2 jets
			[23] AALTONEN	11M	CDF	1.96 TeV $p\bar{p} \to W +$ 2 jets
			[24] ABAZOV	11I	D0	1.96 TeV $p\bar{p} \to W +$ 2 jets
			[25] AAD	10	ATLS	7 TeV $pp \to$ 2 jets
			[26] KHACHATRY...	10	CMS	7 TeV $pp \to$ 2 jets
			[27] ABE	99F	CDF	1.8 TeV $p\bar{p} \to b\bar{b} +$ anything
			[28] ABE	97G	CDF	1.8 TeV $p\bar{p} \to$ 2 jets
<2603	95	200	[29] ABE	93G	CDF	1.8 TeV $p\bar{p} \to$ 2 jets
< 44	95	400	[29] ABE	93G	CDF	1.8 TeV $p\bar{p} \to$ 2 jets
< 7	95	600	[29] ABE	93G	CDF	1.8 TeV $p\bar{p} \to$ 2 jets

YOUR DATA

OCCUR=2
OCCUR=2
OCCUR=3

YOUR NOTE

[1] SIRUNYAN 19B search for low mass resonance $pp \to jA$, $A \to b\bar{b}$ at 13 TeV using 35.9 fb^{-1}; no signal; exclude resonances 50-350 GeV depending on production and decay. NODE=S015HP;LINKAGE=R

[2] AABOUD 18AD search for new heavy particle $Y \to HX \to (bb) + (qq)$. No signal observed. Limits set on m(Y) vs. m(X) in the ranges of m(Y) in 1–4 TeV and m(X) in 50–1000 GeV. NODE=S015HP;LINKAGE=L

[3] AABOUD 18CK search for SUSY Higgsinos in gauge-mediation via $pp \to bbb + \not{E}_T$ at 13 TeV using two complementary analyses with 24.3/36.1 fb^{-1}; no signal is found and Higgsinos with masses between 130 and 230 GeV and between 290 and 880 GeV are excluded at the 95confidence level. NODE=S015HP;LINKAGE=N

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[6] SIRUNYAN 18DJ search for $pp \to ZZ$ or $WZ \to l\bar{l}jj$ resonance at 13 TeV, 35.9 fb^{-1}; no signal; limits set in the 400-4500 GeV mass range, exclusion of W' up to 2270 GeV in the HVT model A, and up to 2330 for HVT model B. WED bulk graviton exclusion up to 925 GeV. NODE=S015HP;LINKAGE=P

[7] SIRUNYAN 18DY search for $pp \to RR$; $R \to jj$ two dijet resonances at 13 TeV 35.9 fb^{-1}; no signal; limits placed on RPV top-squark pair production NODE=S015HP;LINKAGE=Q

[8] KHACHATRYAN 17W search for dijet resonance in 12.9 fb^{-1} data at 13 TeV; see Fig. 2 for limits on axigluons, diquarks, dark matter mediators etc. NODE=S015HP;LINKAGE=I

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[10] SIRUNYAN 17F measure $pp \rightarrow jj$ angular distribution in 2.6 fb^{-1} at 13 TeV; limits set on LEDs and quantum black holes. NODE=S015HP;LINKAGE=K

[11] AABOUD 16 search for resonant dijets including one or two b-jets with 3.2 fb^{-1} at 13 TeV; exclude excited b^* quark from 1.1–2.1 TeV; exclude leptophilic Z' with SM couplings from 1.1–1.5 TeV. NODE=S015HP;LINKAGE=F

[12] AAD 16N search for ≥ 3 jets with 3.6 fb^{-1} at 13 TeV; limits placed on micro black holes (Fig. 10) and string balls (Fig. 11). NODE=S015HP;LINKAGE=D

[13] AAD 16S search for high mass jet-jet resonance with 3.6 fb^{-1} at 13 TeV; exclude portions of excited quarks, W', Z' and contact interaction parameter space. NODE=S015HP;LINKAGE=E

[14] KHACHATRYAN 16K search for dijet resonance in 2.4 fb^{-1} data at 13 TeV; see Fig. 3 for limits on axigluons, diquarks etc. NODE=S015HP;LINKAGE=G

[15] KHACHATRYAN 16L use data scouting technique to search for jj resonance on 18.8 fb^{-1} of data at 8 TeV. Limits on the coupling of a leptophobic Z' to quarks are set, improving on the results by other experiments in the mass range between 500–800 GeV. NODE=S015HP;LINKAGE=H

[16] AAD 13D search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. The observed events are compatible with Standard Model expectation. See their Fig. 6 and Table 2 for limits on resonance cross section in the range m = 1.0–4.0 TeV. NODE=S015HP;LINKAGE=GA

[17] AALTONEN 13R search for production of a pair of jet-jet resonances in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 6.6 fb^{-1}. See their Fig. 5 and Tables I, II for cross section limits. NODE=S015HP;LINKAGE=C

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[19] CHATRCHYAN 13A search for $b\overline{b}$ resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. See their Fig. 8 and Table 4 for limits on resonance cross section in the range m = 1.0–4.0 TeV. NODE=S015HP;LINKAGE=CT

[20] AAD 12S search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 1.0 fb^{-1}. See their Fig. 3 and Table 2 for limits on resonance cross section in the range m = 0.9–4.0 TeV. NODE=S015HP;LINKAGE=DA

[21] CHATRCHYAN 12BL search for $t\overline{t}$ resonances in pp collisions at E_{cm} = 7 TeV with L = 4.4 fb^{-1}. See their Fig. 4 for limits on resonance cross section in the range m = 0.5–3.0 TeV. NODE=S015HP;LINKAGE=CH

[22] AAD 11AG search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 36 pb^{-1}. Limits on number of events for m = 0.6–4 TeV are given in their Table 3. NODE=S015HP;LINKAGE=AD

[23] AALTONEN 11M find a peak in two jet invariant mass distribution around 140 GeV in W + 2 jet events in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 4.3 fb^{-1}. NODE=S015HP;LINKAGE=AL

[24] ABAZOV 11I search for two-jet resonances in W + 2 jet events in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 4.3 fb^{-1} and give limits $\sigma <$ (2.6–1.3) pb (95% CL) for m = 110–170 GeV. The result is incompatible with AALTONEN 11M. NODE=S015HP;LINKAGE=AZ

[25] AAD 10 search for narrow dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 315 nb^{-1}. Limits on the cross section in the range 10–10^3 pb is given for m = 0.3–1.7 TeV. NODE=S015HP;LINKAGE=AA

[26] KHACHATRYAN 10 search for narrow dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 2.9 pb^{-1}. Limits on the cross section in the range 1–300 pb is given for m = 0.5–2.6 TeV separately in the final states qq, qg, and gg. NODE=S015HP;LINKAGE=KH

[27] ABE 99F search for narrow $b\overline{b}$ resonances in $p\overline{p}$ collisions at E_{cm}=1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X+$ anything$)\times$B$(X \rightarrow b\overline{b})$ in the range 3–10^3 pb (95%CL) are given for m_X=200–750 GeV. See their Table I. NODE=S015HP;LINKAGE=FH

[28] ABE 97G search for narrow dijet resonances in $p\overline{p}$ collisions with 106 pb^{-1} of data at E_{cm} = 1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X+$ anything$)\cdot$B$(X \rightarrow jj)$ in the range 10^4–10^{-1} pb (95%CL) are given for dijet mass m=200–1150 GeV with both jets having $|\eta| < 2.0$ and the dijet system having $|\cos\theta^*| < 0.67$. See their Table I for the list of limits. Supersedes ABE 93G. NODE=S015HP;LINKAGE=B

[29] ABE 93G give cross section times branching ratio into light (d, u, s, c, b) quarks for Γ = 0.02 M. Their Table II gives limits for M = 200–900 GeV and Γ = (0.02–0.2) M. NODE=S015HP;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	SIRUNYAN	19B	PR D99 012005	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59516
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	AABOUD	18CK	PR D98 092002	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59470
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	AABOUD	18N	PRL 121 081801	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58866
	SIRUNYAN	18DJ	JHEP 1809 101	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59341
	SIRUNYAN	18DY	PR D98 112014	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59504
	KHACHATRY...	17W	PL B769 520	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57899
	KHACHATRY...	17Y	PL B770 257	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57904
	SIRUNYAN	17F	JHEP 1707 013	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=57820
	AABOUD	16	PL B759 229	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57233

AAD	16N	JHEP 1603 026	G. Aad *et al.*	(ATLAS Collab.)	REFID=57168
AAD	16S	PL B754 302	G. Aad *et al.*	(ATLAS Collab.)	REFID=57206
KHACHATRY...	16K	PRL 116 071801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57181
KHACHATRY...	16L	PRL 117 031802	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57195
AAD	13D	JHEP 1301 029	G. Aad *et al.*	(ATLAS Collab.)	REFID=54792
AALTONEN	13R	PRL 111 031802	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55220
CHATRCHYAN	13A	JHEP 1301 013	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54770
AAD	12S	PL B708 37	G. Aad *et al.*	(ATLAS Collab.)	REFID=54152
CHATRCHYAN	12BL	JHEP 1212 015	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54776
AAD	11AG	NJP 13 053044	G. Aad *et al.*	(ATLAS Collab.)	REFID=54009
AALTONEN	11M	PRL 106 171801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=16445
ABAZOV	11I	PRL 107 011804	V.M. Abazov *et al.*	(D0 Collab.)	REFID=16475
AAD	10	PRL 105 161801	G. Aad *et al.*	(ATLAS Collab.)	REFID=53477
KHACHATRY...	10	PRL 105 211801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53465
Also		PRL 106 029902	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53629
ABE	99F	PRL 82 2038	F. Abe *et al.*	(CDF Collab.)	REFID=46728
ABE	97G	PR D55 5263	F. Abe *et al.*	(CDF Collab.)	REFID=45343
ABE	93G	PRL 71 2542	F. Abe *et al.*	(CDF Collab.)	REFID=43512

Reference = AABOUD 18CM; PR D98 092008
Verifier code = ATLAS

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Pierre Savard

EMAIL: savard@physics.utoronto.ca

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Heavy Particle Production Cross Section

NODE=S015CS

NODE=S015CS

YOUR DATA

VALUE (cm^2/N)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] AABOUD	18CJ	ATLS	$pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$
		[2] AABOUD	18CM	ATLS	$pp \to e\mu/e\tau/\mu\tau$
		[3] AAIJ	18AJ	LHCB	$pp \to A' \to \mu^+\mu^-$; dark photon
		[4] BANERJEE	18	NA64	$eZ \to eZX(A')$
		[5] BANERJEE	18A	NA64	$eZ \to eZA'$, $A' \to \chi\chi$
		[6] MARSICANO	18	E137	$e^+e^- \to A'(\gamma)$ visible decay
		[7] SIRUNYAN	18BB	CMS	$pp \to Z' \to \ell^+\ell^-$ at 13 TeV
		[8] SIRUNYAN	18DA	CMS	$pp \to$ Black Hole, string ball, sphaleron
		[9] SIRUNYAN	18DD	CMS	$pp \to jj$
		[10] SIRUNYAN	18DR	CMS	$pp \to b\mu\overline{\mu}$
		[11] SIRUNYAN	18DU	CMS	$pp \to \gamma\gamma$
		[12] SIRUNYAN	18ED	CMS	$pp \to V \to Wh$; $h \to b\overline{b}$; $W \to l\nu$
		[13] AABOUD	17B	ATLS	WH, ZH resonance
		[14] AAIJ	17BR	LHCB	$pp \to \pi_v\pi_v$, $\pi_v \to jj$
		[15] AAD	16O	ATLS	ℓ + (ℓs or jets)
		[16] AAD	16R	ATLS	WW ,WZ ,ZZ resonance
		[17] KRASZNAHO...	16		$p^7Li \to {}^8Be \to X(17)N$, $X(17) \to e^+e^-$
		[18] LEES	15E	BABR	e^+e^- collisions
		[19] ADAMS	97B	KTEV	m= 1.2–5 GeV
$< 10^{-36}$–10^{-33}	90	[20] GALLAS	95	TOF	m= 0.5–20 GeV
$<(4$–$0.3) \times 10^{-31}$	95	[21] AKESSON	91	CNTR	m = 0–5 GeV
$<2 \times 10^{-36}$	90	[22] BADIER	86	BDMP	$\tau = (0.05$–$1.) \times 10^{-8}$s
$<2.5 \times 10^{-35}$		[23] GUSTAFSON	76	CNTR	$\tau > 10^{-7}$ s

YOUR NOTE

[1] AABOUD 18CJ make multichannel search for $pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$ at 13 TeV, 36.1 fb^{-1}; no signal found; limits placed for several BSM models. NODE=S015CS;LINKAGE=R

[2] AABOUD 18CM search for lepton-flavor violating resonance in $pp \to e\mu/e\tau/\mu\tau$ at 13 TeV, 36.1 fb^{-1}; no signal is found and limits placed for various BSM models. NODE=S015CS;LINKAGE=S

[3] AAIJ 18AJ search for prompt and delayed dark photon decay $A' \to \mu^+\mu^-$ at LHCb detector using 1.6 fb^{-1} of pp collisions at 13 TeV; limits on m(A') vs. kinetic mixing are set. NODE=S015CS;LINKAGE=K

[4] BANERJEE 18 search for dark photon A'/16.7 MeV boson X at NA64 via $eZ \to eZX(A')$; no signal found and limits set on the X-e^- coupling ϵ_e in the range $1.3 \times 10^{-4} \leq \epsilon_e \leq 4.2 \times 10^{-4}$ excluding part of the allowed parameter space. NODE=S015CS;LINKAGE=L

[5] BANERJEE 18A search for invisibly decaying dark photons in $eZ \to eZA'$, $A' \to$ invisible; no signal found and limits set on mixing for m(A') < 1 GeV. NODE=S015CS;LINKAGE=M

[6] MARSICANO 18 search for dark photon $e^+e^- \to A'(\gamma)$ visible decay in SLAC E137 e beam dump data. No signal observed and limits set in ϵ coupling vs m(A') plane, see their figure 7. NODE=S015CS;LINKAGE=P

[7] SIRUNYAN 18BB search for high mass dilepton resonance; no signal found and exclude portions of p-space of Z', KK graviton models. NODE=S015CS;LINKAGE=O

[8] SIRUNYAN 18DA search for $pp \to$ Black Hole, string ball, sphaleron via high multiplicity events at 13 TeV, 35.9 fb^{-1}; no signal, require e.g. m(BH)¿10.1 TeV NODE=S015CS;LINKAGE=T

[9] SIRUNYAN 18DD search for $pp \to jj$ deviations in dijet angular distribution. No signal observed. Set limits on large extra dimensions, black holes and DM mediators e.g. m(BH) > 5.9–8.2 TeV. NODE=S015CS;LINKAGE=U

[10] SIRUNYAN 18DR search for dimuon resonance in $pp \to b\mu\overline{\mu}$ at 8 and 13 TeV. Slight excess seen at m($\mu\overline{\mu}$) ∼ 28 GeV in some channels. NODE=S015CS;LINKAGE=V

[11] SIRUNYAN 18DU search for high mass diphoton resonance in $pp \to \gamma\gamma$ at 13 TeV using 35.9 fb^{-1}; no signal; limits placed on RS Graviton, LED, and clockwork. NODE=S015CS;LINKAGE=W

[12] SIRUNYAN 18ED search for $pp \to V \to Wh$; $h \to b\overline{b}$; $W \to l\nu$ at 13 TeV with 35.9 fb^{-1}; no signal; limits set on m(W')¿2.9 TeV. NODE=S015CS;LINKAGE=X

[13] AABOUD 17B exclude m(W', Z') $<$ 1.49–2.31 TeV depending on the couplings and W'/Z' degeneracy assumptions via WH, ZH search in pp collisions at 13 TeV with 3.2 fb^{-1} of data. NODE=S015CS;LINKAGE=I

[14] AAIJ 17BR search for long-lived hidden valley pions from Higgs decay. Limits are set on the signal strength as a function of the mass and lifetime of the long-lived particle in their Fig. 4 and Tab. 4. NODE=S015CS;LINKAGE=J

[15] AAD 16O search for high E_T ℓ + (ℓs or jets) with 3.2 fb^{-1} at 13 TeV; exclude micro black holes mass $<$ 8 TeV (Fig. 3) for models with two extra dimensions. NODE=S015CS;LINKAGE=G

[16] AAD 16R search for WW, WZ, ZZ resonance in 20.3 fb^{-1} at 8 TeV data; limits placed on massive RS graviton (Fig. 4). NODE=S015CS;LINKAGE=H

[17] KRASZNAHORKAY 16 report pLi $\to$ Be $\to$ $e\overline{e}N$ 5σ resonance at 16.7 MeV– possible evidence for nuclear interference or new light boson . However, such nuclear interference was ruled out already by ZANG 17. NODE=S015CS;LINKAGE=Q

[18] LEES 15E search for long-lived neutral particles produced in e^+e^- collisions in the Upsilon region, which decays into e^+e^-, $\mu^+\mu^-$, $e^\pm\mu^\mp$, $\pi^+\pi^-$, K^+K^-, or $\pi^\pm K^\mp$. See their Fig. 2 for cross section limits. NODE=S015CS;LINKAGE=F

[19] ADAMS 97B search for a hadron-like neutral particle produced in pN interactions, which decays into a ρ^0 and a weakly interacting massive particle. Upper limits are given for the ratio to K_L production for the mass range 1.2–5 GeV and lifetime 10^{-9}–10^{-4} s. See also our Light Gluino Section. NODE=S015CS;LINKAGE=E

[20] GALLAS 95 limit is for a weakly interacting neutral particle produced in 800 GeV/c pN interactions decaying with a lifetime of 10^{-4}–10^{-8} s. See their Figs. 8 and 9. Similar limits are obtained for a stable particle with interaction cross section 10^{-29}–10^{-33} cm^2. See Fig. 10. NODE=S015CS;LINKAGE=C

[21] AKESSON 91 limit is from weakly interacting neutral long-lived particles produced in pN reaction at 450 GeV/c performed at CERN SPS. Bourquin-Gaillard formula is used as the production model. The above limit is for $\tau > 10^{-7}$ s. For $\tau > 10^{-9}$ s, $\sigma < 10^{-30}$ cm^{-2}/nucleon is obtained. NODE=S015CS;LINKAGE=B

[22] BADIER 86 looked for long-lived particles at 300 GeV π^- beam dump. The limit applies for nonstrongly interacting neutral or charged particles with mass >2 GeV. The limit applies for particle modes, $\mu^+\pi^-$, $\mu^+\mu^-$, $\pi^+\pi^-$X, $\pi^+\pi^-\pi^\pm$ etc. See their figure 5 for the contours of limits in the mass-τ plane for each mode. NODE=S015CS;LINKAGE=D

[23] GUSTAFSON 76 is a 300 GeV FNAL experiment looking for heavy (m >2 GeV) long-lived neutral hadrons in the M4 neutral beam. The above typical value is for m = 3 GeV and assumes an interaction cross section of 1 mb. Values as a function of mass and interaction cross section are given in figure 2. NODE=S015CS;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	AABOUD	18CJ	PR D98 052008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59441
YOUR PAPER	AABOUD	18CM	PR D98 092008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59474
	AAIJ	18AJ	PRL 120 061801	R. Aaij *et al.*	(LHCb Collab.)	REFID=59199
	BANERJEE	18	PRL 120 231802	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58838
	BANERJEE	18A	PR D97 072002	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58916
	MARSICANO	18	PR D98 015031	L. Marsicano *et al.*		REFID=58967
	SIRUNYAN	18BB	JHEP 1806 120	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59112
	SIRUNYAN	18DA	JHEP 1811 042	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59306
	SIRUNYAN	18DD	EPJ C78 789	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59318
	SIRUNYAN	18DR	JHEP 1811 161	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59367
	SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
	SIRUNYAN	18ED	JHEP 1811 172	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59566
	AABOUD	17B	PL B765 32	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57706
	AAIJ	17BR	EPJ C77 812	R. Aaij *et al.*	(LHCb Collab.)	REFID=58366
	ZANG	17	PL B773 159	X. Zang, G.A. Miller	(WASH)	REFID=59311
	AAD	16O	PL B760 520	G. Aad *et al.*	(ATLAS Collab.)	REFID=57169
	AAD	16R	PL B755 285	G. Aad *et al.*	(ATLAS Collab.)	REFID=57172
	KRASZNAHO...	16	PRL 116 042501	A.J. Krasznahorkay *et al.*	(HINR, ANIK+)	REFID=59302
	LEES	15E	PRL 114 171801	J.P. Lees *et al.*	(BABAR Collab.)	REFID=56467
	ADAMS	97B	PRL 79 4083	J. Adams *et al.*	(FNAL KTeV Collab.)	REFID=45722
	GALLAS	95	PR D52 6	E. Gallas *et al.*	(MSU, FNAL, MIT, FLOR)	REFID=44291
	AKESSON	91	ZPHY C52 219	T. Akesson *et al.*	(HELIOS Collab.)	REFID=41739
	BADIER	86	ZPHY C31 21	J. Badier *et al.*	(NA3 Collab.)	REFID=10622
	GUSTAFSON	76	PRL 37 474	H.R. Gustafson *et al.*	(MICH)	REFID=12580

Reference = AABOUD 19L; 1812.03017
Verifier code = ATLAS

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April 5, 2019

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Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
$(B = \pm 1)$

NODE=MXXX045

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^{\pm}$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^{\pm}$ section.

NODE=S042220

$\Gamma(\mu^+\mu^-)/\Gamma_{\rm total}$ Γ_{514}/Γ

NODE=S042R7

Test for ΔB=1 weak neutral current. Allowed by higher-order electroweak interactions.

NODE=S042R7
NODE=S042R7

VALUE (units 10^{-9})	CL%	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.16^{+0.16}_{-0.14}}$ **OUR AVERAGE** Error includes scale factor of 1.9. See the ideogram below.					
YOUR DATA – 0.19 ± 0.16		[1] AABOUD	19L	ATLS	pp at 7, 8, 13 TeV
$0.15^{+0.12}_{-0.10}{}^{+0.02}_{-0.01}$		[2] AAIJ	17AI	LHCB	pp at 7, 8, 13 TeV
$0.39^{+0.16}_{-0.14}$		[3] KHACHATRY...	15BE	LHC	pp at 7, 8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
– 0.25 ± 0.20		[4] AABOUD	16L	ATLS	pp at 7, 8 TeV, Repl. by AABOUD 16L
$<$ 0.80	90	[5] AAIJ	13B	LHCB	Repl. by AAIJ 13BA
$<$ 0.63	90	[6] AAIJ	13BA	LHCB	Repl. by KHACHATRYAN 15BE
$<$ 3.8	90	[7] AALTONEN	13F	CDF	$p\overline{p}$ at 1.96 TeV
$<$ 0.92	90	[8] CHATRCHYAN	13AW	CMS	pp at 7, 8 TeV
$<$ 2.6	90	[5] AAIJ	12A	LHCB	Repl. by AAIJ 12W
$<$ 0.81	90	[9] AAIJ	12W	LHCB	Repl. by AAIJ 13B
$<$ 1.4	90	[9] CHATRCHYAN	12A	CMS	pp at 7 TeV
$<$ 12	90	[10] AAIJ	11B	LHCB	Repl. by AAIJ 12A
$<$ 5.0	90	[9] AALTONEN	11AG	CDF	$p\overline{p}$ at 1.96 TeV
$<$ 3.7	90	[9] CHATRCHYAN	11T	CMS	Repl. by CHATRCHYAN 12A

OCCUR=2

YOUR NOTE [1] Corresponds to a 95% CL upper limit of $< 2.1 \times 10^{-10}$.

NODE=S042R7;LINKAGE=F

[2] Corresponds to a 95% CL upper limit of $< 0.34 \times 10^{-9}$.

NODE=S042R7;LINKAGE=E

[3] Derived from the combined fit to CMS and LHCb data. Uncertainty includes both statistical and systematic component. Also reports $B(B^0 \to \mu^+\mu^-)/B(B_s \to \mu^+\mu^-) = 0.14^{+0.08}_{-0.06}$.

NODE=S042R7;LINKAGE=D

[4] This value is obtained from a profile-likelihood fit, see Fig. 9. It corresponds to an uppper limit of $< 0.42 \times 10^{-9}$ at 95% C.L.

NODE=S042R7;LINKAGE=AB

[5] Uses $B(B^+ \to J/\psi K^+ \to \mu^+\mu^- K^+) = (6.01\pm0.21)\times10^{-5}$ and $B(B^0 \to K^+\pi^-) = (1.94 \pm 0.06) \times 10^{-5}$ for normalization.

NODE=S042R7;LINKAGE=AJ

[6] Reports also a limit of $< 7.4 \times 10^{-10}$ at 95% CL. Uses normalization modes $B^+ \to J/\psi K^+ \to \mu^+\mu^- K^+$ and $B^0 \to K^+\pi^-$.

NODE=S042R7;LINKAGE=IA

[7] Uses normalization mode $B(B^+ \to J/\psi K^+) = (10.22 \pm 0.35) \times 10^{-4}$.

NODE=S042R7;LINKAGE=AN

[8] Uses $B(B^+ \to J/\psi K^+ \to \mu^+\mu^- K^+) = (6.0 \pm 0.2) \times 10^{-5}$ for normalization.

NODE=S042R7;LINKAGE=CT

[9] Uses $B(B^+ \to J/\psi K^+ \to \mu^+\mu^- K^+) = (6.01 \pm 0.21) \times 10^{-5}$.

NODE=S042R7;LINKAGE=AT

[10] Uses B production ratio $f(\overline{b} \to B^+)/f(\overline{b} \to B^0_s) = 3.71 \pm 0.47$ and three normalization modes.

NODE=S042R7;LINKAGE=AI

B^0 REFERENCES

NODE=S042

YOUR PAPER

AABOUD	19L	1812.03017	M. AABOUD *et al.*	(ATLAS Collab.)	REFID=59640
AAIJ	17AI	PRL 118 191801	R. Aaij *et al.*	(LHCb Collab.)	REFID=57928
AABOUD	16L	EPJ C76 513	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57469
KHACHATRY...	15BE	NAT 522 68	V. Khachatryan *et al.*	(CMS and LHCb Collab.)	REFID=56946
AAIJ	13B	PRL 110 021801	R. Aaij *et al.*	(LHCb Collab.)	REFID=54767
AAIJ	13BA	PRL 111 101805	R. Aaij *et al.*	(LHCb Collab.)	REFID=55227
AALTONEN	13F	PR D87 072003	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55142
CHATRCHYAN	13AW	PRL 111 101804	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=55225
AAIJ	12A	PL B708 55	R. Aaij *et al.*	(LHCb Collab.)	REFID=54033
AAIJ	12W	PRL 108 231801	R. Aaij *et al.*	(LHCb Collab.)	REFID=54217
CHATRCHYAN	12A	JHEP 1204 033	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54060
AAIJ	11B	PL B699 330	R. Aaij *et al.*	(LHCb Collab.)	REFID=16667
AALTONEN	11AG	PRL 107 191801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=53834
Also		PRL 107 239903 (errat.)	T. Aaltonen *et al.*	(CDF Collab.)	REFID=54005
CHATRCHYAN	11T	PRL 107 191802	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=53839

BOTTOM, STRANGE MESONS
$(B = \pm1,\ S = \mp1)$

NODE=MXXX046

$B_s^0 = s\overline{b}$, $\overline{B}_s^0 = \overline{s}\,b$, similarly for B_s^*'s

NODE=MXXX046

B_s^0

NODE=S086

$I(J^P) = 0(0^-)$

I, *J*, *P* need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S086

B_s^0 BRANCHING RATIOS

NODE=S086230

$\Gamma(\mu^+\mu^-)/\Gamma_{total}$ Γ_{126}/Γ

NODE=S086R14

Test for $\Delta B = 1$ weak neutral current.

NODE=S086R14
NODE=S086R14

VALUE (units 10^{-9})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
$2.7^{+0.6}_{-0.5}$ OUR AVERAGE		Error includes scale factor of 1.2.			
$2.8^{+0.8}_{-0.7}$ (YOUR DATA)		AABOUD	19L	ATLS	pp at 7, 8, 13 TeV
$3.0\pm0.6^{+0.3}_{-0.2}$		AAIJ	17AI	LHCB	pp at 7, 8, 13 TeV
$13\ ^{+9}_{-7}$		[1] AALTONEN	13F	CDF	$p\overline{p}$ at 1.96 TeV
$3.0^{+1.0}_{-0.9}$		[2] CHATRCHYAN	13AW	CMS	pp at 7, 8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.9^{+1.1}_{-0.8}$		[3] AABOUD	16L	ATLS	pp at 7, 8 TeV, Repl. by AABOUD 16L
$2.8^{+0.7}_{-0.6}$		[4] KHACHATRY...	15BE	LHC	pp at 7, 8 TeV
$3.2^{+1.4+0.5}_{-1.2-0.3}$		[5] AAIJ	13B	LHCB	Repl. by AAIJ 13BA
$2.9^{+1.1+0.3}_{-1.0-0.1}$		[6] AAIJ	13BA	LHCB	Repl. by KHACHATRYAN 15BE
<12	90	[7] ABAZOV	13C	D0	$p\overline{p}$ at 1.96 TeV
<19	90	[8] AAD	12AE	ATLS	pp at 7 TeV
<12	90	[9] AAIJ	12A	LHCB	Repl. by AAIJ 12W
< 3.8	90	[10] AAIJ	12W	LHCB	Repl. by AAIJ 13B
< 6.4	90	[11] CHATRCHYAN	12A	CMS	pp at 7 TeV
<43	90	[12] AAIJ	11B	LHCB	Repl. by AAIJ 12A
<35	90	[13] AALTONEN	11AG	CDF	$p\overline{p}$ at 1.96 TeV
<16	90	[14] CHATRCHYAN	11T	CMS	Repl. by CHATRCHYAN 12A
<42	90	[15] ABAZOV	10S	D0	$p\overline{p}$ at 1.96 TeV

OCCUR=2

[1] Uses normalization mode $B(B^+ \to J/\psi K^+) = (10.22\pm0.35)\times10^{-4}$ and B production ratio $f(\overline{b} \to B_s^0)/f(\overline{b} \to B_d^0) = 0.28 \pm 0.04$.

NODE=S086R14;LINKAGE=AN

[2] Uses B production ratio $f(\overline{b} \to B_s^0)/f(\overline{b} \to B_d^0) = 0.256 \pm 0.020$ and $B(B^+ \to J/\psi K^+ \to \mu^+\mu^- K^+) = (6.0 \pm 0.2) \times 10^{-5}$ for normalization.

NODE=S086R14;LINKAGE=CT

[3] This value corresponds to an upper limit of $< 3.0 \times 10^{-9}$ at 95% C.L. It uses $f_s/f_d = 0.24 \pm 0.02$.

NODE=S086R14;LINKAGE=D

[4] Determined from the joint fit to CMS and LHCb data. Uncertainty includes both statistical and systematic component.

NODE=S086R14;LINKAGE=B

[5] Uses B production ratio $f(\overline{b} \to B^0_s)/f(\overline{b} \to B^0_d) = 0.256 \pm 0.020$ and two normalization modes: $B(B^+ \to J/\psi K^+ \to \mu^+ \mu^- K^+) = (6.01 \pm 0.21) \times 10^{-5}$ and $B(B^0 \to K^+ \pi^-) = (1.94 \pm 0.06) \times 10^{-5}$. NODE=S086R14;LINKAGE=A

[6] Uses B production ratio $f(\overline{b} \to B^0_s)/f(\overline{b} \to B^0_d) = 0.259 \pm 0.015$ and normalization modes $B^+ \to J/\psi K^+ \to \mu^+ \mu^- K^+$ and $B^0 \to K^+ \pi^-$. NODE=S086R14;LINKAGE=IA

[7] Uses normalization mode $B(B^+ \to J/\psi K^+ \to \mu^+ \mu^- K^+) = (6.01 \pm 0.21) \times 10^{-5}$ and B production ratio $f(\overline{b} \to B^0_s)/f(\overline{b} \to B^0_d) = 0.263 \pm 0.017$. NODE=S086R14;LINKAGE=BA

[8] Uses B production ratio $f(\overline{b} \to B^+)/f(\overline{b} \to B^0_s) = 3.75 \pm 0.29$ and $B(B^+ \to J/\psi K^+ \to \mu^+ \mu^- K^+) = (6.0 \pm 0.2) \times 10^{-5}$. NODE=S086R14;LINKAGE=AD

[9] Uses B production ratio $f(\overline{b} \to B^0_s)/f(\overline{b} \to B^0_d) = 0.267^{+0.021}_{-0.020}$ and three normalization modes $B(B^+ \to J/\psi K^+ \to \mu^+ \mu^- K^+) = (6.01 \pm 0.21) \times 10^{-5}$, $B(B^0 \to K^+ \pi^-) = (1.94 \pm 0.06) \times 10^{-5}$, and $B(B^0_s \to J/\psi \phi \to \mu^+ \mu^- K^+ K^-) = (3.4 \pm 0.9) \times 10^{-5}$. NODE=S086R14;LINKAGE=AJ

[10] Uses B production ratio $f(\overline{b} \to B^0_s)/f(\overline{b} \to B^0_d) = 0.267^{+0.021}_{-0.020}$ and three normalization modes of $B^+ \to J/\psi K^+$, $B^0 \to K^+ \pi^-$, and $B^0_s \to J/\psi \phi$. NODE=S086R14;LINKAGE=IJ

[11] Uses $f_s/f_u = 0.267 \pm 0.021$ and $B(B^+ \to J/\psi K^+ \to \mu^+ \mu^- K^+) = (6.0 \pm 0.2) \times 10^{-5}$. NODE=S086R14;LINKAGE=CA

[12] Uses B production ratio $f(\overline{b} \to B^+)/f(\overline{b} \to B^0_s) = 3.71 \pm 0.47$ and three normalization modes. NODE=S086R14;LINKAGE=AI

[13] Uses B production ratio $f(\overline{b} \to B^+)/f(\overline{b} \to B^0_s) = 3.55 \pm 0.47$ and $B(B^+ \to J/\psi K^+ \to \mu^+ \mu^- K^+) = (6.01 \pm 0.21) \times 10^{-5}$. NODE=S086R14;LINKAGE=AT

[14] Uses B production ratio $f(\overline{b} \to B^+)/f(\overline{b} \to B^0_s) = 3.55 \pm 0.42$ and $B(B^+ \to J/\psi K^+ \to \mu^+ \mu^- K^+) = (6.0 \pm 0.2) \times 10^{-5}$. NODE=S086R14;LINKAGE=CH

[15] Uses B production ratio $f(\overline{b} \to B^+)/f(\overline{b} \to B^0_s) = 3.86 \pm 0.59$, and the number of $B^+ \to J/\psi K^+$ decays. NODE=S086R14;LINKAGE=AA

B^0_s REFERENCES

NODE=S086

YOUR PAPER	AABOUD	19L	1812.03017	M. AABOUD *et al.*	(ATLAS Collab.)	REFID=59640
	AAIJ	17AI	PRL 118 191801	R. Aaij *et al.*	(LHCb Collab.)	REFID=57928
	AABOUD	16L	EPJ C76 513	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57469
	KHACHATRY...	15BE	NAT 522 68	V. Khachatryan *et al.*	(CMS and LHCb Collab.)	REFID=56946
	AAIJ	13B	PRL 110 021801	R. Aaij *et al.*	(LHCb Collab.)	REFID=54767
	AAIJ	13BA	PRL 111 101805	R. Aaij *et al.*	(LHCb Collab.)	REFID=55227
	AALTONEN	13F	PR D87 072003	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55142
	ABAZOV	13C	PR D87 072006	V.M. Abazov *et al.*	(D0 Collab.)	REFID=55143
	CHATRCHYAN	13AW	PRL 111 101804	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=55225
	AAD	12AE	PL B713 387	G. Aad *et al.*	(ATLAS Collab.)	REFID=54194
	AAIJ	12A	PL B708 55	R. Aaij *et al.*	(LHCb Collab.)	REFID=54033
	AAIJ	12W	PRL 108 231801	R. Aaij *et al.*	(LHCb Collab.)	REFID=54217
	CHATRCHYAN	12A	JHEP 1204 033	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54060
	AAIJ	11B	PL B699 330	R. Aaij *et al.*	(LHCb Collab.)	REFID=16667
	AALTONEN	11AG	PRL 107 191801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=53834
	Also		PRL 107 239903 (errat.)	T. Aaltonen *et al.*	(CDF Collab.)	REFID=54005
	CHATRCHYAN	11T	PRL 107 191802	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=53839
	ABAZOV	10S	PL B693 539	V.M. Abazov *et al.*	(D0 Collab.)	REFID=53481

Reference = LEES 18C; PR D98 071102
Verifier code = BABAR

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PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Fabio Anulli

EMAIL: anulli@slac.stanford.edu

April 5, 2019

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(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
$(B = \pm 1)$

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^\pm$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^\pm$ section.

NODE=S042220

$\Gamma(pp\overline{p}\overline{p})/\Gamma_{total}$ Γ_{460}/Γ

NODE=S042P27
NODE=S042P27

	VALUE (units 10^{-7})	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<2.0**	90	[1] LEES	18C	BABR	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE [1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S042P27;LINKAGE=A

B^0 REFERENCES

NODE=S042

YOUR PAPER LEES 18C PR D98 071102 J.P. Lees *et al.* (BABAR Collab.)

REFID=59451

Reference = MARSICANO 18; PR D98 015031
Verifier code = BATTAGLIER

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Marco Battaglieri

EMAIL: marco.battaglieri@ge.infn.it

April 5, 2019

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USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Heavy Particle Production Cross Section

NODE=S015CS
NODE=S015CS

• • • We do not use the following data for averages, fits, limits, etc. • • •

YOUR DATA

VALUE (cm^2/N)	CL%	DOCUMENT ID		TECN	COMMENT
		[1] AABOUD	18CJ	ATLS	$pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$
		[2] AABOUD	18CM	ATLS	$pp \to e\mu/e\tau/\mu\tau$
		[3] AAIJ	18AJ	LHCB	$pp \to A' \to \mu^+\mu^-$; dark photon
		[4] BANERJEE	18	NA64	$eZ \to eZX(A')$
		[5] BANERJEE	18A	NA64	$eZ \to eZA'$, $A' \to \chi\chi$
		[6] MARSICANO	18	E137	$e^+e^- \to A'(\gamma)$ visible decay
		[7] SIRUNYAN	18BB	CMS	$pp \to Z' \to \ell^+\ell^-$ at 13 TeV
		[8] SIRUNYAN	18DA	CMS	$pp \to$ Black Hole, string ball, sphaleron
		[9] SIRUNYAN	18DD	CMS	$pp \to jj$
		[10] SIRUNYAN	18DR	CMS	$pp \to b\mu\overline{\mu}$
		[11] SIRUNYAN	18DU	CMS	$pp \to \gamma\gamma$
		[12] SIRUNYAN	18ED	CMS	$pp \to V \to Wh$; $h \to b\overline{b}$; $W \to l\nu$
		[13] AABOUD	17B	ATLS	WH, ZH resonance
		[14] AAIJ	17BR	LHCB	$pp \to \pi_V\pi_V$, $\pi_V \to jj$
		[15] AAD	16O	ATLS	ℓ + (ℓs or jets)
		[16] AAD	16R	ATLS	WW ,WZ ,ZZ resonance
		[17] KRASZNAHO...	16		p^7Li $\to$ ^{8}Be $\to X(17)N$, $X(17) \to e^+e^-$
		[18] LEES	15E	BABR	e^+e^- collisions
		[19] ADAMS	97B	KTEV	m= 1.2–5 GeV
$< 10^{-36}$–10^{-33}	90	[20] GALLAS	95	TOF	m= 0.5–20 GeV
$<(4–0.3) \times 10^{-31}$	95	[21] AKESSON	91	CNTR	m = 0–5 GeV
$<2 \times 10^{-36}$	90	[22] BADIER	86	BDMP	$\tau = (0.05–1.) \times 10^{-8}$s
$<2.5 \times 10^{-35}$		[23] GUSTAFSON	76	CNTR	$\tau > 10^{-7}$ s

YOUR NOTE

[1] AABOUD 18CJ make multichannel search for $pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$ at 13 TeV, 36.1 fb^{-1}; no signal found; limits placed for several BSM models. NODE=S015CS;LINKAGE=R

[2] AABOUD 18CM search for lepton-flavor violating resonance in $pp \to e\mu/e\tau/\mu\tau$ at 13 TeV, 36.1 fb^{-1}; no signal is found and limits placed for various BSM models. NODE=S015CS;LINKAGE=S

[3] AAIJ 18AJ search for prompt and delayed dark photon decay $A' \to \mu^+\mu^-$ at LHCb detector using 1.6 fb^{-1} of pp collisions at 13 TeV; limits on m(A') vs. kinetic mixing are set. NODE=S015CS;LINKAGE=K

[4] BANERJEE 18 search for dark photon A'/16.7 MeV boson X at NA64 via $eZ \to eZX(A')$; no signal found and limits set on the X-e^- coupling ϵ_e in the range $1.3 \times 10^{-4} \le \epsilon_e \le 4.2 \times 10^{-4}$ excluding part of the allowed parameter space. NODE=S015CS;LINKAGE=L

[5] BANERJEE 18A search for invisibly decaying dark photons in $eZ \to eZA'$, $A' \to$ invisible; no signal found and limits set on mixing for m(A') $<$ 1 GeV. NODE=S015CS;LINKAGE=M

[6] MARSICANO 18 search for dark photon $e^+e^- \to A'(\gamma)$ visible decay in SLAC E137 e beam dump data. No signal observed and limits set in ϵ coupling vs m(A') plane, see their figure 7. NODE=S015CS;LINKAGE=P

[7] SIRUNYAN 18BB search for high mass dilepton resonance; no signal found and exclude portions of p-space of Z', KK graviton models. NODE=S015CS;LINKAGE=O

[8] SIRUNYAN 18DA search for $pp \to$ Black Hole, string ball, sphaleron via high multiplicity events at 13 TeV, 35.9 fb^{-1}; no signal, require e.g. m(BH)¿10.1 TeV NODE=S015CS;LINKAGE=T

[9] SIRUNYAN 18DD search for $pp \to jj$ deviations in dijet angular distribution. No signal observed. Set limits on large extra dimensions, black holes and DM mediators e.g. m(BH) $>$ 5.9–8.2 TeV. NODE=S015CS;LINKAGE=U

[10] SIRUNYAN 18DR search for dimuon resonance in $pp \to b\mu\overline{\mu}$ at 8 and 13 TeV. Slight excess seen at m($\mu\overline{\mu}$) $\sim$ 28 GeV in some channels. NODE=S015CS;LINKAGE=V

[11] SIRUNYAN 18DU search for high mass diphoton resonance in $pp \rightarrow \gamma\gamma$ at 13 TeV using 35.9 fb^{-1}; no signal; limits placed on RS Graviton, LED, and clockwork. NODE=S015CS;LINKAGE=W

[12] SIRUNYAN 18ED search for $pp \rightarrow V \rightarrow Wh$; $h \rightarrow b\overline{b}$; $W \rightarrow l\nu$ at 13 TeV with 35.9 fb^{-1}; no signal; limits set on m($W^{'}$)¿2.9 TeV. NODE=S015CS;LINKAGE=X

[13] AABOUD 17B exclude m(W', Z') $<$ 1.49–2.31 TeV depending on the couplings and W'/Z' degeneracy assumptions via WH, ZH search in pp collisions at 13 TeV with 3.2 fb^{-1} of data. NODE=S015CS;LINKAGE=I

[14] AAIJ 17BR search for long-lived hidden valley pions from Higgs decay. Limits are set on the signal strength as a function of the mass and lifetime of the long-lived particle in their Fig. 4 and Tab. 4. NODE=S015CS;LINKAGE=J

[15] AAD 16O search for high E_T ℓ + (ℓs or jets) with 3.2 fb^{-1} at 13 TeV; exclude micro black holes mass $<$ 8 TeV (Fig. 3) for models with two extra dimensions. NODE=S015CS;LINKAGE=G

[16] AAD 16R search for WW, WZ, ZZ resonance in 20.3 fb^{-1} at 8 TeV data; limits placed on massive RS graviton (Fig. 4). NODE=S015CS;LINKAGE=H

[17] KRASZNAHORKAY 16 report pLi $\rightarrow$ Be $\rightarrow$ $e\overline{e}N$ 5σ resonance at 16.7 MeV– possible evidence for nuclear interference or new light boson . However, such nuclear interference was ruled out already by ZANG 17. NODE=S015CS;LINKAGE=Q

[18] LEES 15E search for long-lived neutral particles produced in e^+e^- collisions in the Upsilon region, which decays into e^+e^-, $\mu^+\mu^-$, $e^\pm\mu^\mp$, $\pi^+\pi^-$, K^+K^-, or $\pi^\pm K^\mp$. See their Fig. 2 for cross section limits. NODE=S015CS;LINKAGE=F

[19] ADAMS 97B search for a hadron-like neutral particle produced in pN interactions, which decays into a ρ^0 and a weakly interacting massive particle. Upper limits are given for the ratio to K_L production for the mass range 1.2–5 GeV and lifetime 10^{-9}–10^{-4} s. See also our Light Gluino Section. NODE=S015CS;LINKAGE=E

[20] GALLAS 95 limit is for a weakly interacting neutral particle produced in 800 GeV/c pN interactions decaying with a lifetime of 10^{-4}–10^{-8} s. See their Figs. 8 and 9. Similar limits are obtained for a stable particle with interaction cross section 10^{-29}–10^{-33} cm^2. See Fig. 10. NODE=S015CS;LINKAGE=C

[21] AKESSON 91 limit is from weakly interacting neutral long-lived particles produced in pN reaction at 450 GeV/c performed at CERN SPS. Bourquin-Gaillard formula is used as the production model. The above limit is for $\tau > 10^{-7}$ s. For $\tau > 10^{-9}$ s, $\sigma < 10^{-30}$ cm^{-2}/nucleon is obtained. NODE=S015CS;LINKAGE=B

[22] BADIER 86 looked for long-lived particles at 300 GeV π^- beam dump. The limit applies for nonstrongly interacting neutral or charged particles with mass >2 GeV. The limit applies for particle modes, $\mu^+\pi^-$, $\mu^+\mu^-$, $\pi^+\pi^-$X, $\pi^+\pi^-\pi^\pm$ etc. See their figure 5 for the contours of limits in the mass-τ plane for each mode. NODE=S015CS;LINKAGE=D

[23] GUSTAFSON 76 is a 300 GeV FNAL experiment looking for heavy (m >2 GeV) long-lived neutral hadrons in the M4 neutral beam. The above typical value is for m = 3 GeV and assumes an interaction cross section of 1 mb. Values as a function of mass and interaction cross section are given in figure 2. NODE=S015CS;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	AABOUD	18CJ	PR D98 052008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59441
	AABOUD	18CM	PR D98 092008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59474
	AAIJ	18AJ	PRL 120 061801	R. Aaij *et al.*	(LHCb Collab.)	REFID=59199
	BANERJEE	18	PRL 120 231802	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58838
	BANERJEE	18A	PR D97 072002	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58916
YOUR PAPER	MARSICANO	18	PR D98 015031	L. Marsicano *et al.*		REFID=58967
	SIRUNYAN	18BB	JHEP 1806 120	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59112
	SIRUNYAN	18DA	JHEP 1811 042	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59306
	SIRUNYAN	18DD	EPJ C78 789	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59318
	SIRUNYAN	18DR	JHEP 1811 161	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59367
	SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
	SIRUNYAN	18ED	JHEP 1811 172	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59566
	AABOUD	17B	PL B765 32	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57706
	AAIJ	17BR	EPJ C77 812	R. Aaij *et al.*	(LHCb Collab.)	REFID=58366
	ZANG	17	PL B773 159	X. Zang, G.A. Miller	(WASH)	REFID=59311
	AAD	16O	PL B760 520	G. Aad *et al.*	(ATLAS Collab.)	REFID=57169
	AAD	16R	PL B755 285	G. Aad *et al.*	(ATLAS Collab.)	REFID=57172
	KRASZNAHO...	16	PRL 116 042501	A.J. Krasznahorkay *et al.*	(HINR, ANIK+)	REFID=59302
	LEES	15E	PRL 114 171801	J.P. Lees *et al.*	(BABAR Collab.)	REFID=56467
	ADAMS	97B	PRL 79 4083	J. Adams *et al.*	(FNAL KTeV Collab.)	REFID=45722
	GALLAS	95	PR D52 6	E. Gallas *et al.*	(MSU, FNAL, MIT, FLOR)	REFID=44291
	AKESSON	91	ZPHY C52 219	T. Akesson *et al.*	(HELIOS Collab.)	REFID=41739
	BADIER	86	ZPHY C31 21	J. Badier *et al.*	(NA3 Collab.)	REFID=10622
	GUSTAFSON	76	PRL 37 474	H.R. Gustafson *et al.*	(MICH)	REFID=12580

Reference = LOUVOT 10; PRL 104 231801
Verifier code = BELLE

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Karim Trabelsi

EMAIL: karim.trabelsi@kek.jp

April 5, 2019

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Berkeley, CA 94720-8153
USA

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FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM, STRANGE MESONS
($B = \pm1$, $S = \mp1$)

$B^0_s = s\overline{b}$, $\overline{B}^0_s = \overline{s}\,b$, similarly for B^*_s's

NODE=MXXX046

NODE=MXXX046

NODE=S086

B^0_s

$I(J^P) = 0(0^-)$

I, J, P need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S086

B^0_s BRANCHING RATIOS

NODE=S086230

$\Gamma(D^-_s \rho^+)/\Gamma(D^-_s \pi^+)$ — Γ_{11}/Γ_{10}

NODE=S086P41
NODE=S086P41

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**2.3±0.4±0.2**	LOUVOT	10	BELL	$e^+ e^- \to \Upsilon(5S)$

$\Gamma(D^{*-}_s \pi^+)/\Gamma(D^-_s \pi^+)$ — Γ_{20}/Γ_{10}

NODE=S086P40
NODE=S086P40

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{0.65^{+0.15}_{-0.13}\pm0.07}$	LOUVOT	10	BELL	$e^+ e^- \to \Upsilon(5S)$

$\Gamma(D^{*-}_s \rho^+)/\Gamma(D^-_s \pi^+)$ — Γ_{22}/Γ_{10}

NODE=S086P42
NODE=S086P42

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**3.2±0.6±0.3**	LOUVOT	10	BELL	$e^+ e^- \to \Upsilon(5S)$

B^0_s REFERENCES

NODE=S086

YOUR PAPER LOUVOT 10 PRL 104 231801 R. LOUVOT *et al.* (BELLE Collab.) REFID=53334

Reference = SIBIDANOV 18; PRL 121 031801
Verifier code = BELLE

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April 5, 2019

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EMAIL: wmyao@lbl.gov

BOTTOM MESONS
($B = \pm1$)

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$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=S041

$B^\pm$

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S041

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

B^+ BRANCHING RATIOS

NODE=S041215

$\Gamma(\mu^+\nu_\mu)/\Gamma_{\text{total}}$ **Γ_{32}/Γ**

NODE=S041S56
NODE=S041S56

	VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
	0.290 to 1.07 (CL = 90%)	[$<1.0 \times 10^{-6}$ (CL = 90%) OUR 2018 BEST LIMIT]				
YOUR DATA	**0.29 to 1.07**	90	[1] SIBIDANOV	18	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •					
	$<$ 2.7	90	[2] YOOK	15	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	$<$11	90	[3] AUBERT	10E	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	$<$ 1.0	90	[3] AUBERT	09V	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	$<$ 5.6	90	[3] AUBERT	08AD	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	$<$ 1.7	90	[3,4] SATOYAMA	07	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	$<$ 6.6	90	AUBERT	04O	BABR	Repl. by AUBERT 09V
	$<$21	90	ARTUSO	95	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

YOUR NOTE [1] This is a 90% confidence interval in the frequentist approach. A 2.4 standard deviation signal above the background is found, with a measured branching fraction $(6.46 \pm 2.22 \pm 1.60) \times 10^{-7}$.

NODE=S041S56;LINKAGE=B

[2] Assumes B($\Upsilon(4S) \rightarrow B^+B^-$) = 0.513 ± 0.006.

NODE=S041S56;LINKAGE=A

[3] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S041S56;LINKAGE=EP

[4] Superseded by SIBIDANOV 18.

NODE=S041S56;LINKAGE=C

$B^\pm$ REFERENCES

NODE=S041

YOUR PAPER	SIBIDANOV	18	PRL 121 031801	A. Sibidanov *et al.*	(BELLE Collab.)	REFID=58854
	YOOK	15	PR D91 052016	Y. Yook *et al.*	(BELLE Collab.)	REFID=56552
	AUBERT	10E	PR D81 051101	B. Aubert *et al.*	(BABAR Collab.)	REFID=53218
	AUBERT	09V	PR D79 091101	B. Aubert *et al.*	(BABAR Collab.)	REFID=52882
	AUBERT	08AD	PR D77 091104	B. Aubert *et al.*	(BABAR Collab.)	REFID=52347
	SATOYAMA	07	PL B647 67	N. Satoyama *et al.*	(BELLE Collab.)	REFID=51649
	AUBERT	04O	PRL 92 221803	B. Aubert *et al.*	(BABAR Collab.)	REFID=49930
	ARTUSO	95	PRL 75 785	M. Artuso *et al.*	(CLEO Collab.)	REFID=44347

Reference = NAKANO 18; PR D97 092003
Verifier code = BELLE

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PLEASE REPLY WITHIN ONE WEEK

Karim Trabelsi

EMAIL: karim.trabelsi@kek.jp

April 5, 2019

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Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
($B = \pm 1$)

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^\pm$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

NODE=S042

CP VIOLATION PARAMETERS

NODE=S042229

$C_{\eta K^0 \gamma}$ ($B^0 \to \eta K^0 \gamma$)

NODE=S042CEG

	VALUE	DOCUMENT ID	TECN	COMMENT
	0.1 ±0.4 OUR AVERAGE Error includes scale factor of 1.4. [-0.3 ± 0.4 OUR 2018 AVERAGE]			
YOUR DATA	$0.48 \pm 0.41 \pm 0.07$	[1,2] NAKANO 18	BELL	$e^+ e^- \to \Upsilon(4S)$
	$-0.32^{+0.40}_{-0.39} \pm 0.07$	[3] AUBERT 09	BABR	$e^+ e^- \to \Upsilon(4S)$

NODE=S042CEG

NEW

[1] Assuming $m_{\eta K^0_S} < 2.1$ GeV.

YOUR NOTE [2] Reversed the sign for C=-A.

YOUR NOTE [3] Assuming $m_{\eta K} < 3.25$ GeV.

NODE=S042CEG;LINKAGE=A

NODE=S042CEG;LINKAGE=B

NODE=S042CEG;LINKAGE=AR

$S_{\eta K^0 \gamma}$ ($B^0 \to \eta K^0 \gamma$)

NODE=S042SEG

	VALUE	DOCUMENT ID	TECN	COMMENT
	−0.5 ±0.5 OUR AVERAGE Error includes scale factor of 1.2. [-0.2 ± 0.5 OUR 2018 AVERAGE]			
YOUR DATA	$-1.32 \pm 0.77 \pm 0.36$	[1] NAKANO 18	BELL	$e^+ e^- \to \Upsilon(4S)$
	$-0.18^{+0.49}_{-0.46} \pm 0.12$	[2] AUBERT 09	BABR	$e^+ e^- \to \Upsilon(4S)$

NODE=S042SEG

NEW

YOUR NOTE [1] Assuming $m_{\eta K^0_S} < 2.1$ GeV.

[2] Assuming $m_{\eta K} < 3.25$ GeV.

NODE=S042SEG;LINKAGE=A

NODE=S042SEG;LINKAGE=AR

B^0 REFERENCES

NODE=S042

YOUR PAPER NAKANO 18 PR D97 092003 H. Nakano *et al.* (BELLE Collab.) REFID=58936

AUBERT 09 PR D79 011102 B. Aubert *et al.* (BABAR Collab.) REFID=52639

Reference = VOSSEN 18; PR D98 012005
Verifier code = BELLE

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NODE=MXXX045

NODE=S041

$B^{\pm}$

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S041

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

B^+ BRANCHING RATIOS

NODE=S041215

$\Gamma(D^-\pi^+\ell^+\nu_\ell)/\Gamma_{total}$ Γ_8/Γ

NODE=S041Q54
NODE=S041Q54

	VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
	4.4 ±0.4 OUR AVERAGE				
	[(4.1 ± 0.5) × 10^{-3} OUR 2018 AVERAGE]				
YOUR DATA	4.55±0.27±0.39	VOSSEN	18	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	4.2 ±0.6 ±0.3	[1] AUBERT	08Q	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	4.1 ±0.6 ±0.2	[1,2] LIVENTSEV	08	BELL	Repl. by VOSSEN 18
	5.5 ±0.9 ±0.2	[3] LIVENTSEV	05	BELL	Repl. by LIVENTSEV 08

NEW

[1] Uses a fully reconstructed B meson as a tag on the recoil side.

NODE=S041Q54;LINKAGE=BE

[2] LIVENTSEV 08 reports $(4.0 \pm 0.4 \pm 0.6) \times 10^{-3}$ from a measurement of $[\Gamma(B^+ \rightarrow D^-\pi^+\ell^+\nu_\ell)/\Gamma_{total}]$ / $[B(B^+ \rightarrow \overline{D}^0\ell^+\nu_\ell)]$ assuming $B(B^+ \rightarrow \overline{D}^0\ell^+\nu_\ell) = (2.15 \pm 0.22) \times 10^{-2}$, which we rescale to our best value $B(B^+ \rightarrow \overline{D}^0\ell^+\nu_\ell) = (2.20 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S041Q54;LINKAGE=LV

[3] LIVENTSEV 05 reports $[\Gamma(B^+ \rightarrow D^-\pi^+\ell^+\nu_\ell)/\Gamma_{total}]$ / $[B(B^0 \rightarrow D^-\ell^+\nu_\ell)]$ $= 0.25 \pm 0.03 \pm 0.03$ which we multiply by our best value $B(B^0 \rightarrow D^-\ell^+\nu_\ell) = (2.20 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S041Q54;LINKAGE=LI

$\Gamma(D^{*-}\pi^+\ell^+\nu_\ell)/\Gamma_{total}$ Γ_{12}/Γ

NODE=S041Q55
NODE=S041Q55

	VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
	6.0 ±0.4 OUR AVERAGE				
	[(6.1 ± 0.6) × 10^{-3} OUR 2018 AVERAGE]				
YOUR DATA	6.03±0.43±0.38	VOSSEN	18	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	5.9 ±0.5 ±0.4	[1] AUBERT	08Q	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	6.5 ±1.0 ±0.3	[1,2] LIVENTSEV	08	BELL	Repl. by VOSSEN 18
	5.9 ±1.4 ±0.1	[3,4] LIVENTSEV	05	BELL	Repl. by LIVENTSEV 08

NEW

[1] Uses a fully reconstructed B meson as a tag on the recoil side.

NODE=S041Q55;LINKAGE=BE

[2] LIVENTSEV 08 reports $(6.4 \pm 0.8 \pm 0.9) \times 10^{-3}$ from a measurement of $[\Gamma(B^+ \rightarrow D^{*-}\pi^+\ell^+\nu_\ell)/\Gamma_{total}]$ / $[B(B^+ \rightarrow \overline{D}^0\ell^+\nu_\ell)]$ assuming $B(B^+ \rightarrow \overline{D}^0\ell^+\nu_\ell) = (2.15 \pm 0.22) \times 10^{-2}$, which we rescale to our best value $B(B^+ \rightarrow \overline{D}^0\ell^+\nu_\ell) = (2.20 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S041Q55;LINKAGE=LV

[3] Excludes D^{*+} contribution to $D\pi$ modes.

NODE=S041Q55;LINKAGE=EC

[4] LIVENTSEV 05 reports $[\Gamma(B^+ \rightarrow D^{*-}\pi^+\ell^+\nu_\ell)/\Gamma_{total}]$ / $[B(B^0 \rightarrow D^*(2010)^-\ell^+\nu_\ell)] = 0.12 \pm 0.02 \pm 0.02$ which we multiply by our best value $B(B^0 \rightarrow D^*(2010)^-\ell^+\nu_\ell) = (4.88 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S041Q55;LINKAGE=LI

$B^{\pm}$ REFERENCES

NODE=S041

YOUR PAPER

VOSSEN	18	PR D98 012005	A. Vossen *et al.*	(BELLE Collab.)	REFID=58961
AUBERT	08Q	PRL 100 151802	B. Aubert *et al.*	(BABAR Collab.)	REFID=52229
LIVENTSEV	08	PR D77 091503	D. Liventsev *et al.*	(BELLE Collab.)	REFID=52230
LIVENTSEV	05	PR D72 051109	D. Liventsev *et al.*	(BELLE Collab.)	REFID=50903

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s$/b-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^{\pm}$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^{\pm}$ section.

NODE=S042220

$\Gamma(\overline{D}^0\pi^-\ell^+\nu_\ell)/\Gamma_{total}$ Γ_8/Γ

NODE=S042Q36
NODE=S042Q36

VALUE (units 10^{-3})		DOCUMENT ID	TECN	COMMENT
4.1 ±0.5 OUR AVERAGE				
[(4.3 ± 0.6) × 10^{-3} OUR 2018 AVERAGE]				
YOUR DATA 4.05±0.36±0.41		VOSSEN	18 BELL	$e^+e^- \to \Upsilon(4S)$
4.3 ±0.8 ±0.3	[1]	AUBERT	08Q BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.4 ±0.9 ±0.2	[1,2]	LIVENTSEV	08 BELL	Repl. by VOSSEN 18
3.3 ±0.9 ±0.1	[3]	LIVENTSEV	05 BELL	Repl. by LIVENTSEV 08

NEW

[1] Uses a fully reconstructed B meson as a tag on the recoil side. NODE=S042Q36;LINKAGE=BE

[2] LIVENTSEV 08 reports $(4.2 \pm 0.7 \pm 0.6) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \to \overline{D}^0\pi^-\ell^+\nu_\ell)/\Gamma_{total}]$ / $[B(B^0 \to D^-\ell^+\nu_\ell)]$ assuming $B(B^0 \to D^-\ell^+\nu_\ell) = (2.12 \pm 0.20) \times 10^{-2}$, which we rescale to our best value $B(B^0 \to D^-\ell^+\nu_\ell) = (2.20 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=S042Q36;LINKAGE=LV

[3] LIVENTSEV 05 reports $[\Gamma(B^0 \to \overline{D}^0\pi^-\ell^+\nu_\ell)/\Gamma_{total}]$ / $[B(B^+ \to \overline{D}^0\ell^+\nu_\ell)] = 0.15 \pm 0.03 \pm 0.03$ which we multiply by our best value $B(B^+ \to \overline{D}^0\ell^+\nu_\ell) = (2.20 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=S042Q36;LINKAGE=LI

$\Gamma(\overline{D}^{*0}\pi^-\ell^+\nu_\ell)/\Gamma_{total}$ Γ_{12}/Γ

NODE=S042Q37
NODE=S042Q37

VALUE (units 10^{-3})		DOCUMENT ID	TECN	COMMENT
5.8 ±0.8 OUR AVERAGE Error includes scale factor of 1.4. [(4.9 ± 0.8) × 10^{-3} OUR 2018 AVERAGE]				
YOUR DATA 6.46±0.53±0.52		VOSSEN	18 BELL	$e^+e^- \to \Upsilon(4S)$
4.8 ±0.8 ±0.4	[1]	AUBERT	08Q BABR	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
5.8 ±2.3 ±0.3	[1,2]	LIVENTSEV	08 BELL	Repl. by VOSSEN 18
4.9 ±1.1 ±0.1	[3,4]	LIVENTSEV	05 BELL	Repl. by LIVENTSEV 08

NEW

[1] Uses a fully reconstructed B meson as a tag on the recoil side. NODE=S042Q37;LINKAGE=BE

[2] LIVENTSEV 08 reports $(5.6 \pm 2.1 \pm 0.8) \times 10^{-3}$ from a measurement of $[\Gamma(B^0 \to \overline{D}^{*0}\pi^-\ell^+\nu_\ell)/\Gamma_{total}]$ / $[B(B^0 \to D^-\ell^+\nu_\ell)]$ assuming $B(B^0 \to D^-\ell^+\nu_\ell) = (2.12 \pm 0.20) \times 10^{-2}$, which we rescale to our best value $B(B^0 \to D^-\ell^+\nu_\ell) = (2.20 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=S042Q37;LINKAGE=LV

[3] Excludes D^{*+} contribution to $D\pi$ modes. NODE=S042Q37;LINKAGE=EC

[4] LIVENTSEV 05 reports $[\Gamma(B^0 \to \overline{D}^{*0}\pi^-\ell^+\nu_\ell)/\Gamma_{total}]$ / $[B(B^+ \to \overline{D}^*(2007)^0\ell^+\nu_\ell)] = 0.10 \pm 0.02 \pm 0.01$ which we multiply by our best value $B(B^+ \to \overline{D}^*(2007)^0\ell^+\nu_\ell) = (4.88 \pm 0.10) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=S042Q37;LINKAGE=LI

B^0 REFERENCES

NODE=S042

YOUR PAPER	VOSSEN	18	PR D98 012005	A. Vossen *et al.*	(BELLE Collab.)	REFID=58961
	AUBERT	08Q	PRL 100 151802	B. Aubert *et al.*	(BABAR Collab.)	REFID=52229
	LIVENTSEV	08	PR D77 091503	D. Liventsev *et al.*	(BELLE Collab.)	REFID=52230
	LIVENTSEV	05	PR D72 051109	D. Liventsev *et al.*	(BELLE Collab.)	REFID=50903

Reference = LI 18A; EPJ C78 252
Verifier code = BELLE

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NODE=MXXX045

NODE=MXXX045

NODE=S041

$B^\pm$

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S041

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

B^+ BRANCHING RATIOS

NODE=S041215

$\Gamma(\Lambda_c^+\Lambda_c^- K^+)/\Gamma_{total}$ **Γ_{540}/Γ**

NODE=S041R02
NODE=S041R02

	VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
	4.9 ±0.7 OUR AVERAGE				
	[$(7.0 \pm 2.2) \times 10^{-4}$ OUR 2018 AVERAGE]				
YOUR DATA	4.80±0.43±0.60	LI	18A	BELL	$e^+e^- \to \Upsilon(4S)$
	9.1 ±4.5 ±0.5	[1,2] AUBERT	08H	BABR	$e^+e^- \to \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	6.3 ±2.5 ±0.3	[2,3] GABYSHEV	06	BELL	Repl. by LI 18A.

NEW

[1] AUBERT 08H reports $(1.14 \pm 0.15 \pm 0.62) \times 10^{-3}$ from a measurement of $[\Gamma(B^+ \to \Lambda_c^+\Lambda_c^- K^+)/\Gamma_{total}] \times [B(\Lambda_c^+ \to pK^-\pi^+)]$ assuming $B(\Lambda_c^+ \to pK^-\pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \to pK^-\pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S041R02;LINKAGE=AU

[2] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S041R02;LINKAGE=EP

[3] GABYSHEV 06 reports $(7.9^{+1.0}_{-0.9} \pm 3.6) \times 10^{-4}$ from a measurement of $[\Gamma(B^+ \to \Lambda_c^+\Lambda_c^- K^+)/\Gamma_{total}] \times [B(\Lambda_c^+ \to pK^-\pi^+)]$ assuming $B(\Lambda_c^+ \to pK^-\pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda_c^+ \to pK^-\pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S041R02;LINKAGE=AG

$\Gamma(\Xi_c(2930)\Lambda_c^+,\ \Xi_c \to K^+\Lambda_c^-)/\Gamma_{total}$ **Γ_{541}/Γ**

NODE=S041P53
NODE=S041P53

	VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**1.73±0.45±0.21**	[1] LI	18A	BELL	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE [1] The $\Xi_c(2930)$ is found in its decay to $K^-\Lambda_c^+$ in $B^- \to K^-\Lambda_c^-\Lambda_c^+$ with a significance more than 5 sigma.

NODE=S041P53;LINKAGE=A

$B^\pm$ REFERENCES

NODE=S041

YOUR PAPER	LI	18A	EPJ C78 252	Y.B. Li *et al.*	(BELLE Collab.)	REFID=59162
	AUBERT	08H	PR D77 031101	B. Aubert *et al.*	(BABAR Collab.)	REFID=52169
	GABYSHEV	06	PRL 97 202003	N. Gabyshev *et al.*	(BELLE Collab.)	REFID=51488

Reference = LI 18D; EPJ C78 928
Verifier code = BELLE

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NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

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B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^\pm$ section.

NODE=S042220

$\Gamma(\psi(4660)K^0,\ \psi\to\Lambda_c^+\Lambda_c^-)/\Gamma_{total}$ — Γ_{265}/Γ

NODE=S042P30
NODE=S042P30

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**$<2.3 \times 10^{-4}$**	90	[1] LI	18D	BELL	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE [1] Assumes B($\Upsilon(4S) \to B^0\overline{B}^0$) = 48.6 ± 0.6% and B($\Lambda_c^+ \to pK^-\pi^+$) = 6.23 ± 0.33%.

NODE=S042P30;LINKAGE=A

$\Gamma(\Lambda_c^+\Lambda_c^-K^0)/\Gamma_{total}$ — Γ_{509}/Γ

NODE=S042R09
NODE=S042R09

	VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
	4.0 ±0.9 OUR AVERAGE				
	[$(4.3 \pm 2.3) \times 10^{-4}$ OUR 2018 AVERAGE]				
YOUR DATA	$3.99 \pm 0.76 \pm 0.51$	[1] LI	18D	BELL	$e^+e^- \to \Upsilon(4S)$
	$3.8 \pm 3.1 \pm 2.1$	[2,3] AUBERT	08H	BABR	$e^+e^- \to \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	$7.9\ ^{+2.9}_{-2.3} \pm 4.3$	[2,3] GABYSHEV	06	BELL	Repl. by LI 18D

NEW

YOUR NOTE [1] Assumes B($\Upsilon(4S) \to B^0\overline{B}^0$) = 48.6 ± 0.6% and B($\Lambda_c^+ \to pK^-\pi^+$) = 6.23 ± 0.33%.

NODE=S042R09;LINKAGE=A

[2] Assumes B($\Lambda_c^+ \to pK^-\pi^+$) = 5.0 ± 1.3%.

NODE=S042R09;LINKAGE=AG

[3] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S042R09;LINKAGE=EP

$\Gamma(\Xi_c(2930)^-\Lambda_c^+,\ \Xi_c^-\to\Lambda_c^-K^0)/\Gamma_{total}$ — Γ_{510}/Γ

NODE=S042P31
NODE=S042P31

	VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**$2.37 \pm 0.51 \pm 0.31$**	[1] LI	18D	BELL	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE [1] Assumes B($\Upsilon(4S) \to B^0\overline{B}^0$) = 48.6 ± 0.6% and B($\Lambda_c^+ \to pK^-\pi^+$) = 6.23 ± 0.33%.

NODE=S042P31;LINKAGE=A

B^0 REFERENCES

NODE=S042

YOUR PAPER LI 18D EPJ C78 928 Y.B. Li *et al.* (BELLE Collab.) REFID=59326
AUBERT 08H PR D77 031101 B. Aubert *et al.* (BABAR Collab.) REFID=52169
GABYSHEV 06 PRL 97 202003 N. Gabyshev *et al.* (BELLE Collab.) REFID=51488

Reference = SANDILYA 18; PR D98 071101
Verifier code = BELLE

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1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
($B = \pm 1$)

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^\pm$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

NODE=S042

B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^\pm$ section.

NODE=S042220

$\Gamma(K^*(892)^0 e^+ \mu^-)/\Gamma_{total}$ Γ_{543}/Γ

NODE=S042T03
NODE=S042T03

	VALUE (units 10^{-7})	CL%	DOCUMENT ID	TECN	COMMENT
	<1.6 (CL = 90%) [$<5.3 \times 10^{-7}$ (CL = 90%) OUR 2018 BEST LIMIT]				
YOUR DATA	**<1.6**	90	[1] SANDILYA 18	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	<5.3	90	[2] AUBERT,B 06J	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

YOUR NOTE [1] Uses B($\Upsilon(4S) \rightarrow B^0\overline{B}^0$) = 0.486 ± 0.006.

NODE=S042T03;LINKAGE=A

[2] Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$.

NODE=S042T03;LINKAGE=EP

$\Gamma(K^*(892)^0 e^- \mu^+)/\Gamma_{total}$ Γ_{544}/Γ

NODE=S042T04
NODE=S042T04

	VALUE (units 10^{-7})	CL%	DOCUMENT ID	TECN	COMMENT
	<1.2 (CL = 90%) [$<3.4 \times 10^{-7}$ (CL = 90%) OUR 2018 BEST LIMIT]				
YOUR DATA	**<1.2**	90	[1] SANDILYA 18	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	<3.4	90	[2] AUBERT,B 06J	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

YOUR NOTE [1] Uses B($\Upsilon(4S) \rightarrow B^0\overline{B}^0$) = 0.486 ± 0.006.

NODE=S042T04;LINKAGE=A

[2] Assumes equal production of B^0 and B^+ at $\Upsilon(4S)$.

NODE=S042T04;LINKAGE=EP

$\Gamma(K^*(892)^0 e^\pm \mu^\mp)/\Gamma_{total}$ Γ_{545}/Γ

NODE=S042B25

Test of lepton family number conservation.

NODE=S042B25
NODE=S042B25

	VALUE (units 10^{-7})	CL%	DOCUMENT ID	TECN	COMMENT
	< 1.8 (CL = 90%) [$<5.8 \times 10^{-7}$ (CL = 90%) OUR 2018 BEST LIMIT]				
YOUR DATA	**< 1.8**	90	[1] SANDILYA 18	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	< 5.8	90	[2] AUBERT,B 06J	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	<34	90	[2] AUBERT 02L	BABR	Repl. by AUBERT,B 06J

YOUR NOTE [1] Uses B($\Upsilon(4S) \rightarrow B^0\overline{B}^0$) = 0.486 ± 0.006.

NODE=S042B25;LINKAGE=A

[2] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S042B25;LINKAGE=EP

B^0 REFERENCES

NODE=S042

YOUR PAPER	SANDILYA	18	PR D98 071101	S. Sandilya *et al.*	(BELLE Collab.)	REFID=59450
	AUBERT,B	06J	PR D73 092001	B. Aubert *et al.*	(BABAR Collab.)	REFID=51305
	AUBERT	02L	PRL 88 241801	B. Aubert *et al.*	(BABAR Collab.)	REFID=48751

Reference = PAL 18; PR D98 112008
Verifier code = BELLE

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NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^\pm$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^\pm$ section.

NODE=S042220

$\Gamma(J/\psi(1S)\pi^0)/\Gamma_{total}$ — Γ_{201}/Γ

NODE=S042S35
NODE=S042S35

	VALUE (units 10^{-5})	CL%	DOCUMENT ID	TECN	COMMENT
	1.66±0.10 OUR AVERAGE				
	[(1.76 ± 0.16) × 10^{-5} OUR 2018 AVERAGE Scale factor = 1.1]				
YOUR DATA	1.62±0.11±0.06		[1] PAL	18	BELL	$e^+e^- \to \Upsilon(4S)$
	1.69±0.14±0.07		[1] AUBERT	08AU	BABR	$e^+e^- \to \Upsilon(4S)$
	$2.5\ ^{+1.1}_{-0.9}\ \pm 0.2$		[1] AVERY	00	CLE2	$e^+e^- \to \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	1.94±0.22±0.17		[1] AUBERT,B	06B	BABR	Repl. by AUBERT 08AU
	2.3 ±0.5 ±0.2		[1] ABE	03B	BELL	Repl. by PAL 18
	2.0 ±0.6 ±0.2		[1] AUBERT	02	BABR	Repl. by AUBERT,B 06B
	< 32	90	[2] ACCIARRI	97C	L3	
	< 5.8	90	BISHAI	96	CLE2	Sup. by AVERY 00
	<690	90	[1] ALEXANDER	95	CLE2	Sup. by BISHAI 96

NEW

YOUR NOTE [1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S042S35;LINKAGE=EP

[2] ACCIARRI 97C assumes B^0 production fraction (39.5 ± 4.0%) and B_s (12.0 ± 3.0%).

NODE=S042S35;LINKAGE=CQ

CP VIOLATION PARAMETERS

NODE=S042229

$C_{J/\psi(1S)\pi^0}$ $(B^0 \to J/\psi(1S)\pi^0)$

NODE=S042CPL
NODE=S042CPL

	VALUE	DOCUMENT ID	TECN	COMMENT
	0.03±0.17 OUR AVERAGE Error includes scale factor of 1.5. [−0.13 ± 0.13 OUR 2018 AVERAGE]			
YOUR DATA	$0.15\pm0.14^{+0.04}_{-0.03}$	[1] PAL	18	BELL	$e^+e^- \to \Upsilon(4S)$
	−0.20±0.19±0.03	AUBERT	08AU	BABR	$e^+e^- \to \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •			
	−0.08±0.16±0.05	[1] LEE	08A	BELL	Repl. by PAL 18
	−0.21±0.26±0.06	AUBERT,B	06B	BABR	Repl. by AUBERT 08AU
	0.01±0.29±0.03	[1] KATAOKA	04	BELL	Repl. by LEE 08A
	0.38±0.41±0.09	AUBERT	03N	BABR	Repl. by AUBERT,B 06B

NEW

YOUR NOTE [1] BELLE Collab. quotes $A_{J/\psi\pi^0}$ which is equal to $-C_{J/\psi\pi^0}$.

NODE=S042CPL;LINKAGE=KA

$S_{J/\psi(1S)\pi^0}$ $(B^0 \to J/\psi(1S)\pi^0)$

NODE=S042SPL
NODE=S042SPL

	VALUE	DOCUMENT ID	TECN	COMMENT
	−0.88±0.32 OUR AVERAGE Error includes scale factor of 2.2. [−0.94 ± 0.29 OUR 2018 AVERAGE Scale factor = 1.9]			
YOUR DATA	−0.59±0.19±0.03	PAL	18	BELL	$e^+e^- \to \Upsilon(4S)$
	−1.23±0.21±0.04	AUBERT	08AU	BABR	$e^+e^- \to \Upsilon(4S)$

NEW

• • • We do not use the following data for averages, fits, limits, etc. • • •

$-0.65\pm0.21\pm0.05$	LEE	08A	BELL	Repl. by PAL 18
$-0.68\pm0.30\pm0.04$	AUBERT,B	06B	BABR	Repl. by AUBERT 08AU
$-0.72\pm0.42\pm0.09$	KATAOKA	04	BELL	Repl. by LEE 08A
$0.05\pm0.49\pm0.16$	AUBERT	03N	BABR	Repl. by AUBERT,B 06B

B^0 REFERENCES

NODE=S042

YOUR PAPER PAL 18 PR D98 112008 B. Pal *et al.* (BELLE Collab.) REFID=59499
AUBERT 08AU PRL 101 021801 B. Aubert *et al.* (BABAR Collab.) REFID=52369
LEE 08A PR D77 071101 S.E. Lee *et al.* (BELLE Collab.) REFID=52338
AUBERT,B 06B PR D74 011101 B. Aubert *et al.* (BABAR Collab.) REFID=51288
KATAOKA 04 PRL 93 261801 S.U. Kataoka *et al.* (BELLE Collab.) REFID=50364
ABE 03B PR D67 032003 K. Abe *et al.* (BELLE Collab.) REFID=49205
AUBERT 03N PRL 91 061802 B. Aubert *et al.* (BABAR Collab.) REFID=49514
AUBERT 02 PR D65 032001 B. Aubert *et al.* (BABAR Collab.) REFID=48514
AVERY 00 PR D62 051101 P. Avery *et al.* (CLEO Collab.) REFID=47693
ACCIARRI 97C PL B391 481 M. Acciarri *et al.* (L3 Collab.) REFID=45249
BISHAI 96 PL B369 186 M. Bishai *et al.* (CLEO Collab.) REFID=44832
ALEXANDER 95 PL B341 435 J. Alexander *et al.* (CLEO Collab.) REFID=44113
Also PL B347 469 (erratum) J. Alexander *et al.* (CLEO Collab.) REFID=44211

Reference = ADACHI 18; PR D98 112012
Verifier code = BELLE

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NODE=MXXX045

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

NODE=S042

Quantum numbers not measured. Values shown are quark-model predictions.

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^{\pm}$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

CP VIOLATION PARAMETERS

NODE=S042229

$\cos 2\beta$ $(B^0 \to [K^0_S \pi^+ \pi^-]_{D^{(*)}} h^0)$

NODE=S042CJ2
NODE=S042CJ2

	VALUE	DOCUMENT ID	TECN	COMMENT
	0.88±0.19 OUR AVERAGE			
	[0.84 ± 0.31 OUR 2018 AVERAGE]			
YOUR DATA	$0.91 \pm 0.22 \pm 0.11$	[1] ADACHI 18		$e^+ e^- \to \Upsilon(4S)$
	$1.06 \pm 0.33 {}^{+0.21}_{-0.15}$	[2] VOROBYEV 16	BELL	$e^+ e^- \to \Upsilon(4S)$
	$0.42 \pm 0.49 \pm 0.16$	[3] AUBERT 07BH	BABR	$e^+ e^- \to \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •			
	$1.87 {}^{+0.40}_{-0.53} {}^{+0.22}_{-0.32}$	[4] KROKOVNY 06	BELL	Repl. by VOROBYEV 16

NEW

YOUR NOTE

[1] Analyses joint data sample of Belle and BaBar using Dalitz plot analysis of $D \to K^0_S \pi^+ \pi^-$; the second error combines experimental systematic uncertainty and the Dalitz plot model uncertainty

NODE=S042CJ2;LINKAGE=A

[2] A model-independent measurement uses the binned Dalitz plot technique.

NODE=S042CJ2;LINKAGE=B

[3] AUBERT 07BH evaluates the likelihoods for the positive and negative solutions assuming $\sin(2\,\beta_{eff}) = 0.678$. It quotes $L_+ / (L_+ + L_-) = 0.86$ corresponding to a likelihood ratio of $L_+/L_- = 6.14$ in favor of the positive solution.

NODE=S042CJ2;LINKAGE=AU

[4] KROKOVNY 06 evaluates the likelihoods for the positive and negative solutions assuming $\sin(2\,\beta_{eff}) = 0.689$. It quotes $L_+ / (L_+ + L_-) = 0.983$ corresponding to a likelihood ratio of $L_+/L_- = 57.8$ in favor of the positive solution.

NODE=S042CJ2;LINKAGE=KR

$\sin(2\beta_{\mathrm{eff}})(B^0 \to [K^0_S \pi^+ \pi^-]_{D^{(*)}} h^0)$

NODE=S042BTM
NODE=S042BTM

	VALUE	DOCUMENT ID	TECN	COMMENT
	0.66±0.15 OUR AVERAGE Error includes scale factor of 1.1. [0.37 ± 0.22 OUR 2018 AVERAGE]			
YOUR DATA	$0.80 \pm 0.14 \pm 0.07$	[1] ADACHI 18		$e^+ e^- \to \Upsilon(4S)$
	$0.43 \pm 0.27 \pm 0.08$	[2] VOROBYEV 16	BELL	$e^+ e^- \to \Upsilon(4S)$
	$0.29 \pm 0.34 \pm 0.06$	AUBERT 07BH	BABR	$e^+ e^- \to \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •			
	$0.78 \pm 0.44 \pm 0.22$	KROKOVNY 06	BELL	Repl. by VOROBYEV 16

NEW

YOUR NOTE

[1] Analyses joint data sample of Belle and BaBar using Dalitz plot analysis of $D \to K^0_S \pi^+ \pi^-$; the second error combines experimental systematic uncertainty and the Dalitz plot model uncertainty

NODE=S042BTM;LINKAGE=A

[2] A model-independent measurement uses the binned Dalitz plot technique.

NODE=S042BTM;LINKAGE=B

$\beta_{\mathrm{eff}}(B^0 \to [K^0_S \pi^+ \pi^-]_{D^{(*)}} h^0)$

NODE=S042A01
NODE=S042A01

	VALUE (°)	DOCUMENT ID	TECN	COMMENT
	11.7±7.8±2.1	[1] VOROBYEV 16	BELL	$e^+ e^- \to \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •			
YOUR DATA	$22.5 \pm 4.4 \pm 1.3$	[2] ADACHI 18		$e^+ e^- \to \Upsilon(4S)$

OCCUR=2

YOUR NOTE
[1] A model-independent measurement uses the binned Dalitz plot technique. NODE=S042A01;LINKAGE=A
[2] Analyses joint data sample of Belle and BaBar using Dalitz plot analysis of $D \rightarrow K^0_S \pi^+ \pi^-$; the second error combines experimental systematic uncertainty and the Dalitz plot model uncertainty NODE=S042A01;LINKAGE=C

B^0 REFERENCES

NODE=S042

YOUR PAPER

ADACHI	18	PR D98 112012	I. Adachi *et al.*	(BELLE and BABAR Collabs.)	REFID=59502
Also		PRL 121 261801	I. Adachi *et al.*	(BELLE and BABAR Collabs.)	REFID=59543
VOROBYEV	16	PR D94 052004	V. Vorobyev *et al.*	(BELLE Collab.)	REFID=57427
AUBERT	07BH	PRL 99 231802	B. Aubert *et al.*	(BABAR Collab.)	REFID=52090
KROKOVNY	06	PRL 97 081801	P. Krokovny *et al.*	(BELLE Collab.)	REFID=51363

Reference = GELB 18; PR D98 112016
Verifier code = BELLE

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NODE=MXXX045

NODE=MXXX045

NODE=S041

$B^{\pm}$

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

NODE=S041

B^+ BRANCHING RATIOS

NODE=S041215

$\Gamma(\ell^+\nu_\ell\gamma)/\Gamma_{total}$ — Γ_{34}/Γ

NODE=S041P01
NODE=S041P01

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$< 3.0 \times 10^{-6}$	90	[1] GELB	18	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •					
	$< 3.5 \times 10^{-6}$	90	[2,3] HELLER	15	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	$<15.6 \times 10^{-6}$	90	[3] AUBERT	09AT	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

YOUR NOTE
[1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$; Supersedes HELLER 15. NODE=S041P01;LINKAGE=A
[2] Superseded by GELB 18. NODE=S041P01;LINKAGE=B
[3] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. NODE=S041P01;LINKAGE=EP

$\Gamma(e^+\nu_e\gamma)/\Gamma_{total}$ — Γ_{35}/Γ

NODE=S041B9
NODE=S041B9

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$< 4.3 \times 10^{-6}$	90	[1] GELB	18	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •					
	$< 6.1 \times 10^{-6}$	90	[2,3] HELLER	15	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	$< 17 \times 10^{-6}$	90	[3] AUBERT	09AT	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	$<200 \times 10^{-6}$	90	[4] BROWDER	97	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

YOUR NOTE
[1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$; Supersedes HELLER 15. NODE=S041B9;LINKAGE=B
[2] Superseded by GELB 18. NODE=S041B9;LINKAGE=C
[3] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. NODE=S041B9;LINKAGE=EP
[4] BROWDER 97 uses the hermiticity of the CLEO II detector to reconstruct the neutrino energy and momentum. NODE=S041B9;LINKAGE=A

$\Gamma(\mu^+\nu_\mu\gamma)/\Gamma_{total}$ — Γ_{36}/Γ

NODE=S041B10
NODE=S041B10

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$< 3.4 \times 10^{-6}$	90	[1] GELB	18	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •					
	$< 3.4 \times 10^{-6}$	90	[2,3] HELLER	15	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	$<24 \times 10^{-6}$	90	[3,4] AUBERT	09AT	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	$<52 \times 10^{-6}$	90	[5] BROWDER	97	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

YOUR NOTE
[1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$; Supersedes HELLER 15. NODE=S041B10;LINKAGE=B
[2] Superseded by GELB 18. NODE=S041B10;LINKAGE=D
[3] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. NODE=S041B10;LINKAGE=EP
[4] Note that the value given by Aubert 2009 is 24 E-6 in the paper abstract, and 26 E-6 in the paper itself (Table I). NODE=S041B10;LINKAGE=C
[5] BROWDER 97 uses the hermiticity of the CLEO II detector to reconstruct the neutrino energy and momentum. NODE=S041B10;LINKAGE=A

$B^{\pm}$ REFERENCES

NODE=S041

YOUR PAPER

GELB	18	PR D98 112016	M. Gelb *et al.*	(BELLE Collab.)	REFID=59506
HELLER	15	PR D91 112009	A. Heller *et al.*	(BELLE Collab.)	REFID=56586
AUBERT	09AT	PR D80 111105	B. Aubert *et al.*	(BABAR Collab.)	REFID=53179
BROWDER	97	PR D56 11	T. Browder *et al.*	(CLEO Collab.)	REFID=45431

Reference = LI 19A; PRL 122 082001
Verifier code = BELLE

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Karim Trabelsi

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April 5, 2019

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USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
$(B = \pm 1)$

NODE=MXXX045

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=S041

$B^{\pm}$

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S041

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

B^+ BRANCHING RATIOS

NODE=S041215

$\Gamma(\Xi^0_c \Lambda^+_c)/\Gamma_{total}$ — Γ_{547}/Γ

NODE=S041P59
NODE=S041P59

	VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**9.51±2.10±0.88**	[1] LI	19A	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

YOUR NOTE [1] First measured the absolute branching fraction using a missing-mass technique.

NODE=S041P59;LINKAGE=A

$\Gamma(\Xi^0_c \Lambda^+_c,\ \Xi^0_c \rightarrow \Xi^+\pi^-)/\Gamma_{total}$ — Γ_{548}/Γ

NODE=S041R04
NODE=S041R04

	VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
	1.85±0.28 OUR AVERAGE				
	[(2.4 ± 0.9) × 10^{-5} OUR 2018 AVERAGE Scale factor = 1.4]				
YOUR DATA	1.71±0.28±0.15	[1] LI	19A	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	2.0 ±0.7 ±0.1	[2,3] AUBERT	08H	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	4.5 $^{+1.8}_{-1.5}$ ±0.2	[3,4] CHISTOV	06A	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

NEW

YOUR NOTE [1] Using a hadronic B-tagging method based on a full reconstruction.

NODE=S041R04;LINKAGE=A

[2] AUBERT 08H reports $(2.51 \pm 0.89 \pm 0.61) \times 10^{-5}$ from a measurement of $[\Gamma(B^+ \rightarrow \Xi^0_c \Lambda^+_c,\ \Xi^0_c \rightarrow \Xi^+\pi^-)/\Gamma_{total}] \times [B(\Lambda^+_c \rightarrow pK^-\pi^+)]$ assuming $B(\Lambda^+_c \rightarrow pK^-\pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda^+_c \rightarrow pK^-\pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S041R04;LINKAGE=AU

[3] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S041R04;LINKAGE=EP

[4] CHISTOV 06A reports $(5.6^{+1.9}_{-1.5} \pm 1.9) \times 10^{-5}$ from a measurement of $[\Gamma(B^+ \rightarrow \Xi^0_c \Lambda^+_c,\ \Xi^0_c \rightarrow \Xi^+\pi^-)/\Gamma_{total}] \times [B(\Lambda^+_c \rightarrow pK^-\pi^+)]$ assuming $B(\Lambda^+_c \rightarrow pK^-\pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda^+_c \rightarrow pK^-\pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S041R04;LINKAGE=CH

$\Gamma(\Xi^0_c \Lambda^+_c,\ \Xi^0_c \rightarrow \Lambda K^+\pi^-)/\Gamma_{total}$ — Γ_{549}/Γ

NODE=S041R05
NODE=S041R05

	VALUE (units 10^{-5})	DOCUMENT ID		TECN	COMMENT
	1.3 ±0.4 OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.				
	[(2.1 ± 0.9) × 10^{-5} OUR 2018 AVERAGE Scale factor = 1.5]				
YOUR DATA	1.11±0.26±0.10	[1] LI	19A	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	1.4 ±0.8 ±0.1	[2,3] AUBERT	08H	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	3.2 $^{+1.1}_{-0.9}$ ±0.2	[3,4] CHISTOV	06A	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

NEW

YOUR NOTE [1] Using a hadronic B-tagging method based on a full reconstruction.

NODE=S041R05;LINKAGE=A

[2] AUBERT 08H reports $(1.70 \pm 0.93 \pm 0.53) \times 10^{-5}$ from a measurement of $[\Gamma(B^+ \rightarrow \Xi^0_c \Lambda^+_c,\ \Xi^0_c \rightarrow \Lambda K^+\pi^-)/\Gamma_{total}] \times [B(\Lambda^+_c \rightarrow pK^-\pi^+)]$ assuming $B(\Lambda^+_c \rightarrow pK^-\pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda^+_c \rightarrow pK^-\pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S041R05;LINKAGE=AU

[3] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S041R05;LINKAGE=EP

[4] CHISTOV 06A reports $(4.0^{+1.1}_{-0.9} \pm 1.3) \times 10^{-5}$ from a measurement of $[\Gamma(B^+ \rightarrow \Xi^0_c \Lambda^+_c,\ \Xi^0_c \rightarrow \Lambda K^+\pi^-)/\Gamma_{total}] \times [B(\Lambda^+_c \rightarrow pK^-\pi^+)]$ assuming $B(\Lambda^+_c \rightarrow pK^-\pi^+) = (5.0 \pm 1.3) \times 10^{-2}$, which we rescale to our best value $B(\Lambda^+_c \rightarrow pK^-\pi^+) =$

NODE=S041R05;LINKAGE=CH

$(6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(\Xi_c^0 \Lambda_c^+, \Xi_c^0 \to p K^- K^- \pi^+)/\Gamma_{\text{total}}$ **Γ_{550}/Γ** NODE=S041P60

NODE=S041P60

	VALUE (units 10^{-6})	*DOCUMENT ID*		*TECN*	*COMMENT*
YOUR DATA	**5.47±1.78±0.57**	[1] LI	19A	BELL	$e^+ e^- \to \Upsilon(4S)$

YOUR NOTE [1] Using a hadronic B-tagging method based on a full reconstruction. NODE=S041P60;LINKAGE=A

$B^{\pm}$ REFERENCES

NODE=S041

YOUR PAPER LI 19A PRL 122 082001 Y.B. Li *et al.* (BELLE Collab.) REFID=59595
AUBERT 08H PR D77 031101 B. Aubert *et al.* (BABAR Collab.) REFID=52169
CHISTOV 06A PR D74 111105 R. Chistov *et al.* (BELLE Collab.) REFID=51588

Reference = YUSA 19; PR D99 011102
Verifier code = BELLE

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BOTTOM MESONS
$(B = \pm 1)$

NODE=MXXX045

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

B^0

NODE=S042

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^\pm$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

CP VIOLATION PARAMETERS

NODE=S042229

$C\,(B^0 \to K^0_S \pi^0 \pi^0)$

NODE=S042CK2
NODE=S042CK2

	VALUE	DOCUMENT ID	TECN	COMMENT
	-0.21 ± 0.20 OUR AVERAGE			
	[0.2 ± 0.5 OUR 2018 AVERAGE]			
YOUR DATA	$-0.28\pm0.21\pm0.04$	[1] YUSA 19	BELL	$e^+e^- \to \Upsilon(4S)$
	$0.23\pm0.52\pm0.13$	AUBERT 07AQ	BABR	$e^+e^- \to \Upsilon(4S)$

NEW

YOUR NOTE [1] Reports value of A which is equal to $-C$.

NODE=S042CK2;LINKAGE=A

$S\,(B^0 \to K^0_S \pi^0 \pi^0)$

NODE=S042SK2
NODE=S042SK2

	VALUE	DOCUMENT ID	TECN	COMMENT
	$0.89^{+0.27}_{-0.30}$ OUR AVERAGE			
	[0.7 ± 0.7 OUR 2018 AVERAGE]			
YOUR DATA	$0.92^{+0.27}_{-0.31}\pm0.11$	YUSA 19	BELL	$e^+e^- \to \Upsilon(4S)$
	$0.72\pm0.71\pm0.08$	AUBERT 07AQ	BABR	$e^+e^- \to \Upsilon(4S)$

NEW

B^0 REFERENCES

NODE=S042

YOUR PAPER YUSA 19 PR D99 011102 Y. Yusa *et al.* (BELLE Collab.) REFID=59597
AUBERT 07AQ PR D76 071101 B. Aubert *et al.* (BABAR Collab.) REFID=51980

Reference = LU 19; PR D99 032003
Verifier code = BELLE

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EMAIL: wmyao@lbl.gov

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NODE=MXXX045

NODE=MXXX045

NODE=S041

$B^{\pm}$

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S041

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

B^+ BRANCHING RATIOS

NODE=S041215

$\Gamma(p\overline{\Lambda}K^+K^-)/\Gamma_{total}$ **Γ_{512}/Γ**

NODE=S041P54
NODE=S041P54

	VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**$4.10^{+0.45}_{-0.43}\pm0.50$**	[1] LU	19	BELL	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE [1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S041P54;LINKAGE=A

$\Gamma(p\overline{\Lambda}\phi)/\Gamma_{total}$ **Γ_{513}/Γ**

NODE=S041P55
NODE=S041P55

	VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**$0.795\pm0.209\pm0.077$**	[1] LU	19	BELL	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE [1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S041P55;LINKAGE=A

$\Gamma(\overline{p}\Lambda K^+K^-)/\Gamma_{total}$ **Γ_{514}/Γ**

NODE=S041P56
NODE=S041P56

	VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**$3.70^{+0.39}_{-0.37}\pm0.44$**	[1] LU	19	BELL	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE [1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S041P56;LINKAGE=A

$\Gamma(\Lambda(1520)\overline{\Lambda}K^+)/\Gamma_{total}$ **Γ_{518}/Γ**

NODE=S041P57
NODE=S041P57

	VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**$2.23\pm0.63\pm0.25$**	[1] LU	19	BELL	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE [1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S041P57;LINKAGE=A

$\Gamma(\Lambda\overline{\Lambda}(1520)K^+)/\Gamma_{total}$ **Γ_{519}/Γ**

NODE=S041P58
NODE=S041P58

	VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<2.08**	[1] LU	19	BELL	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE [1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S041P58;LINKAGE=A

$B^{\pm}$ REFERENCES

NODE=S041

YOUR PAPER LU 19 PR D99 032003 P.-C. Lu *et al.* (BELLE Collab.)

REFID=59614

Reference = WATANUKI 19; PR D99 032012
Verifier code = BELLE

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NODE=MXXX045

NODE=MXXX045

$B^\pm/B^0$ ADMIXTURE

NODE=S049

CP VIOLATION

NODE=S049225

A_{CP} is defined as

$$\frac{B(\overline{B}\to\overline{f})-B(B\to f)}{B(\overline{B}\to\overline{f})+B(B\to f)},$$

the CP-violation charge asymmetry of inclusive $B^\pm$ and B^0 decay.

NODE=S049225

$A_{CP}(b\to s\gamma)$

NODE=S049CP2
NODE=S049CP2

	VALUE	DOCUMENT ID		TECN	COMMENT
	0.015 ±0.011 OUR AVERAGE				
	[0.015 ± 0.020 OUR 2018 AVERAGE]				
YOUR DATA	0.0144±0.0128±0.0011	[1] WATANUKI	19	BELL	$e^+e^-\to\Upsilon(4S)$
	0.017 ±0.019 ±0.010	[2] LEES	14K	BABR	$e^+e^-\to\Upsilon(4S)$
	0.002 ±0.050 ±0.030	[3] NISHIDA	04	BELL	Repl. by WATANUKI 19.

NEW

• • • We do not use the following data for averages, fits, limits, etc. • • •

	VALUE	DOCUMENT ID		TECN	COMMENT
	−0.011 ±0.030 ±0.014	[4] AUBERT	08BJ	BABR	Repl. by LEES 14K
	0.025 ±0.050 ±0.015	[5] AUBERT,B	04E	BABR	Repl. by AUBERT 08BJ

YOUR NOTE

[1] Using a sum-of-exclusive technique with $m_{X_s} < 2.8$ GeV/c^2.

NODE=S049CP2;LINKAGE=C

[2] Measured with 16 exclusively reconstructed $B\to X_s\gamma$ decays with $0.6 < m_{X_s} < 2.0$ GeV/c^2 (ten charged and six neutral self-tagging B modes).

NODE=S049CP2;LINKAGE=B

[3] This measurement is performed inclusively for recoil mass X_s less than 2.1 GeV, which corresponds to $-0.093 < A_{CP} < 0.096$ at 90% CL.

NODE=S049CP2;LINKAGE=NI

[4] Uses a sum of exclusively reconstructed $B\to X_s$ decay modes, with X_s mass between 0.6 and 2.8 GeV/c^2.

NODE=S049CP2;LINKAGE=BE

[5] Corresponds to $-0.06 < A_{CP} < 0.11$ at 90% CL.

NODE=S049CP2;LINKAGE=AU

$A_{CP}(B^0\to X_s\gamma)$

NODE=S049A04
NODE=S049A04

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**−0.0094±0.0174±0.0047**	[1] WATANUKI	19	BELL	$e^+e^-\to\Upsilon(4S)$

YOUR NOTE

[1] Using a sum-of-exclusive technique with $m_{X_s} < 2.8$ GeV/c^2.

NODE=S049A04;LINKAGE=A

$A_{CP}(B^+\to X_s\gamma)$

NODE=S049A05
NODE=S049A05

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.0275±0.0184±0.0032**	[1] WATANUKI	19	BELL	$e^+e^-\to\Upsilon(4S)$

YOUR NOTE

[1] Using a sum-of-exclusive technique with $m_{X_s} < 2.8$ GeV/c^2.

NODE=S049A05;LINKAGE=A

$\Delta A_{CP}(X_s\gamma) = A_{CP}(B^\pm\to X_s\gamma) - A_{CP}(B^0\to X_s\gamma)$

NODE=S049DA1

This is the isospin difference of the CP asymmetries.

NODE=S049DA1
NODE=S049DA1

	VALUE	DOCUMENT ID		TECN	COMMENT
	0.041 ±0.023 OUR AVERAGE				
	[0.05 ± 0.04 OUR 2018 AVERAGE]				
YOUR DATA	0.0369±0.0265±0.0076	[1] WATANUKI	19	BELL	$e^+e^-\to\Upsilon(4S)$
	0.050 ±0.039 ±0.015	[2] LEES	14K	BABR	$e^+e^-\to\Upsilon(4S)$

NEW

YOUR NOTE

[1] Using a sum-of-exclusive technique with $m_{X_s} < 2.8$ GeV/c^2.

NODE=S049DA1;LINKAGE=B

[2] Measured with 16 exclusively reconstructed $B\to X_s\gamma$ decays with $0.6 < m_{X_s} < 2.0$ GeV/c^2 (ten charged and six neutral self-tagging B modes).

NODE=S049DA1;LINKAGE=A

$\overline{A}_{CP}(B \to X_s\gamma) = (A_{CP}(B^+ \to X_s\gamma) + A_{CP}(B^0 \to X_s\gamma))/2$ NODE=S049A06

	VALUE	DOCUMENT ID	TECN	COMMENT	
YOUR DATA	**0.0091±0.0121±0.0013**	[1] WATANUKI 19	BELL	$e^+e^- \to \Upsilon(4S)$	NODE=S049A06

YOUR NOTE [1] Using a sum-of-exclusive technique with $m_{X_s} < 2.8$ GeV/c^2. NODE=S049A06;LINKAGE=A

ISOSPIN ASYMMETRY NODE=S049245

Δ_{0-} is defined as NODE=S049245

$$\frac{\Gamma(\overline{B}^0 \to f_d) - \Gamma(B^- \to f_u)}{\Gamma(\overline{B}^0 \to f_d) + \Gamma(B^- \to f_u)},$$

the isospin asymmetry of inclusive neutral and charged B decay.

Δ_{0-}(B($B \to X_s\gamma$)) NODE=S049IA1

	VALUE	DOCUMENT ID	TECN	COMMENT	
	−0.006 ±0.020 OUR AVERAGE				NEW
	[−0.01 ± 0.06 OUR 2018 AVERAGE]				
YOUR DATA	−0.0048±0.0149±0.0150	[1] WATANUKI 19	BELL	$e^+e^- \to \Upsilon(4S)$	
	−0.06 ±0.15 ±0.07	[2,3] AUBERT 08O	BABR	$e^+e^- \to \Upsilon(4S)$	
	−0.006 ±0.058 ±0.026	AUBERT,B 05R	BABR	$e^+e^- \to \Upsilon(4S)$	

YOUR NOTE [1] Using a sum-of-exclusive technique with $m_{X_s} < 2.8$ GeV/c^2. NODE=S049IA1;LINKAGE=A

[2] The result is for $E_\gamma > 2.2$ GeV. NODE=S049IA1;LINKAGE=RT

[3] Uses a fully reconstructed B meson as a tag on the recoil side. NODE=S049IA1;LINKAGE=UB

$B^\pm/B^0$ ADMIXTURE REFERENCES NODE=S049

YOUR PAPER	WATANUKI	19	PR D99 032012	S. Watanuki *et al.*	(BELLE Collab.)	REFID=59618
	LEES	14K	PR D90 092001	J.P. Lees *et al.*	(BABAR Collab.)	REFID=56157
	AUBERT	08BJ	PRL 101 171804	B. Aubert *et al.*	(BABAR Collab.)	REFID=52553
	AUBERT	08O	PR D77 051103	B. Aubert *et al.*	(BABAR Collab.)	REFID=52223
	AUBERT,B	05R	PR D72 052004	B. Aubert *et al.*	(BABAR Collab.)	REFID=50896
	AUBERT,B	04E	PRL 93 021804	B. Aubert *et al.*	(BABAR Collab.)	REFID=50058
	NISHIDA	04	PRL 93 031803	S. Nishida *et al.*	(BELLE Collab.)	REFID=49994

Reference = KALIYAR 19; PR D99 031102
Verifier code = BELLE

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PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Karim Trabelsi

EMAIL: karim.trabelsi@kek.jp

April 5, 2019

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1 Cyclotron Road
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USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
($B = \pm 1$)

$B^+ = u\bar{b}$, $B^0 = d\bar{b}$, $\bar{B}^0 = \bar{d}\,b$, $B^- = \bar{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S041

$B^\pm$

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

NODE=S041

B^+ BRANCHING RATIOS

NODE=S041215

$\Gamma(K^+ K^0_S K^0_S)/\Gamma_{total}$ — Γ_{397}/Γ

NODE=S041C6
NODE=S041C6

	VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
	10.5 ±0.4 OUR AVERAGE				
	[$(10.8 \pm 0.6) \times 10^{-6}$ OUR 2018 AVERAGE]				
YOUR DATA	$10.42 \pm 0.43 \pm 0.22$	[1] KALIYAR	19	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	$10.6 \pm 0.5 \pm 0.3$	[1,2] LEES	12O	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	$10.7 \pm 1.2 \pm 1.0$	[1] AUBERT,B	04V	BABR	Repl. by LEES 12O
	$13.4 \pm 1.9 \pm 1.5$	[1] GARMASH	04	BELL	Repl. by KALIYAR 19

NEW

YOUR NOTE [1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

[2] All intermediate charmonium and charm resonances are removed, except of χ_{c0}.

NODE=S041C6;LINKAGE=EP

NODE=S041C6;LINKAGE=LE

$\Gamma(K^0_S K^0_S \pi^+)/\Gamma_{total}$ — Γ_{401}/Γ

NODE=S041C7
NODE=S041C7

	VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
	<0.51	90	[1] AUBERT	09J	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •					
YOUR DATA	<0.87		[1] KALIYAR	19	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	<3.2	90	[1] GARMASH	04	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

[1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S041C7;LINKAGE=EP

CP VIOLATION

NODE=S041220

A_{CP} is defined as

$$\frac{B(B^- \rightarrow \bar{f}) - B(B^+ \rightarrow f)}{B(B^- \rightarrow \bar{f}) + B(B^+ \rightarrow f)},$$

the *CP*-violation charge asymmetry of exclusive B^- and B^+ decay.

NODE=S041220

$A_{CP}(B^+ \rightarrow K^+ K^0_S K^0_S)$

NODE=S041AY8
NODE=S041AY8

	VALUE	DOCUMENT ID		TECN	COMMENT
	0.025±0.031 OUR AVERAGE				
	[$0.04^{+0.04}_{-0.05}$ OUR 2018 AVERAGE]				
YOUR DATA	$0.016 \pm 0.039 \pm 0.009$	KALIYAR	19	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	$0.04\ ^{+0.04}_{-0.05} \pm 0.02$	LEES	12O	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	$-0.04 \pm 0.11 \pm 0.02$	[1] AUBERT,B	04V	BABR	Repl. by LEES 12O

NEW

[1] Corresponds to 90% confidence range $-0.23 < A_{CP} < 0.15$.

NODE=S041AY8;LINKAGE=AU

$B^\pm$ REFERENCES

NODE=S041

YOUR PAPER

KALIYAR	19	PR D99 031102	A.B. Kaliyar *et al.*	(BELLE Collab.)	REFID=59619
LEES	12O	PR D85 112010	J.P. Lees *et al.*	(BABAR Collab.)	REFID=54382
AUBERT	09J	PR D79 051101	B. Aubert *et al.*	(BABAR Collab.)	REFID=52691
AUBERT,B	04V	PRL 93 181805	B. Aubert *et al.*	(BABAR Collab.)	REFID=50265
GARMASH	04	PR D69 012001	A. Garmash *et al.*	(BELLE Collab.)	REFID=49642

Reference = SIRUNYAN 18R; PR D97 072010
Verifier code = CMS

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CMS Physics Coordinator

EMAIL: cms-physics-coordinator@cern.ch

April 5, 2019

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BOTTOM BARYONS
$(B=-1)$

$\Lambda_b^0 = u\,d\,b$, $\Xi_b^0 = u\,s\,b$, $\Xi_b^- = d\,s\,b$, $\Omega_b^- = s\,s\,b$

NODE=BXXX045

NODE=BXXX045

NODE=S040

Λ_b^0

$I(J^P) = 0(\frac{1}{2}^+)$ Status: ∗∗∗

In the quark model, a Λ_b^0 is an isospin-0 $u\,d\,b$ state. The lowest Λ_b^0 ought to have $J^P = 1/2^+$. None of I, J, or P have actually been measured.

NODE=S040

Λ_b^0 DECAY PARAMETERS

NODE=S040250

See the note on "Baryon Decay Parameters" in the neutron Listings.

NODE=S040250

α decay parameter for $\Lambda_b \rightarrow J/\psi \Lambda$

NODE=S040A01
NODE=S040A01

	VALUE	DOCUMENT ID		TECN	COMMENT
	0.07±0.13 OUR AVERAGE	Error includes scale factor of 1.3. See the ideogram below.			
	[0.18 ± 0.13 OUR 2018 AVERAGE]				
YOUR DATA	$-0.14\pm0.14\pm0.10$	[1] SIRUNYAN	18R	CMS	pp at 7, 8 TeV
	$0.30\pm0.16\pm0.06$	[2] AAD	14L	ATLS	pp at 7 TeV
	$0.05\pm0.17\pm0.07$	[3] AAIJ	13AG	LHCB	pp at 7 TeV

NEW

YOUR NOTE [1] An angular analysis of $\Lambda_b \rightarrow J/\psi \Lambda$ decay is performed. Note that the sign of α in CMS definition is the opposite to that used by AAIJ 13AG and AAD 14L. Λ_b transverse production polarization of 0.00 ± 0.06 ± 0.06 is also reported, as well as squares of the helicity amplitudes.

NODE=S040A01;LINKAGE=B

[2] An angular analysis of $\Lambda_b \rightarrow J/\psi \Lambda$ decay is performed and magnitudes of all helicity amplitudes are also reported.

NODE=S040A01;LINKAGE=A

[3] An angular analysis of $\Lambda_b \rightarrow J/\psi \Lambda$ decay is performed and a Λ_b transverse production polarization of 0.06 ± 0.07 ± 0.02 is also reported.

NODE=S040A01;LINKAGE=AA

Λ_b^0 REFERENCES

NODE=S040

YOUR PAPER SIRUNYAN 18R PR D97 072010 A.M. Sirunyan *et al.* (CMS Collab.) REFID=58922

AAD 14L PR D89 092009 G. Aad *et al.* (ATLAS Collab.) REFID=55783

AAIJ 13AG PL B724 27 R. Aaij *et al.* (LHCb Collab.) REFID=55086

Reference = SIRUNYAN 18AW; JHEP 1805 127
Verifier code = CMS

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SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON CHARGED PARTICLES IN HADRONIC REACTIONS

NODE=S015430

Long-Lived Particle Search at Hadron Collisions

NODE=S015XL

Limits are for cross section times branching ratio.

NODE=S015XL
NODE=S015XL

VALUE (pb/nucleon)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] SIRUNYAN	18AW	CMS	Long-lived particle search
		[2] AAIJ	16AR	LHCB	$H \rightarrow XX$ long-lived particles
		[3] KHACHATRY...	16BW	CMS	direct production: HSCPs
<2	90	[4] BADIER	86	BDMP	$\tau = (0.05–1.) \times 10^{-8}$s

YOUR DATA

YOUR NOTE

[1] SIRUNYAN 18AW search for very long lived particles (LLPs) decaying hadronically or to $\mu\overline{\mu}$ in CMS detector; none seen/limits set on lifetime vs. cross section.

NODE=S015XL;LINKAGE=D

[2] AAIJ 16AR search for long lived particles from $H \rightarrow XX$ with displaced X decay vertex using 0.62 fb^{-1} at 7 TeV; limits set in Fig. 7.

NODE=S015XL;LINKAGE=B

[3] KHACHATRYAN 16BW search for heavy stable charged particles via ToF with 2.5 fb^{-1} at 13 TeV; require stable m(gluinoball) $>$ 1610 GeV.

NODE=S015XL;LINKAGE=C

[4] BADIER 86 looked for long-lived particles at 300 GeV π^- beam dump. The limit applies for nonstrongly interacting neutral or charged particles with mass $>$2 GeV. The limit applies for particle modes, $\mu^+\pi^-$, $\mu^+\mu^-$, $\pi^+\pi^-$X, $\pi^+\pi^-\pi^\pm$ etc. See their figure 5 for the contours of limits in the mass-τ plane for each mode.

NODE=S015XL;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

YOUR PAPER

SIRUNYAN	18AW	JHEP 1805 127	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59101
AAIJ	16AR	EPJ C76 664	R. Aaij *et al.*	(LHCb Collab.)	REFID=57684
KHACHATRY...	16BW	PR D94 112004	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57620
BADIER	86	ZPHY C31 21	J. Badier *et al.*	(NA3 Collab.)	REFID=10622

Reference = SIRUNYAN 18BB; JHEP 1806 120
Verifier code = CMS

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SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Heavy Particle Production Cross Section

NODE=S015CS

NODE=S015CS

• • • We do not use the following data for averages, fits, limits, etc. • • •

VALUE (cm^2/N)	CL%	DOCUMENT ID		TECN	COMMENT
		[1] AABOUD	18CJ	ATLS	$pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$
		[2] AABOUD	18CM	ATLS	$pp \to e\mu/e\tau/\mu\tau$
		[3] AAIJ	18AJ	LHCB	$pp \to A' \to \mu^+\mu^-$; dark photon
		[4] BANERJEE	18	NA64	$eZ \to eZX(A')$
		[5] BANERJEE	18A	NA64	$eZ \to eZA'$, $A' \to \chi\chi$
		[6] MARSICANO	18	E137	$e^+e^- \to A'(\gamma)$ visible decay
		[7] SIRUNYAN	18BB	CMS	$pp \to Z' \to \ell^+\ell^-$ at 13 TeV
		[8] SIRUNYAN	18DA	CMS	$pp \to$ Black Hole, string ball, sphaleron
		[9] SIRUNYAN	18DD	CMS	$pp \to jj$
		[10] SIRUNYAN	18DR	CMS	$pp \to b\mu\overline{\mu}$
		[11] SIRUNYAN	18DU	CMS	$pp \to \gamma\gamma$
		[12] SIRUNYAN	18ED	CMS	$pp \to V \to Wh$; $h \to b\overline{b}$; $W \to l\nu$
		[13] AABOUD	17B	ATLS	WH, ZH resonance
		[14] AAIJ	17BR	LHCB	$pp \to \pi_v\pi_v$, $\pi_v \to jj$
		[15] AAD	16O	ATLS	ℓ + (ℓs or jets)
		[16] AAD	16R	ATLS	WW, WZ, ZZ resonance
		[17] KRASZNAHO...	16		p^7Li $\to$ ^{8}Be $\to X(17)N$, $X(17) \to e^+e^-$
		[18] LEES	15E	BABR	e^+e^- collisions
		[19] ADAMS	97B	KTEV	m= 1.2–5 GeV
$< 10^{-36}$–10^{-33}	90	[20] GALLAS	95	TOF	m= 0.5–20 GeV
$<(4$–$0.3) \times 10^{-31}$	95	[21] AKESSON	91	CNTR	m = 0–5 GeV
$<2 \times 10^{-36}$	90	[22] BADIER	86	BDMP	$\tau = (0.05$–$1.) \times 10^{-8}$s
$<2.5 \times 10^{-35}$		[23] GUSTAFSON	76	CNTR	$\tau > 10^{-7}$ s

YOUR DATA

[1] AABOUD 18CJ make multichannel search for $pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$ at 13 TeV, 36.1 fb^{-1}; no signal found; limits placed for several BSM models. NODE=S015CS;LINKAGE=R

[2] AABOUD 18CM search for lepton-flavor violating resonance in $pp \to e\mu/e\tau/\mu\tau$ at 13 TeV, 36.1 fb^{-1}; no signal is found and limits placed for various BSM models. NODE=S015CS;LINKAGE=S

[3] AAIJ 18AJ search for prompt and delayed dark photon decay $A' \to \mu^+\mu^-$ at LHCb detector using 1.6 fb^{-1} of pp collisions at 13 TeV; limits on m(A') vs. kinetic mixing are set. NODE=S015CS;LINKAGE=K

[4] BANERJEE 18 search for dark photon A'/16.7 MeV boson X at NA64 via $eZ \to eZX(A')$; no signal found and limits set on the X-e^- coupling ϵ_e in the range $1.3 \times 10^{-4} \leq \epsilon_e \leq 4.2 \times 10^{-4}$ excluding part of the allowed parameter space. NODE=S015CS;LINKAGE=L

[5] BANERJEE 18A search for invisibly decaying dark photons in $eZ \to eZA'$, $A' \to$ invisible; no signal found and limits set on mixing for m(A') $<$ 1 GeV. NODE=S015CS;LINKAGE=M

[6] MARSICANO 18 search for dark photon $e^+e^- \to A'(\gamma)$ visible decay in SLAC E137 e beam dump data. No signal observed and limits set in ϵ coupling vs m(A') plane, see their figure 7. NODE=S015CS;LINKAGE=P

YOUR NOTE

[7] SIRUNYAN 18BB search for high mass dilepton resonance; no signal found and exclude portions of p-space of Z', KK graviton models. NODE=S015CS;LINKAGE=O

[8] SIRUNYAN 18DA search for $pp \to$ Black Hole, string ball, sphaleron via high multiplicity events at 13 TeV, 35.9 fb^{-1}; no signal, require e.g. m(BH)¿10.1 TeV NODE=S015CS;LINKAGE=T

[9] SIRUNYAN 18DD search for $pp \to jj$ deviations in dijet angular distribution. No signal observed. Set limits on large extra dimensions, black holes and DM mediators e.g. m(BH) $>$ 5.9–8.2 TeV. NODE=S015CS;LINKAGE=U

[10] SIRUNYAN 18DR search for dimuon resonance in $pp \to b\mu\overline{\mu}$ at 8 and 13 TeV. Slight excess seen at m($\mu\overline{\mu}$) $\sim$ 28 GeV in some channels. NODE=S015CS;LINKAGE=V

[11] SIRUNYAN 18DU search for high mass diphoton resonance in $pp \rightarrow \gamma\gamma$ at 13 TeV using 35.9 fb^{-1}; no signal; limits placed on RS Graviton, LED, and clockwork. NODE=S015CS;LINKAGE=W

[12] SIRUNYAN 18ED search for $pp \rightarrow V \rightarrow Wh$; $h \rightarrow b\overline{b}$; $W \rightarrow l\nu$ at 13 TeV with 35.9 fb^{-1}; no signal; limits set on m($W^{'}$)¿2.9 TeV. NODE=S015CS;LINKAGE=X

[13] AABOUD 17B exclude m(W', Z') $<$ 1.49–2.31 TeV depending on the couplings and W'/Z' degeneracy assumptions via WH, ZH search in pp collisions at 13 TeV with 3.2 fb^{-1} of data. NODE=S015CS;LINKAGE=I

[14] AAIJ 17BR search for long-lived hidden valley pions from Higgs decay. Limits are set on the signal strength as a function of the mass and lifetime of the long-lived particle in their Fig. 4 and Tab. 4. NODE=S015CS;LINKAGE=J

[15] AAD 16O search for high E_T ℓ + (ℓs or jets) with 3.2 fb^{-1} at 13 TeV; exclude micro black holes mass $<$ 8 TeV (Fig. 3) for models with two extra dimensions. NODE=S015CS;LINKAGE=G

[16] AAD 16R search for WW, WZ, ZZ resonance in 20.3 fb^{-1} at 8 TeV data; limits placed on massive RS graviton (Fig. 4). NODE=S015CS;LINKAGE=H

[17] KRASZNAHORKAY 16 report pLi $\rightarrow$ Be $\rightarrow$ $e\overline{e}N$ 5σ resonance at 16.7 MeV– possible evidence for nuclear interference or new light boson . However, such nuclear interference was ruled out already by ZANG 17. NODE=S015CS;LINKAGE=Q

[18] LEES 15E search for long-lived neutral particles produced in e^+e^- collisions in the Upsilon region, which decays into e^+e^-, $\mu^+\mu^-$, $e^\pm\mu^\mp$, $\pi^+\pi^-$, K^+K^-, or $\pi^\pm K^\mp$. See their Fig. 2 for cross section limits. NODE=S015CS;LINKAGE=F

[19] ADAMS 97B search for a hadron-like neutral particle produced in pN interactions, which decays into a ρ^0 and a weakly interacting massive particle. Upper limits are given for the ratio to K_L production for the mass range 1.2–5 GeV and lifetime 10^{-9}–10^{-4} s. See also our Light Gluino Section. NODE=S015CS;LINKAGE=E

[20] GALLAS 95 limit is for a weakly interacting neutral particle produced in 800 GeV/c pN interactions decaying with a lifetime of 10^{-4}–10^{-8} s. See their Figs. 8 and 9. Similar limits are obtained for a stable particle with interaction cross section 10^{-29}–10^{-33} cm^2. See Fig. 10. NODE=S015CS;LINKAGE=C

[21] AKESSON 91 limit is from weakly interacting neutral long-lived particles produced in pN reaction at 450 GeV/c performed at CERN SPS. Bourquin-Gaillard formula is used as the production model. The above limit is for $\tau > 10^{-7}$ s. For $\tau > 10^{-9}$ s, $\sigma < 10^{-30}$ cm^{-2}/nucleon is obtained. NODE=S015CS;LINKAGE=B

[22] BADIER 86 looked for long-lived particles at 300 GeV π^- beam dump. The limit applies for nonstrongly interacting neutral or charged particles with mass >2 GeV. The limit applies for particle modes, $\mu^+\pi^-$, $\mu^+\mu^-$, $\pi^+\pi^-$X, $\pi^+\pi^-\pi^\pm$ etc. See their figure 5 for the contours of limits in the mass-τ plane for each mode. NODE=S015CS;LINKAGE=D

[23] GUSTAFSON 76 is a 300 GeV FNAL experiment looking for heavy (m >2 GeV) long-lived neutral hadrons in the M4 neutral beam. The above typical value is for m = 3 GeV and assumes an interaction cross section of 1 mb. Values as a function of mass and interaction cross section are given in figure 2. NODE=S015CS;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	AABOUD	18CJ	PR D98 052008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59441
	AABOUD	18CM	PR D98 092008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59474
	AAIJ	18AJ	PRL 120 061801	R. Aaij *et al.*	(LHCb Collab.)	REFID=59199
	BANERJEE	18	PRL 120 231802	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58838
	BANERJEE	18A	PR D97 072002	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58916
	MARSICANO	18	PR D98 015031	L. Marsicano *et al.*		REFID=58967
YOUR PAPER	SIRUNYAN	18BB	JHEP 1806 120	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59112
	SIRUNYAN	18DA	JHEP 1811 042	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59306
	SIRUNYAN	18DD	EPJ C78 789	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59318
	SIRUNYAN	18DR	JHEP 1811 161	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59367
	SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
	SIRUNYAN	18ED	JHEP 1811 172	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59566
	AABOUD	17B	PL B765 32	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57706
	AAIJ	17BR	EPJ C77 812	R. Aaij *et al.*	(LHCb Collab.)	REFID=58366
	ZANG	17	PL B773 159	X. Zang, G.A. Miller	(WASH)	REFID=59311
	AAD	16O	PL B760 520	G. Aad *et al.*	(ATLAS Collab.)	REFID=57169
	AAD	16R	PL B755 285	G. Aad *et al.*	(ATLAS Collab.)	REFID=57172
	KRASZNAHO...	16	PRL 116 042501	A.J. Krasznahorkay *et al.*	(HINR, ANIK+)	REFID=59302
	LEES	15E	PRL 114 171801	J.P. Lees *et al.*	(BABAR Collab.)	REFID=56467
	ADAMS	97B	PRL 79 4083	J. Adams *et al.*	(FNAL KTeV Collab.)	REFID=45722
	GALLAS	95	PR D52 6	E. Gallas *et al.*	(MSU, FNAL, MIT, FLOR)	REFID=44291
	AKESSON	91	ZPHY C52 219	T. Akesson *et al.*	(HELIOS Collab.)	REFID=41739
	BADIER	86	ZPHY C31 21	J. Badier *et al.*	(NA3 Collab.)	REFID=10622
	GUSTAFSON	76	PRL 37 474	H.R. Gustafson *et al.*	(MICH)	REFID=12580

Reference = SIRUNYAN 18BY; EPJ C78 457
Verifier code = CMS

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

CMS Physics Coordinator

EMAIL: cms-physics-coordinator@cern.ch

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
($B = \pm 1$)

NODE=MXXX045

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^{\pm}$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

B^0 MEAN LIFE

NODE=S042T

See $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE section for data on B-hadron mean life averaged over species of bottom particles.

NODE=S042T

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at http://www.slac.stanford.edu/xorg/hflav/. The averaging/rescaling procedure takes into account correlations between the measurements and asymmetric lifetime errors.

NODE=S042T

	VALUE (10^{-12} s)	EVTS	DOCUMENT ID		TECN	COMMENT	
	1.520±0.004 OUR EVALUATION						→ UNCHECKED ←
	Average is meaningless.	[(1.519 ± 0.004) × 10^{-12} s OUR 2018 AVERAGE]					
YOUR DATA	1.515±0.005±0.006		[1] SIRUNYAN	18BY	CMS	pp at 8 TeV	
	1.534±0.019±0.021		[2] ABAZOV	15A	D0	$p\overline{p}$ at 1.96 TeV	
	1.499±0.013±0.005		[3] AAIJ	14E	LHCB	pp at 7 TeV	
	1.524±0.006±0.004		[4] AAIJ	14E	LHCB	pp at 7 TeV	OCCUR=2
	1.524±0.011±0.004		[5] AAIJ	14R	LHCB	pp at 7 TeV	
	1.509±0.012±0.018		[6] AAD	13U	ATLS	pp at 7 TeV	
	1.508±0.025±0.043		[3] ABAZOV	12U	D0	$p\overline{p}$ at 1.96 TeV	
	1.507±0.010±0.008		[7] AALTONEN	11	CDF	$p\overline{p}$ at 1.96 TeV	
	1.414±0.018±0.034		[8] ABAZOV	09E	D0	$p\overline{p}$ at 1.96 TeV	
	$1.504\pm0.013^{+0.018}_{-0.013}$		[9] AUBERT	06G	BABR	$e^+e^- \to \Upsilon(4S)$	
	1.534±0.008±0.010		[10] ABE	05B	BELL	$e^+e^- \to \Upsilon(4S)$	
	1.531±0.021±0.031		[11] ABDALLAH	04E	DLPH	$e^+e^- \to Z$	
	$1.523^{+0.024}_{-0.023}\pm0.022$		[12] AUBERT	03C	BABR	$e^+e^- \to \Upsilon(4S)$	
	1.533±0.034±0.038		[13] AUBERT	03H	BABR	$e^+e^- \to \Upsilon(4S)$	
	1.497±0.073±0.032		[14] ACOSTA	02C	CDF	$p\overline{p}$ at 1.8 TeV	
	1.529±0.012±0.029		[15] AUBERT	02H	BABR	$e^+e^- \to \Upsilon(4S)$	
	1.546±0.032±0.022		[16] AUBERT	01F	BABR	$e^+e^- \to \Upsilon(4S)$	
	1.541±0.028±0.023		[15] ABBIENDI,G	00B	OPAL	$e^+e^- \to Z$	
	1.518±0.053±0.034		[17] BARATE	00R	ALEP	$e^+e^- \to Z$	
	1.523±0.057±0.053		[18] ABBIENDI	99J	OPAL	$e^+e^- \to Z$	
	$1.474\pm0.039^{+0.052}_{-0.051}$		[17] ABE	98Q	CDF	$p\overline{p}$ at 1.8 TeV	
	1.52 ±0.06 ±0.04		[18] ACCIARRI	98S	L3	$e^+e^- \to Z$	
	1.64 ±0.08 ±0.08		[18] ABE	97J	SLD	$e^+e^- \to Z$	
	1.532±0.041±0.040		[19] ABREU	97F	DLPH	$e^+e^- \to Z$	
	$1.25\,^{+0.15}_{-0.13}\pm0.05$	121	[14] BUSKULIC	96J	ALEP	$e^+e^- \to Z$	OCCUR=3

1.49	$^{+0.17}_{-0.15}$	$^{+0.08}_{-0.06}$		[20] BUSKULIC	96J	ALEP	$e^+e^- \rightarrow Z$	OCCUR=4
1.61	$^{+0.14}_{-0.13}$	± 0.08		[17,21] ABREU	95Q	DLPH	$e^+e^- \rightarrow Z$	
1.63	± 0.14	± 0.13		[22] ADAM	95	DLPH	$e^+e^- \rightarrow Z$	
1.53	± 0.12	± 0.08		[17,23] AKERS	95T	OPAL	$e^+e^- \rightarrow Z$	

• • • We do not use the following data for averages, fits, limits, etc. • • •

1.501	$^{+0.078}_{-0.074}$	± 0.050		[3] ABAZOV	07S	D0	Repl. by ABAZOV 12U	
1.524	± 0.030	± 0.016		[3] ABULENCIA	07A	CDF	Repl. by AALTONEN 11	
1.473	$^{+0.052}_{-0.050}$	± 0.023		[8] ABAZOV	05B	D0	Repl. by ABAZOV 05W	
1.40	$^{+0.11}_{-0.10}$	± 0.03		[3] ABAZOV	05C	D0	Repl. by ABAZOV 07S	
1.530	± 0.043	± 0.023		[8] ABAZOV	05W	D0	Repl. by ABAZOV 09E	
1.54	± 0.05	± 0.02		[24] ACOSTA	05	CDF	Repl. by AALTONEN 11	
1.554	± 0.030	± 0.019		[16] ABE	02H	BELL	Repl. by ABE 05B	
1.58	± 0.09	± 0.02		[14] ABE	98B	CDF	Repl. by ACOSTA 02C	
1.54	± 0.08	± 0.06		[17] ABE	96C	CDF	Repl. by ABE 98Q	
1.55	± 0.06	± 0.03		[25] BUSKULIC	96J	ALEP	$e^+e^- \rightarrow Z$	
1.61	± 0.07	± 0.04		[17] BUSKULIC	96J	ALEP	Repl. by BARATE 00R	OCCUR=2
1.62	± 0.12			[26] ADAM	95	DLPH	$e^+e^- \rightarrow Z$	OCCUR=2
1.57	± 0.18	± 0.08	121	[14] ABE	94D	CDF	Repl. by ABE 98B	
1.17	$^{+0.29}_{-0.23}$	± 0.16	96	[17] ABREU	93D	DLPH	Sup. by ABREU 95Q	
1.55	± 0.25	± 0.18	76	[22] ABREU	93G	DLPH	Sup. by ADAM 95	
1.51	$^{+0.24}_{-0.23}$	$^{+0.12}_{-0.14}$	78	[17] ACTON	93C	OPAL	Sup. by AKERS 95T	
1.52	$^{+0.20}_{-0.18}$	$^{+0.07}_{-0.13}$	77	[17] BUSKULIC	93D	ALEP	Sup. by BUSKULIC 96J	
1.20	$^{+0.52}_{-0.36}$	$^{+0.16}_{-0.14}$	15	[27] WAGNER	90	MRK2	E^{ee}_{cm}= 29 GeV	
0.82	$^{+0.57}_{-0.37}$	± 0.27		[28] AVERILL	89	HRS	E^{ee}_{cm}= 29 GeV	

YOUR NOTE

[1] Measured using $B^0 \rightarrow J/\psi K^*(892)^0$ and $B^0 \rightarrow J/\psi K^0_S$ decays. NODE=S042T;LINKAGE=G

[2] Measured using $B^0 \rightarrow D^- \mu^+ \nu X$ decays. NODE=S042T;LINKAGE=AV

[3] Measured mean life using $B^0 \rightarrow J/\psi K^0_S$ decays. NODE=S042T;LINKAGE=AO

[4] Measured using $B^0 \rightarrow J/\psi K^{*0}$ decays. NODE=S042T;LINKAGE=B

[5] Measured using $B^0 \rightarrow K^+ \pi^-$ decays. NODE=S042T;LINKAGE=D

[6] Measured with $B^0_d \rightarrow J/\psi(\mu^+\mu^-)\ K^0_S(\pi^+\pi^-)$ decays. NODE=S042T;LINKAGE=AD

[7] Measured mean life using fully reconstructed decays $(J/\psi K^{(*)})$. NODE=S042T;LINKAGE=AA

[8] Measured mean life using $B^0 \rightarrow J/\psi K^{*0}$ decays. NODE=S042T;LINKAGE=AZ

[9] Measured using a simultaneous fit of the B^0 lifetime and $\overline{B}{}^0 B^0$ oscillation frequency Δm_d in the partially reconstructed $B^0 \rightarrow D^{*-} \ell \nu$ decays. NODE=S042T;LINKAGE=AU

[10] Measurement performed using a combined fit of *CP*-violation, mixing and lifetimes. NODE=S042T;LINKAGE=AE

[11] Measurement performed using an inclusive reconstruction and B flavor identification technique. NODE=S042T;LINKAGE=AB

[12] AUBERT 03C uses a sample of approximately 14,000 exclusively reconstructed $B^0 \rightarrow D^*(2010)^- \ell \nu$ and simultaneously measures the lifetime and oscillation frequency. NODE=S042T;LINKAGE=C3

[13] Measurement performed with decays $B^0 \rightarrow D^{*-}\pi^+$ and $B^0 \rightarrow D^{*-}\rho^+$ using a partial reconstruction technique. NODE=S042T;LINKAGE=BH

[14] Measured mean life using fully reconstructed decays. NODE=S042T;LINKAGE=CD

[15] Data analyzed using partially reconstructed $\overline{B}{}^0 \rightarrow D^{*+} \ell^- \overline{\nu}$ decays. NODE=S042T;LINKAGE=C2

[16] Events are selected in which one B meson is fully reconstructed while the second B meson is reconstructed inclusively. NODE=S042T;LINKAGE=FT

[17] Data analyzed using $D\,/\,D^* \ell$X event vertices. NODE=S042T;LINKAGE=C

[18] Data analyzed using charge of secondary vertex. NODE=S042T;LINKAGE=M

[19] Data analyzed using inclusive $D/D^* \ell X$. NODE=S042T;LINKAGE=L

[20] Measured mean life using partially reconstructed $D^{*-}\pi^+$X vertices. NODE=S042T;LINKAGE=I

[21] ABREU 95Q assumes B($B^0 \rightarrow D^{**-} \ell^+ \nu_\ell$) = 3.2 ± 1.7%. NODE=S042T;LINKAGE=CQ

[22] Data analyzed using vertex-charge technique to tag B charge. NODE=S042T;LINKAGE=F

[23] AKERS 95T assumes B($B^0 \rightarrow D_s{}^{(*)} D^{0\,(*)}$) = 5.0 ± 0.9% to find B^+/B^0 yield. NODE=S042T;LINKAGE=H

[24] Measured using the time-dependent angular analysis of $B^0_d \rightarrow J/\psi K^{*0}$ decays. NODE=S042T;LINKAGE=AC

[25] Combined result of $D/D^* \ell$x analysis, fully reconstructed B analysis, and partially reconstructed $D^{*-}\pi^+$X analysis. NODE=S042T;LINKAGE=J

[26] Combined ABREU 95Q and ADAM 95 result. NODE=S042T;LINKAGE=K

[27] WAGNER 90 tagged B^0 mesons by their decays into $D^{*-} e^+ \nu$ and $D^{*-} \mu^+ \nu$ where the D^{*-} is tagged by its decay into $\pi^- \overline{D}{}^0$. NODE=S042T;LINKAGE=BB

[28] AVERILL 89 is an estimate of the B^0 mean lifetime assuming that $B^0 \rightarrow D^{*+} + X$ always. NODE=S042T;LINKAGE=A

$\Delta\Gamma_{B^0_d} / \Gamma_{B^0_d}$

NODE=S042DGS

$\Gamma_{B^0_d}$ and $\Delta\Gamma_{B^0_d}$ are the decay rate average and difference between two B^0_d *CP* eigenstates (light − heavy). The λ_{CP} characterizes B^0 and $\overline{B}^0$ decays to states of charmonium plus K^0_L, see the review on "*CP* Violation" in the reviews section. NODE=S042DGS

"OUR EVALUATION" has been obtained by the Heavy Flavor Averaging Group (HFLAV) by taking into account correlations between measurements.

NODE=S042DGS

→ UNCHECKED ←

NEW

VALUE (units 10^{-2})	CL%	DOCUMENT ID		TECN	COMMENT
− 0.2 ±1.0 OUR EVALUATION					
0.1 ±1.0 OUR AVERAGE					
[$(-0.2 \pm 1.1) \times 10^{-2}$ OUR 2018 AVERAGE]					
YOUR DATA 3.4 ±2.3 ±2.4		[1] SIRUNYAN	18BY	CMS	pp at 8 TeV
− 0.1 ±1.1 ±0.9		[2] AABOUD	16G	ATLS	pp at 7, 8 TeV
− 4.4 ±2.5 ±1.1		[3] AAIJ	14E	LHCB	pp at 7 TeV
1.7 ±1.8 ±1.1		[4] HIGUCHI	12	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
0.8 ±3.7 ±1.8		[5] AUBERT,B	04C	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
0 ±9		[6] ABDALLAH	03B	DLPH	$e^+e^- \rightarrow Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.50±1.38		ABAZOV	14	D0	$p\overline{p}$ at 1.96 TeV
< 80	95	[7] BEHRENS	00B	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

YOUR NOTE [1] Measured using $B^0 \rightarrow J/\psi K^*(892)^0$ and $B^0 \rightarrow J/\psi K^0_S$ decays, and assuming $\beta = 21.9 \pm 0.7$ degrees. NODE=S042DGS;LINKAGE=C

[2] Measured from the ratio of decay time distributions of $B^0 \rightarrow J/\psi K^0_S$ and $B^0 \rightarrow J/\psi K^{*0}$ decays. NODE=S042DGS;LINKAGE=B

[3] Measured using the effective lifetimes of $B^0 \rightarrow J/\psi K^0_S$ and $B^0 \rightarrow J/\psi K^{*0}$ decays. NODE=S042DGS;LINKAGE=A

[4] Reports $-\Delta\Gamma_d/\Gamma_d$ using $B^0 \rightarrow J/\psi K^0_S$, $J/\psi K^0_L$, $D^-\pi^+$, $D^{*-}\pi^+$, $D^{*-}\rho^+$, and $D^{*-}\ell^+\nu$ decays. NODE=S042DGS;LINKAGE=HI

[5] Corresponds to 90% confidence range [−0.084, 0.068]. NODE=S042DGS;LINKAGE=AB

[6] Used the measured $\tau_{B^0} = 1.55 \pm 0.03$ ps. Corresponds to an upper limit of < 0.18 at 95% C.L. NODE=S042DGS;LINKAGE=BL

[7] BEHRENS 00B uses high-momentum lepton tags and partially reconstructed $\overline{B}^0 \rightarrow D^{*+}\pi^-$, ρ^- decays to determine the flavor of the B meson. Assumes Δ_{md}=0.478 ± 0.018 ps^{-1} and τ_{B^0}=1.548 ± 0.032 ps. NODE=S042DGS;LINKAGE=KS

B^0 REFERENCES

NODE=S042

YOUR PAPER SIRUNYAN	18BY	EPJ C78 457	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59185
AABOUD	16G	JHEP 1606 081	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57337
ABAZOV	15A	PRL 114 062001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=56380
AAIJ	14E	JHEP 1404 114	R. Aaij *et al.*	(LHCb Collab.)	REFID=55689
AAIJ	14R	PL B736 446	R. Aaij *et al.*	(LHCb Collab.)	REFID=55760
ABAZOV	14	PR D89 012002	V.M. Abazov *et al.*	(D0 Collab.)	REFID=55621
AAD	13U	PR D87 032002	G. Aad *et al.*	(ATLAS Collab.)	REFID=54939
ABAZOV	12U	PR D85 112003	V.M. Abazov *et al.*	(D0 Collab.)	REFID=54350
HIGUCHI	12	PR D85 071105	T. Higuchi *et al.*	(BELLE Collab.)	REFID=54069
AALTONEN	11	PRL 106 121804	T. Aaltonen *et al.*	(CDF Collab.)	REFID=53674
ABAZOV	09E	PRL 102 032001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=52650
ABAZOV	07S	PRL 99 142001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=52008
ABULENCIA	07A	PRL 98 122001	A. Abulencia *et al.*	(FNAL CDF Collab.)	REFID=51662
AUBERT	06G	PR D73 012004	B. Aubert *et al.*	(BABAR Collab.)	REFID=51087
ABAZOV	05B	PRL 94 042001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=50492
ABAZOV	05C	PRL 94 102001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=50511
ABAZOV	05W	PRL 95 171801	V.M. Abazov *et al.*	(D0 Collab.)	REFID=50929
ABE	05B	PR D71 072003	K. Abe *et al.*	(BELLE Collab.)	REFID=50517
Also		PR D71 079903 (errat.)	K. Abe *et al.*	(BELLE Collab.)	REFID=50555
ACOSTA	05	PRL 94 101803	D. Acosta *et al.*	(CDF Collab.)	REFID=50519
ABDALLAH	04E	EPJ C33 307	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=49917
AUBERT,B	04C	PR D70 012007	B. Aubert *et al.*	(BABAR Collab.)	REFID=50046
Also		PRL 92 181801	B. Aubert *et al.*	(BABAR Collab.)	REFID=49927
ABDALLAH	03B	EPJ C28 155	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=49242
AUBERT	03C	PR D67 072002	B. Aubert *et al.*	(BABAR Collab.)	REFID=49210
AUBERT	03H	PR D67 091101	B. Aubert *et al.*	(BABAR Collab.)	REFID=49430
ABE	02H	PRL 88 171801	K. Abe *et al.*	(BELLE Collab.)	REFID=48633
ACOSTA	02C	PR D65 092009	D. Acosta *et al.*	(CDF Collab.)	REFID=48794
AUBERT	02H	PRL 89 011802	B. Aubert *et al.*	(BABAR Collab.)	REFID=48639
Also		PRL 89 169903 (errat.)	B. Aubert *et al.*	(BABAR Collab.)	REFID=48983

AUBERT	01F	PRL 87 201803	B. Aubert *et al.*	(BABAR Collab.)	REFID=48432
ABBIENDI,G	00B	PL B493 266	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=47835
BARATE	00R	PL B492 275	R. Barate *et al.*	(ALEPH Collab.)	REFID=47827
BEHRENS	00B	PL B490 36	B.H. Behrens *et al.*	(CLEO Collab.)	REFID=47776
ABBIENDI	99J	EPJ C12 609	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=46738
ABE	98B	PR D57 5382	F. Abe *et al.*	(CDF Collab.)	REFID=45880
ABE	98Q	PR D58 092002	F. Abe *et al.*	(CDF Collab.)	REFID=46475
ACCIARRI	98S	PL B438 417	M. Acciarri *et al.*	(L3 Collab.)	REFID=46503
ABE	97J	PRL 79 590	K. Abe *et al.*	(SLD Collab.)	REFID=45413
ABREU	97F	ZPHY C74 19	P. Abreu *et al.*	(DELPHI Collab.)	REFID=45412
Also		ZPHY C75 579 (erratum)	P. Abreu *et al.*	(DELPHI Collab.)	REFID=45614
ABE	96C	PRL 76 4462	F. Abe *et al.*	(CDF Collab.)	REFID=44700
BUSKULIC	96J	ZPHY C71 31	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=44824
ABREU	95Q	ZPHY C68 13	P. Abreu *et al.*	(DELPHI Collab.)	REFID=44460
ADAM	95	ZPHY C68 363	W. Adam *et al.*	(DELPHI Collab.)	REFID=44465
AKERS	95T	ZPHY C67 379	R. Akers *et al.*	(OPAL Collab.)	REFID=44379
ABE	94D	PRL 72 3456	F. Abe *et al.*	(CDF Collab.)	REFID=43761
ABREU	93D	ZPHY C57 181	P. Abreu *et al.*	(DELPHI Collab.)	REFID=43267
ABREU	93G	PL B312 253	P. Abreu *et al.*	(DELPHI Collab.)	REFID=43443
ACTON	93C	PL B307 247	P.D. Acton *et al.*	(OPAL Collab.)	REFID=43352
BUSKULIC	93D	PL B307 194	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=43349
Also		PL B325 537 (erratum)	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=43945
WAGNER	90	PRL 64 1095	S.R. Wagner *et al.*	(Mark II Collab.)	REFID=41096
AVERILL	89	PR D39 123	D.A. Averill *et al.*	(HRS Collab.)	REFID=40691

BOTTOM, STRANGE MESONS
$(B = \pm 1,\ S = \mp 1)$

NODE=MXXX046

$B_s^0 = s\overline{b}$, $\overline{B}_s^0 = \overline{s}\,b$, similarly for B_s^*'s

NODE=MXXX046

NODE=S086

B_s^0

$I(J^P) = 0(0^-)$

I, *J*, *P* need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S086

B_{sH}^0 MEAN LIFE

NODE=S086TSH

B_{sH}^0 is the heavy mass state of two B_s^0 *CP* eigenstates.

NODE=S086TSH

"OUR EVALUATION" is provided by the Heavy Flavor Averaging Group (HFLAV). It is derived from the averages of $\Gamma_{B_s^0}$ and $\Delta\Gamma_{B_s^0}$ (and their correlation).

NODE=S086TSH

→ UNCHECKED ← NEW

	VALUE (10^{-12} s)	*DOCUMENT ID*		*TECN*	*COMMENT*
	1.615±0.009 OUR EVALUATION				
	1.68 ±0.04 OUR AVERAGE				
	[$(2.0 \pm 0.4) \times 10^{-12}$ s OUR 2018 AVERAGE]				
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
YOUR DATA	$1.677 \pm 0.034 \pm 0.011$	[1] SIRUNYAN	18BY	CMS	pp at 8 TeV
	$2.04 \pm 0.44 \pm 0.05$	[2] AAIJ	17AI	LHCB	pp at 7, 8, 13 TeV
	$1.70 \pm 0.14 \pm 0.05$	[3] ABAZOV	16C	D0	$p\overline{p}$ at 1.96 TeV
	$1.75 \pm 0.12 \pm 0.07$	[4] AAIJ	13AB	LHCB	pp at 7 TeV
	$1.652 \pm 0.024 \pm 0.024$	[5] AAIJ	13AR	LHCB	pp at 7 TeV
	$1.700 \pm 0.040 \pm 0.026$	[6] AAIJ	12AN	LHCB	pp at 7 TeV
		[7] AALTONEN	12D	CDF	$p\overline{p}$ at 1.96 TeV
	$1.70\ ^{+0.12}_{-0.11} \pm 0.03$	[6] AALTONEN	11AB	CDF	$p\overline{p}$ at 1.96 TeV
	$1.613\ ^{+0.123}_{-0.113}$	[8,9] AALTONEN	08J	CDF	Repl. by AALTONEN 12D
	$1.58\ ^{+0.39}_{-0.42}\ ^{+0.01}_{-0.02}$	[9] ABAZOV	05W	D0	Repl. by ABAZOV 08AM
	$2.07\ ^{+0.58}_{-0.46} \pm 0.03$	[9] ACOSTA	05	CDF	Repl. by AALTONEN 08J

NODE=S086TSH

YOUR NOTE [1] Measured using $B_s^0 \to J/\psi \pi^+ \pi^-$ decays with $0.9240 < m(\pi\pi) < 1.0204$ GeV, which is dominated by the $f_0(980)$ resonance, making it a *CP*-odd state. NODE=S086TSH;LINKAGE=E

[2] Measured using $B_s \to \mu^+ \mu^-$ decays which, in the Standard Model, correspond to B_{sH}^0 decays. Assumes $-2\ \mathrm{Re}(\lambda)/(1+ |\lambda|^2) = 1$. NODE=S086TSH;LINKAGE=D

[3] Measured using $J/\psi \pi^+ \pi^-$ mode with $0.880 < m(\pi\pi) < 1.080$ GeV/c^2, which is mostly $J/\psi f(0)(980)$ mode, a pure *CP*-odd final state. NODE=S086TSH;LINKAGE=B

[4] Measured using a pure CP-odd final state $J/\psi K^0_S$ with the assumption that contributions from penguin diagrams are small. NODE=S086TSH;LINKAGE=A
[5] Measured using $B_s \to J/\psi \pi^+ \pi^-$ decays which, in the limit of $\phi_s = 0$ and $|\lambda| = 1$, correspond to B^0_{sH} decays. NODE=S086TSH;LINKAGE=C
[6] Measured using a pure CP-odd final state $J/\psi f_0(980)$. NODE=S086TSH;LINKAGE=AL
[7] Uses the time-dependent angular analysis of $B^0_s \to J/\psi \phi$ decays assuming CP-violating angle $\beta_s(B^0 \to J/\psi \phi) = 0.02$. NODE=S086TSH;LINKAGE=AT
[8] Obtained from $\Delta\Gamma_s$ and Γ_s fit with a correlation of 0.6. NODE=S086TSH;LINKAGE=AA
[9] Measured using the time-dependent angular analysis of $B^0_s \to J/\psi \phi$ decays. NODE=S086TSH;LINKAGE=AC

B^0_{sL} MEAN LIFE

NODE=S086TSL

B^0_{sL} is the light mass state of two B^0_s CP eigenstates.

NODE=S086TSL

"OUR EVALUATION" is provided by the Heavy Flavor Averaging Group (HFLAV). It is derived from the averages of $\Gamma_{B^0_s}$ and $\Delta\Gamma_{B^0_s}$ (and their correlation).

NODE=S086TSL

→ UNCHECKED ←

NEW

	VALUE (10^{-12} s)	DOCUMENT ID	TECN	COMMENT
	1.415±0.006 OUR EVALUATION			
	1.40 ±0.02 OUR AVERAGE [$(1.379 \pm 0.031) \times 10^{-12}$ s OUR 2016 AVERAGE]			
	• • • We do not use the following data for averages, fits, limits, etc. • • •			
YOUR DATA	1.40 ±0.02	[1] SIRUNYAN 18BY	CMS	pp at 8 TeV
	1.479±0.034±0.011	[2] AAIJ 16AL	LHCB	pp at 7, 8 TeV
	1.379±0.026±0.017	[3] AAIJ 14F	LHCB	pp at 7, 8 TeV
	1.407±0.016±0.007	[4] AAIJ 14R	LHCB	pp at 7 TeV
	1.440±0.096±0.009	[4] AAIJ 12	LHCB	Repl. by AAIJ 14R
	1.455±0.046±0.006	[4] AAIJ 12R	LHCB	Repl. by AAIJ 14R
		[5] AALTONEN 12D	CDF	$p\overline{p}$ at 1.96 TeV
	$1.437^{+0.054}_{-0.047}$	[6,7] AALTONEN 08J	CDF	Repl. by AALTONEN 12D
	$1.24\ ^{+0.14}_{-0.11}\ ^{+0.01}_{-0.02}$	[7] ABAZOV 05W	D0	Repl. by ABAZOV 08AM
	$1.05\ ^{+0.16}_{-0.13} \pm 0.02$	[7] ACOSTA 05	CDF	Repl. by AALTONEN 08J
	1.27 ±0.33 ±0.08	[8] BARATE 00K	ALEP	$e^+e^- \to Z$

YOUR NOTE [1] Measured using results in SIRUNYAN 18BY for the heavy B^0_s lifetime obtained from $B^0_s \to J/\psi \pi^+ \pi^-$ decays and the average effective $B^0_s \to J/\psi \phi$ lifetime, and magnitude squared of the CP-odd amplitude $|A_\perp|^2 = 0.250 \pm 0.006$. The uncertainty includes all statistical and systematic contributions. NODE=S086TSL;LINKAGE=C
[2] Measured using $B^0_s \to J/\psi \eta$ decays. NODE=S086TSL;LINKAGE=B
[3] Measured using $B^0_s \to D^-_s D^+_s$. The effective lifetime is translated into a decay width of $\Gamma_L = 0.725 \pm 0.014 \pm 0.009$ ps^{-1}. NODE=S086TSL;LINKAGE=A
[4] Measured using $B^0_s \to K^+ K^-$ decays. There may still be CPV in the decay. NODE=S086TSL;LINKAGE=AI
[5] Uses the time-dependent angular analysis of $B^0_s \to J/\psi \phi$ decays and assuming CP-violating angle $\beta_s(B^0 \to J/\psi \phi) = 0.02$. NODE=S086TSL;LINKAGE=AT
[6] Obtained from $\Delta\Gamma_s$ and Γ_s fit with a correlation of 0.6. NODE=S086TSL;LINKAGE=AA
[7] Measured using the time-dependent angular analysis of $B^0_s \to J/\psi \phi$ decays. NODE=S086TSL;LINKAGE=AC
[8] Uses $\phi\phi$ correlations from $B^0_s \to D^{(*)+}_s D^{(*)-}_s$. NODE=S086TSL;LINKAGE=BA

B^0_s MEAN LIFE ($B_s \to J/\psi \phi$)

NODE=S086TJP

NODE=S086TJP

→ UNCHECKED ←

NEW

	VALUE (10^{-12} s)	DOCUMENT ID	TECN	COMMENT
	1.479±0.012 OUR EVALUATION			
	1.480±0.007 OUR AVERAGE [$(1.479 \pm 0.012) \times 10^{-12}$ s OUR 2018 AVERAGE]			
YOUR DATA	1.481±0.007±0.005	[1] SIRUNYAN 18BY	CMS	pp at 8 TeV
	1.480±0.011±0.005	[1] AAIJ 14E	LHCB	pp at 7 TeV
	$1.444^{+0.098}_{-0.090} \pm 0.020$	[1] ABAZOV 05B	D0	$p\overline{p}$ at 1.96 TeV
	$1.34\ ^{+0.23}_{-0.19} \pm 0.05$	[2] ABE 98B	CDF	$p\overline{p}$ at 1.8 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •			

$1.39\ ^{+0.13}_{-0.16}\ ^{+0.01}_{-0.02}$	[2] ABAZOV	05W	D0	$p\overline{p}$ at 1.96 TeV
$1.34\ ^{+0.23}_{-0.19}\ \pm0.05$	[3] ABE	96N	CDF	Repl. by ABE 98B

YOUR NOTE [1] Measured using fully reconstructed $B_s \rightarrow J/\psi\phi$ decays. NODE=S086TJP;LINKAGE=CD

[2] Measured using the time-dependent angular analysis of $B_s^0 \rightarrow J/\psi\phi$ decays. NODE=S086TJP;LINKAGE=AC

[3] ABE 96N uses 58 ± 12 exclusive $B_s \rightarrow J/\psi\phi$ events. NODE=S086TJP;LINKAGE=AB

$\tau_{B_s^0}/\tau_{B^0}$ MEAN LIFE RATIO

NODE=S086A21

$\tau_{B_s^0}/\tau_{B^0}$ (direct measurements)

NODE=S086A21
NODE=S086A21

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.980±0.006±0.003**	[1] SIRUNYAN	18BY	CMS	pp at 8 TeV

YOUR NOTE [1] Measured using $B_s^0 \rightarrow J/\psi\phi(1020)$ and $B^0 \rightarrow J/\psi K^*(892)^0$ decays. NODE=S086A21;LINKAGE=A

B_s^0 REFERENCES

NODE=S086

YOUR PAPER

SIRUNYAN	18BY	EPJ C78 457	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59185
AAIJ	17AI	PRL 118 191801	R. Aaij *et al.*	(LHCb Collab.)	REFID=57928
AAIJ	16AL	PL B762 484	R. Aaij *et al.*	(LHCb Collab.)	REFID=57577
ABAZOV	16C	PR D94 012001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=57305
AAIJ	14E	JHEP 1404 114	R. Aaij *et al.*	(LHCb Collab.)	REFID=55689
AAIJ	14F	PRL 112 111802	R. Aaij *et al.*	(LHCb Collab.)	REFID=55692
AAIJ	14R	PL B736 446	R. Aaij *et al.*	(LHCb Collab.)	REFID=55760
AAIJ	13AB	NP B873 275	R. Aaij *et al.*	(LHCb Collab.)	REFID=55063
AAIJ	13AR	PR D87 112010	R. Aaij *et al.*	(LHCb Collab.)	REFID=55159
AAIJ	12	PL B707 349	R. Aaij *et al.*	(LHCb Collab.)	REFID=53982
AAIJ	12AN	PRL 109 152002	R. Aaij *et al.*	(LHCb Collab.)	REFID=54591
AAIJ	12R	PL B716 393	R. Aaij *et al.*	(LHCb Collab.)	REFID=54191
AALTONEN	12D	PR D85 072002	T. Aaltonen *et al.*	(CDF Collab.)	REFID=54070
AALTONEN	11AB	PR D84 052012	T. Aaltonen *et al.*	(CDF Collab.)	REFID=53799
AALTONEN	08J	PRL 100 121803	T. Aaltonen *et al.*	(CDF Collab.)	REFID=52234
ABAZOV	08AM	PRL 101 241801	V.M. Abazov *et al.*	(D0 Collab.)	REFID=52604
ABAZOV	05B	PRL 94 042001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=50492
ABAZOV	05W	PRL 95 171801	V.M. Abazov *et al.*	(D0 Collab.)	REFID=50929
ACOSTA	05	PRL 94 101803	D. Acosta *et al.*	(CDF Collab.)	REFID=50519
BARATE	00K	PL B486 286	R. Barate *et al.*	(ALEPH Collab.)	REFID=47721
ABE	98B	PR D57 5382	F. Abe *et al.*	(CDF Collab.)	REFID=45880
ABE	96N	PRL 77 1945	F. Abe *et al.*	(CDF Collab.)	REFID=44811

BOTTOM, CHARMED MESONS
$(B = C = \pm1)$

NODE=MXXX049

$B_c^+ = c\overline{b}$, $B_c^- = \overline{c}\,b$, similarly for B_c^*'s

NODE=MXXX049

NODE=S091

B_c^+

$I(J^P) = 0(0^-)$
I, J, P need confirmation.

Quantum numbers shown are quark-model predictions.

NODE=S091

B_c^+ MEAN LIFE

NODE=S091T

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at http://www.slac.stanford.edu/xorg/hflav/. The averaging/rescaling procedure takes into account correlations between the measurements.

NODE=S091T

NODE=S091T

→ UNCHECKED ←
NEW

	VALUE (10^{-12} s)	DOCUMENT ID		TECN	COMMENT
	0.507 ±0.009 OUR EVALUATION				
	0.510 ±0.009 OUR AVERAGE				
	[$(0.507 \pm 0.009) \times 10^{-12}$ s OUR 2018 AVERAGE]				
YOUR DATA	0.541 ±0.026 ±0.014	[1] SIRUNYAN	18BY	CMS	pp at 8 TeV
	0.5134±0.0110±0.0057	[2,3] AAIJ	15G	LHCB	pp at 7, 8 TeV
	0.509 ±0.008 ±0.012	[4] AAIJ	14G	LHCB	pp at 8 TeV
	0.452 ±0.048 ±0.027	[3] AALTONEN	13	CDF	$p\overline{p}$ at 1.96 TeV

$0.448\ {+0.038 \atop -0.036}\ \pm 0.032$	[5] ABAZOV	09H	D0	$p\overline{p}$ at 1.96 TeV
$0.463\ {+0.073 \atop -0.065}\ \pm 0.036$	[5] ABULENCIA	06O	CDF	$p\overline{p}$ at 1.96 TeV
$0.46\ {+0.18 \atop -0.16}\ \pm 0.03$	[5] ABE	98M	CDF	$p\overline{p}$ 1.8 TeV

YOUR NOTE

[1] The lifetime is measured using the decays $B_c^+ \rightarrow J/\psi \pi^+$ and $B^+ \rightarrow J/\psi K^+$. NODE=S091T;LINKAGE=C

[2] Also measures the width difference $\Delta\Gamma = \Gamma_{B_c^+} - \Gamma_{B^+} = 4.46 \pm 0.14 \pm 0.07\ \text{mm}^{-1}$ c. NODE=S091T;LINKAGE=AA

[3] Uses fully reconstructed $B_c^+ \rightarrow J/\psi \pi^+$ decays. NODE=S091T;LINKAGE=AL

[4] Measured using $B_c^+ \rightarrow J/\psi \mu^+ \nu_\mu X$ decays. NODE=S091T;LINKAGE=B

[5] The lifetime is measured from the $J/\psi e$ decay vertices. NODE=S091T;LINKAGE=A

B_c^+ REFERENCES

NODE=S091

YOUR PAPER

SIRUNYAN	18BY	EPJ C78 457	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59185
AAIJ	15G	PL B742 29	R. Aaij *et al.*	(LHCb Collab.)	REFID=56373
AAIJ	14G	EPJ C74 2839	R. Aaij *et al.*	(LHCb Collab.)	REFID=55693
AALTONEN	13	PR D87 011101	T. Aaltonen *et al.*	(CDF Collab.)	REFID=54798
ABAZOV	09H	PRL 102 092001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=52702
ABULENCIA	06O	PRL 97 012002	A. Abulencia *et al.*	(CDF Collab.)	REFID=51241
ABE	98M	PRL 81 2432	F. Abe *et al.*	(CDF Collab.)	REFID=46120
Also		PR D58 112004	F. Abe *et al.*	(CDF Collab.)	REFID=46488

BOTTOM BARYONS
$(B = -1)$

NODE=BXXX045

$\Lambda_b^0 = u\,d\,b$, $\Xi_b^0 = u\,s\,b$, $\Xi_b^- = d\,s\,b$, $\Omega_b^- = s\,s\,b$

NODE=BXXX045

NODE=S040

Λ_b^0

$I(J^P) = 0(\frac{1}{2}^+)$ Status: ∗∗∗

In the quark model, a Λ_b^0 is an isospin-0 $u\,d\,b$ state. The lowest Λ_b^0 ought to have $J^P = 1/2^+$. None of I, J, or P have actually been measured.

NODE=S040

Λ_b^0 MEAN LIFE

NODE=S040T

See b-baryon Admixture section for data on b-baryon mean life average over species of b-baryon particles.

NODE=S040T

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at http://www.slac.stanford.edu/xorg/hflav/. The averaging/rescaling procedure takes into account correlations between the measurements and asymmetric lifetime errors.

NODE=S040T

→ UNCHECKED ←

YOUR DATA

VALUE (10^{-12} s)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1.470±0.010 OUR EVALUATION					
1.477±0.027±0.009		[1] SIRUNYAN	18BY	CMS	pp at 8 TeV
1.415±0.027±0.006		[2] AAIJ	14E	LHCB	pp at 7 TeV
1.479±0.009±0.010		[3] AAIJ	14U	LHCB	pp at 7, 8 TeV
1.565±0.035±0.020		[2] AALTONEN	14B	CDF	$p\overline{p}$ at 1.96 TeV
1.449±0.036±0.017		[2] AAD	13U	ATLS	pp at 7 TeV
1.503±0.052±0.031		[2] CHATRCHYAN	13AC	CMS	pp at 7 TeV
1.303±0.075±0.035		[2] ABAZOV	12U	D0	$p\overline{p}$ at 1.96 TeV
1.401±0.046±0.035		[4] AALTONEN	10B	CDF	$p\overline{p}$ at 1.96 TeV
$1.27\ {+0.35 \atop -0.29}\ \pm 0.09$		ABREU	95S	DLPH	Excess $p\mu^-$, decay lengths
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.482±0.018±0.012		[5] AAIJ	13BB	LHCB	Repl. by AAIJ 14U
1.537±0.045±0.014		[2] AALTONEN	11	CDF	Repl. by AALTONEN 14B
$1.218{+0.130 \atop -0.115}\pm 0.042$		[2] ABAZOV	07S	D0	Repl. by ABAZOV 12U
$1.290{+0.119 \atop -0.110}{+0.087 \atop -0.091}$		[6] ABAZOV	07U	D0	$p\overline{p}$ at 1.96 TeV

NODE=S040T

$1.593^{+0.083}_{-0.078}\pm0.033$		[2] ABULENCIA	07A	CDF	Repl. by AALTONEN 11
$1.22\ ^{+0.22}_{-0.18}\ \pm0.04$		[2] ABAZOV	05C	D0	Repl. by ABAZOV 07S
$1.11\ ^{+0.19}_{-0.18}\ \pm0.05$		[7] ABREU	99W	DLPH	$e^+e^- \rightarrow Z$
$1.29\ ^{+0.24}_{-0.22}\ \pm0.06$		[7] ACKERSTAFF	98G	OPAL	$e^+e^- \rightarrow Z$
$1.21\ \pm0.11$		[7] BARATE	98D	ALEP	$e^+e^- \rightarrow Z$
$1.32\ \pm0.15\ \pm0.07$		[8] ABE	96M	CDF	$p\overline{p}$ at 1.8 TeV
$1.19\ ^{+0.21}_{-0.18}\ ^{+0.07}_{-0.08}$		ABREU	96D	DLPH	Repl. by ABREU 99W
$1.14\ ^{+0.22}_{-0.19}\ \pm0.07$	69	AKERS	95K	OPAL	Repl. by ACKERSTAFF 98G
$1.02\ ^{+0.23}_{-0.18}\ \pm0.06$	44	BUSKULIC	95L	ALEP	Repl. by BARATE 98D

OCCUR=3

OCCUR=2

YOUR NOTE

[1] Measured using $\Lambda_b^0 \rightarrow J/\psi\Lambda$ decays. NODE=S040T;LINKAGE=A

[2] Measured mean life using fully reconstructed $\Lambda_b^0 \rightarrow J/\psi\Lambda$ decays. NODE=S040T;LINKAGE=AB

[3] Used $\Lambda_b^0 \rightarrow J/\psi p K^-$ decays. NODE=S040T;LINKAGE=AI

[4] Measured mean life using fully reconstructed $\Lambda_b^0 \rightarrow \Lambda_c^+\pi^-$ decays. NODE=S040T;LINKAGE=AA

[5] Measured the lifetime ratio of decays $\Lambda_b^0 \rightarrow J/\psi p K^-$ to $B^0 \rightarrow J/\psi \pi^+ K^-$ to be $0.976 \pm 0.012 \pm 0.006$ with $\tau_{B^0} = 1.519 \pm 0.007$ ps. NODE=S040T;LINKAGE=AJ

[6] Measured using semileptonic decays $\Lambda_b^0 \rightarrow \Lambda_c^+\mu\nu X$ and $\Lambda_c^+ \rightarrow K_S^0 p$. NODE=S040T;LINKAGE=AZ

[7] Measured using $\Lambda_c\ell^-$ and $\Lambda\ell^+\ell^-$. NODE=S040T;LINKAGE=KK

[8] Excess $\Lambda_c\ell^-$, decay lengths. NODE=S040T;LINKAGE=AE

$\tau_{\Lambda_b^0}/\tau_{B^0}$ MEAN LIFE RATIO

NODE=S040211

$\tau_{\Lambda_b^0}/\tau_{B^0}$ (direct measurements)

NODE=S040TR

"OUR EVALUATION" has been obtained by the Heavy Flavor Averaging Group (HFLAV) by including both B^0 and B^+ decays.

NODE=S040TR

NODE=S040TR

→ UNCHECKED ←

NEW

0.964±0.007 OUR EVALUATION

0.970±0.009 OUR AVERAGE Error includes scale factor of 1.4. See the ideogram below.
[0.969 ± 0.010 OUR 2018 AVERAGE Scale factor = 1.6]

YOUR DATA

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
$0.978\pm0.018\pm0.006$	[1] SIRUNYAN	18BY	CMS	pp at 8 TeV
$0.929\pm0.018\pm0.004$	[1] AAIJ	14E	LHCB	pp at 7 TeV
$0.974\pm0.006\pm0.004$	[2] AAIJ	14U	LHCB	pp at 7, 8 TeV
$0.960\pm0.025\pm0.016$	[3] AAD	13U	ATLS	pp at 7 TeV
$0.864\pm0.052\pm0.033$	[4,5] ABAZOV	12U	D0	$p\overline{p}$ at 1.96 TeV
$1.020\pm0.030\pm0.008$	[4] AALTONEN	11	CDF	$p\overline{p}$ at 1.96 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.976\pm0.012\pm0.006$	[6] AAIJ	13BB	LHCB	Repl. by AAIJ 14U
$0.811^{+0.096}_{-0.087}\pm0.034$	[4,5] ABAZOV	07S	D0	Repl. by ABAZOV 12U
1.041 ± 0.057	[7] ABULENCIA	07A	CDF	Repl. by AALTONEN 11
$0.87\ ^{+0.17}_{-0.14}\ \pm0.03$	[7] ABAZOV	05C	D0	Repl. by ABAZOV 07S

YOUR NOTE

[1] Measured using $\Lambda_b^0 \rightarrow J/\psi\Lambda$ and $B^0 \rightarrow J/\psi K^*(892)^0$ decays. NODE=S040TR;LINKAGE=B

[2] Used $\Lambda_b^0 \rightarrow J/\psi p K^-$ and $B^0 \rightarrow J/\psi K^*(892)^0$ decays. NODE=S040TR;LINKAGE=AA

[3] Measured with $\Lambda_b^0 \rightarrow J/\psi(\mu^+\mu^-)\ \Lambda^0(p\pi^-)$ decays. NODE=S040TR;LINKAGE=AD

[4] Uses fully reconstructed $\Lambda_b \rightarrow J/\psi\Lambda$ decays. NODE=S040TR;LINKAGE=ZO

[5] Uses $B^0 \rightarrow J/\psi K_S^0$ decays for denominator. NODE=S040TR;LINKAGE=ZV

[6] Measures $1/\tau_{\Lambda_b^0} - 1/\tau_{B^0}$ and uses $\tau_{B^0} = 1.519 \pm 0.007$ ps to extract lifetime ratio. NODE=S040TR;LINKAGE=A

[7] Measured mean life ratio using fully reconstructed decays. NODE=S040TR;LINKAGE=AB

Λ_b^0 REFERENCES

NODE=S040

YOUR PAPER

SIRUNYAN	18BY	EPJ C78 457	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59185
AAIJ	14E	JHEP 1404 114	R. Aaij *et al.*	(LHCb Collab.)	REFID=55689
AAIJ	14U	PL B734 122	R. Aaij *et al.*	(LHCb Collab.)	REFID=55763
AALTONEN	14B	PR D89 072014	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55804
AAD	13U	PR D87 032002	G. Aad *et al.*	(ATLAS Collab.)	REFID=54939
AAIJ	13BB	PRL 111 102003	R. Aaij *et al.*	(LHCb Collab.)	REFID=55228
CHATRCHYAN	13AC	JHEP 1307 163	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=55044
ABAZOV	12U	PR D85 112003	V.M. Abazov *et al.*	(D0 Collab.)	REFID=54350
AALTONEN	11	PRL 106 121804	T. Aaltonen *et al.*	(CDF Collab.)	REFID=53674
AALTONEN	10B	PRL 104 102002	T. Aaltonen *et al.*	(CDF Collab.)	REFID=53241
ABAZOV	07S	PRL 99 142001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=52008

ABAZOV	07U	PRL 99 182001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=52043
ABULENCIA	07A	PRL 98 122001	A. Abulencia *et al.*	(FNAL CDF Collab.)	REFID=51662
ABAZOV	05C	PRL 94 102001	V.M. Abazov *et al.*	(D0 Collab.)	REFID=50511
ABREU	99W	EPJ C10 185	P. Abreu *et al.*	(DELPHI Collab.)	REFID=47301
ACKERSTAFF	98G	PL B426 161	K. Ackerstaff *et al.*	(OPAL Collab.)	REFID=45875
BARATE	98D	EPJ C2 197	R. Barate *et al.*	(ALEPH Collab.)	REFID=45878
ABE	96M	PRL 77 1439	F. Abe *et al.*	(CDF Collab.)	REFID=44810
ABREU	96D	ZPHY C71 199	P. Abreu *et al.*	(DELPHI Collab.)	REFID=44691
ABREU	95S	ZPHY C68 375	P. Abreu *et al.*	(DELPHI Collab.)	REFID=44466
AKERS	95K	PL B353 402	R. Akers *et al.*	(OPAL Collab.)	REFID=44324
BUSKULIC	95L	PL B357 685	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=44468

Reference = SIRUNYAN 18DA; JHEP 1811 042
Verifier code = CMS

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

CMS Physics Coordinator

EMAIL: cms-physics-coordinator@cern.ch

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

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Thank you for helping us make the Review accurate and useful.

Sincerely,

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USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Heavy Particle Production Cross Section

NODE=S015CS
NODE=S015CS

VALUE (cm^2/N)	CL%	DOCUMENT ID		TECN	COMMENT
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	AAIJ	18AJ	PRL 120 061801	R. Aaij *et al.*	(LHCb Collab.)	REFID=59199
	BANERJEE	18	PRL 120 231802	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58838
	BANERJEE	18A	PR D97 072002	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58916
	MARSICANO	18	PR D98 015031	L. Marsicano *et al.*		REFID=58967
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YOUR PAPER	SIRUNYAN	18DA	JHEP 1811 042	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59306
	SIRUNYAN	18DD	EPJ C78 789	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59318
	SIRUNYAN	18DR	JHEP 1811 161	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59367
	SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
	SIRUNYAN	18ED	JHEP 1811 172	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59566
	AABOUD	17B	PL B765 32	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57706
	AAIJ	17BR	EPJ C77 812	R. Aaij *et al.*	(LHCb Collab.)	REFID=58366
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	AAD	16O	PL B760 520	G. Aad *et al.*	(ATLAS Collab.)	REFID=57169
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	KRASZNAHO...	16	PRL 116 042501	A.J. Krasznahorkay *et al.*	(HINR, ANIK+)	REFID=59302
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	ADAMS	97B	PRL 79 4083	J. Adams *et al.*	(FNAL KTeV Collab.)	REFID=45722
	GALLAS	95	PR D52 6	E. Gallas *et al.*	(MSU, FNAL, MIT, FLOR)	REFID=44291
	AKESSON	91	ZPHY C52 219	T. Akesson *et al.*	(HELIOS Collab.)	REFID=41739
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	GUSTAFSON	76	PRL 37 474	H.R. Gustafson *et al.*	(MICH)	REFID=12580

Reference = SIRUNYAN 18DD; EPJ C78 789
Verifier code = CMS

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PLEASE REPLY WITHIN ONE WEEK

CMS Physics Coordinator

EMAIL: cms-physics-coordinator@cern.ch

April 5, 2019

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NODE=S015

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Reference = SIRUNYAN 18DJ; JHEP 1809 101
Verifier code = CMS

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SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

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LIMITS ON JET-JET RESONANCES

NODE=S015420

Heavy Particle Production Cross Section

NODE=S015HP

Limits are for a particle decaying to two hadronic jets.

NODE=S015HP
NODE=S015HP

• • • We do not use the following data for averages, fits, limits, etc. • • •

YOUR DATA

Units(pb)	CL%	Mass(GeV)	DOCUMENT ID		TECN	COMMENT
			[1] SIRUNYAN	19B	CMS	$p p \to j A$, $A \to b \overline{b}$
			[2] AABOUD	18AD	ATLS	$p p \to Y \to H X \to (b b) + (q q)$
			[3] AABOUD	18CK	ATLS	$p p \to b b b + \not{E}_T$
			[4] AABOUD	18CL	ATLS	$p p \to$ vector-like quarks
			[5] AABOUD	18N	ATLS	$p p \to j j$ resonance
			[6] SIRUNYAN	18DJ	CMS	$p p \to Z Z$ or $W Z \to l \bar{l} j j$
			[7] SIRUNYAN	18DY	CMS	$p p \to R R$; $R \to j j$
			[8] KHACHATRY...	17W	CMS	$p p \to j j$ resonance
			[9] KHACHATRY...	17Y	CMS	$p p \to$ (8–10) $j + \not{E}_T$
			[10] SIRUNYAN	17F	CMS	$p p \to j j$ angular distribution
			[11] AABOUD	16	ATLS	$p p \to b +$ jet
			[12] AAD	16N	ATLS	$p p \to$ 3 high E_T jets
			[13] AAD	16S	ATLS	$p p \to j j$ resonance
			[14] KHACHATRY...	16K	CMS	$p p \to j j$ resonance
			[15] KHACHATRY...	16L	CMS	$p p \to j j$ resonance
			[16] AAD	13D	ATLS	7 TeV $p p \to$ 2 jets
			[17] AALTONEN	13R	CDF	1.96 TeV $p \overline{p} \to$ 4 jets
			[18] CHATRCHYAN	13A	CMS	7 TeV $p p \to$ 2 jets
			[19] CHATRCHYAN	13A	CMS	7 TeV $p p \to b \overline{b} X$
			[20] AAD	12S	ATLS	7 TeV $p p \to$ 2 jets
			[21] CHATRCHYAN	12BL	CMS	7 TeV $p p \to t \overline{t} X$
			[22] AAD	11AG	ATLS	7 TeV $p p \to$ 2 jets
			[23] AALTONEN	11M	CDF	1.96 TeV $p \overline{p} \to W +$ 2 jets
			[24] ABAZOV	11I	D0	1.96 TeV $p \overline{p} \to W +$ 2 jets
			[25] AAD	10	ATLS	7 TeV $p p \to$ 2 jets
			[26] KHACHATRY...	10	CMS	7 TeV $p p \to$ 2 jets
			[27] ABE	99F	CDF	1.8 TeV $p \overline{p} \to b \overline{b} +$ anything
			[28] ABE	97G	CDF	1.8 TeV $p \overline{p} \to$ 2 jets
<2603	95	200	[29] ABE	93G	CDF	1.8 TeV $p \overline{p} \to$ 2 jets
< 44	95	400	[29] ABE	93G	CDF	1.8 TeV $p \overline{p} \to$ 2 jets
< 7	95	600	[29] ABE	93G	CDF	1.8 TeV $p \overline{p} \to$ 2 jets

OCCUR=2 (CHATRCHYAN 13A, $b\overline{b}X$)
OCCUR=2 (< 44)
OCCUR=3 (< 7)

YOUR NOTE

[1] SIRUNYAN 19B search for low mass resonance $p p \to j A$, $A \to b \overline{b}$ at 13 TeV using 35.9 fb^{-1}; no signal; exclude resonances 50-350 GeV depending on production and decay. NODE=S015HP;LINKAGE=R

[2] AABOUD 18AD search for new heavy particle $Y \to H X \to (b b) + (q q)$. No signal observed. Limits set on m(Y) vs. m(X) in the ranges of m(Y) in 1–4 TeV and m(X) in 50–1000 GeV. NODE=S015HP;LINKAGE=L

[3] AABOUD 18CK search for SUSY Higgsinos in gauge-mediation via $p p \to b b b + \not{E}_T$ at 13 TeV using two complementary analyses with 24.3/36.1 fb^{-1}; no signal is found and Higgsinos with masses between 130 and 230 GeV and between 290 and 880 GeV are excluded at the 95confidence level. NODE=S015HP;LINKAGE=N

[4] AABOUD 18CL search for $p p \to$ vector-like quarks $\to$ jets at 13 TeV with 36 fb^{-1}; no signal seen; limits set on various VLQ scenarios. For pure $B \to H b$ or $T \to H t$, set the mass limit m $>$ 1010 GeV. NODE=S015HP;LINKAGE=O

[5] AABOUD 18N search for dijet resonance at Atlas with 13 TeV and 29.3 fb^{-1}; limits set on m(Z') in the mass range of 450–1800 GeV. NODE=S015HP;LINKAGE=M

[6] SIRUNYAN 18DJ search for $p p \to Z Z$ or $W Z \to l \bar{l} j j$ resonance at 13 TeV, 35.9 fb^{-1}; no signal; limits set in the 400-4500 GeV mass range, exclusion of W' up to 2270 GeV in the HVT model A, and up to 2330 for HVT model B. WED bulk graviton exclusion up to 925 GeV. NODE=S015HP;LINKAGE=P

[7] SIRUNYAN 18DY search for $p p \to R R$; $R \to j j$ two dijet resonances at 13 TeV 35.9 fb^{-1}; no signal; limits placed on RPV top-squark pair production NODE=S015HP;LINKAGE=Q

[8] KHACHATRYAN 17W search for dijet resonance in 12.9 fb^{-1} data at 13 TeV; see Fig. 2 for limits on axigluons, diquarks, dark matter mediators etc. NODE=S015HP;LINKAGE=I

[9] KHACHATRYAN 17Y search for $pp \rightarrow$ (8–10) j in 19.7 fb^{-1} at 8 TeV. No signal seen. Limits set on colorons, axigluons, RPV, and SUSY. NODE=S015HP;LINKAGE=J

[10] SIRUNYAN 17F measure $pp \rightarrow jj$ angular distribution in 2.6 fb^{-1} at 13 TeV; limits set on LEDs and quantum black holes. NODE=S015HP;LINKAGE=K

[11] AABOUD 16 search for resonant dijets including one or two b-jets with 3.2 fb^{-1} at 13 TeV; exclude excited b^* quark from 1.1–2.1 TeV; exclude leptophilic Z' with SM couplings from 1.1–1.5 TeV. NODE=S015HP;LINKAGE=F

[12] AAD 16N search for ≥ 3 jets with 3.6 fb^{-1} at 13 TeV; limits placed on micro black holes (Fig. 10) and string balls (Fig. 11). NODE=S015HP;LINKAGE=D

[13] AAD 16S search for high mass jet-jet resonance with 3.6 fb^{-1} at 13 TeV; exclude portions of excited quarks, W', Z' and contact interaction parameter space. NODE=S015HP;LINKAGE=E

[14] KHACHATRYAN 16K search for dijet resonance in 2.4 fb^{-1} data at 13 TeV; see Fig. 3 for limits on axigluons, diquarks etc. NODE=S015HP;LINKAGE=G

[15] KHACHATRYAN 16L use data scouting technique to search for jj resonance on 18.8 fb^{-1} of data at 8 TeV. Limits on the coupling of a leptophobic Z' to quarks are set, improving on the results by other experiments in the mass range between 500–800 GeV. NODE=S015HP;LINKAGE=H

[16] AAD 13D search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. The observed events are compatible with Standard Model expectation. See their Fig. 6 and Table 2 for limits on resonance cross section in the range m = 1.0–4.0 TeV. NODE=S015HP;LINKAGE=GA

[17] AALTONEN 13R search for production of a pair of jet-jet resonances in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 6.6 fb^{-1}. See their Fig. 5 and Tables I, II for cross section limits. NODE=S015HP;LINKAGE=C

[18] CHATRCHYAN 13A search for qq, qg, and gg resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. See their Fig. 3 and Table 1 for limits on resonance cross section in the range m = 1.0–4.3 TeV. NODE=S015HP;LINKAGE=CA

[19] CHATRCHYAN 13A search for $b\overline{b}$ resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. See their Fig. 8 and Table 4 for limits on resonance cross section in the range m = 1.0–4.0 TeV. NODE=S015HP;LINKAGE=CT

[20] AAD 12S search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 1.0 fb^{-1}. See their Fig. 3 and Table 2 for limits on resonance cross section in the range m = 0.9–4.0 TeV. NODE=S015HP;LINKAGE=DA

[21] CHATRCHYAN 12BL search for $t\overline{t}$ resonances in pp collisions at E_{cm} = 7 TeV with L = 4.4 fb^{-1}. See their Fig. 4 for limits on resonance cross section in the range m = 0.5–3.0 TeV. NODE=S015HP;LINKAGE=CH

[22] AAD 11AG search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 36 pb^{-1}. Limits on number of events for m = 0.6–4 TeV are given in their Table 3. NODE=S015HP;LINKAGE=AD

[23] AALTONEN 11M find a peak in two jet invariant mass distribution around 140 GeV in W + 2 jet events in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 4.3 fb^{-1}. NODE=S015HP;LINKAGE=AL

[24] ABAZOV 11I search for two-jet resonances in W + 2 jet events in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 4.3 fb^{-1} and give limits $\sigma <$ (2.6–1.3) pb (95% CL) for m = 110–170 GeV. The result is incompatible with AALTONEN 11M. NODE=S015HP;LINKAGE=AZ

[25] AAD 10 search for narrow dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 315 nb^{-1}. Limits on the cross section in the range 10–10^3 pb is given for m = 0.3–1.7 TeV. NODE=S015HP;LINKAGE=AA

[26] KHACHATRYAN 10 search for narrow dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 2.9 pb^{-1}. Limits on the cross section in the range 1–300 pb is given for m = 0.5–2.6 TeV separately in the final states qq, qg, and gg. NODE=S015HP;LINKAGE=KH

[27] ABE 99F search for narrow $b\overline{b}$ resonances in $p\overline{p}$ collisions at E_{cm}=1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X+$ anything)$\times$B($X \rightarrow b\overline{b}$) in the range 3–$10^3$ pb (95%CL) are given for m_X=200–750 GeV. See their Table I. NODE=S015HP;LINKAGE=FH

[28] ABE 97G search for narrow dijet resonances in $p\overline{p}$ collisions with 106 pb^{-1} of data at E_{cm} = 1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X+$ anything)$\cdot$B($X \rightarrow jj$) in the range 10^4–10^{-1} pb (95%CL) are given for dijet mass m=200–1150 GeV with both jets having $|\eta| < 2.0$ and the dijet system having $|\cos\theta^*| < 0.67$. See their Table I for the list of limits. Supersedes ABE 93G. NODE=S015HP;LINKAGE=B

[29] ABE 93G give cross section times branching ratio into light (d, u, s, c, b) quarks for Γ = 0.02 M. Their Table II gives limits for M = 200–900 GeV and Γ = (0.02–0.2) M. NODE=S015HP;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	SIRUNYAN	19B	PR D99 012005	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59516
	AABOUD	18AD	PL B779 24	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58998
	AABOUD	18CK	PR D98 092002	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59470
	AABOUD	18CL	PR D98 092005	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59472
	AABOUD	18N	PRL 121 081801	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58866
YOUR PAPER	SIRUNYAN	18DJ	JHEP 1809 101	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59341
	SIRUNYAN	18DY	PR D98 112014	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59504
	KHACHATRY...	17W	PL B769 520	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57899
	KHACHATRY...	17Y	PL B770 257	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57904
	SIRUNYAN	17F	JHEP 1707 013	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=57820
	AABOUD	16	PL B759 229	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57233

AAD	16N	JHEP 1603 026	G. Aad *et al.*	(ATLAS Collab.)	REFID=57168
AAD	16S	PL B754 302	G. Aad *et al.*	(ATLAS Collab.)	REFID=57206
KHACHATRY...	16K	PRL 116 071801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57181
KHACHATRY...	16L	PRL 117 031802	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57195
AAD	13D	JHEP 1301 029	G. Aad *et al.*	(ATLAS Collab.)	REFID=54792
AALTONEN	13R	PRL 111 031802	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55220
CHATRCHYAN	13A	JHEP 1301 013	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54770
AAD	12S	PL B708 37	G. Aad *et al.*	(ATLAS Collab.)	REFID=54152
CHATRCHYAN	12BL	JHEP 1212 015	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54776
AAD	11AG	NJP 13 053044	G. Aad *et al.*	(ATLAS Collab.)	REFID=54009
AALTONEN	11M	PRL 106 171801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=16445
ABAZOV	11I	PRL 107 011804	V.M. Abazov *et al.*	(D0 Collab.)	REFID=16475
AAD	10	PRL 105 161801	G. Aad *et al.*	(ATLAS Collab.)	REFID=53477
KHACHATRY...	10	PRL 105 211801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53465
Also		PRL 106 029902	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53629
ABE	99F	PRL 82 2038	F. Abe *et al.*	(CDF Collab.)	REFID=46728
ABE	97G	PR D55 5263	F. Abe *et al.*	(CDF Collab.)	REFID=45343
ABE	93G	PRL 71 2542	F. Abe *et al.*	(CDF Collab.)	REFID=43512

Reference = SIRUNYAN 18DR; JHEP 1811 161
Verifier code = CMS

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

CMS Physics Coordinator

EMAIL: cms-physics-coordinator@cern.ch

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

NODE=SXXX005

SEARCHES not in other sections

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Heavy Particle Production Cross Section

NODE=S015CS
NODE=S015CS

VALUE (cm^2/N)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] AABOUD	18CJ	ATLS	$pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$
		[2] AABOUD	18CM	ATLS	$pp \to e\mu/e\tau/\mu\tau$
		[3] AAIJ	18AJ	LHCB	$pp \to A' \to \mu^+\mu^-$; dark photon
		[4] BANERJEE	18	NA64	$eZ \to eZX(A')$
		[5] BANERJEE	18A	NA64	$eZ \to eZA'$, $A' \to \chi\chi$
		[6] MARSICANO	18	E137	$e^+e^- \to A'(\gamma)$ visible decay
		[7] SIRUNYAN	18BB	CMS	$pp \to Z' \to \ell^+\ell^-$ at 13 TeV
		[8] SIRUNYAN	18DA	CMS	$pp \to$ Black Hole, string ball, sphaleron
		[9] SIRUNYAN	18DD	CMS	$pp \to jj$
		[10] SIRUNYAN	18DR	CMS	$pp \to b\mu\overline{\mu}$
		[11] SIRUNYAN	18DU	CMS	$pp \to \gamma\gamma$
		[12] SIRUNYAN	18ED	CMS	$pp \to V \to Wh$; $h \to b\overline{b}$; $W \to l\nu$
		[13] AABOUD	17B	ATLS	WH, ZH resonance
		[14] AAIJ	17BR	LHCB	$pp \to \pi_v\pi_v$, $\pi_v \to jj$
		[15] AAD	16O	ATLS	ℓ + (ℓs or jets)
		[16] AAD	16R	ATLS	WW, WZ, ZZ resonance
		[17] KRASZNAHO...	16		$p^7\mathrm{Li} \to {}^8\mathrm{Be} \to X(17)N$, $X(17) \to e^+e^-$
		[18] LEES	15E	BABR	e^+e^- collisions
		[19] ADAMS	97B	KTEV	m= 1.2–5 GeV
$< 10^{-36}$–10^{-33}	90	[20] GALLAS	95	TOF	m= 0.5–20 GeV
$<(4$–$0.3) \times 10^{-31}$	95	[21] AKESSON	91	CNTR	m = 0–5 GeV
$<2 \times 10^{-36}$	90	[22] BADIER	86	BDMP	$\tau = (0.05$–$1.) \times 10^{-8}$s
$<2.5 \times 10^{-35}$		[23] GUSTAFSON	76	CNTR	$\tau > 10^{-7}$ s

YOUR DATA

[1] AABOUD 18CJ make multichannel search for $pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$ at 13 TeV, 36.1 fb^{-1}; no signal found; limits placed for several BSM models. NODE=S015CS;LINKAGE=R

[2] AABOUD 18CM search for lepton-flavor violating resonance in $pp \to e\mu/e\tau/\mu\tau$ at 13 TeV, 36.1 fb^{-1}; no signal is found and limits placed for various BSM models. NODE=S015CS;LINKAGE=S

[3] AAIJ 18AJ search for prompt and delayed dark photon decay $A' \to \mu^+\mu^-$ at LHCb detector using 1.6 fb^{-1} of pp collisions at 13 TeV; limits on m(A') vs. kinetic mixing are set. NODE=S015CS;LINKAGE=K

[4] BANERJEE 18 search for dark photon A'/16.7 MeV boson X at NA64 via $eZ \to eZX(A')$; no signal found and limits set on the X-e^- coupling ϵ_e in the range $1.3 \times 10^{-4} \leq \epsilon_e \leq 4.2 \times 10^{-4}$ excluding part of the allowed parameter space. NODE=S015CS;LINKAGE=L

[5] BANERJEE 18A search for invisibly decaying dark photons in $eZ \to eZA'$, $A' \to$ invisible; no signal found and limits set on mixing for m(A') $<$ 1 GeV. NODE=S015CS;LINKAGE=M

[6] MARSICANO 18 search for dark photon $e^+e^- \to A'(\gamma)$ visible decay in SLAC E137 e beam dump data. No signal observed and limits set in ϵ coupling vs m(A') plane, see their figure 7. NODE=S015CS;LINKAGE=P

[7] SIRUNYAN 18BB search for high mass dilepton resonance; no signal found and exclude portions of p-space of Z', KK graviton models. NODE=S015CS;LINKAGE=O

[8] SIRUNYAN 18DA search for $pp \to$ Black Hole, string ball, sphaleron via high multiplicity events at 13 TeV, 35.9 fb^{-1}; no signal, require e.g. m(BH)¿10.1 TeV NODE=S015CS;LINKAGE=T

[9] SIRUNYAN 18DD search for $pp \to jj$ deviations in dijet angular distribution. No signal observed. Set limits on large extra dimensions, black holes and DM mediators e.g. m(BH) $>$ 5.9–8.2 TeV. NODE=S015CS;LINKAGE=U

YOUR NOTE

[10] SIRUNYAN 18DR search for dimuon resonance in $pp \to b\mu\overline{\mu}$ at 8 and 13 TeV. Slight excess seen at m($\mu\overline{\mu}$) $\sim$ 28 GeV in some channels. NODE=S015CS;LINKAGE=V

[11] SIRUNYAN 18DU search for high mass diphoton resonance in $pp \rightarrow \gamma\gamma$ at 13 TeV using 35.9 fb^{-1}; no signal; limits placed on RS Graviton, LED, and clockwork. NODE=S015CS;LINKAGE=W

[12] SIRUNYAN 18ED search for $pp \rightarrow V \rightarrow Wh$; $h \rightarrow b\overline{b}$; $W \rightarrow l\nu$ at 13 TeV with 35.9 fb^{-1}; no signal; limits set on m($W^{'}$)¿2.9 TeV. NODE=S015CS;LINKAGE=X

[13] AABOUD 17B exclude m(W', Z') $<$ 1.49–2.31 TeV depending on the couplings and W'/Z' degeneracy assumptions via WH, ZH search in pp collisions at 13 TeV with 3.2 fb^{-1} of data. NODE=S015CS;LINKAGE=I

[14] AAIJ 17BR search for long-lived hidden valley pions from Higgs decay. Limits are set on the signal strength as a function of the mass and lifetime of the long-lived particle in their Fig. 4 and Tab. 4. NODE=S015CS;LINKAGE=J

[15] AAD 16O search for high E_T ℓ + (ℓs or jets) with 3.2 fb^{-1} at 13 TeV; exclude micro black holes mass $<$ 8 TeV (Fig. 3) for models with two extra dimensions. NODE=S015CS;LINKAGE=G

[16] AAD 16R search for WW, WZ, ZZ resonance in 20.3 fb^{-1} at 8 TeV data; limits placed on massive RS graviton (Fig. 4). NODE=S015CS;LINKAGE=H

[17] KRASZNAHORKAY 16 report pLi $\rightarrow$ Be $\rightarrow$ $e\overline{e}N$ 5σ resonance at 16.7 MeV– possible evidence for nuclear interference or new light boson . However, such nuclear interference was ruled out already by ZANG 17. NODE=S015CS;LINKAGE=Q

[18] LEES 15E search for long-lived neutral particles produced in e^+e^- collisions in the Upsilon region, which decays into e^+e^-, $\mu^+\mu^-$, $e^\pm\mu^\mp$, $\pi^+\pi^-$, K^+K^-, or $\pi^\pm K^\mp$. See their Fig. 2 for cross section limits. NODE=S015CS;LINKAGE=F

[19] ADAMS 97B search for a hadron-like neutral particle produced in pN interactions, which decays into a ρ^0 and a weakly interacting massive particle. Upper limits are given for the ratio to K_L production for the mass range 1.2–5 GeV and lifetime 10^{-9}–10^{-4} s. See also our Light Gluino Section. NODE=S015CS;LINKAGE=E

[20] GALLAS 95 limit is for a weakly interacting neutral particle produced in 800 GeV/c pN interactions decaying with a lifetime of 10^{-4}–10^{-8} s. See their Figs. 8 and 9. Similar limits are obtained for a stable particle with interaction cross section 10^{-29}–10^{-33} cm^2. See Fig. 10. NODE=S015CS;LINKAGE=C

[21] AKESSON 91 limit is from weakly interacting neutral long-lived particles produced in pN reaction at 450 GeV/c performed at CERN SPS. Bourquin-Gaillard formula is used as the production model. The above limit is for $\tau > 10^{-7}$ s. For $\tau > 10^{-9}$ s, $\sigma < 10^{-30}$ cm^{-2}/nucleon is obtained. NODE=S015CS;LINKAGE=B

[22] BADIER 86 looked for long-lived particles at 300 GeV π^- beam dump. The limit applies for nonstrongly interacting neutral or charged particles with mass >2 GeV. The limit applies for particle modes, $\mu^+\pi^-$, $\mu^+\mu^-$, $\pi^+\pi^-$X, $\pi^+\pi^-\pi^\pm$ etc. See their figure 5 for the contours of limits in the mass-τ plane for each mode. NODE=S015CS;LINKAGE=D

[23] GUSTAFSON 76 is a 300 GeV FNAL experiment looking for heavy (m >2 GeV) long-lived neutral hadrons in the M4 neutral beam. The above typical value is for m = 3 GeV and assumes an interaction cross section of 1 mb. Values as a function of mass and interaction cross section are given in figure 2. NODE=S015CS;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

AABOUD	18CJ	PR D98 052008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59441
AABOUD	18CM	PR D98 092008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59474
AAIJ	18AJ	PRL 120 061801	R. Aaij *et al.*	(LHCb Collab.)	REFID=59199
BANERJEE	18	PRL 120 231802	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58838
BANERJEE	18A	PR D97 072002	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58916
MARSICANO	18	PR D98 015031	L. Marsicano *et al.*		REFID=58967
SIRUNYAN	18BB	JHEP 1806 120	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59112
SIRUNYAN	18DA	JHEP 1811 042	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59306
SIRUNYAN	18DD	EPJ C78 789	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59318
YOUR PAPER SIRUNYAN	18DR	JHEP 1811 161	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59367
SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
SIRUNYAN	18ED	JHEP 1811 172	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59566
AABOUD	17B	PL B765 32	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57706
AAIJ	17BR	EPJ C77 812	R. Aaij *et al.*	(LHCb Collab.)	REFID=58366
ZANG	17	PL B773 159	X. Zang, G.A. Miller	(WASH)	REFID=59311
AAD	16O	PL B760 520	G. Aad *et al.*	(ATLAS Collab.)	REFID=57169
AAD	16R	PL B755 285	G. Aad *et al.*	(ATLAS Collab.)	REFID=57172
KRASZNAHO...	16	PRL 116 042501	A.J. Krasznahorkay *et al.*	(HINR, ANIK+)	REFID=59302
LEES	15E	PRL 114 171801	J.P. Lees *et al.*	(BABAR Collab.)	REFID=56467
ADAMS	97B	PRL 79 4083	J. Adams *et al.*	(FNAL KTeV Collab.)	REFID=45722
GALLAS	95	PR D52 6	E. Gallas *et al.*	(MSU, FNAL, MIT, FLOR)	REFID=44291
AKESSON	91	ZPHY C52 219	T. Akesson *et al.*	(HELIOS Collab.)	REFID=41739
BADIER	86	ZPHY C31 21	J. Badier *et al.*	(NA3 Collab.)	REFID=10622
GUSTAFSON	76	PRL 37 474	H.R. Gustafson *et al.*	(MICH)	REFID=12580

Reference = SIRUNYAN 18DU; PR D98 092001
Verifier code = CMS

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1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Heavy Particle Production Cross Section

NODE=S015CS
NODE=S015CS

VALUE (cm^2/N)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] AABOUD	18CJ	ATLS	$pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$
		[2] AABOUD	18CM	ATLS	$pp \to e\mu/e\tau/\mu\tau$
		[3] AAIJ	18AJ	LHCB	$pp \to A' \to \mu^+\mu^-$; dark photon
		[4] BANERJEE	18	NA64	$eZ \to eZX(A')$
		[5] BANERJEE	18A	NA64	$eZ \to eZA'$, $A' \to \chi\chi$
		[6] MARSICANO	18	E137	$e^+e^- \to A'(\gamma)$ visible decay
		[7] SIRUNYAN	18BB	CMS	$pp \to Z' \to \ell^+\ell^-$ at 13 TeV
		[8] SIRUNYAN	18DA	CMS	$pp \to$ Black Hole, string ball, sphaleron
		[9] SIRUNYAN	18DD	CMS	$pp \to jj$
		[10] SIRUNYAN	18DR	CMS	$pp \to b\mu\overline{\mu}$
		[11] SIRUNYAN	18DU	CMS	$pp \to \gamma\gamma$
		[12] SIRUNYAN	18ED	CMS	$pp \to V \to Wh$; $h \to b\overline{b}$; $W \to l\nu$
		[13] AABOUD	17B	ATLS	WH, ZH resonance
		[14] AAIJ	17BR	LHCB	$pp \to \pi_v\pi_v$, $\pi_v \to jj$
		[15] AAD	16O	ATLS	ℓ + (ℓs or jets)
		[16] AAD	16R	ATLS	WW ,WZ ,ZZ resonance
		[17] KRASZNAHO...	16		p^7Li $\to$ ^{8}Be $\to X(17)N$, $X(17) \to e^+e^-$
		[18] LEES	15E	BABR	e^+e^- collisions
		[19] ADAMS	97B	KTEV	m= 1.2–5 GeV
$< 10^{-36}$–10^{-33}	90	[20] GALLAS	95	TOF	m= 0.5–20 GeV
$<(4$–$0.3) \times 10^{-31}$	95	[21] AKESSON	91	CNTR	m = 0–5 GeV
$<2 \times 10^{-36}$	90	[22] BADIER	86	BDMP	$\tau = (0.05$–$1.) \times 10^{-8}$s
$<2.5 \times 10^{-35}$		[23] GUSTAFSON	76	CNTR	$\tau > 10^{-7}$ s

YOUR DATA

[1] AABOUD 18CJ make multichannel search for $pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$ at 13 TeV, 36.1 fb^{-1}; no signal found; limits placed for several BSM models. NODE=S015CS;LINKAGE=R

[2] AABOUD 18CM search for lepton-flavor violating resonance in $pp \to e\mu/e\tau/\mu\tau$ at 13 TeV, 36.1 fb^{-1}; no signal is found and limits placed for various BSM models. NODE=S015CS;LINKAGE=S

[3] AAIJ 18AJ search for prompt and delayed dark photon decay $A' \to \mu^+\mu^-$ at LHCb detector using 1.6 fb^{-1} of pp collisions at 13 TeV; limits on m(A') vs. kinetic mixing are set. NODE=S015CS;LINKAGE=K

[4] BANERJEE 18 search for dark photon A'/16.7 MeV boson X at NA64 via $eZ \to eZX(A')$; no signal found and limits set on the X-e^- coupling ϵ_e in the range $1.3 \times 10^{-4} \le \epsilon_e \le 4.2 \times 10^{-4}$ excluding part of the allowed parameter space. NODE=S015CS;LINKAGE=L

[5] BANERJEE 18A search for invisibly decaying dark photons in $eZ \to eZA'$, $A' \to$ invisible; no signal found and limits set on mixing for m(A') $<$ 1 GeV. NODE=S015CS;LINKAGE=M

[6] MARSICANO 18 search for dark photon $e^+e^- \to A'(\gamma)$ visible decay in SLAC E137 e beam dump data. No signal observed and limits set in ϵ coupling vs m(A') plane, see their figure 7. NODE=S015CS;LINKAGE=P

[7] SIRUNYAN 18BB search for high mass dilepton resonance; no signal found and exclude portions of p-space of Z', KK graviton models. NODE=S015CS;LINKAGE=O

[8] SIRUNYAN 18DA search for $pp \to$ Black Hole, string ball, sphaleron via high multiplicity events at 13 TeV, 35.9 fb^{-1}; no signal, require e.g. m(BH)¿10.1 TeV NODE=S015CS;LINKAGE=T

[9] SIRUNYAN 18DD search for $pp \to jj$ deviations in dijet angular distribution. No signal observed. Set limits on large extra dimensions, black holes and DM mediators e.g. m(BH) $>$ 5.9–8.2 TeV. NODE=S015CS;LINKAGE=U

[10] SIRUNYAN 18DR search for dimuon resonance in $pp \to b\mu\overline{\mu}$ at 8 and 13 TeV. Slight excess seen at m($\mu\overline{\mu}$) $\sim$ 28 GeV in some channels. NODE=S015CS;LINKAGE=V

YOUR NOTE [11] SIRUNYAN 18DU search for high mass diphoton resonance in $pp \to \gamma\gamma$ at 13 TeV using 35.9 fb^{-1}; no signal; limits placed on RS Graviton, LED, and clockwork. NODE=S015CS;LINKAGE=W

[12] SIRUNYAN 18ED search for $pp \to V \to Wh$; $h \to b\overline{b}$; $W \to l\nu$ at 13 TeV with 35.9 fb^{-1}; no signal; limits set on m(W')¿2.9 TeV. NODE=S015CS;LINKAGE=X

[13] AABOUD 17B exclude m(W', Z') $<$ 1.49–2.31 TeV depending on the couplings and W'/Z' degeneracy assumptions via WH, ZH search in pp collisions at 13 TeV with 3.2 fb^{-1} of data. NODE=S015CS;LINKAGE=I

[14] AAIJ 17BR search for long-lived hidden valley pions from Higgs decay. Limits are set on the signal strength as a function of the mass and lifetime of the long-lived particle in their Fig. 4 and Tab. 4. NODE=S015CS;LINKAGE=J

[15] AAD 16O search for high E_T ℓ + (ℓs or jets) with 3.2 fb^{-1} at 13 TeV; exclude micro black holes mass $<$ 8 TeV (Fig. 3) for models with two extra dimensions. NODE=S015CS;LINKAGE=G

[16] AAD 16R search for WW, WZ, ZZ resonance in 20.3 fb^{-1} at 8 TeV data; limits placed on massive RS graviton (Fig. 4). NODE=S015CS;LINKAGE=H

[17] KRASZNAHORKAY 16 report pLi $\to$ Be $\to$ $e\overline{e}N$ 5σ resonance at 16.7 MeV– possible evidence for nuclear interference or new light boson . However, such nuclear interference was ruled out already by ZANG 17. NODE=S015CS;LINKAGE=Q

[18] LEES 15E search for long-lived neutral particles produced in e^+e^- collisions in the Upsilon region, which decays into e^+e^-, $\mu^+\mu^-$, $e^\pm\mu^\mp$, $\pi^+\pi^-$, K^+K^-, or $\pi^\pm K^\mp$. See their Fig. 2 for cross section limits. NODE=S015CS;LINKAGE=F

[19] ADAMS 97B search for a hadron-like neutral particle produced in pN interactions, which decays into a ρ^0 and a weakly interacting massive particle. Upper limits are given for the ratio to K_L production for the mass range 1.2–5 GeV and lifetime 10^{-9}–10^{-4} s. See also our Light Gluino Section. NODE=S015CS;LINKAGE=E

[20] GALLAS 95 limit is for a weakly interacting neutral particle produced in 800 GeV/c pN interactions decaying with a lifetime of 10^{-4}–10^{-8} s. See their Figs. 8 and 9. Similar limits are obtained for a stable particle with interaction cross section 10^{-29}–10^{-33} cm^2. See Fig. 10. NODE=S015CS;LINKAGE=C

[21] AKESSON 91 limit is from weakly interacting neutral long-lived particles produced in pN reaction at 450 GeV/c performed at CERN SPS. Bourquin-Gaillard formula is used as the production model. The above limit is for $\tau > 10^{-7}$ s. For $\tau > 10^{-9}$ s, $\sigma < 10^{-30}$ cm^{-2}/nucleon is obtained. NODE=S015CS;LINKAGE=B

[22] BADIER 86 looked for long-lived particles at 300 GeV π^- beam dump. The limit applies for nonstrongly interacting neutral or charged particles with mass >2 GeV. The limit applies for particle modes, $\mu^+\pi^-$, $\mu^+\mu^-$, $\pi^+\pi^-$X, $\pi^+\pi^-\pi^\pm$ etc. See their figure 5 for the contours of limits in the mass-τ plane for each mode. NODE=S015CS;LINKAGE=D

[23] GUSTAFSON 76 is a 300 GeV FNAL experiment looking for heavy (m >2 GeV) long-lived neutral hadrons in the M4 neutral beam. The above typical value is for m = 3 GeV and assumes an interaction cross section of 1 mb. Values as a function of mass and interaction cross section are given in figure 2. NODE=S015CS;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	AABOUD	18CJ	PR D98 052008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59441
	AABOUD	18CM	PR D98 092008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59474
	AAIJ	18AJ	PRL 120 061801	R. Aaij *et al.*	(LHCb Collab.)	REFID=59199
	BANERJEE	18	PRL 120 231802	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58838
	BANERJEE	18A	PR D97 072002	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58916
	MARSICANO	18	PR D98 015031	L. Marsicano *et al.*		REFID=58967
	SIRUNYAN	18BB	JHEP 1806 120	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59112
	SIRUNYAN	18DA	JHEP 1811 042	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59306
	SIRUNYAN	18DD	EPJ C78 789	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59318
	SIRUNYAN	18DR	JHEP 1811 161	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59367
YOUR PAPER	SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
	SIRUNYAN	18ED	JHEP 1811 172	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59566
	AABOUD	17B	PL B765 32	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57706
	AAIJ	17BR	EPJ C77 812	R. Aaij *et al.*	(LHCb Collab.)	REFID=58366
	ZANG	17	PL B773 159	X. Zang, G.A. Miller	(WASH)	REFID=59311
	AAD	16O	PL B760 520	G. Aad *et al.*	(ATLAS Collab.)	REFID=57169
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	GALLAS	95	PR D52 6	E. Gallas *et al.*	(MSU, FNAL, MIT, FLOR)	REFID=44291
	AKESSON	91	ZPHY C52 219	T. Akesson *et al.*	(HELIOS Collab.)	REFID=41739
	BADIER	86	ZPHY C31 21	J. Badier *et al.*	(NA3 Collab.)	REFID=10622
	GUSTAFSON	76	PRL 37 474	H.R. Gustafson *et al.*	(MICH)	REFID=12580

Reference = SIRUNYAN 18DX; PR D98 112011
Verifier code = CMS

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BOTTOM MESONS
($B = \pm 1$)

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S041

$B^\pm$

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S041

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

PARTIAL BRANCHING FRACTIONS

NODE=S041240

$A_{FB}(B^+ \to K^+\mu^+\mu^-)$ ($1.1 < q^2 < 6.0$ GeV^2/c^4)

NODE=S041PBJ

A_{FB} is the forward-backward angular asymmetry of the lepton pair in $B \to K^{(*)}\ell^+\ell^-$ decay as defined in B^+, B^0 admixture particle listings.

NODE=S041PBJ

VALUE	DOCUMENT ID	TECN	COMMENT
-0.003 ± 0.017 OUR AVERAGE			
[0.005 ± 0.018 OUR 2018 AVERAGE]			
YOUR DATA $-0.14\ ^{+0.07}_{-0.06}\ \pm0.03$	[1] SIRUNYAN 18DX	CMS	pp at 8 TeV
$0.005\pm0.015\pm0.010$	[2] AAIJ 14O	LHCB	pp at 7,8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$0.02\ ^{+0.05}_{-0.03}\ ^{+0.02}_{-0.01}$	AAIJ 13H	LHCB	Repl. by AAIJ 14O

NODE=S041PBJ
NEW

YOUR NOTE [1] Measurement is performed in $1.0 < q^2 < 6.0$ GeV^2/c^4. SIRUNYAN 18DX reports also measurements in several other q^2 intervals.

NODE=S041PBJ;LINKAGE=B

[2] AAIJ 14O reports 68% C.L. interval, which we encode as midpoint with uncertainty as half of the width of interval.

NODE=S041PBJ;LINKAGE=A

$F_H(B^+ \to K^+\mu^+\mu^-)$ ($1.1 < q^2 < 6.0$ GeV^2/c^4)

NODE=S041PBL

F_H is a fractional contribution of (pseudo) scalar and tensor amplitudes to the decay width in the massless muon approximation.

NODE=S041PBL

VALUE	DOCUMENT ID	TECN	COMMENT
0.04 ± 0.04 OUR AVERAGE			
[0.03 ± 0.04 OUR 2018 AVERAGE]			
YOUR DATA $0.38^{+0.17}_{-0.21}\pm0.09$	[1] SIRUNYAN 18DX	CMS	pp at 8 TeV
$0.03\pm0.03\pm0.02$	[2] AAIJ 14O	LHCB	pp at 7, 8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$0.05^{+0.08}_{-0.05}{}^{+0.04}_{-0.02}$	AAIJ 13H	LHCB	Repl. by AAIJ 14O

NODE=S041PBL
NEW

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NODE=S041PBL;LINKAGE=B

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NODE=S041PBL;LINKAGE=A

$B^\pm$ REFERENCES

NODE=S041

YOUR PAPER SIRUNYAN 18DX PR D98 112011 A.M. Sirunyan *et al.* (CMS Collab.) REFID=59501
AAIJ 14O JHEP 1405 082 R. Aaij *et al.* (LHCb Collab.) REFID=55728
AAIJ 13H JHEP 1302 105 R. Aaij *et al.* (LHCb Collab.) REFID=54859

Reference = SIRUNYAN 18DY; PR D98 112014
Verifier code = CMS

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SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON JET-JET RESONANCES

NODE=S015420

Heavy Particle Production Cross Section

NODE=S015HP

Limits are for a particle decaying to two hadronic jets.

NODE=S015HP
NODE=S015HP

Units(pb)	CL%	Mass(GeV)	DOCUMENT ID		TECN	COMMENT	
• • • We do not use the following data for averages, fits, limits, etc. • • •							
			[1] SIRUNYAN	19B	CMS	$pp \to jA$, $A \to b\overline{b}$	
			[2] AABOUD	18AD	ATLS	$pp \to Y \to HX \to (bb) + (qq)$	
			[3] AABOUD	18CK	ATLS	$pp \to bbb + \not{E}_T$	
			[4] AABOUD	18CL	ATLS	$pp \to$ vector-like quarks	
			[5] AABOUD	18N	ATLS	$pp \to jj$ resonance	
			[6] SIRUNYAN	18DJ	CMS	$pp \to ZZ$ or $WZ \to l\bar{l}jj$	
			[7] SIRUNYAN	18DY	CMS	$pp \to RR$; $R \to jj$	YOUR DATA
			[8] KHACHATRY...	17W	CMS	$pp \to jj$ resonance	
			[9] KHACHATRY...	17Y	CMS	$pp \to$ (8–10) $j + \not{E}_T$	
			[10] SIRUNYAN	17F	CMS	$pp \to jj$ angular distribution	
			[11] AABOUD	16	ATLS	$pp \to b$ + jet	
			[12] AAD	16N	ATLS	$pp \to$ 3 high E_T jets	
			[13] AAD	16S	ATLS	$pp \to jj$ resonance	
			[14] KHACHATRY...	16K	CMS	$pp \to jj$ resonance	
			[15] KHACHATRY...	16L	CMS	$pp \to jj$ resonance	
			[16] AAD	13D	ATLS	7 TeV $pp \to$ 2 jets	
			[17] AALTONEN	13R	CDF	1.96 TeV $p\overline{p} \to$ 4 jets	
			[18] CHATRCHYAN	13A	CMS	7 TeV $pp \to$ 2 jets	
			[19] CHATRCHYAN	13A	CMS	7 TeV $pp \to b\overline{b}X$	OCCUR=2
			[20] AAD	12S	ATLS	7 TeV $pp \to$ 2 jets	
			[21] CHATRCHYAN	12BL	CMS	7 TeV $pp \to t\overline{t}X$	
			[22] AAD	11AG	ATLS	7 TeV $pp \to$ 2 jets	
			[23] AALTONEN	11M	CDF	1.96 TeV $p\overline{p} \to W+$ 2 jets	
			[24] ABAZOV	11I	D0	1.96 TeV $p\overline{p} \to W+$ 2 jets	
			[25] AAD	10	ATLS	7 TeV $pp \to$ 2 jets	
			[26] KHACHATRY...	10	CMS	7 TeV $pp \to$ 2 jets	
			[27] ABE	99F	CDF	1.8 TeV $p\overline{p} \to b\overline{b}+$ anything	
			[28] ABE	97G	CDF	1.8 TeV $p\overline{p} \to$ 2 jets	
<2603	95	200	[29] ABE	93G	CDF	1.8 TeV $p\overline{p} \to$ 2 jets	
< 44	95	400	[29] ABE	93G	CDF	1.8 TeV $p\overline{p} \to$ 2 jets	OCCUR=2
< 7	95	600	[29] ABE	93G	CDF	1.8 TeV $p\overline{p} \to$ 2 jets	OCCUR=3

[1] SIRUNYAN 19B search for low mass resonance $pp \to jA$, $A \to b\overline{b}$ at 13 TeV using 35.9 fb^{-1}; no signal; exclude resonances 50-350 GeV depending on production and decay. NODE=S015HP;LINKAGE=R

[2] AABOUD 18AD search for new heavy particle $Y \to HX \to (bb) + (qq)$. No signal observed. Limits set on m(Y) vs. m(X) in the ranges of m(Y) in 1–4 TeV and m(X) in 50–1000 GeV. NODE=S015HP;LINKAGE=L

[3] AABOUD 18CK search for SUSY Higgsinos in gauge-mediation via $pp \to bbb + \not{E}_T$ at 13 TeV using two complementary analyses with 24.3/36.1 fb^{-1}; no signal is found and Higgsinos with masses between 130 and 230 GeV and between 290 and 880 GeV are excluded at the 95confidence level. NODE=S015HP;LINKAGE=N

[4] AABOUD 18CL search for $pp \to$ vector-like quarks $\to$ jets at 13 TeV with 36 fb^{-1}; no signal seen; limits set on various VLQ scenarios. For pure $B \to Hb$ or $T \to Ht$, set the mass limit m > 1010 GeV. NODE=S015HP;LINKAGE=O

[5] AABOUD 18N search for dijet resonance at Atlas with 13 TeV and 29.3 fb^{-1}; limits set on m(Z') in the mass range of 450–1800 GeV. NODE=S015HP;LINKAGE=M

[6] SIRUNYAN 18DJ search for $pp \to ZZ$ or $WZ \to l\bar{l}jj$ resonance at 13 TeV, 35.9 fb^{-1}; no signal; limits set in the 400-4500 GeV mass range, exclusion of W' up to 2270 GeV in the HVT model A, and up to 2330 for HVT model B. WED bulk graviton exclusion up to 925 GeV. NODE=S015HP;LINKAGE=P

YOUR NOTE [7] SIRUNYAN 18DY search for $pp \to RR$; $R \to jj$ two dijet resonances at 13 TeV 35.9 fb^{-1}; no signal; limits placed on RPV top-squark pair production NODE=S015HP;LINKAGE=Q

[8] KHACHATRYAN 17W search for dijet resonance in 12.9 fb^{-1} data at 13 TeV; see Fig. 2 for limits on axigluons, diquarks, dark matter mediators etc. NODE=S015HP;LINKAGE=I

[9] KHACHATRYAN 17Y search for $pp \rightarrow$ (8–10) j in 19.7 fb^{-1} at 8 TeV. No signal seen. Limits set on colorons, axigluons, RPV, and SUSY. NODE=S015HP;LINKAGE=J

[10] SIRUNYAN 17F measure $pp \rightarrow jj$ angular distribution in 2.6 fb^{-1} at 13 TeV; limits set on LEDs and quantum black holes. NODE=S015HP;LINKAGE=K

[11] AABOUD 16 search for resonant dijets including one or two b-jets with 3.2 fb^{-1} at 13 TeV; exclude excited b^* quark from 1.1–2.1 TeV; exclude leptophilic Z' with SM couplings from 1.1–1.5 TeV. NODE=S015HP;LINKAGE=F

[12] AAD 16N search for ≥ 3 jets with 3.6 fb^{-1} at 13 TeV; limits placed on micro black holes (Fig. 10) and string balls (Fig. 11). NODE=S015HP;LINKAGE=D

[13] AAD 16S search for high mass jet-jet resonance with 3.6 fb^{-1} at 13 TeV; exclude portions of excited quarks, W', Z' and contact interaction parameter space. NODE=S015HP;LINKAGE=E

[14] KHACHATRYAN 16K search for dijet resonance in 2.4 fb^{-1} data at 13 TeV; see Fig. 3 for limits on axigluons, diquarks etc. NODE=S015HP;LINKAGE=G

[15] KHACHATRYAN 16L use data scouting technique to search for jj resonance on 18.8 fb^{-1} of data at 8 TeV. Limits on the coupling of a leptophobic Z' to quarks are set, improving on the results by other experiments in the mass range between 500–800 GeV. NODE=S015HP;LINKAGE=H

[16] AAD 13D search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. The observed events are compatible with Standard Model expectation. See their Fig. 6 and Table 2 for limits on resonance cross section in the range m = 1.0–4.0 TeV. NODE=S015HP;LINKAGE=GA

[17] AALTONEN 13R search for production of a pair of jet-jet resonances in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 6.6 fb^{-1}. See their Fig. 5 and Tables I, II for cross section limits. NODE=S015HP;LINKAGE=C

[18] CHATRCHYAN 13A search for qq, qg, and gg resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. See their Fig. 3 and Table 1 for limits on resonance cross section in the range m = 1.0–4.3 TeV. NODE=S015HP;LINKAGE=CA

[19] CHATRCHYAN 13A search for $b\overline{b}$ resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. See their Fig. 8 and Table 4 for limits on resonance cross section in the range m = 1.0–4.0 TeV. NODE=S015HP;LINKAGE=CT

[20] AAD 12S search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 1.0 fb^{-1}. See their Fig. 3 and Table 2 for limits on resonance cross section in the range m = 0.9–4.0 TeV. NODE=S015HP;LINKAGE=DA

[21] CHATRCHYAN 12BL search for $t\overline{t}$ resonances in pp collisions at E_{cm} = 7 TeV with L = 4.4 fb^{-1}. See their Fig. 4 for limits on resonance cross section in the range m = 0.5–3.0 TeV. NODE=S015HP;LINKAGE=CH

[22] AAD 11AG search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 36 pb^{-1}. Limits on number of events for m = 0.6–4 TeV are given in their Table 3. NODE=S015HP;LINKAGE=AD

[23] AALTONEN 11M find a peak in two jet invariant mass distribution around 140 GeV in W + 2 jet events in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 4.3 fb^{-1}. NODE=S015HP;LINKAGE=AL

[24] ABAZOV 11I search for two-jet resonances in W + 2 jet events in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 4.3 fb^{-1} and give limits $\sigma <$ (2.6–1.3) pb (95% CL) for m = 110–170 GeV. The result is incompatible with AALTONEN 11M. NODE=S015HP;LINKAGE=AZ

[25] AAD 10 search for narrow dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 315 nb^{-1}. Limits on the cross section in the range 10–10^3 pb is given for m = 0.3–1.7 TeV. NODE=S015HP;LINKAGE=AA

[26] KHACHATRYAN 10 search for narrow dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 2.9 pb^{-1}. Limits on the cross section in the range 1–300 pb is given for m = 0.5–2.6 TeV separately in the final states qq, qg, and gg. NODE=S015HP;LINKAGE=KH

[27] ABE 99F search for narrow $b\overline{b}$ resonances in $p\overline{p}$ collisions at E_{cm}=1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X+$ anything)$\times$B($X \rightarrow b\overline{b}$) in the range 3–$10^3$ pb (95%CL) are given for m_X=200–750 GeV. See their Table I. NODE=S015HP;LINKAGE=FH

[28] ABE 97G search for narrow dijet resonances in $p\overline{p}$ collisions with 106 pb^{-1} of data at E_{cm} = 1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X+$ anything)$\cdot$B($X \rightarrow jj$) in the range 10^4–10^{-1} pb (95%CL) are given for dijet mass m=200–1150 GeV with both jets having $|\eta| < 2.0$ and the dijet system having $|\cos\theta^*| < 0.67$. See their Table I for the list of limits. Supersedes ABE 93G. NODE=S015HP;LINKAGE=B

[29] ABE 93G give cross section times branching ratio into light (d, u, s, c, b) quarks for Γ = 0.02 M. Their Table II gives limits for M = 200–900 GeV and Γ = (0.02–0.2) M. NODE=S015HP;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	SIRUNYAN	19B	PR D99 012005	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59516
	AABOUD	18AD	PL B779 24	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58998
	AABOUD	18CK	PR D98 092002	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59470
	AABOUD	18CL	PR D98 092005	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59472
	AABOUD	18N	PRL 121 081801	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=58866
	SIRUNYAN	18DJ	JHEP 1809 101	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59341
YOUR PAPER	SIRUNYAN	18DY	PR D98 112014	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59504
	KHACHATRY...	17W	PL B769 520	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57899
	KHACHATRY...	17Y	PL B770 257	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57904
	SIRUNYAN	17F	JHEP 1707 013	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=57820
	AABOUD	16	PL B759 229	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57233

AAD	16N	JHEP 1603 026	G. Aad *et al.*	(ATLAS Collab.)	REFID=57168
AAD	16S	PL B754 302	G. Aad *et al.*	(ATLAS Collab.)	REFID=57206
KHACHATRY...	16K	PRL 116 071801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57181
KHACHATRY...	16L	PRL 117 031802	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57195
AAD	13D	JHEP 1301 029	G. Aad *et al.*	(ATLAS Collab.)	REFID=54792
AALTONEN	13R	PRL 111 031802	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55220
CHATRCHYAN	13A	JHEP 1301 013	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54770
AAD	12S	PL B708 37	G. Aad *et al.*	(ATLAS Collab.)	REFID=54152
CHATRCHYAN	12BL	JHEP 1212 015	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54776
AAD	11AG	NJP 13 053044	G. Aad *et al.*	(ATLAS Collab.)	REFID=54009
AALTONEN	11M	PRL 106 171801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=16445
ABAZOV	11I	PRL 107 011804	V.M. Abazov *et al.*	(D0 Collab.)	REFID=16475
AAD	10	PRL 105 161801	G. Aad *et al.*	(ATLAS Collab.)	REFID=53477
KHACHATRY...	10	PRL 105 211801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53465
Also		PRL 106 029902	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53629
ABE	99F	PRL 82 2038	F. Abe *et al.*	(CDF Collab.)	REFID=46728
ABE	97G	PR D55 5263	F. Abe *et al.*	(CDF Collab.)	REFID=45343
ABE	93G	PRL 71 2542	F. Abe *et al.*	(CDF Collab.)	REFID=43512

Reference = SIRUNYAN 19B; PR D99 012005
Verifier code = CMS

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

CMS Physics Coordinator

EMAIL: cms-physics-coordinator@cern.ch

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON JET-JET RESONANCES

NODE=S015420

Heavy Particle Production Cross Section

NODE=S015HP

Limits are for a particle decaying to two hadronic jets.

NODE=S015HP
NODE=S015HP

• • • We do not use the following data for averages, fits, limits, etc. • • •

YOUR DATA

Units(pb)	CL%	Mass(GeV)	DOCUMENT ID		TECN	COMMENT	
			[1] SIRUNYAN	19B	CMS	$pp \rightarrow jA$, $A \rightarrow b\overline{b}$	
			[2] AABOUD	18AD	ATLS	$pp \rightarrow Y \rightarrow HX \rightarrow (bb) + (qq)$	
			[3] AABOUD	18CK	ATLS	$pp \rightarrow bbb+\not{E}_T$	
			[4] AABOUD	18CL	ATLS	$pp \rightarrow$ vector-like quarks	
			[5] AABOUD	18N	ATLS	$pp \rightarrow jj$ resonance	
			[6] SIRUNYAN	18DJ	CMS	$pp \rightarrow ZZ$ or $WZ \rightarrow l\bar{l}jj$	
			[7] SIRUNYAN	18DY	CMS	$pp \rightarrow RR$; $R \rightarrow jj$	
			[8] KHACHATRY...	17W	CMS	$pp \rightarrow jj$ resonance	
			[9] KHACHATRY...	17Y	CMS	$pp \rightarrow$ (8–10) $j+\not{E}_T$	
			[10] SIRUNYAN	17F	CMS	$pp \rightarrow jj$ angular distribution	
			[11] AABOUD	16	ATLS	$pp \rightarrow b +$ jet	
			[12] AAD	16N	ATLS	$pp \rightarrow$ 3 high E_T jets	
			[13] AAD	16S	ATLS	$pp \rightarrow jj$ resonance	
			[14] KHACHATRY...	16K	CMS	$pp \rightarrow jj$ resonance	
			[15] KHACHATRY...	16L	CMS	$pp \rightarrow jj$ resonance	
			[16] AAD	13D	ATLS	7 TeV $pp \rightarrow$ 2 jets	
			[17] AALTONEN	13R	CDF	1.96 TeV $p\overline{p} \rightarrow$ 4 jets	
			[18] CHATRCHYAN	13A	CMS	7 TeV $pp \rightarrow$ 2 jets	
			[19] CHATRCHYAN	13A	CMS	7 TeV $pp \rightarrow b\overline{b}X$	OCCUR=2
			[20] AAD	12S	ATLS	7 TeV $pp \rightarrow$ 2 jets	
			[21] CHATRCHYAN	12BL	CMS	7 TeV $pp \rightarrow t\overline{t}X$	
			[22] AAD	11AG	ATLS	7 TeV $pp \rightarrow$ 2 jets	
			[23] AALTONEN	11M	CDF	1.96 TeV $p\overline{p} \rightarrow W+$ 2 jets	
			[24] ABAZOV	11I	D0	1.96 TeV $p\overline{p} \rightarrow W+$ 2 jets	
			[25] AAD	10	ATLS	7 TeV $pp \rightarrow$ 2 jets	
			[26] KHACHATRY...	10	CMS	7 TeV $pp \rightarrow$ 2 jets	
			[27] ABE	99F	CDF	1.8 TeV $p\overline{p} \rightarrow b\overline{b}+$ anything	
			[28] ABE	97G	CDF	1.8 TeV $p\overline{p} \rightarrow$ 2 jets	
<2603	95	200	[29] ABE	93G	CDF	1.8 TeV $p\overline{p} \rightarrow$ 2 jets	
< 44	95	400	[29] ABE	93G	CDF	1.8 TeV $p\overline{p} \rightarrow$ 2 jets	OCCUR=2
< 7	95	600	[29] ABE	93G	CDF	1.8 TeV $p\overline{p} \rightarrow$ 2 jets	OCCUR=3

YOUR NOTE

[1] SIRUNYAN 19B search for low mass resonance $pp \rightarrow jA$, $A \rightarrow b\overline{b}$ at 13 TeV using 35.9 fb^{-1}; no signal; exclude resonances 50-350 GeV depending on production and decay.

NODE=S015HP;LINKAGE=R

[2] AABOUD 18AD search for new heavy particle $Y \rightarrow HX \rightarrow (bb) + (qq)$. No signal observed. Limits set on m(Y) vs. m(X) in the ranges of m(Y) in 1–4 TeV and m(X) in 50–1000 GeV.

NODE=S015HP;LINKAGE=L

[3] AABOUD 18CK search for SUSY Higgsinos in gauge-mediation via $pp \rightarrow bbb+\not{E}_T$ at 13 TeV using two complementary analyses with 24.3/36.1 fb^{-1}; no signal is found and Higgsinos with masses between 130 and 230 GeV and between 290 and 880 GeV are excluded at the 95confidence level.

NODE=S015HP;LINKAGE=N

[4] AABOUD 18CL search for $pp \rightarrow$ vector-like quarks $\rightarrow$ jets at 13 TeV with 36 fb^{-1}; no signal seen; limits set on various VLQ scenarios. For pure $B \rightarrow Hb$ or $T \rightarrow Ht$, set the mass limit m > 1010 GeV.

NODE=S015HP;LINKAGE=O

[5] AABOUD 18N search for dijet resonance at Atlas with 13 TeV and 29.3 fb^{-1}; limits set on m(Z') in the mass range of 450–1800 GeV.

NODE=S015HP;LINKAGE=M

[6] SIRUNYAN 18DJ search for $pp \rightarrow ZZ$ or $WZ \rightarrow l\bar{l}jj$ resonance at 13 TeV, 35.9 fb^{-1}; no signal; limits set in the 400-4500 GeV mass range, exclusion of W' up to 2270 GeV in the HVT model A, and up to 2330 for HVT model B. WED bulk graviton exclusion up to 925 GeV.

NODE=S015HP;LINKAGE=P

[7] SIRUNYAN 18DY search for $pp \rightarrow RR$; $R \rightarrow jj$ two dijet resonances at 13 TeV 35.9 fb^{-1}; no signal; limits placed on RPV top-squark pair production

NODE=S015HP;LINKAGE=Q

[8] KHACHATRYAN 17W search for dijet resonance in 12.9 fb^{-1} data at 13 TeV; see Fig. 2 for limits on axigluons, diquarks, dark matter mediators etc. NODE=S015HP;LINKAGE=I

[9] KHACHATRYAN 17Y search for $pp \rightarrow$ (8–10) j in 19.7 fb^{-1} at 8 TeV. No signal seen. Limits set on colorons, axigluons, RPV, and SUSY. NODE=S015HP;LINKAGE=J

[10] SIRUNYAN 17F measure $pp \rightarrow jj$ angular distribution in 2.6 fb^{-1} at 13 TeV; limits set on LEDs and quantum black holes. NODE=S015HP;LINKAGE=K

[11] AABOUD 16 search for resonant dijets including one or two b-jets with 3.2 fb^{-1} at 13 TeV; exclude excited b^* quark from 1.1–2.1 TeV; exclude leptophilic Z' with SM couplings from 1.1–1.5 TeV. NODE=S015HP;LINKAGE=F

[12] AAD 16N search for ≥ 3 jets with 3.6 fb^{-1} at 13 TeV; limits placed on micro black holes (Fig. 10) and string balls (Fig. 11). NODE=S015HP;LINKAGE=D

[13] AAD 16S search for high mass jet-jet resonance with 3.6 fb^{-1} at 13 TeV; exclude portions of excited quarks, W', Z' and contact interaction parameter space. NODE=S015HP;LINKAGE=E

[14] KHACHATRYAN 16K search for dijet resonance in 2.4 fb^{-1} data at 13 TeV; see Fig. 3 for limits on axigluons, diquarks etc. NODE=S015HP;LINKAGE=G

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[17] AALTONEN 13R search for production of a pair of jet-jet resonances in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 6.6 fb^{-1}. See their Fig. 5 and Tables I, II for cross section limits. NODE=S015HP;LINKAGE=C

[18] CHATRCHYAN 13A search for qq, qg, and gg resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. See their Fig. 3 and Table 1 for limits on resonance cross section in the range m = 1.0–4.3 TeV. NODE=S015HP;LINKAGE=CA

[19] CHATRCHYAN 13A search for $b\overline{b}$ resonances in pp collisions at E_{cm} = 7 TeV with L = 4.8 fb^{-1}. See their Fig. 8 and Table 4 for limits on resonance cross section in the range m = 1.0–4.0 TeV. NODE=S015HP;LINKAGE=CT

[20] AAD 12S search for dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 1.0 fb^{-1}. See their Fig. 3 and Table 2 for limits on resonance cross section in the range m = 0.9–4.0 TeV. NODE=S015HP;LINKAGE=DA

[21] CHATRCHYAN 12BL search for $t\overline{t}$ resonances in pp collisions at E_{cm} = 7 TeV with L = 4.4 fb^{-1}. See their Fig. 4 for limits on resonance cross section in the range m = 0.5–3.0 TeV. NODE=S015HP;LINKAGE=CH

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[23] AALTONEN 11M find a peak in two jet invariant mass distribution around 140 GeV in W + 2 jet events in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 4.3 fb^{-1}. NODE=S015HP;LINKAGE=AL

[24] ABAZOV 11I search for two-jet resonances in W + 2 jet events in $p\overline{p}$ collisions at E_{cm} = 1.96 TeV with L = 4.3 fb^{-1} and give limits $\sigma <$ (2.6–1.3) pb (95% CL) for m = 110–170 GeV. The result is incompatible with AALTONEN 11M. NODE=S015HP;LINKAGE=AZ

[25] AAD 10 search for narrow dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 315 nb^{-1}. Limits on the cross section in the range 10–10^3 pb is given for m = 0.3–1.7 TeV. NODE=S015HP;LINKAGE=AA

[26] KHACHATRYAN 10 search for narrow dijet resonances in pp collisions at E_{cm} = 7 TeV with L = 2.9 pb^{-1}. Limits on the cross section in the range 1–300 pb is given for m = 0.5–2.6 TeV separately in the final states qq, qg, and gg. NODE=S015HP;LINKAGE=KH

[27] ABE 99F search for narrow $b\overline{b}$ resonances in $p\overline{p}$ collisions at E_{cm}=1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X+$ anything$)\times$B$(X \rightarrow b\overline{b})$ in the range 3–10^3 pb (95%CL) are given for m_X=200–750 GeV. See their Table I. NODE=S015HP;LINKAGE=FH

[28] ABE 97G search for narrow dijet resonances in $p\overline{p}$ collisions with 106 pb^{-1} of data at E_{cm} = 1.8 TeV. Limits on $\sigma(p\overline{p} \rightarrow X+$ anything$)\cdot$B$(X \rightarrow jj)$ in the range 10^4–10^{-1} pb (95%CL) are given for dijet mass m=200–1150 GeV with both jets having $|\eta| < 2.0$ and the dijet system having $|\cos\theta^*| < 0.67$. See their Table I for the list of limits. Supersedes ABE 93G. NODE=S015HP;LINKAGE=B

[29] ABE 93G give cross section times branching ratio into light (d, u, s, c, b) quarks for Γ = 0.02 M. Their Table II gives limits for M = 200–900 GeV and Γ = (0.02–0.2) M. NODE=S015HP;LINKAGE=A

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NODE=S015

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AAD	16S	PL B754 302	G. Aad *et al.*	(ATLAS Collab.)	REFID=57206
KHACHATRY...	16K	PRL 116 071801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57181
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KHACHATRY...	10	PRL 105 211801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53465
Also		PRL 106 029902	V. Khachatryan *et al.*	(CMS Collab.)	REFID=53629
ABE	99F	PRL 82 2038	F. Abe *et al.*	(CDF Collab.)	REFID=46728
ABE	97G	PR D55 5263	F. Abe *et al.*	(CDF Collab.)	REFID=45343
ABE	93G	PRL 71 2542	F. Abe *et al.*	(CDF Collab.)	REFID=43512

Reference = SIRUNYAN 18ED; JHEP 1811 172
Verifier code = CMS

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

CMS Physics Coordinator

EMAIL: cms-physics-coordinator@cern.ch

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

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Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Heavy Particle Production Cross Section

NODE=S015CS
NODE=S015CS

• • • We do not use the following data for averages, fits, limits, etc. • • •

YOUR DATA

VALUE (cm^2/N)	CL%	DOCUMENT ID		TECN	COMMENT
		[1] AABOUD	18CJ	ATLS	$pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$
		[2] AABOUD	18CM	ATLS	$pp \to e\mu/e\tau/\mu\tau$
		[3] AAIJ	18AJ	LHCB	$pp \to A' \to \mu^+\mu^-$; dark photon
		[4] BANERJEE	18	NA64	$eZ \to eZX(A')$
		[5] BANERJEE	18A	NA64	$eZ \to eZA'$, $A' \to \chi\chi$
		[6] MARSICANO	18	E137	$e^+e^- \to A'(\gamma)$ visible decay
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		[13] AABOUD	17B	ATLS	WH, ZH resonance
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REFERENCES FOR Other Particle Searches

NODE=S015

	AABOUD	18CJ	PR D98 052008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59441
	AABOUD	18CM	PR D98 092008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59474
	AAIJ	18AJ	PRL 120 061801	R. Aaij *et al.*	(LHCb Collab.)	REFID=59199
	BANERJEE	18	PRL 120 231802	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58838
	BANERJEE	18A	PR D97 072002	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58916
	MARSICANO	18	PR D98 015031	L. Marsicano *et al.*		REFID=58967
	SIRUNYAN	18BB	JHEP 1806 120	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59112
	SIRUNYAN	18DA	JHEP 1811 042	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59306
	SIRUNYAN	18DD	EPJ C78 789	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59318
	SIRUNYAN	18DR	JHEP 1811 161	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59367
	SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
YOUR PAPER	SIRUNYAN	18ED	JHEP 1811 172	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59566
	AABOUD	17B	PL B765 32	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57706
	AAIJ	17BR	EPJ C77 812	R. Aaij *et al.*	(LHCb Collab.)	REFID=58366
	ZANG	17	PL B773 159	X. Zang, G.A. Miller	(WASH)	REFID=59311
	AAD	16O	PL B760 520	G. Aad *et al.*	(ATLAS Collab.)	REFID=57169
	AAD	16R	PL B755 285	G. Aad *et al.*	(ATLAS Collab.)	REFID=57172
	KRASZNAHO...	16	PRL 116 042501	A.J. Krasznahorkay *et al.*	(HINR, ANIK+)	REFID=59302
	LEES	15E	PRL 114 171801	J.P. Lees *et al.*	(BABAR Collab.)	REFID=56467
	ADAMS	97B	PRL 79 4083	J. Adams *et al.*	(FNAL KTeV Collab.)	REFID=45722
	GALLAS	95	PR D52 6	E. Gallas *et al.*	(MSU, FNAL, MIT, FLOR)	REFID=44291
	AKESSON	91	ZPHY C52 219	T. Akesson *et al.*	(HELIOS Collab.)	REFID=41739
	BADIER	86	ZPHY C31 21	J. Badier *et al.*	(NA3 Collab.)	REFID=10622
	GUSTAFSON	76	PRL 37 474	H.R. Gustafson *et al.*	(MICH)	REFID=12580

Reference = ABAZOV 18B; PR D98 052010
Verifier code = D0

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Dmitri Denisov

EMAIL: denisovd@fnal.gov

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
$(B = \pm 1)$

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^{\pm}$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^{\pm}$ section.

NODE=S042220

$\Gamma(Z_c(3900)^{\pm} K^{\mp},\ Z_c^{\pm} \to J/\psi\pi^{\pm})/\Gamma(J/\psi(1S) K^*(892)^0)$ **$\Gamma_{238}/\Gamma_{193}$**

NODE=S042P29

NODE=S042P29

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<0.015**	90	ABAZOV	18B	D0	$p\overline{p}$ at 1.96 TeV

B^0 REFERENCES

NODE=S042

YOUR PAPER ABAZOV 18B PR D98 052010 V.M. Abazov *et al.* (D0 Collab.)

REFID=59442

Reference = BANERJEE 18; PRL 120 231802
Verifier code = GNINENKO

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Sergei N. Gninenko

EMAIL: sergei.gninenko@cern.ch

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SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Heavy Particle Production Cross Section

NODE=S015CS
NODE=S015CS

YOUR DATA

VALUE (cm^2/N)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] AABOUD	18CJ	ATLS	$pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$
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	SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
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	ADAMS	97B	PRL 79 4083	J. Adams *et al.*	(FNAL KTeV Collab.)	REFID=45722
	GALLAS	95	PR D52 6	E. Gallas *et al.*	(MSU, FNAL, MIT, FLOR)	REFID=44291
	AKESSON	91	ZPHY C52 219	T. Akesson *et al.*	(HELIOS Collab.)	REFID=41739
	BADIER	86	ZPHY C31 21	J. Badier *et al.*	(NA3 Collab.)	REFID=10622
	GUSTAFSON	76	PRL 37 474	H.R. Gustafson *et al.*	(MICH)	REFID=12580

Reference = BANERJEE 18A; PR D97 072002
Verifier code = GNINENKO

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PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Sergei N. Gninenko

EMAIL: sergei.gninenko@cern.ch

April 5, 2019

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(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Heavy Particle Production Cross Section

NODE=S015CS
NODE=S015CS

YOUR DATA

VALUE (cm^2/N)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] AABOUD	18CJ	ATLS	$pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$
		[2] AABOUD	18CM	ATLS	$pp \to e\mu/e\tau/\mu\tau$
		[3] AAIJ	18AJ	LHCB	$pp \to A' \to \mu^+\mu^-$; dark photon
		[4] BANERJEE	18	NA64	$eZ \to eZX(A')$
		[5] BANERJEE	18A	NA64	$eZ \to eZA'$, $A' \to \chi\chi$
		[6] MARSICANO	18	E137	$e^+e^- \to A'(\gamma)$ visible decay
		[7] SIRUNYAN	18BB	CMS	$pp \to Z' \to \ell^+\ell^-$ at 13 TeV
		[8] SIRUNYAN	18DA	CMS	$pp \to$ Black Hole, string ball, sphaleron
		[9] SIRUNYAN	18DD	CMS	$pp \to jj$
		[10] SIRUNYAN	18DR	CMS	$pp \to b\mu\overline{\mu}$
		[11] SIRUNYAN	18DU	CMS	$pp \to \gamma\gamma$
		[12] SIRUNYAN	18ED	CMS	$pp \to V \to Wh$; $h \to b\overline{b}$; $W \to l\nu$
		[13] AABOUD	17B	ATLS	WH, ZH resonance
		[14] AAIJ	17BR	LHCB	$pp \to \pi_v\pi_v$, $\pi_v \to jj$
		[15] AAD	16O	ATLS	ℓ + (ℓs or jets)
		[16] AAD	16R	ATLS	WW, WZ, ZZ resonance
		[17] KRASZNAHO...	16		$p^7\text{Li} \to {}^8\text{Be} \to X(17)N$, $X(17) \to e^+e^-$
		[18] LEES	15E	BABR	e^+e^- collisions
		[19] ADAMS	97B	KTEV	m= 1.2–5 GeV
$< 10^{-36}$–10^{-33}	90	[20] GALLAS	95	TOF	m= 0.5–20 GeV
$<(4$–$0.3) \times 10^{-31}$	95	[21] AKESSON	91	CNTR	m = 0–5 GeV
$<2 \times 10^{-36}$	90	[22] BADIER	86	BDMP	$\tau = (0.05$–$1.) \times 10^{-8}$s
$<2.5 \times 10^{-35}$		[23] GUSTAFSON	76	CNTR	$\tau > 10^{-7}$ s

YOUR NOTE

[1] AABOUD 18CJ make multichannel search for $pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$ at 13 TeV, 36.1 fb^{-1}; no signal found; limits placed for several BSM models. NODE=S015CS;LINKAGE=R

[2] AABOUD 18CM search for lepton-flavor violating resonance in $pp \to e\mu/e\tau/\mu\tau$ at 13 TeV, 36.1 fb^{-1}; no signal is found and limits placed for various BSM models. NODE=S015CS;LINKAGE=S

[3] AAIJ 18AJ search for prompt and delayed dark photon decay $A' \to \mu^+\mu^-$ at LHCb detector using 1.6 fb^{-1} of pp collisions at 13 TeV; limits on m(A') vs. kinetic mixing are set. NODE=S015CS;LINKAGE=K

[4] BANERJEE 18 search for dark photon A'/16.7 MeV boson X at NA64 via $eZ \to eZX(A')$; no signal found and limits set on the X-e^- coupling ϵ_e in the range $1.3 \times 10^{-4} \leq \epsilon_e \leq 4.2 \times 10^{-4}$ excluding part of the allowed parameter space. NODE=S015CS;LINKAGE=L

[5] BANERJEE 18A search for invisibly decaying dark photons in $eZ \to eZA'$, $A' \to$ invisible; no signal found and limits set on mixing for m(A') $<$ 1 GeV. NODE=S015CS;LINKAGE=M

[6] MARSICANO 18 search for dark photon $e^+e^- \to A'(\gamma)$ visible decay in SLAC E137 e beam dump data. No signal observed and limits set in ϵ coupling vs m(A') plane, see their figure 7. NODE=S015CS;LINKAGE=P

[7] SIRUNYAN 18BB search for high mass dilepton resonance; no signal found and exclude portions of p-space of Z', KK graviton models. NODE=S015CS;LINKAGE=O

[8] SIRUNYAN 18DA search for $pp \to$ Black Hole, string ball, sphaleron via high multiplicity events at 13 TeV, 35.9 fb^{-1}; no signal, require e.g. m(BH)¿10.1 TeV NODE=S015CS;LINKAGE=T

[9] SIRUNYAN 18DD search for $pp \to jj$ deviations in dijet angular distribution. No signal observed. Set limits on large extra dimensions, black holes and DM mediators e.g. m(BH) $>$ 5.9–8.2 TeV. NODE=S015CS;LINKAGE=U

[10] SIRUNYAN 18DR search for dimuon resonance in $pp \to b\mu\overline{\mu}$ at 8 and 13 TeV. Slight excess seen at m($\mu\overline{\mu}$) $\sim$ 28 GeV in some channels. NODE=S015CS;LINKAGE=V

11 SIRUNYAN 18DU search for high mass diphoton resonance in $pp \rightarrow \gamma\gamma$ at 13 TeV using 35.9 fb^{-1}; no signal; limits placed on RS Graviton, LED, and clockwork. NODE=S015CS;LINKAGE=W

12 SIRUNYAN 18ED search for $pp \rightarrow V \rightarrow Wh$; $h \rightarrow b\overline{b}$; $W \rightarrow l\nu$ at 13 TeV with 35.9 fb^{-1}; no signal; limits set on m($W^{'}$)¿2.9 TeV. NODE=S015CS;LINKAGE=X

13 AABOUD 17B exclude m(W', Z') $<$ 1.49–2.31 TeV depending on the couplings and W'/Z' degeneracy assumptions via WH, ZH search in pp collisions at 13 TeV with 3.2 fb^{-1} of data. NODE=S015CS;LINKAGE=I

14 AAIJ 17BR search for long-lived hidden valley pions from Higgs decay. Limits are set on the signal strength as a function of the mass and lifetime of the long-lived particle in their Fig. 4 and Tab. 4. NODE=S015CS;LINKAGE=J

15 AAD 16O search for high E_T ℓ + (ℓs or jets) with 3.2 fb^{-1} at 13 TeV; exclude micro black holes mass $<$ 8 TeV (Fig. 3) for models with two extra dimensions. NODE=S015CS;LINKAGE=G

16 AAD 16R search for WW, WZ, ZZ resonance in 20.3 fb^{-1} at 8 TeV data; limits placed on massive RS graviton (Fig. 4). NODE=S015CS;LINKAGE=H

17 KRASZNAHORKAY 16 report pLi $\rightarrow$ Be $\rightarrow$ $e\overline{e}N$ 5σ resonance at 16.7 MeV– possible evidence for nuclear interference or new light boson . However, such nuclear interference was ruled out already by ZANG 17. NODE=S015CS;LINKAGE=Q

18 LEES 15E search for long-lived neutral particles produced in e^+e^- collisions in the Upsilon region, which decays into e^+e^-, $\mu^+\mu^-$, $e^\pm\mu^\mp$, $\pi^+\pi^-$, K^+K^-, or $\pi^\pm K^\mp$. See their Fig. 2 for cross section limits. NODE=S015CS;LINKAGE=F

19 ADAMS 97B search for a hadron-like neutral particle produced in pN interactions, which decays into a ρ^0 and a weakly interacting massive particle. Upper limits are given for the ratio to K_L production for the mass range 1.2–5 GeV and lifetime 10^{-9}–10^{-4} s. See also our Light Gluino Section. NODE=S015CS;LINKAGE=E

20 GALLAS 95 limit is for a weakly interacting neutral particle produced in 800 GeV/c pN interactions decaying with a lifetime of 10^{-4}–10^{-8} s. See their Figs. 8 and 9. Similar limits are obtained for a stable particle with interaction cross section 10^{-29}–10^{-33} cm^2. See Fig. 10. NODE=S015CS;LINKAGE=C

21 AKESSON 91 limit is from weakly interacting neutral long-lived particles produced in pN reaction at 450 GeV/c performed at CERN SPS. Bourquin-Gaillard formula is used as the production model. The above limit is for $\tau > 10^{-7}$ s. For $\tau > 10^{-9}$ s, $\sigma < 10^{-30}$ cm^{-2}/nucleon is obtained. NODE=S015CS;LINKAGE=B

22 BADIER 86 looked for long-lived particles at 300 GeV π^- beam dump. The limit applies for nonstrongly interacting neutral or charged particles with mass $>$2 GeV. The limit applies for particle modes, $\mu^+\pi^-$, $\mu^+\mu^-$, $\pi^+\pi^-$X, $\pi^+\pi^-\pi^\pm$ etc. See their figure 5 for the contours of limits in the mass-τ plane for each mode. NODE=S015CS;LINKAGE=D

23 GUSTAFSON 76 is a 300 GeV FNAL experiment looking for heavy ($m >$2 GeV) long-lived neutral hadrons in the M4 neutral beam. The above typical value is for m = 3 GeV and assumes an interaction cross section of 1 mb. Values as a function of mass and interaction cross section are given in figure 2. NODE=S015CS;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	AABOUD	18CJ	PR D98 052008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59441
	AABOUD	18CM	PR D98 092008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59474
	AAIJ	18AJ	PRL 120 061801	R. Aaij *et al.*	(LHCb Collab.)	REFID=59199
	BANERJEE	18	PRL 120 231802	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58838
YOUR PAPER	BANERJEE	18A	PR D97 072002	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58916
	MARSICANO	18	PR D98 015031	L. Marsicano *et al.*		REFID=58967
	SIRUNYAN	18BB	JHEP 1806 120	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59112
	SIRUNYAN	18DA	JHEP 1811 042	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59306
	SIRUNYAN	18DD	EPJ C78 789	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59318
	SIRUNYAN	18DR	JHEP 1811 161	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59367
	SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
	SIRUNYAN	18ED	JHEP 1811 172	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59566
	AABOUD	17B	PL B765 32	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57706
	AAIJ	17BR	EPJ C77 812	R. Aaij *et al.*	(LHCb Collab.)	REFID=58366
	ZANG	17	PL B773 159	X. Zang, G.A. Miller	(WASH)	REFID=59311
	AAD	16O	PL B760 520	G. Aad *et al.*	(ATLAS Collab.)	REFID=57169
	AAD	16R	PL B755 285	G. Aad *et al.*	(ATLAS Collab.)	REFID=57172
	KRASZNAHO...	16	PRL 116 042501	A.J. Krasznahorkay *et al.*	(HINR, ANIK+)	REFID=59302
	LEES	15E	PRL 114 171801	J.P. Lees *et al.*	(BABAR Collab.)	REFID=56467
	ADAMS	97B	PRL 79 4083	J. Adams *et al.*	(FNAL KTeV Collab.)	REFID=45722
	GALLAS	95	PR D52 6	E. Gallas *et al.*	(MSU, FNAL, MIT, FLOR)	REFID=44291
	AKESSON	91	ZPHY C52 219	T. Akesson *et al.*	(HELIOS Collab.)	REFID=41739
	BADIER	86	ZPHY C31 21	J. Badier *et al.*	(NA3 Collab.)	REFID=10622
	GUSTAFSON	76	PRL 37 474	H.R. Gustafson *et al.*	(MICH)	REFID=12580

Reference = ALBERT 18C; PR D98 123012
Verifier code = JGOODMAN

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jordan goodman

EMAIL: goodman@umd.edu

April 5, 2019

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1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Production Cross Section of Radiatively-Decaying Neutral Particle

NODE=S015GAM
NODE=S015GAM

	VALUE (pb)	CL%	DOCUMENT ID		TECN	COMMENT	
	• • • We do not use the following data for averages, fits, limits, etc. • • •						
YOUR DATA		95	[1] ALBERT	18C	HAWC	γ from Sun	
			[2] KHACHATRY...	17D	CMS	$Z\gamma$ resonance	OCCUR=2
	<0.0008	95	[3] AAD	16AI	ATLS	$pp \to \gamma + \text{jet}$	
			[4] KHACHATRY...	16M	CMS	$pp \to \gamma\gamma$ resonance	
	$<(0.043–0.17)$	95	[5] ABBIENDI	00D	OPAL	$e^+e^- \to X^0 Y^0$, $X^0 \to Y^0\gamma$	
	$<(0.05–0.8)$	95	[6] ABBIENDI	00D	OPAL	$e^+e^- \to X^0 X^0$, $X^0 \to Y^0\gamma$	OCCUR=2
	$<(2.5–0.5)$	95	[7] ACKERSTAFF	97B	OPAL	$e^+e^- \to X^0 Y^0$, $X^0 \to Y^0\gamma$	
	$<(1.6–0.9)$	95	[8] ACKERSTAFF	97B	OPAL	$e^+e^- \to X^0 X^0$, $X^0 \to Y^0\gamma$	OCCUR=2

YOUR NOTE [1] ALBERT 18C search for WIMP annihilation in Sun to long-lived, radiatively decaying mediator; no signal; limits set on $\sigma^{SD}(\chi\ \mathrm{p})$ assuming long-lived mediator. NODE=S015GAM;LINKAGE=G

[2] KHACHATRYAN 17D search for new scalar resonance decaying to $Z\gamma$ with $Z \to e^+e^-$, $\mu^+\mu^-$ in pp collisions at 8 and 13 TeV; no signal seen. NODE=S015GAM;LINKAGE=F

[3] AAD 16AI search for excited quarks (EQ) and quantum black holes (QBH) in 3.2 fb^{-1} at 13 TeV of data; exclude EQ below 4.4 TeV and QBH below 3.8 (6.2) TeV for RS1 (ADD) models. The visible cross section limit was obtained for 5 TeV resonance with $\sigma_G/M_G = 2\%$. NODE=S015GAM;LINKAGE=C

[4] KHACHATRYAN 16M search for $\gamma\gamma$ resonance using 19.7 fb^{-1} at 8 TeV and 3.3 fb^{-1} at 13 Tev; slight excess at 750 GeV noted; limit set on RS graviton. NODE=S015GAM;LINKAGE=D

[5] ABBIENDI 00D associated production limit is for m_{X^0}= 90–188 GeV, m_{Y^0}=0 at $E_{\rm cm}$=189 GeV. See also their Fig. 9. NODE=S015GAM;LINKAGE=G1

[6] ABBIENDI 00D pair production limit is for m_{X^0} = 45–94 GeV, m_{Y^0}=0 at $E_{\rm cm}$=189 GeV. See also their Fig. 12. NODE=S015GAM;LINKAGE=G2

[7] ACKERSTAFF 97B associated production limit is for m_{X^0} = 80–160 GeV, m_{Y^0}=0 from 10.0 pb^{-1} at $E_{\rm cm}$ = 161 GeV. See their Fig. 3(a). NODE=S015GAM;LINKAGE=A

[8] ACKERSTAFF 97B pair production limit is for m_{X^0} = 40–80 GeV, m_{Y^0}=0 from 10.0 pb^{-1} at $E_{\rm cm}$ = 161 GeV. See their Fig. 3(b). NODE=S015GAM;LINKAGE=B

REFERENCES FOR Other Particle Searches

NODE=S015

YOUR PAPER

ALBERT	18C	PR D98 123012	A. Albert *et al.*	(HAWC Collab.)	REFID=59510
KHACHATRY...	17D	JHEP 1701 076	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57750
AAD	16AI	JHEP 1603 041	G. Aad *et al.*	(ATLAS Collab.)	REFID=57322
KHACHATRY...	16M	PRL 117 051802	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57196
ABBIENDI	00D	EPJ C13 197	G. Abbiendi *et al.*	(OPAL Collab.)	REFID=47464
ACKERSTAFF	97B	PL B391 210	K. Ackerstaff *et al.*	(OPAL Collab.)	REFID=45244

Reference = KILE 18; JHEP 1810 116
Verifier code = KILE

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Jennifer Kile

EMAIL: jennifer.kile@cftp.tecnico.ulisboa.pt

April 5, 2019

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Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON CHARGED PARTICLES IN e^+e^-

NODE=S015425

Heavy Particle Production Cross Section in e^+e^-

NODE=S015EE

Ratio to $\sigma(e^+e^- \rightarrow \mu^+\mu^-)$ unless noted. See also entries in Free Quark Search and Magnetic Monopole Searches.

NODE=S015EE

NODE=S015EE

YOUR DATA

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] KILE	18	ALEP	$e^+e^- \rightarrow$ 4 jets
$<1 \times 10^{-3}$	90	[2] ABLIKIM	17AA	BES3	$e^+e^- \rightarrow \ell\bar{\ell}\gamma$
		[3] ACKERSTAFF	98P	OPAL	Q=1,2/3, m=45–89.5 GeV
		[4] ABREU	97D	DLPH	Q=1,2/3, m=45–84 GeV
		[5] BARATE	97K	ALEP	Q=1, m=45–85 GeV
$<2 \times 10^{-5}$	95	[6] AKERS	95R	OPAL	Q=1, m= 5–45 GeV
$<1 \times 10^{-5}$	95	[6] AKERS	95R	OPAL	Q=2, m= 5–45 GeV
$<2 \times 10^{-3}$	90	[7] BUSKULIC	93C	ALEP	Q=1, m=32–72 GeV
$<(10^{-2}$–1)	95	[8] ADACHI	90C	TOPZ	Q=1, m=1–16, 18–27 GeV
$<7 \times 10^{-2}$	90	[9] ADACHI	90E	TOPZ	$Q = 1$, $m = $ 5–25 GeV
$<1.6 \times 10^{-2}$	95	[10] KINOSHITA	82	PLAS	Q=3–180, $m <$14.5 GeV
$<5.0 \times 10^{-2}$	90	[11] BARTEL	80	JADE	Q=(3,4,5)/3 2–12 GeV

OCCUR=2

YOUR NOTE

[1] KILE 18 investigate archived ALEPH $e^+e^- \rightarrow$ 4 jets data and see 4–5 σ excess at 110 GeV.

NODE=S015EE;LINKAGE=I

[2] ABLIKIM 17AA search for dark photon $A \rightarrow \ell\bar{\ell}$ at 3.773 GeV with 2.93 fb^{-1}. Limits are set in ϵ vs m(A) plane.

NODE=S015EE;LINKAGE=H

[3] ACKERSTAFF 98P search for pair production of long-lived charged particles at $E_{\rm cm}$ between 130 and 183 GeV and give limits $\sigma <$(0.05–0.2) pb (95%CL) for spin-0 and spin-1/2 particles with m=45–89.5 GeV, charge 1 and 2/3. The limit is translated to the cross section at $E_{\rm cm}$=183 GeV with the s dependence described in the paper. See their Figs. 2–4.

NODE=S015EE;LINKAGE=EP

[4] ABREU 97D search for pair production of long-lived particles and give limits $\sigma <$(0.4–2.3) pb (95%CL) for various center-of-mass energies $E_{\rm cm}$=130–136, 161, and 172 GeV, assuming an almost flat production distribution in cosθ.

NODE=S015EE;LINKAGE=DE

[5] BARATE 97K search for pair production of long-lived charged particles at $E_{\rm cm}$ = 130, 136, 161, and 172 GeV and give limits $\sigma <$(0.2–0.4) pb (95%CL) for spin-0 and spin-1/2 particles with m=45–85 GeV. The limit is translated to the cross section at $E_{\rm cm}$=172 GeV with the $E_{\rm cm}$ dependence described in the paper. See their Figs. 2 and 3 for limits on $J = 1/2$ and $J = 0$ cases.

NODE=S015EE;LINKAGE=G

[6] AKERS 95R is a CERN-LEP experiment with $W_{\rm cm} \sim m_Z$. The limit is for the production of a stable particle in multihadron events normalized to $\sigma(e^+e^- \rightarrow$ hadrons). Constant phase space distribution is assumed. See their Fig. 3 for bounds for $Q = \pm2/3$, $\pm4/3$.

NODE=S015EE;LINKAGE=F

[7] BUSKULIC 93C is a CERN-LEP experiment with $W_{\rm cm} = m_Z$. The limit is for a pair or single production of heavy particles with unusual ionization loss in TPC. See their Fig. 5 and Table 1.

NODE=S015EE;LINKAGE=E

[8] ADACHI 90C is a KEK-TRISTAN experiment with $W_{\rm cm}$ = 52–60 GeV. The limit is for pair production of a scalar or spin-1/2 particle. See Figs. 3 and 4.

NODE=S015EE;LINKAGE=D

[9] ADACHI 90E is KEK-TRISTAN experiment with $W_{\rm cm}$ = 52–61.4 GeV. The above limit is for inclusive production cross section normalized to $\sigma(e^+e^- \rightarrow \mu^+\mu^-)\cdot\beta(3-\beta^2)/2$, where $\beta = (1-4m^2/W^2_{\rm cm})^{1/2}$. See the paper for the assumption about the production mechanism.

NODE=S015EE;LINKAGE=C

[10] KINOSHITA 82 is SLAC PEP experiment at $W_{\rm cm}$ = 29 GeV using lexan and ^{39}Cr plastic sheets sensitive to highly ionizing particles.

NODE=S015EE;LINKAGE=B

[11] BARTEL 80 is DESY-PETRA experiment with $W_{\rm cm}$ = 27–35 GeV. Above limit is for inclusive pair production and ranges between $1. \times 10^{-1}$ and $1. \times 10^{-2}$ depending on mass and production momentum distributions. (See their figures 9, 10, 11).

NODE=S015EE;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

YOUR PAPER	KILE	18	JHEP 1810 116	J. Kile, J. von Wimmersperg-Toeller	(LISBT)	REFID=59564
	ABLIKIM	17AA	PL B774 252	M. Ablikim *et al.*	(BES III Collab.)	REFID=58253
	ACKERSTAFF	98P	PL B433 195	K. Ackerstaff *et al.*	(OPAL Collab.)	REFID=46077
	ABREU	97D	PL B396 315	P. Abreu *et al.*	(DELPHI Collab.)	REFID=45316
	BARATE	97K	PL B405 379	R. Barate *et al.*	(ALEPH Collab.)	REFID=45551
	AKERS	95R	ZPHY C67 203	R. Akers *et al.*	(OPAL Collab.)	REFID=44370
	BUSKULIC	93C	PL B303 198	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=43295
	ADACHI	90C	PL B244 352	I. Adachi *et al.*	(TOPAZ Collab.)	REFID=41322
	ADACHI	90E	PL B249 336	I. Adachi *et al.*	(TOPAZ Collab.)	REFID=41410
	KINOSHITA	82	PRL 48 77	K. Kinoshita, P.B. Price, D. Fryberger	(UCB+)	REFID=12388
	BARTEL	80	ZPHY C6 295	W. Bartel *et al.*	(JADE Collab.)	REFID=12158

Reference = KRASZNAHORKAY 16; PRL 116 042501
Verifier code = KRASZNAHOR

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

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A. KRASZNAHORKAY

EMAIL: kraszna@atomki.hu

April 5, 2019

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(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Heavy Particle Production Cross Section

NODE=S015CS
NODE=S015CS

VALUE (cm^2/N)	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
		[1] AABOUD	18CJ	ATLS	$pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$
		[2] AABOUD	18CM	ATLS	$pp \to e\mu/e\tau/\mu\tau$
		[3] AAIJ	18AJ	LHCB	$pp \to A' \to \mu^+\mu^-$; dark photon
		[4] BANERJEE	18	NA64	$eZ \to eZX(A')$
		[5] BANERJEE	18A	NA64	$eZ \to eZA'$, $A' \to \chi\chi$
		[6] MARSICANO	18	E137	$e^+e^- \to A'(\gamma)$ visible decay
		[7] SIRUNYAN	18BB	CMS	$pp \to Z' \to \ell^+\ell^-$ at 13 TeV
		[8] SIRUNYAN	18DA	CMS	$pp \to$ Black Hole, string ball, sphaleron
		[9] SIRUNYAN	18DD	CMS	$pp \to jj$
		[10] SIRUNYAN	18DR	CMS	$pp \to b\mu\overline{\mu}$
		[11] SIRUNYAN	18DU	CMS	$pp \to \gamma\gamma$
		[12] SIRUNYAN	18ED	CMS	$pp \to V \to Wh$; $h \to b\overline{b}$; $W \to l\nu$
		[13] AABOUD	17B	ATLS	WH, ZH resonance
		[14] AAIJ	17BR	LHCB	$pp \to \pi_V\pi_V$, $\pi_V \to jj$
		[15] AAD	16O	ATLS	ℓ + (ℓs or jets)
		[16] AAD	16R	ATLS	WW, WZ, ZZ resonance
YOUR DATA		[17] KRASZNAHO...	16		$p^7Li \to {}^8Be \to X(17)N$, $X(17) \to e^+e^-$
		[18] LEES	15E	BABR	e^+e^- collisions
		[19] ADAMS	97B	KTEV	m= 1.2–5 GeV
$< 10^{-36}$–10^{-33}	90	[20] GALLAS	95	TOF	m= 0.5–20 GeV
$<(4–0.3) \times 10^{-31}$	95	[21] AKESSON	91	CNTR	m = 0–5 GeV
$<2 \times 10^{-36}$	90	[22] BADIER	86	BDMP	$\tau = (0.05–1.) \times 10^{-8}$s
$<2.5 \times 10^{-35}$		[23] GUSTAFSON	76	CNTR	$\tau > 10^{-7}$ s

[1] AABOUD 18CJ make multichannel search for $pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$ at 13 TeV, 36.1 fb^{-1}; no signal found; limits placed for several BSM models.

NODE=S015CS;LINKAGE=R

[2] AABOUD 18CM search for lepton-flavor violating resonance in $pp \to e\mu/e\tau/\mu\tau$ at 13 TeV, 36.1 fb^{-1}; no signal is found and limits placed for various BSM models.

NODE=S015CS;LINKAGE=S

[3] AAIJ 18AJ search for prompt and delayed dark photon decay $A' \to \mu^+\mu^-$ at LHCb detector using 1.6 fb^{-1} of pp collisions at 13 TeV; limits on m(A') vs. kinetic mixing are set.

NODE=S015CS;LINKAGE=K

[4] BANERJEE 18 search for dark photon A'/16.7 MeV boson X at NA64 via $eZ \to eZX(A')$; no signal found and limits set on the X-e^- coupling ϵ_e in the range $1.3 \times 10^{-4} \leq \epsilon_e \leq 4.2 \times 10^{-4}$ excluding part of the allowed parameter space.

NODE=S015CS;LINKAGE=L

[5] BANERJEE 18A search for invisibly decaying dark photons in $eZ \to eZA'$, $A' \to$ invisible; no signal found and limits set on mixing for m(A') $<$ 1 GeV.

NODE=S015CS;LINKAGE=M

[6] MARSICANO 18 search for dark photon $e^+e^- \to A'(\gamma)$ visible decay in SLAC E137 e beam dump data. No signal observed and limits set in ϵ coupling vs m(A') plane, see their figure 7.

NODE=S015CS;LINKAGE=P

[7] SIRUNYAN 18BB search for high mass dilepton resonance; no signal found and exclude portions of p-space of Z', KK graviton models.

NODE=S015CS;LINKAGE=O

[8] SIRUNYAN 18DA search for $pp \to$ Black Hole, string ball, sphaleron via high multiplicity events at 13 TeV, 35.9 fb^{-1}; no signal, require e.g. m(BH)¿10.1 TeV

NODE=S015CS;LINKAGE=T

[9] SIRUNYAN 18DD search for $pp \to jj$ deviations in dijet angular distribution. No signal observed. Set limits on large extra dimensions, black holes and DM mediators e.g. m(BH) $>$ 5.9–8.2 TeV.

NODE=S015CS;LINKAGE=U

[10] SIRUNYAN 18DR search for dimuon resonance in $pp \to b\mu\overline{\mu}$ at 8 and 13 TeV. Slight excess seen at m($\mu\overline{\mu}$) $\sim$ 28 GeV in some channels.

NODE=S015CS;LINKAGE=V

[11] SIRUNYAN 18DU search for high mass diphoton resonance in $pp \to \gamma\gamma$ at 13 TeV using 35.9 fb^{-1}; no signal; limits placed on RS Graviton, LED, and clockwork. NODE=S015CS;LINKAGE=W

[12] SIRUNYAN 18ED search for $pp \to V \to Wh$; $h \to b\overline{b}$; $W \to l\nu$ at 13 TeV with 35.9 fb^{-1}; no signal; limits set on m($W^{'}$)¿2.9 TeV. NODE=S015CS;LINKAGE=X

[13] AABOUD 17B exclude m(W', Z') $<$ 1.49–2.31 TeV depending on the couplings and W'/Z' degeneracy assumptions via WH, ZH search in pp collisions at 13 TeV with 3.2 fb^{-1} of data. NODE=S015CS;LINKAGE=I

[14] AAIJ 17BR search for long-lived hidden valley pions from Higgs decay. Limits are set on the signal strength as a function of the mass and lifetime of the long-lived particle in their Fig. 4 and Tab. 4. NODE=S015CS;LINKAGE=J

[15] AAD 16O search for high E_T ℓ + (ℓs or jets) with 3.2 fb^{-1} at 13 TeV; exclude micro black holes mass $<$ 8 TeV (Fig. 3) for models with two extra dimensions. NODE=S015CS;LINKAGE=G

[16] AAD 16R search for WW, WZ, ZZ resonance in 20.3 fb^{-1} at 8 TeV data; limits placed on massive RS graviton (Fig. 4). NODE=S015CS;LINKAGE=H

YOUR NOTE [17] KRASZNAHORKAY 16 report pLi $\to$ Be $\to$ $e\overline{e}N$ 5σ resonance at 16.7 MeV– possible evidence for nuclear interference or new light boson . However, such nuclear interference was ruled out already by ZANG 17. NODE=S015CS;LINKAGE=Q

[18] LEES 15E search for long-lived neutral particles produced in e^+e^- collisions in the Upsilon region, which decays into e^+e^-, $\mu^+\mu^-$, $e^\pm\mu^\mp$, $\pi^+\pi^-$, K^+K^-, or $\pi^\pm K^\mp$. See their Fig. 2 for cross section limits. NODE=S015CS;LINKAGE=F

[19] ADAMS 97B search for a hadron-like neutral particle produced in pN interactions, which decays into a ρ^0 and a weakly interacting massive particle. Upper limits are given for the ratio to K_L production for the mass range 1.2–5 GeV and lifetime 10^{-9}–10^{-4} s. See also our Light Gluino Section. NODE=S015CS;LINKAGE=E

[20] GALLAS 95 limit is for a weakly interacting neutral particle produced in 800 GeV/c pN interactions decaying with a lifetime of 10^{-4}–10^{-8} s. See their Figs. 8 and 9. Similar limits are obtained for a stable particle with interaction cross section 10^{-29}–10^{-33} cm^2. See Fig. 10. NODE=S015CS;LINKAGE=C

[21] AKESSON 91 limit is from weakly interacting neutral long-lived particles produced in pN reaction at 450 GeV/c performed at CERN SPS. Bourquin-Gaillard formula is used as the production model. The above limit is for $\tau > 10^{-7}$ s. For $\tau > 10^{-9}$ s, $\sigma < 10^{-30}$ cm^{-2}/nucleon is obtained. NODE=S015CS;LINKAGE=B

[22] BADIER 86 looked for long-lived particles at 300 GeV π^- beam dump. The limit applies for nonstrongly interacting neutral or charged particles with mass >2 GeV. The limit applies for particle modes, $\mu^+\pi^-$, $\mu^+\mu^-$, $\pi^+\pi^-$X, $\pi^+\pi^-\pi^\pm$ etc. See their figure 5 for the contours of limits in the mass-τ plane for each mode. NODE=S015CS;LINKAGE=D

[23] GUSTAFSON 76 is a 300 GeV FNAL experiment looking for heavy (m >2 GeV) long-lived neutral hadrons in the M4 neutral beam. The above typical value is for m = 3 GeV and assumes an interaction cross section of 1 mb. Values as a function of mass and interaction cross section are given in figure 2. NODE=S015CS;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	AABOUD	18CJ	PR D98 052008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59441
	AABOUD	18CM	PR D98 092008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59474
	AAIJ	18AJ	PRL 120 061801	R. Aaij *et al.*	(LHCb Collab.)	REFID=59199
	BANERJEE	18	PRL 120 231802	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58838
	BANERJEE	18A	PR D97 072002	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58916
	MARSICANO	18	PR D98 015031	L. Marsicano *et al.*		REFID=58967
	SIRUNYAN	18BB	JHEP 1806 120	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59112
	SIRUNYAN	18DA	JHEP 1811 042	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59306
	SIRUNYAN	18DD	EPJ C78 789	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59318
	SIRUNYAN	18DR	JHEP 1811 161	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59367
	SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
	SIRUNYAN	18ED	JHEP 1811 172	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59566
	AABOUD	17B	PL B765 32	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57706
	AAIJ	17BR	EPJ C77 812	R. Aaij *et al.*	(LHCb Collab.)	REFID=58366
	ZANG	17	PL B773 159	X. Zang, G.A. Miller	(WASH)	REFID=59311
	AAD	16O	PL B760 520	G. Aad *et al.*	(ATLAS Collab.)	REFID=57169
	AAD	16R	PL B755 285	G. Aad *et al.*	(ATLAS Collab.)	REFID=57172
YOUR PAPER	KRASZNAHO...	16	PRL 116 042501	A.J. Krasznahorkay *et al.*	(HINR, ANIK+)	REFID=59302
	LEES	15E	PRL 114 171801	J.P. Lees *et al.*	(BABAR Collab.)	REFID=56467
	ADAMS	97B	PRL 79 4083	J. Adams *et al.*	(FNAL KTeV Collab.)	REFID=45722
	GALLAS	95	PR D52 6	E. Gallas *et al.*	(MSU, FNAL, MIT, FLOR)	REFID=44291
	AKESSON	91	ZPHY C52 219	T. Akesson *et al.*	(HELIOS Collab.)	REFID=41739
	BADIER	86	ZPHY C31 21	J. Badier *et al.*	(NA3 Collab.)	REFID=10622
	GUSTAFSON	76	PRL 37 474	H.R. Gustafson *et al.*	(MICH)	REFID=12580

Reference = AAIJ 18C; PRL 120 121801
Verifier code = LHCB

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Matthew Charles

EMAIL: matthew.john.charles@cern.ch

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Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM, CHARMED MESONS ($B = C = \pm1$)

NODE=MXXX049

$B_c^+ = c\overline{b}$, $B_c^- = \overline{c}\,b$, similarly for B_c^*'s

NODE=MXXX049

NODE=S091

B_c^+

$I(J^P) = 0(0^-)$
I, J, P need confirmation.

Quantum numbers shown are quark-model predictions.

NODE=S091

B_c^+ BRANCHING RATIOS

NODE=S091225

$\Gamma(J/\psi(1S)\tau^+\nu_\tau)/\Gamma(J/\psi(1S)\mu^+\nu_\mu)$ Γ_3/Γ_2

NODE=S091R29
NODE=S091R29

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.71±0.17±0.18**	[1] AAIJ	18C	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18C uses $\tau^+ \rightarrow \mu^+\nu_\mu\overline{\nu}_\tau$ mode to obtain the ratio value.

NODE=S091R29;LINKAGE=A

B_c^+ REFERENCES

NODE=S091

YOUR PAPER AAIJ 18C PRL 120 121801 R. Aaij *et al.* (LHCb Collab.)

REFID=58813

Reference = AAIJ 18D; PRL 120 171802
Verifier code = LHCB

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BOTTOM MESONS
($B = \pm 1$)

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^\pm$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^\pm$ section.

NODE=S042220

$\Gamma(D^*(2010)^- \tau^+ \nu_\tau)/\Gamma_{\rm total}$ — Γ_7/Γ

NODE=S042B09
NODE=S042B09

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
	1.48±0.18 OUR AVERAGE Error includes scale factor of 1.1. [$(2.0 \pm 0.5) \times 10^{-2}$ OUR 2018 AVERAGE]				
YOUR DATA	$1.42 \pm 0.094 \pm 0.140$	[1] AAIJ	18D	LHCB	pp at 7, 8 TeV
	$2.02^{+0.40}_{-0.37} \pm 0.37$	[2] MATYJA	07	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	$1.11 \pm 0.51 \pm 0.06$	[3] AUBERT	08N	BABR	Repl. by AUBERT 09S

NEW

YOUR NOTE
[1] Noramlizes to B($B^0 \rightarrow D^*(2010)^- \pi^+ \pi^- \pi^+$) = $(7.214 \pm 0.28) \times 10^{-3}$.
[2] Observed in the recoil of the accompanying B meson.
[3] Uses a fully reconstructed B meson as a tag on the recoil side.

NODE=S042B09;LINKAGE=A
NODE=S042B09;LINKAGE=MA
NODE=S042B09;LINKAGE=AU

$\Gamma(D^*(2010)^- \tau^+ \nu_\tau)/\Gamma(D^*(2010)^- \ell^+ \nu_\ell)$ — Γ_7/Γ_6

NODE=S042B95
NODE=S042B95

	VALUE	DOCUMENT ID		TECN	COMMENT
	0.315±0.018 OUR AVERAGE [0.325 ± 0.022 OUR 2018 AVERAGE]				
YOUR DATA	$0.291 \pm 0.019 \pm 0.029$	[1] AAIJ	18D	LHCB	pp at 7, 8 TeV
	$0.302 \pm 0.030 \pm 0.011$	[2] SATO	16B	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	$0.336 \pm 0.027 \pm 0.030$	[3] AAIJ	15Q	LHCB	pp at 7, 8 TeV
	$0.355 \pm 0.039 \pm 0.021$	[4,5] LEES	12D	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	$0.207 \pm 0.095 \pm 0.008$	[4] AUBERT	09S	BABR	Repl. by LEES 12D

NEW

YOUR NOTE
[1] Uses $\tau^+ \rightarrow \pi^+\pi^-\pi^+\overline{\nu}_\tau$ and $\tau^+ \rightarrow \pi^+\pi^-\pi^+\pi^0\overline{\nu}_\tau$, and μ^+ as ℓ^+.
[2] Uses semileptonic B decay events for tagging and $\tau^+ \rightarrow \ell^+\nu_\ell\overline{\nu}_\tau$ mode.
[3] Uses $\tau^+ \rightarrow \mu^+\nu_\mu\overline{\nu}_\tau$ and μ^+ as ℓ^+.
[4] Uses a fully reconstructed B meson as a tag on the recoil side.
[5] Uses $\tau^+ \rightarrow e^+\nu_e\overline{\nu}_\tau$ and $\tau^+ \rightarrow \mu^+\nu_\mu\overline{\nu}_\tau$ and e^+ or μ^+ as ℓ^+.

NODE=S042B95;LINKAGE=C
NODE=S042B95;LINKAGE=B
NODE=S042B95;LINKAGE=A
NODE=S042B95;LINKAGE=AU
NODE=S042B95;LINKAGE=LE

$\Gamma(D^*(2010)^- \tau^+ \nu_\tau)/\Gamma(D^*(2010)^- \pi^+ \pi^+ \pi^-)$ — Γ_7/Γ_{57}

NODE=S042P26
NODE=S042P26

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**1.97±0.13±0.18**	[1] AAIJ	18D	LHCB	pp at 7, 8 TeV

YOUR NOTE
[1] Uses $\tau^+ \rightarrow \pi^+\pi^-\pi^+\overline{\nu}_\tau$ and $\tau^+ \rightarrow \pi^+\pi^-\pi^+\pi^0\overline{\nu}_\tau$ modes.

NODE=S042P26;LINKAGE=A

B^0 REFERENCES

NODE=S042

YOUR PAPER	AAIJ	18D	PRL 120 171802	R. Aaij *et al.*	(LHCb Collab.)	REFID=58822
	SATO	16B	PR D94 072007	Y. Sato *et al.*	(BELLE Collab.)	REFID=57523
	AAIJ	15Q	PRL 115 111803	R. Aaij *et al.*	(LHCb Collab.)	REFID=56493
	LEES	12D	PRL 109 101802	J.P. Lees *et al.*	(BABAR Collab.)	REFID=54261
	Also		PR D88 072012	J.P. Lees *et al.*	(BABAR Collab.)	REFID=55461
	AUBERT	09S	PR D79 092002	B. Aubert *et al.*	(BABAR Collab.)	REFID=52799
	AUBERT	08N	PRL 100 021801	B. Aubert *et al.*	(BABAR Collab.)	REFID=52222
	Also		PR D79 092002	B. Aubert *et al.*	(BABAR Collab.)	REFID=52799
	MATYJA	07	PRL 99 191807	A. Matyja *et al.*	(BELLE Collab.)	REFID=52022

Reference = AAIJ 18F; PRL 120 261801
Verifier code = LHCB

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NODE=MXXX045

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NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^{\pm}$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^{\pm}$ section.

NODE=S042220

$\Gamma(\chi_{c0} K^0)/\Gamma_{total}$ Γ_{250}/Γ

NODE=S042S89
NODE=S042S89

VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
$1.12^{+0.24}_{-0.21}$ OUR AVERAGE				
$[(146 \pm 27) \times 10^{-6}$ OUR 2018 AVERAGE]				
$1.11^{+0.20}_{-0.16} \pm 0.14$		[1] AAIJ	18F LHCB	pp at 7, 8 TeV
$145\ ^{+103}_{-85} \pm 8$		[2,3] LEES	12I BABR	$e^+e^- \rightarrow \Upsilon(4S)$
$148 \pm 30 \pm 13$		[2,4] LEES	12O BABR	$e^+e^- \rightarrow \Upsilon(4S)$
$142\ ^{+55}_{-44} \pm 22$		[2,5] AUBERT	09AU BABR	$e^+e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 113	90	[5] GARMASH	07 BELL	$e^+e^- \rightarrow \Upsilon(4S)$
<1240	90	[2] AUBERT	05K BABR	$e^+e^- \rightarrow \Upsilon(4S)$
< 500	90	[6] EDWARDS	01 CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

NEW

YOUR DATA

YOUR NOTE

[1] Uses Dalitz plot analysis of the $B^0 \rightarrow K^0_S \pi^+\pi^-$ final state decays. For the branching fraction of the reference mode, the PDG average $B(B^0 \rightarrow K^0_S \pi^+\pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used.

NODE=S042S89;LINKAGE=B

[2] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S042S89;LINKAGE=EP

[3] LEES 12I reports $[\Gamma(B^0 \rightarrow \chi_{c0} K^0)/\Gamma_{total}] \times [B(\chi_{c0}(1P) \rightarrow K^0_S K^0_S)] = (0.46^{+0.25}_{-0.17} \pm 0.21) \times 10^{-6}$ which we divide by our best value $B(\chi_{c0}(1P) \rightarrow K^0_S K^0_S) = (3.16 \pm 0.17) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S042S89;LINKAGE=LE

[4] Measured in the $B^0 \rightarrow K^0_S K^+ K^-$ decay.

NODE=S042S89;LINKAGE=LA

[5] Uses Dalitz plot analysis of the $B^0 \rightarrow K^0 \pi^+\pi^-$ final state decays.

NODE=S042S89;LINKAGE=GM

[6] EDWARDS 01 assumes equal production of B^0 and B^+ at the $\Upsilon(4S)$. The correlated uncertainties (28.3)% from $B(J/\psi(1S) \rightarrow \gamma\eta_c)$ in those modes have been accounted for.

NODE=S042S89;LINKAGE=A

$\Gamma(K^0\pi^+\pi^-$ non-resonant$)/\Gamma_{total}$ — Γ_{301}/Γ

NODE=S042B00
NODE=S042B00

$13.9^{+2.6}_{-1.8}$ OUR AVERAGE Error includes scale factor of 1.6. See the ideogram below.

NEW

$[(14.7^{+4.0}_{-2.6}) \times 10^{-6}$ OUR 2018 AVERAGE Scale factor = 2.1]

	VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$12.1 \pm 0.6 \pm 2.9$	[1] AAIJ	18F	LHCB	pp at 7, 8 TeV
	$11.1^{+2.5}_{-1.0} \pm 0.9$	[2] AUBERT	09AU	BABR	$e^+e^- \to \Upsilon(4S)$
	$19.9 \pm 2.5^{+1.7}_{-2.0}$	[3] GARMASH	07	BELL	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE

[1] Uses Dalitz plot analysis of the $B^0 \to K^0_S\pi^+\pi^-$ final state decays. For the branching fraction of the reference mode, the PDG average $B(B^0 \to K^0_S\pi^+\pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used.

NODE=S042B00;LINKAGE=A

[2] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S042B00;LINKAGE=EP

[3] Uses Dalitz plot analysis of the $B^0 \to K^0\pi^+\pi^-$ final state decays.

NODE=S042B00;LINKAGE=GM

$\Gamma(K^0\rho^0)/\Gamma_{total}$ — Γ_{302}/Γ

NODE=S042R12
NODE=S042R12

3.4 ± 1.1 OUR AVERAGE Error includes scale factor of 2.3. See the ideogram below. $[(4.7 \pm 0.6) \times 10^{-6}$ OUR 2018 AVERAGE]

NEW

	VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$1.89^{+0.55}_{-0.79} \pm 0.40$		[1] AAIJ	18F	LHCB	pp at 7, 8 TeV
	$4.4\ ^{+0.7}_{-0.6} \pm 0.3$		[2] AUBERT	09AU	BABR	$e^+e^- \to \Upsilon(4S)$
	$6.1 \pm 1.0\ ^{+1.1}_{-1.2}$		[3] GARMASH	07	BELL	$e^+e^- \to \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •					
	$4.9 \pm 0.8 \pm 0.9$		[2] AUBERT	07F	BABR	Repl. by AUBERT 09AU
	$<$ 39	90	ASNER	96	CLEO	$e^+e^- \to \Upsilon(4S)$
	$<$ 320	90	ALBRECHT	91B	ARG	$e^+e^- \to \Upsilon(4S)$
	$<$ 500	90	[4] AVERY	89B	CLEO	$e^+e^- \to \Upsilon(4S)$
	$<$64000	90	[5] AVERY	87	CLEO	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE

[1] Uses Dalitz plot analysis of the $B^0 \to K^0_S\pi^+\pi^-$ final state decays. For the branching fraction of the reference mode, the PDG average $B(B^0 \to K^0_S\pi^+\pi^-) = (4.96 \pm 0.20) \times 10^{-5}$ is used.

NODE=S042R12;LINKAGE=A

[2] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S042R12;LINKAGE=EP

[3] Uses Dalitz plot analysis of the $B^0 \to K^0\pi^+\pi^-$ final state decays.

NODE=S042R12;LINKAGE=GM

[4] AVERY 89B reports $< 5.8 \times 10^{-4}$ assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%.

NODE=S042R12;LINKAGE=A1

[5] AVERY 87 reports < 0.08 assuming the $\Upsilon(4S)$ decays 40% to $B^0\overline{B}^0$. We rescale to 50%.

NODE=S042R12;LINKAGE=AV

$\Gamma(K^*(892)^+\pi^-)/\Gamma_{total}$ — Γ_{303}/Γ

NODE=S042R11
NODE=S042R11

7.5 ± 0.4 OUR AVERAGE

NEW

$[(8.4 \pm 0.8) \times 10^{-6}$ OUR 2018 AVERAGE]

	VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$7.02 \pm 0.30 \pm 0.45$		[1] AAIJ	18F	LHCB	pp at 7, 8 TeV
	$8.0 \pm 1.1 \pm 0.8$		[2,3] LEES	11	BABR	$e^+e^- \to \Upsilon(4S)$
	$8.3\ ^{+0.9}_{-0.8} \pm 0.8$		[3,4] AUBERT	09AU	BABR	$e^+e^- \to \Upsilon(4S)$
	$8.4 \pm 1.1\ ^{+1.0}_{-0.9}$		[4] GARMASH	07	BELL	$e^+e^- \to \Upsilon(4S)$
	$16\ ^{+6}_{-5} \pm 2$		[3] ECKHART	02	CLE2	$e^+e^- \to \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •					
	$12.6\ ^{+2.7}_{-1.6} \pm 0.9$		[2,3] AUBERT	08AQ	BABR	Repl. by LEES 11
	$11.0 \pm 1.5 \pm 0.71$		[3] AUBERT	06I	BABR	Repl. by AUBERT 09AU
	$12.9 \pm 2.4 \pm 1.4$		[3] AUBERT,B	04O	BABR	Repl. by AUBERT 06I
	$14.8\ ^{+4.6}_{-4.4}\ ^{+2.8}_{-1.3}$		[3] CHANG	04	BELL	Repl. by GARMASH 07

< 72	90	ASNER	96	CLE2	$e^+e^- \to \Upsilon(4S)$
<620	90	ALBRECHT	91B	ARG	$e^+e^- \to \Upsilon(4S)$
<380	90	[5] AVERY	89B	CLEO	$e^+e^- \to \Upsilon(4S)$
<560	90	[6] AVERY	87	CLEO	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE [1] Uses Dalitz plot analysis of the $B^0 \to K^0_S \pi^+\pi^-$ final state decays. For the branching fraction of the reference mode, the PDG average B($B^0 \to K^0_S \pi^+\pi^-$) = (4.96 ± 0.20) × 10^{-5} is used. NODE=S042R11;LINKAGE=A

[2] Uses Dalitz plot analysis of $B^0 \to K^+\pi^-\pi^0$ decays. NODE=S042R11;LINKAGE=DA

[3] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. NODE=S042R11;LINKAGE=EP

[4] Uses Dalitz plot analysis of the $B^0 \to K^0\pi^+\pi^-$ final state decays. NODE=S042R11;LINKAGE=GM

[5] AVERY 89B reports < 4.4 × 10^{-4} assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%. NODE=S042R11;LINKAGE=A1

[6] AVERY 87 reports < 7 × 10^{-4} assuming the $\Upsilon(4S)$ decays 40% to $B^0\overline{B}^0$. We rescale to 50%. NODE=S042R11;LINKAGE=AV

$\Gamma((,K)^{*+}_0\pi^-,\ (,K)^{*+}_0 \to K^0\pi^+)/\Gamma_{total}$ — Γ_{307}/Γ

NODE=S042P43
NODE=S042P43

VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA **(16.2±0.69±1.15) × 10^{-6}**	[1] AAIJ	18F	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Uses Dalitz plot analysis of the $B^0 \to K^0_S \pi^+\pi^-$ final state decays. $(K\pi)^{*+}_0$ is the S-wave component of $K^0\pi^+$. For the branching fraction of the reference mode, the PDG average B($B^0 \to K^0_S \pi^+\pi^-$) = (4.96 ± 0.20) × 10^{-5} is used. NODE=S042P43;LINKAGE=A

$\Gamma(K^0\sigma)/\Gamma_{total}$ — Γ_{309}/Γ

NODE=S042P40
NODE=S042P40

VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA **$(0.16^{+0.20}_{-0.04}\pm0.15) \times 10^{-6}$**	[1] AAIJ	18F	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Uses Dalitz plot analysis of the $B^0 \to K^0_S \pi^+\pi^-$ final state decays. For the branching fraction of the reference mode, the PDG average B($B^0 \to K^0_S \pi^+\pi^-$) = (4.96 ± 0.20) × 10^{-5} is used. NODE=S042P40;LINKAGE=A

$\Gamma(f_0(980)K^0,\ f_0 \to \pi^+\pi^-)/\Gamma_{total}$ — Γ_{308}/Γ

NODE=S042B05
NODE=S042B05

8.1 ±0.8 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below. [(7.0 ± 0.9) × 10^{-6} OUR 2018 AVERAGE] NEW

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA 9.23±0.40±0.79		[1] AAIJ	18F	LHCB	pp at 7, 8 TeV
6.9 ±0.8 ±0.6		[2] AUBERT	09AU	BABR	$e^+e^- \to \Upsilon(4S)$
7.6 ±1.7 $^{+0.9}_{-1.3}$		[3] GARMASH	07	BELL	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
5.5 ±0.7 ±0.6		[2] AUBERT	06I	BABR	Repl. by AUBERT 09AU
<360	90	[4] AVERY	89B	CLEO	$e^+e^- \to \Upsilon(4S)$

YOUR NOTE [1] Uses Dalitz plot analysis of the $B^0 \to K^0_S \pi^+\pi^-$ final state decays. For the branching fraction of the reference mode, the PDG average B($B^0 \to K^0_S \pi^+\pi^-$) = (4.96 ± 0.20) × 10^{-5} is used. NODE=S042B05;LINKAGE=A

[2] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. NODE=S042B05;LINKAGE=EP

[3] Uses Dalitz plot analysis of the $B^0 \to K^0\pi^+\pi^-$ final state decays. NODE=S042B05;LINKAGE=GM

[4] AVERY 89B reports < 4.2 × 10^{-4} assuming the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%. NODE=S042B05;LINKAGE=A1

$\Gamma(K^0 f_0(1500))/\Gamma_{total}$ — Γ_{310}/Γ

NODE=S042P42
NODE=S042P42

VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA **(1.29±0.27±0.70) × 10^{-6}**	[1] AAIJ	18F	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Uses Dalitz plot analysis of the $B^0 \to K^0_S \pi^+\pi^-$ final state decays. For the branching fraction of the reference mode, the PDG average B($B^0 \to K^0_S \pi^+\pi^-$) = (4.96 ± 0.20) × 10^{-5} is used. NODE=S042P42;LINKAGE=A

$\Gamma(K^*_2(1430)^+\pi^-)/\Gamma_{total}$ — Γ_{314}/Γ

NODE=S042R72
NODE=S042R72

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA **$3.65^{+0.15}_{-0.12}\pm0.31$**		[1] AAIJ	18F	LHCB	pp at 7, 8 TeV
< 6	90	[2] GARMASH	07	BELL	$e^+e^- \to \Upsilon(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$<$ 16.2	90	[3,4] AUBERT	08AQ	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
$<$ 18	90	[4] GARMASH	04	BELL	Repl. by GARMASH 07
$<$2600	90	ALBRECHT	91B	ARG	$e^+e^- \rightarrow \Upsilon(4S)$

YOUR NOTE NODE=S042R72;LINKAGE=A

[1] Uses Dalitz plot analysis of the $B^0 \rightarrow K^0_S\pi^+\pi^-$ final state decays. We compute B($B^0 \rightarrow K^*_2(1430)^+\pi^-$) using the PDG value B($K^*_2(1430) \rightarrow K\pi$) = 49.9×10^{-2} and 2/3 for the $K^0\pi^+$ fraction. For the branching fraction of the reference mode, the PDG average B($B^0 \rightarrow K^0_S\pi^+\pi^-$) = $(4.96 \pm 0.20) \times 10^{-5}$ is used.

[2] GARMASH 07 reports B($B^0 \rightarrow K^*_2(1430)^+\pi^-$)$\times$B($K^{*+}_2 \rightarrow K^0\pi^+$) $< 2.1 \times 10^{-6}$ using Dalitz plot analysis. We compute B($B^0 \rightarrow K^*_2(1430)^+\pi^-$) using the PDG value B($K^*_2(1430) \rightarrow K\pi$) = 49.9×10^{-2} and 2/3 for the $K^0\pi^+$ fraction. NODE=S042R72;LINKAGE=GM

[3] Uses Dalitz plot analysis of $B^0 \rightarrow K^+\pi^-\pi^0$ decays. NODE=S042R72;LINKAGE=DA

[4] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. NODE=S042R72;LINKAGE=EP

$\Gamma(K^*(1680)^+\pi^-)/\Gamma_{total}$ Γ_{315}/Γ

NODE=S042B03
NODE=S042B03

	VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**14.1±0.58±0.84**		[1] AAIJ	18F	LHCB	pp at 7, 8 TeV
	<10	90	[2] GARMASH	07	BELL	$e^+e^- \rightarrow \Upsilon(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$<$25	90	[3,4] AUBERT	08AQ	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

YOUR NOTE NODE=S042B03;LINKAGE=A

[1] Uses Dalitz plot analysis of the $B^0 \rightarrow K^0_S\pi^+\pi^-$ final state decays. We compute B($B^0 \rightarrow K^*_2(1430)^+\pi^-$) using the PDG value B($K^*_2(1430) \rightarrow K\pi$) = 49.9×10^{-2} and 2/3 for the $K^0\pi^+$ fraction. For the branching fraction of the reference mode, the PDG average B($B^0 \rightarrow K^0_S\pi^+\pi^-$) = $(4.96 \pm 0.20) \times 10^{-5}$ is used.

[2] GARMASH 07 reports B($B^0 \rightarrow K^*(1680)^+\pi^-$)$\times$B($K^{*+} \rightarrow K^0\pi^+$) $< 2.6 \times 10^{-6}$ using Dalitz plot analysis. We compute B($B^0 \rightarrow K^*(1680)^+\pi^-$) using the PDG value B($K^*(1680) \rightarrow K\pi$)=$38.7 \times 10^{-2}$ and 2/3 for the $K^0\pi^+$ fraction. NODE=S042B03;LINKAGE=GM

[3] Uses Dalitz plot analysis of $B^0 \rightarrow K^+\pi^-\pi^0$ decays. NODE=S042B03;LINKAGE=DA

[4] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. NODE=S042B03;LINKAGE=EP

CP VIOLATION PARAMETERS

NODE=S042229

$A_{CP}(B^0 \rightarrow K^*(892)^+\pi^-)$

NODE=S042AC3
NODE=S042AC3
NEW

	VALUE	DOCUMENT ID		TECN	COMMENT
	$-$0.27 ±0.04 OUR AVERAGE				
	[$-$0.22 ± 0.06 OUR 2018 AVERAGE]				
YOUR DATA	$-0.308 \pm 0.060 \pm 0.016$	[1] AAIJ	18F	LHCB	pp at 7, 8 TeV
	$-0.29 \pm 0.11 \pm 0.02$	[2] LEES	11	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	$-0.21 \pm 0.10 \pm 0.02$	[3,4] AUBERT	09AU	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	$-0.21 \pm 0.11 \pm 0.07$	[5] DALSENO	09	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	$0.26\ ^{+0.33}_{-0.34}\ ^{+0.10}_{-0.08}$	[6] EISENSTEIN	03	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$-0.19\ ^{+0.20}_{-0.15} \pm 0.04$	[2] AUBERT	08AQ	BABR	Repl. by LEES 11
$-0.11 \pm 0.14 \pm 0.05$	[3] AUBERT	06I	BABR	Repl. by AUBERT 09AU
$0.23 \pm 0.18\ ^{+0.09}_{-0.06}$	AUBERT,B	04O	BABR	Repl. by AUBERT 06I

YOUR NOTE

[1] Uses Dalitz plot analysis of the $B^0 \rightarrow K^0_S\pi^+\pi^-$ final state decays. NODE=S042AC3;LINKAGE=B

[2] Uses Dalitz plot analysis of $B^0 \rightarrow K^+\pi^-\pi^0$ decays. NODE=S042AC3;LINKAGE=DA

[3] Uses Dalitz plot analysis of $B^0 \rightarrow K^0\pi^+\pi^-$ decays. NODE=S042AC3;LINKAGE=AU

[4] The first of two equivalent solutions is used. NODE=S042AC3;LINKAGE=BE

[5] Uses Dalitz plot analysis of $B^0 \rightarrow K^0\pi^+\pi^-$ decays and the first of two consistent solutions that may be preferred. NODE=S042AC3;LINKAGE=DL

[6] Corresponds to 90% confidence range $-0.31 < A_{CP} < 0.78$. NODE=S042AC3;LINKAGE=A

$A_{CP}(B^0 \rightarrow (K\pi)^{*+}_0\pi^-)$

NODE=S042CQ6
NODE=S042CQ6
NEW

	VALUE	DOCUMENT ID		TECN	COMMENT
	0.02 ±0.04 OUR AVERAGE				
	[0.09 ± 0.07 OUR 2018 AVERAGE]				
YOUR DATA	$-0.032 \pm 0.047 \pm 0.031$	[1] AAIJ	18F	LHCB	pp at 7, 8 TeV
	$0.07 \pm 0.14 \pm 0.01$	[2] LEES	11	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	$0.09 \pm 0.07 \pm 0.03$	[3] AUBERT	09AU	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$0.17\ ^{+0.11}_{-0.16}\ \pm 0.22$	[2] AUBERT	08AQ	BABR	Repl. by LEES 11

YOUR NOTE [1] Uses Dalitz plot analysis of the $B^0 \to K^0_S \pi^+ \pi^-$ decays. NODE=S042CQ6;LINKAGE=A

[2] Uses Dalitz plot analysis of $B^0 \to K^+ \pi^- \pi^0$ decays. NODE=S042CQ6;LINKAGE=DA

[3] Uses Dalitz plot analysis of $B^0 \to K^0 \pi^+ \pi^-$ decays and the first of two equivalent solutions is used. NODE=S042CQ6;LINKAGE=AU

$A_{CP}(B^0 \to K^*_2(1430)^+ \pi^-)$

NODE=S042A09
NODE=S042A09

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**−0.29±0.22±0.09**	[1] AAIJ	18F	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Uses Dalitz plot analysis of the $B^0 \to K^0_S \pi^+ \pi^-$ decays. NODE=S042A09;LINKAGE=A

$A_{CP}(B^0 \to K^*(1680)^+ \pi^-)$

NODE=S042A10
NODE=S042A10

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**−0.07±0.13±0.04**	[1] AAIJ	18F	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Uses Dalitz plot analysis of the $B^0 \to K^0_S \pi^+ \pi^-$ decays. NODE=S042A10;LINKAGE=A

$A_{CP}(B^0 \to f_0(980) K^0_S)$

NODE=S042A11
NODE=S042A11

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.28±0.27±0.15**	[1] AAIJ	18F	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Uses Dalitz plot analysis of the $B^0 \to K^0_S \pi^+ \pi^-$ decays. NODE=S042A11;LINKAGE=A

B^0 REFERENCES

NODE=S042

YOUR PAPER

AAIJ	18F	PRL 120 261801	R. Aaij *et al.*	(LHCb Collab.)	REFID=58844
LEES	12I	PR D85 054023	J.P. Lees *et al.*	(BABAR Collab.)	REFID=54376
LEES	12O	PR D85 112010	J.P. Lees *et al.*	(BABAR Collab.)	REFID=54382
LEES	11	PR D83 112010	J.P. Lees *et al.*	(BABAR Collab.)	REFID=16579
AUBERT	09AU	PR D80 112001	B. Aubert *et al.*	(BABAR Collab.)	REFID=53180
DALSENO	09	PR D79 072004	J. Dalseno *et al.*	(BELLE Collab.)	REFID=52807
AUBERT	08AQ	PR D78 052005	B. Aubert *et al.*	(BABAR Collab.)	REFID=52365
AUBERT	07F	PRL 98 051803	B. Aubert *et al.*	(BABAR Collab.)	REFID=51634
GARMASH	07	PR D75 012006	A. Garmash *et al.*	(BELLE Collab.)	REFID=51594
AUBERT	06I	PR D73 031101	B. Aubert *et al.*	(BABAR Collab.)	REFID=51089
AUBERT	05K	PRL 94 171801	B. Aubert *et al.*	(BABAR Collab.)	REFID=50591
AUBERT,B	04O	PR D70 091103	B. Aubert *et al.*	(BABAR Collab.)	REFID=50190
CHANG	04	PL B599 148	P. Chang *et al.*	(BELLE Collab.)	REFID=50123
GARMASH	04	PR D69 012001	A. Garmash *et al.*	(BELLE Collab.)	REFID=49642
EISENSTEIN	03	PR D68 017101	B.I. Eisenstein *et al.*	(CLEO Collab.)	REFID=49509
ECKHART	02	PRL 89 251801	E. Eckhart *et al.*	(CLEO Collab.)	REFID=49080
EDWARDS	01	PRL 86 30	K.W. Edwards *et al.*	(CLEO Collab.)	REFID=47903
ASNER	96	PR D53 1039	D.M. Asner *et al.*	(CLEO Collab.)	REFID=44734
ALBRECHT	91B	PL B254 288	H. Albrecht *et al.*	(ARGUS Collab.)	REFID=41451
AVERY	89B	PL B223 470	P. Avery *et al.*	(CLEO Collab.)	REFID=40820
AVERY	87	PL B183 429	P. Avery *et al.*	(CLEO Collab.)	REFID=40387

Reference = AAIJ 18H; PRL 121 072002
Verifier code = LHCB

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Matthew Charles

EMAIL: matthew.john.charles@cern.ch

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

NODE=BXXX045

BOTTOM BARYONS
$(B = -1)$

NODE=BXXX045

$\Lambda_b^0 = udb$, $\Xi_b^0 = usb$, $\Xi_b^- = dsb$, $\Omega_b^- = ssb$

NODE=B180

$\Xi_b(6227)$

$J^P = ?^?$ Status: ∗∗∗

$\Xi_b(6227)$ MASS

NODE=B180M

NODE=B180M

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**6226.9±2.0±0.4**	[1,2] AAIJ	18H	LHCB	pp at 7, 8, 13 TeV

YOUR NOTE [1] Uses $\Lambda_b^0 K^-$ and $\Xi_b^0 \pi^-$ modes. NODE=B180M;LINKAGE=A

YOUR NOTE [2] Measures mass difference m($\Xi_b(6227)^-$) − m(Λ_b^0) = 607.3 ± 2.0 ± 0.3 MeV and uses m(Λ_b^0) = 5619.58 ± 0.17 MeV. NODE=B180M;LINKAGE=B

$\Xi_b(6227)$ WIDTH

NODE=B180W

NODE=B180W

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**18.1±5.4±1.8**	[1] AAIJ	18H	LHCB	pp at 7, 8, 13 TeV

YOUR NOTE [1] Uses $\Lambda_b^0 K^-$ and $\Xi_b^0 \pi^-$ modes. NODE=B180W;LINKAGE=A

$\Xi_b(6227)$ BRANCHING RATIOS

NODE=B180220

$\Gamma(\Lambda_b^0 K^- \times B(b \to \Xi_b(6227))/B(b \to \Lambda_b^0))/\Gamma_{total}$ Γ_1/Γ

NODE=B180R01

NODE=B180R01

	VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT	
	3.20±0.35 OUR AVERAGE					
YOUR DATA	3.0 ±0.3 ±0.4	AAIJ	18H	LHCB	pp at 7, 8 TeV	
YOUR DATA	3.4 ±0.3 ±0.4	AAIJ	18H	LHCB	pp at 13 TeV	OCCUR=2

$\Gamma(\Xi_b^0 \pi^- \times B(b \to \Xi_b(6227))/B(b \to \Xi_b^0))/\Gamma_{total}$ Γ_2/Γ

NODE=B180R02

NODE=B180R02

	VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT	
	28±11 OUR AVERAGE Error includes scale factor of 1.8.					
YOUR DATA	47±10±7	AAIJ	18H	LHCB	pp at 7, 8 TeV	
YOUR DATA	22± 6±3	AAIJ	18H	LHCB	pp at 13 TeV	OCCUR=2

$\Xi_b(6227)$ REFERENCES

NODE=B180

YOUR PAPER AAIJ 18H PRL 121 072002 R. Aaij *et al.* (LHCb Collab.) REFID=58863

Reference = AAIJ 18O; PR D98 032004
Verifier code = LHCB

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Matthew Charles

EMAIL: matthew.john.charles@cern.ch

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
($B = \pm1$)

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^\pm$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

NODE=S042

CP VIOLATION PARAMETERS

NODE=S042229

A_{CP} ($B^0 \to K^+\pi^-$)

NODE=S042ACP
NODE=S042ACP
NEW

VALUE	DOCUMENT ID		TECN	COMMENT
-0.083 ± 0.004 OUR AVERAGE				
[-0.082 ± 0.006 OUR 2018 AVERAGE]				
YOUR DATA $-0.084\pm0.004\pm0.003$	AAIJ	18O	LHCB	pp at 7, 8 TeV
$-0.083\pm0.013\pm0.004$	AALTONEN	14P	CDF	$p\overline{p}$ at 1.96 TeV
$-0.080\pm0.007\pm0.003$	AAIJ	13AX	LHCB	pp at 7 TeV
$-0.069\pm0.014\pm0.007$	DUH	13	BELL	$e^+e^- \to \Upsilon(4S)$
$-0.107\pm0.016^{+0.006}_{-0.004}$	LEES	13D	BABR	$e^+e^- \to \Upsilon(4S)$
$-0.04\ \pm0.16$	[1] CHEN	00	CLE2	$e^+e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$-0.088\pm0.011\pm0.008$	AAIJ	12V	LHCB	Repl. by AAIJ 13AX
$-0.086\pm0.023\pm0.009$	AALTONEN	11N	CDF	Repl. by AALTONEN 14P
$-0.094\pm0.018\pm0.008$	LIN	08	BELL	Repl. by DUH 13
$-0.107\pm0.018^{+0.007}_{-0.004}$	AUBERT	07AF	BABR	Repl. by LEES 13D
$-0.013\pm0.078\pm0.012$	ABULENCIA,A	06D	CDF	Repl. by AALTONEN 11N
$-0.088\pm0.035\pm0.013$	[2] CHAO	05A	BELL	Repl. by CHAO 04B
$-0.133\pm0.030\pm0.009$	[3] AUBERT,B	04K	BABR	Repl. by AUBERT 07AF
$-0.101\pm0.025\pm0.005$	[4] CHAO	04B	BELL	Repl. by LIN 08
$-0.07\ \pm0.08\ \pm0.02$	[5] AUBERT	02D	BABR	Repl. by AUBERT 02Q
$-0.102\pm0.050\pm0.016$	[6] AUBERT	02Q	BABR	Repl. by AUBERT,B 04K
$-0.06\ \pm0.09\ ^{+0.01}_{-0.02}$	[7] CASEY	02	BELL	Repl. by CHAO 04B
$0.044^{+0.186}_{-0.167}{}^{+0.018}_{-0.021}$	[8] ABE	01K	BELL	Repl. by CASEY 02
$-0.19\ \pm0.10\ \pm0.03$	[9] AUBERT	01E	BABR	Repl. by AUBERT 02Q

[1] Corresponds to 90% confidence range $-0.30 < A_{CP} < 0.22$.
[2] Corresponds to a 90% CL interval of $-0.15 < A_{CP} < -0.03$.
[3] Based on a total signal yield of N($K^-\pi^+$) + N($K^+\pi^-$) = 1606 ± 51 events.
[4] CHAO 04B reports significance of 3.9 standard deviation for deviation of A_{CP} from zero.
[5] Corresponds to 90% confidence range $-0.21 < A_{CP} < 0.07$.
[6] Corresponds to 90% confidence range $-0.188 < A_{CP} < -0.016$.
[7] Corresponds to 90% confidence range $-0.21 < A_{CP} < +0.09$.
[8] Corresponds to 90% confidence range $-0.25 < A_{CP} < 0.37$.
[9] Corresponds to 90% confidence range $-0.35 < A_{CP} < -0.03$.

NODE=S042ACP;LINKAGE=AA
NODE=S042ACP;LINKAGE=CO
NODE=S042ACP;LINKAGE=AU
NODE=S042ACP;LINKAGE=CH
NODE=S042ACP;LINKAGE=AD
NODE=S042ACP;LINKAGE=BR
NODE=S042ACP;LINKAGE=CA
NODE=S042ACP;LINKAGE=AX
NODE=S042ACP;LINKAGE=L3

$C_{\pi\pi}$ ($B^0 \to \pi^+\pi^-$)

NODE=S042CPI

$C_{\pi\pi}$ is defined as $(1-|\lambda|^2)/(1+|\lambda|^2)$, where the quantity $\lambda = q/p\ \overline{A}_f/A_f$ is a phase convention independent observable quantity for the final state f. For details, see the review on "*CP* Violation" in the Reviews section.

NODE=S042CPI

VALUE	DOCUMENT ID	TECN	COMMENT
-0.32 ± 0.04 OUR AVERAGE			

NODE=S042CPI
NEW

[−0.31 ± 0.05 OUR 2018 AVERAGE]

	VALUE		DOCUMENT ID	TECN	COMMENT
YOUR DATA	$-0.34\pm0.06\pm0.01$		AAIJ 18O	LHCB	pp at 7, 8 TeV
	$-0.38\pm0.15\pm0.02$		AAIJ 13BO	LHCB	pp at 7 TeV
	$-0.33\pm0.06\pm0.03$	1	DALSENO 13	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	$-0.25\pm0.08\pm0.02$		LEES 13D	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

VALUE		DOCUMENT ID	TECN	COMMENT
$-0.21\pm0.09\pm0.02$		AUBERT 07AF	BABR	Repl. by LEES 13D
$-0.55\pm0.08\pm0.05$	1	ISHINO 07	BELL	Repl. by DALSENO 13
$-0.56\pm0.12\pm0.06$	1	ABE 05D	BELL	Repl. by ISHINO 07
$-0.09\pm0.15\pm0.04$		AUBERT,BE 05	BABR	Repl. by AUBERT 07AF
$-0.58\pm0.15\pm0.07$	1	ABE 04E	BELL	Repl. by ABE 05D
$-0.77\pm0.27\pm0.08$	1	ABE 03G	BELL	Repl. by ABE 04E.
$-0.94^{+0.31}_{-0.25}\pm0.09$	1	ABE 02M	BELL	Repl. by ABE 03G
$-0.25^{+0.45}_{-0.47}\pm0.14$	2	AUBERT 02D	BABR	Repl. by AUBERT 02Q
$-0.30\pm0.25\pm0.04$	3	AUBERT 02Q	BABR	Repl. by AUBERT,BE 05

[1] Paper reports $A_{\pi\pi}$ which equals to $-C_{\pi\pi}$. NODE=S042CPI;LINKAGE=MA

[2] Corresponds to 90% confidence range $-1.0 < C_{\pi\pi} < 0.47$. NODE=S042CPI;LINKAGE=AD

[3] Corresponds to 90% confidence range $-0.72 < C_{\pi\pi} < 0.12$. NODE=S042CPI;LINKAGE=BR

$S_{\pi\pi}$ ($B^0 \rightarrow \pi^+\pi^-$)

NODE=S042SPI

$S_{\pi\pi} = 2\mathrm{Im}\lambda/(1+|\lambda|^2)$, see the note in the $C_{\pi\pi}$ datablock above. NODE=S042SPI

NODE=S042SPI

NEW

	VALUE		DOCUMENT ID	TECN	COMMENT
	-0.65 ± 0.04 OUR AVERAGE				
	[−0.67 ± 0.06 OUR 2018 AVERAGE]				
YOUR DATA	$-0.63\pm0.05\pm0.01$		AAIJ 18O	LHCB	pp at 7, 8 TeV
	$-0.71\pm0.13\pm0.02$		AAIJ 13BO	LHCB	pp at 7 TeV
	$-0.64\pm0.08\pm0.03$	1	DALSENO 13	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	$-0.68\pm0.10\pm0.03$		LEES 13D	BABR	$e^+e^- \rightarrow \Upsilon(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

VALUE		DOCUMENT ID	TECN	COMMENT
$-0.60\pm0.11\pm0.03$		AUBERT 07AF	BABR	Repl. by LEES 13D
$-0.61\pm0.10\pm0.04$		ISHINO 07	BELL	Repl. by DALSENO 13
$-0.67\pm0.16\pm0.06$	2	ABE 05D	BELL	Repl. by ISHINO 07
$-0.30\pm0.17\pm0.03$		AUBERT,BE 05	BABR	Repl. by AUBERT 07AF
$-1.00\pm0.21\pm0.07$	3	ABE 04E	BELL	Repl. by ABE 05D
$-1.23\pm0.41^{+0.08}_{-0.07}$		ABE 03G	BELL	Repl. by ABE 04E.
$-1.21^{+0.38}_{-0.27}{}^{+0.16}_{-0.13}$		ABE 02M	BELL	Repl. by ABE 03G
$0.03^{+0.52}_{-0.56}\pm0.11$	4	AUBERT 02D	BABR	Repl. by AUBERT 02Q
$0.02\pm0.34\pm0.05$	5	AUBERT 02Q	BABR	Repl. by AUBERT,BE 05

[1] An isospin analysis using other BELLE measurements, disfavors the region of $23.8^\circ < \phi_2 < 66.8^\circ$ at 68% CL. NODE=S042SPI;LINKAGE=DA

[2] Rule out the CP-conserving case, $C_{\pi\pi} = S_{\pi\pi} = 0$, at the 5.4 sigma level. NODE=S042SPI;LINKAGE=AE

[3] Rule out the CP-conserving case, $C_{\pi\pi} = S_{\pi\pi} = 0$, at the 5.2 sigma level. NODE=S042SPI;LINKAGE=AB

[4] Corresponds to 90% confidence range $-0.89 < S_{\pi\pi} < 0.85$. NODE=S042SPI;LINKAGE=AD

[5] Corresponds to 90% confidence range $-0.54 < S_{\pi\pi} < 0.58$. NODE=S042SPI;LINKAGE=BR

B^0 REFERENCES

NODE=S042

YOUR PAPER	AAIJ	18O	PR D98 032004	R. Aaij *et al.*	(LHCb Collab.)	REFID=58973
	AALTONEN	14P	PRL 113 242001	T. Aaltonen *et al.*	(CDF Collab.)	REFID=56259
	AAIJ	13AX	PRL 110 221601	R. Aaij *et al.*	(LHCb Collab.)	REFID=55208
	AAIJ	13BO	JHEP 1310 183	R. Aaij *et al.*	(LHCb Collab.)	REFID=55423
	DALSENO	13	PR D88 092003	J. Dalseno *et al.*	(BELLE Collab.)	REFID=55488
	DUH	13	PR D87 031103	Y. T. Duh *et al.*	(BELLE Collab.)	REFID=54957
	LEES	13D	PR D87 052009	J.P. Lees *et al.*	(BABAR Collab.)	REFID=54958
	AAIJ	12V	PRL 108 201601	R. Aaij *et al.*	(LHCb Collab.)	REFID=54216
	AALTONEN	11N	PRL 106 181802	T. Aaltonen *et al.*	(CDF Collab.)	REFID=16447
	LIN	08	NAT 452 332	S.-W. Lin *et al.*	(BELLE Collab.)	REFID=52509
	AUBERT	07AF	PRL 99 021603	B. Aubert *et al.*	(BABAR Collab.)	REFID=51861
	ISHINO	07	PRL 98 211801	H. Ishino *et al.*	(BELLE Collab.)	REFID=51753
	ABULENCIA,A	06D	PRL 97 211802	A. Abulencia *et al.*	(CDF Collab.)	REFID=51490
	ABE	05D	PRL 95 101801	K. Abe *et al.*	(BELLE Collab.)	REFID=50561
	AUBERT,BE	05	PRL 95 151803	B. Aubert *et al.*	(BABAR Collab.)	REFID=50921
	CHAO	05A	PR D71 031502	Y. Chao *et al.*	(BELLE Collab.)	REFID=50619
	ABE	04E	PRL 93 021601	K. Abe *et al.*	(BELLE Collab.)	REFID=50056
	AUBERT,B	04K	PRL 93 131801	B. Aubert *et al.*	(BABAR Collab.)	REFID=50084
	CHAO	04B	PRL 93 191802	Y. Chao *et al.*	(BELLE Collab.)	REFID=50272
	ABE	03G	PR D68 012001	K. Abe *et al.*	(BELLE Collab.)	REFID=49506

ABE	02M	PRL 89 071801	K. Abe *et al.*	(BELLE Collab.)	REFID=48757
AUBERT	02D	PR D65 051502	B. Aubert *et al.*	(BABAR Collab.)	REFID=48635
AUBERT	02Q	PRL 89 281802	B. Aubert *et al.*	(BABAR Collab.)	REFID=49243
CASEY	02	PR D66 092002	B.C.K. Casey *et al.*	(BELLE Collab.)	REFID=49071
ABE	01K	PR D64 071101	K. Abe *et al.*	(BELLE Collab.)	REFID=48367
AUBERT	01E	PRL 87 151802	B. Aubert *et al.*	(BABAR Collab.)	REFID=48378
CHEN	00	PRL 85 525	S. Chen *et al.*	(CLEO Collab.)	REFID=47669

BOTTOM, STRANGE MESONS $(B = \pm1,\ S = \mp1)$

NODE=MXXX046

$B_s^0 = s\overline{b}$, $\overline{B}_s^0 = \overline{s}\,b$, similarly for B_s^*'s

NODE=MXXX046

NODE=S086

B_s^0

$I(J^P) = 0(0^-)$

I, *J*, *P* need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S086

CP VIOLATION PARAMETERS in B_s^0

NODE=S086240

A, *CP* violation parameter

NODE=S086JKA

$A = -2\,\mathrm{Re}(\lambda) / (1 + |\lambda|^2)$

NODE=S086JKA

NODE=S086JKA

	VALUE	DOCUMENT ID		TECN	COMMENT
	−0.75±0.12 OUR AVERAGE				
	[$0.5^{+0.8}_{-0.7}$ OUR 2018 AVERAGE]				
YOUR DATA	$-0.79\pm0.07\pm0.10$	[1] AAIJ	18O	LHCB	pp at 7, 8 TeV
	$0.49^{+0.77}_{-0.65}\pm0.06$	[2] AAIJ	15AL	LHCB	pp at 7, 8 TeV

NEW

YOUR NOTE [1] Measured in $B_s^0 \to K^+K^-$ decays.

NODE=S086JKA;LINKAGE=B

[2] Measured in $B_s^0 \to J/\psi K_S^0$ decays.

NODE=S086JKA;LINKAGE=A

C, *CP* violation parameter

NODE=S086JKC

$C = (1 - |\lambda|^2) / (1 + |\lambda|^2)$

NODE=S086JKC

NODE=S086JKC

	VALUE	DOCUMENT ID		TECN	COMMENT
	0.19±0.06 OUR AVERAGE				
	[−0.3 ± 0.4 OUR 2018 AVERAGE]				
YOUR DATA	$0.20\pm0.06\pm0.02$	[1] AAIJ	18O	LHCB	pp at 7, 8 TeV
	$-0.28\pm0.41\pm0.08$	[2] AAIJ	15AL	LHCB	pp at 7, 8 TeV

NEW

YOUR NOTE [1] Measured in $B_s^0 \to K^+K^-$ decays.

NODE=S086JKC;LINKAGE=B

[2] Measured in $B_s^0 \to J/\psi K_S^0$ decays.

NODE=S086JKC;LINKAGE=A

S, *CP* violation parameter

NODE=S086JKS

$S = -2\,\mathrm{Im}(\lambda) / (1 + |\lambda|^2)$

NODE=S086JKS

NODE=S086JKS

	VALUE	DOCUMENT ID		TECN	COMMENT
	0.17±0.06 OUR AVERAGE				
	[−0.1 ± 0.4 OUR 2018 AVERAGE]				
YOUR DATA	$0.18\pm0.06\pm0.02$	[1] AAIJ	18O	LHCB	pp at 7, 8 TeV
	$-0.08\pm0.40\pm0.08$	[2] AAIJ	15AL	LHCB	pp at 7, 8 TeV

NEW

YOUR NOTE [1] Measured in $B_s^0 \to K^+K^-$ decays.

NODE=S086JKS;LINKAGE=B

[2] Measured in $B_s^0 \to J/\psi K_S^0$ decays.

NODE=S086JKS;LINKAGE=A

$A_{CP}(B_s \to \pi^+K^-)$

NODE=S086CP1

A_{CP} is defined as

NODE=S086CP1

$$\frac{B(\overline{B}_s^0 \to f) - B(B_s^0 \to \overline{f})}{B(\overline{B}_s^0 \to f) + B(B_s^0 \to \overline{f})},$$

the *CP*-violation asymmetry of exclusive B_s^0 and $\overline{B}_s^0$ decay.

VALUE	DOCUMENT ID	TECN	COMMENT
0.221±0.015 OUR AVERAGE			

NODE=S086CP1

NEW

	[0.26 ± 0.04 OUR 2018 AVERAGE]				
YOUR DATA	0.213 ± 0.015 ± 0.007	AAIJ	18O	LHCB	pp at 7, 8 TeV
	0.22 ± 0.07 ± 0.02	AALTONEN	14P	CDF	$p\overline{p}$ at 1.96 TeV
	0.27 ± 0.04 ± 0.01	AAIJ	13AX	LHCB	pp at 7 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	0.27 ± 0.08 ± 0.02	AAIJ	12V	LHCB	Repl. by AAIJ 13AX
	0.39 ± 0.15 ± 0.08	AALTONEN	11N	CDF	Repl. by AALTONEN 14P

B_s^0 REFERENCES

NODE=S086

YOUR PAPER	AAIJ	18O	PR D98 032004	R. Aaij *et al.*	(LHCb Collab.)	REFID=58973
	AAIJ	15AL	JHEP 1506 131	R. Aaji *et al.*	(LHCb Collab.)	REFID=56705
	AALTONEN	14P	PRL 113 242001	T. Aaltonen *et al.*	(CDF Collab.)	REFID=56259
	AAIJ	13AX	PRL 110 221601	R. Aaij *et al.*	(LHCb Collab.)	REFID=55208
	AAIJ	12V	PRL 108 201601	R. Aaij *et al.*	(LHCb Collab.)	REFID=54216
	AALTONEN	11N	PRL 106 181802	T. Aaltonen *et al.*	(CDF Collab.)	REFID=16447

Reference = AAIJ 18P; NP B930 563
Verifier code = LHCB

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PLEASE REPLY WITHIN ONE WEEK

Matthew Charles

EMAIL: matthew.john.charles@cern.ch

April 5, 2019

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Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM, CHARMED MESONS ($B = C = \pm1$)

NODE=MXXX049

$B_c^+ = c\overline{b}$, $B_c^- = \overline{c}\,b$, similarly for B_c^*'s

NODE=MXXX049

NODE=S091

B_c^+

$I(J^P) = 0(0^-)$
I, J, P need confirmation.

Quantum numbers shown are quark-model predictions.

NODE=S091

B_c^+ BRANCHING RATIOS

NODE=S091225

$\Gamma(D_s^+\overline{D}^0)/\Gamma_{total} \times B(\overline{b} \to B_c)$ — $\Gamma_{24}/\Gamma \times B$

NODE=S091R30
NODE=S091R30

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<1.4 × 10^{-7}**	90	[1] AAIJ	18P	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18P reports $[\Gamma(B_c^+ \to D_s^+\overline{D}^0)/\Gamma_{total} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 0.9 \times 10^{-3}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.5 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

NODE=S091R30;LINKAGE=A

$\Gamma(D_s^+ D^0)/\Gamma_{total} \times B(\overline{b} \to B_c)$ — $\Gamma_{25}/\Gamma \times B$

NODE=S091R31
NODE=S091R31

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<6 × 10^{-8}**	90	[1] AAIJ	18P	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18P reports $[\Gamma(B_c^+ \to D_s^+ D^0)/\Gamma_{total} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 3.7 \times 10^{-4}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.5 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

NODE=S091R31;LINKAGE=A

$\Gamma(D^+\overline{D}^0)/\Gamma_{total} \times B(\overline{b} \to B_c)$ — $\Gamma_{26}/\Gamma \times B$

NODE=S091R32
NODE=S091R32

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<3.0 × 10^{-6}**	90	[1] AAIJ	18P	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18P reports $[\Gamma(B_c^+ \to D^+\overline{D}^0)/\Gamma_{total} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 1.9 \times 10^{-2}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.5 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

NODE=S091R32;LINKAGE=A

$\Gamma(D^+ D^0)/\Gamma_{total} \times B(\overline{b} \to B_c)$ — $\Gamma_{27}/\Gamma \times B$

NODE=S091R33
NODE=S091R33

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<1.9 × 10^{-6}**	90	[1] AAIJ	18P	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18P reports $[\Gamma(B_c^+ \to D^+ D^0)/\Gamma_{total} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 1.2 \times 10^{-2}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.5 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

NODE=S091R33;LINKAGE=A

$\left[\Gamma(D_s^{*+}\overline{D}^0) + \Gamma(D_s^+\overline{D}^*(2007)^0)\right]/\Gamma_{total} \times B(\overline{b} \to B_c)$ — $(\Gamma_{28}+\Gamma_{29})/\Gamma \times B$

NODE=S091R34
NODE=S091R34

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<4 × 10^{-7}**	90	[1] AAIJ	18P	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18P reports $[\left[\Gamma(B_c^+ \to D_s^{*+}\overline{D}^0) + \Gamma(B_c^+ \to D_s^+\overline{D}^*(2007)^0)\right]/\Gamma_{total} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 2.8 \times 10^{-3}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.5 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

NODE=S091R34;LINKAGE=A

$\left[\Gamma(D_s^{*+} D^0) + \Gamma(D_s^+ D^*(2007)^0)\right]/\Gamma_{total} \times B(\overline{b} \to B_c)$ — $(\Gamma_{30}+\Gamma_{31})/\Gamma \times B$

NODE=S091R35
NODE=S091R35

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<5 × 10^{-7}**	90	[1] AAIJ	18P	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18P reports $[\left[\Gamma(B_c^+ \to D_s^{*+} D^0) + \Gamma(B_c^+ \to D_s^+ D^*(2007)^0)\right]/\Gamma_{total} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 3.0 \times 10^{-3}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.5 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

NODE=S091R35;LINKAGE=A

$\left[\Gamma\left(D^*(2010)^+ \overline{D}^0,\ D^{*+} \to D^+ \pi^0/\gamma\right) + \Gamma\left(D^+ \overline{D}^*(2007)^0\right)\right]/\Gamma_{\text{total}} \times B\left(\overline{b} \to B_c\right)$ $(\Gamma_{33}+\Gamma_{34})/\Gamma \times B$

NODE=S091R36
NODE=S091R36

	VALUE	CL%	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**<9 × 10^−6**	90	[1] AAIJ 18P	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18P reports $\left[\left[\Gamma\left(B_c^+ \to D^*(2010)^+ \overline{D}^0,\ D^{*+} \to D^+ \pi^0/\gamma\right) + \Gamma\left(B_c^+ \to D^+ \overline{D}^*(2007)^0\right)\right]/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)\right] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 5.5 \times 10^{-2}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.5 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

NODE=S091R36;LINKAGE=A

$\left[\Gamma\left(D^*(2010)^+ D^0,\ D^{*+} \to D^+ \pi^0/\gamma\right) + \Gamma\left(D^+ D^*(2007)^0\right)\right]/\Gamma_{\text{total}} \times B\left(\overline{b} \to B_c\right)$ $(\Gamma_{35}+\Gamma_{36})/\Gamma \times B$

NODE=S091R37
NODE=S091R37

	VALUE	CL%	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**<3.4 × 10^−6**	90	[1] AAIJ 18P	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18P reports $\left[\left[\Gamma\left(B_c^+ \to D^*(2010)^+ D^0,\ D^{*+} \to D^+ \pi^0/\gamma\right) + \Gamma\left(B_c^+ \to D^+ D^*(2007)^0\right)\right]/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)\right] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 2.2 \times 10^{-2}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.5 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

NODE=S091R37;LINKAGE=A

$\Gamma\left(D_s^{*+} \overline{D}^*(2007)^0\right)/\Gamma_{\text{total}} \times B\left(\overline{b} \to B_c\right)$ $\Gamma_{37}/\Gamma \times B$

NODE=S091R38
NODE=S091R38

	VALUE	CL%	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**<1.7 × 10^−6**	90	[1] AAIJ 18P	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18P reports $[\Gamma\left(B_c^+ \to D_s^{*+} \overline{D}^*(2007)^0\right)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 1.1 \times 10^{-2}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.5 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

NODE=S091R38;LINKAGE=A

$\Gamma\left(D_s^{*+} D^*(2007)^0\right)/\Gamma_{\text{total}} \times B\left(\overline{b} \to B_c\right)$ $\Gamma_{38}/\Gamma \times B$

NODE=S091R39
NODE=S091R39

	VALUE	CL%	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**<3.1 × 10^−6**	90	[1] AAIJ 18P	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18P reports $[\Gamma\left(B_c^+ \to D_s^{*+} D^*(2007)^0\right)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 2.0 \times 10^{-2}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.5 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

NODE=S091R39;LINKAGE=A

$\Gamma\left(D^*(2010)^+ \overline{D}^*(2007)^0\right)/\Gamma_{\text{total}} \times B\left(\overline{b} \to B_c\right)$ $\Gamma_{39}/\Gamma \times B$

NODE=S091R40
NODE=S091R40

	VALUE	CL%	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**<1.0 × 10^−4**	90	[1] AAIJ 18P	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18P reports $[\Gamma\left(B_c^+ \to D^*(2010)^+ \overline{D}^*(2007)^0\right)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 6.5 \times 10^{-1}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.5 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

NODE=S091R40;LINKAGE=A

$\Gamma\left(D^*(2010)^+ D^*(2007)^0\right)/\Gamma_{\text{total}} \times B\left(\overline{b} \to B_c\right)$ $\Gamma_{40}/\Gamma \times B$

NODE=S091R41
NODE=S091R41

	VALUE	CL%	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**<2.0 × 10^−5**	90	[1] AAIJ 18P	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18P reports $[\Gamma\left(B_c^+ \to D^*(2010)^+ D^*(2007)^0\right)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 1.3 \times 10^{-1}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.5 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

NODE=S091R41;LINKAGE=A

B_c^+ REFERENCES

NODE=S091

YOUR PAPER AAIJ 18P NP B930 563 R. Aaij *et al.* (LHCb Collab.) REFID=59040

Reference = AAIJ 18Q; JHEP 1802 098
Verifier code = LHCB

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PLEASE REPLY WITHIN ONE WEEK

Matthew Charles

EMAIL: matthew.john.charles@cern.ch

April 5, 2019

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Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

NODE=BXXX045

BOTTOM BARYONS
$(B = -1)$

$\Lambda_b^0 = udb$, $\Xi_b^0 = usb$, $\Xi_b^- = dsb$, $\Omega_b^- = ssb$

NODE=BXXX045

NODE=S040

Λ_b^0

$I(J^P) = 0(\frac{1}{2}^+)$ Status: ∗∗∗

In the quark model, a Λ_b^0 is an isospin-0 udb state. The lowest Λ_b^0 ought to have $J^P = 1/2^+$. None of I, J, or P have actually been measured.

NODE=S040

Λ_b^0 BRANCHING RATIOS

NODE=S040215

$\Gamma(p\pi^-\pi^+\pi^-)/\Gamma(\Lambda_c^+\pi^-)$ Γ_{56}/Γ_{21}

NODE=S040R51
NODE=S040R51

	VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{4.30 \pm 0.24^{+0.22}_{-0.23}}$	[1] AAIJ	18Q	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18Q reports $[\Gamma(\Lambda_b^0 \to p\pi^-\pi^+\pi^-)/\Gamma(\Lambda_b^0 \to \Lambda_c^+\pi^-)]$ / $[B(\Lambda_c^+ \to pK^-\pi^+)]$ $= (6.85 \pm 0.19 \pm 0.08 \pm 0.32) \times 10^{-2}$ which we multiply by our best value $B(\Lambda_c^+ \to pK^-\pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S040R51;LINKAGE=A

$\Gamma(pK^-K^+\pi^-)/\Gamma(\Lambda_c^+\pi^-)$ Γ_{57}/Γ_{21}

NODE=S040R52
NODE=S040R52

	VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.83±0.10±0.04**	[1] AAIJ	18Q	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18Q reports $[\Gamma(\Lambda_b^0 \to pK^-K^+\pi^-)/\Gamma(\Lambda_b^0 \to \Lambda_c^+\pi^-)]$ / $[B(\Lambda_c^+ \to pK^-\pi^+)]$ $= (1.32 \pm 0.09 \pm 0.09 \pm 0.10) \times 10^{-2}$ which we multiply by our best value $B(\Lambda_c^+ \to pK^-\pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S040R52;LINKAGE=A

$\Gamma(pK^-\pi^+\pi^-)/\Gamma(\Lambda_c^+\pi^-)$ Γ_{58}/Γ_{21}

NODE=S040R53
NODE=S040R53

	VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**10.3±0.5±0.5**	[1] AAIJ	18Q	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18Q reports $[\Gamma(\Lambda_b^0 \to pK^-\pi^+\pi^-)/\Gamma(\Lambda_b^0 \to \Lambda_c^+\pi^-)]$ / $[B(\Lambda_c^+ \to pK^-\pi^+)]$ $= (16.4 \pm 0.3 \pm 0.2 \pm 0.7) \times 10^{-2}$ which we multiply by our best value $B(\Lambda_c^+ \to pK^-\pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S040R53;LINKAGE=A

$\Gamma(pK^-K^+K^-)/\Gamma(\Lambda_c^+\pi^-)$ Γ_{59}/Γ_{21}

NODE=S040R54
NODE=S040R54

	VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{2.58 \pm 0.15^{+0.13}_{-0.14}}$	[1] AAIJ	18Q	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] AAIJ 18Q reports $[\Gamma(\Lambda_b^0 \to pK^-K^+K^-)/\Gamma(\Lambda_b^0 \to \Lambda_c^+\pi^-)]$ / $[B(\Lambda_c^+ \to pK^-\pi^+)]$ $= (4.11 \pm 0.12 \pm 0.06 \pm 0.19) \times 10^{-2}$ which we multiply by our best value $B(\Lambda_c^+ \to pK^-\pi^+) = (6.28 \pm 0.32) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

NODE=S040R54;LINKAGE=A

Λ_b^0 REFERENCES

NODE=S040

YOUR PAPER AAIJ 18Q JHEP 1802 098 R. Aaij *et al.* (LHCb Collab.)

REFID=59075
NODE=S060

Ξ_b^0, Ξ_b^-

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$ Status: ∗∗∗
I, J, P need confirmation.

In the quark model, Ξ_b^0 and Ξ_b^- are an isodoublet (usb, dsb) state; the lowest Ξ_b^0 and Ξ_b^- ought to have $J^P = 1/2^+$. None of I, J, or P have actually been measured.

NODE=S060

Ξ_b BRANCHING RATIOS

NODE=S060215

$\Gamma(pK^-\pi^+\pi^- \times B(b\to \Xi_b^0)/B(b\to \Lambda_b^0))/\Gamma_{total}$ Γ_{16}/Γ

NODE=S060R12
NODE=S060R12

	VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT	
YOUR DATA	**1.91±0.35±0.18**	[1] AAIJ	18Q	LHCB	pp at 7, 8 TeV	

YOUR NOTE [1] AAIJ 18Q reports $[\Gamma(\Xi_b \to pK^-\pi^+\pi^- \times B(b \to \Xi_b^0)/B(b \to \Lambda_b^0))/\Gamma_{total}]$ / $[B(\Lambda_c^+ \to pK^-\pi^+)]$ / $[B(\Lambda_b^0 \to \Lambda_c^+\pi^-)] = (6.2 \pm 0.8 \pm 0.2 \pm 0.8) \times 10^{-3}$ which we multiply by our best values $B(\Lambda_c^+ \to pK^-\pi^+) = (6.28 \pm 0.32) \times 10^{-2}$, $B(\Lambda_b^0 \to \Lambda_c^+\pi^-) = (4.9 \pm 0.4) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best values. NODE=S060R12;LINKAGE=A

$\Gamma(pK^-K^-\pi^+ \times B(b\to \Xi_b^0)/B(b\to \Lambda_b^0))/\Gamma_{total}$ Γ_{17}/Γ

NODE=S060R13
NODE=S060R13

	VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT	
YOUR DATA	**1.73±0.27±0.16**	[1] AAIJ	18Q	LHCB	pp at 7, 8 TeV	

YOUR NOTE [1] AAIJ 18Q reports $[\Gamma(\Xi_b \to pK^-K^-\pi^+ \times B(b \to \Xi_b^0)/B(b \to \Lambda_b^0))/\Gamma_{total}]$ / $[B(\Lambda_c^+ \to pK^-\pi^+)]$ / $[B(\Lambda_b^0 \to \Lambda_c^+\pi^-)] = (5.6 \pm 0.6 \pm 0.4 \pm 0.5) \times 10^{-3}$ which we multiply by our best values $B(\Lambda_c^+ \to pK^-\pi^+) = (6.28 \pm 0.32) \times 10^{-2}$, $B(\Lambda_b^0 \to \Lambda_c^+\pi^-) = (4.9 \pm 0.4) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best values. NODE=S060R13;LINKAGE=A

$\Gamma(pK^-K^+K^- \times B(b\to \Xi_b^0)/B(b\to \Lambda_b^0))/\Gamma_{total}$ Γ_{18}/Γ

NODE=S060R14
NODE=S060R14

	VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT	
YOUR DATA	**0.18±0.09±0.02**	[1,2] AAIJ	18Q	LHCB	pp at 7, 8 TeV	

YOUR NOTE [1] AAIJ 18Q reports $[\Gamma(\Xi_b \to pK^-K^+K^- \times B(b \to \Xi_b^0)/B(b \to \Lambda_b^0))/\Gamma_{total}]$ / $[B(\Lambda_c^+ \to pK^-\pi^+)]$ / $[B(\Lambda_b^0 \to \Lambda_c^+\pi^-)] = (0.57 \pm 0.28 \pm 0.08 \pm 0.10) \times 10^{-3}$ which we multiply by our best values $B(\Lambda_c^+ \to pK^-\pi^+) = (6.28 \pm 0.32) \times 10^{-2}$, $B(\Lambda_b^0 \to \Lambda_c^+\pi^-) = (4.9 \pm 0.4) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best values. NODE=S060R14;LINKAGE=A

YOUR NOTE [2] AAIJ 18Q sees excess with a significance of 2.3σ. Using $B(\Lambda_b^0 \to \Lambda_c^+\pi^-) = (0.430 \pm 0.036) \times 10^{-2}$ and $B(\Lambda_c^+ \to pK^-\pi^+) = (6.46 \pm 0.24) \times 10^{-2}$ the authors set two sided limit [0.11–0.25] at 90% C.L. NODE=S060R14;LINKAGE=B

Ξ_b REFERENCES

NODE=S060

YOUR PAPER AAIJ 18Q JHEP 1802 098 R. Aaij *et al.* (LHCb Collab.) REFID=59075

Reference = AAIJ 18S; JHEP 1803 140
Verifier code = LHCB

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Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM, STRANGE MESONS
$(B = \pm1,\ S = \mp1)$

NODE=MXXX046

$B_s^0 = s\overline{b}$, $\overline{B}_s^0 = \overline{s}\,b$, similarly for B_s^*'s

NODE=MXXX046

NODE=S086

B_s^0

$I(J^P) = 0(0^-)$

I, J, P need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S086

POLARIZATION IN B_s^0 DECAY

NODE=S086233

In decays involving two vector mesons, one can distinguish among the states in which meson polarizations are both longitudinal (L), or both are transverse and parallel ($\|$), or perpendicular ($\perp$) to each other with the parameters Γ_L/Γ, $\Gamma_\perp/\Gamma$, and the relative phases $\phi_\|$ and $\phi_\perp$. In decays involving two tensor mesons, the transverse polarization states are described by parameters $\Gamma_{\|1}$, $\Gamma_{\|2}$, $\Gamma_{\perp1}$, $\Gamma_{\perp2}$ and their relative phases $\phi_{\|1}$, $\phi_{\|2}$, $\phi_{\perp1}$, $\phi_{\perp2}$. See also the review on "Polarization in B Decays."

NODE=S086233

Γ_L/Γ in $B_s^0 \to K^{*0}\overline{K}^{*0}$

NODE=S086P02
NODE=S086P02

	VALUE	DOCUMENT ID		TECN	COMMENT
	0.21 ±0.06 OUR AVERAGE [0.20 ± 0.07 OUR 2018 AVERAGE]				
YOUR DATA	**0.208±0.032±0.046**	[1] AAIJ	18S	LHCB	pp at 7, 8 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	0.201±0.057±0.040	[2] AAIJ	15AF	LHCB	Repl. by AAIJ 18S
	0.31 ±0.12 ±0.04	AAIJ	12F	LHCB	Repl. by AAIJ 15AF

NEW

YOUR NOTE [1] Measured in angular analysis, which takes into account S-, P- and D-wave. contributions.

[2] Measured in angular analysis, which takes into account S-wave contributions.

NODE=S086P02;LINKAGE=B
NODE=S086P02;LINKAGE=A

$\Gamma_\|/\Gamma$ in $B_s^0 \to K^*(892)^0\overline{K}^*(892)^0$

NODE=S086P17
NODE=S086P17

	VALUE	DOCUMENT ID		TECN	COMMENT
	0.30 ±0.05 OUR AVERAGE [0.21 ± 0.05 OUR 2018 AVERAGE]				
YOUR DATA	**0.297±0.029±0.042**	[1] AAIJ	18S	LHCB	pp at 7, 8 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	0.215±0.046±0.015	AAIJ	15AF	LHCB	Repl. by AAIJ 18S

NEW

YOUR NOTE [1] Measured in angular analysis, which takes into account S-, P- and D-wave. contributions.

NODE=S086P17;LINKAGE=A

$\Phi_\|$ in $B_s^0 \to K^*(892)^0\overline{K}^*(892)^0$

NODE=S086P18
NODE=S086P18

	VALUE	DOCUMENT ID		TECN	COMMENT
	2.40±0.35 OUR AVERAGE [5.31 ± 0.28 OUR 2018 AVERAGE]				
YOUR DATA	**2.40±0.11±0.33**	[1] AAIJ	18S	LHCB	pp at 7, 8 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	5.31±0.24±0.14	AAIJ	15AF	LHCB	Repl. by AAIJ 18S

NEW

YOUR NOTE [1] Measured in angular analysis, which takes into account S-, P- and D-wave. contributions.

NODE=S086P18;LINKAGE=A

$\Phi_\perp$ in $B_s^0 \to K^*(892)^0\overline{K}^*(892)^0$

NODE=S086A11
NODE=S086A11

	VALUE (rad)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**2.62±0.26±0.64**	[1] AAIJ	18S	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured in angular analysis, which takes into account S-, P- and D-wave. contributions.

NODE=S086A11;LINKAGE=A

Γ_L/Γ in $B_s^0 \to K^*(892)^0\overline{K}_2^*(1430)^0$

NODE=S086A08
NODE=S086A08

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.911±0.020±0.165**	[1] AAIJ	18S	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured in angular analysis, which takes into account S-, P- and D-wave. contributions.

NODE=S086A08;LINKAGE=A

$\Gamma_\|/\Gamma$ in $B_s^0 \to K^*(892)^0\overline{K}_2^*(1430)^0$

NODE=S086A12
NODE=S086A12

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.012±0.008±0.053**	[1] AAIJ	18S	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured in angular analysis, which takes into account S-, P- and D-wave. contributions.

NODE=S086A12;LINKAGE=A

Γ_L/Γ in $B_s^0 \to K_2^*(1430)^0 \overline{K}^*(892)^0$

NODE=S086A09

	VALUE	DOCUMENT ID		TECN	COMMENT	
YOUR DATA	**0.62±0.16±0.25**	[1] AAIJ	18S	LHCB	pp at 7, 8 TeV	

YOUR NOTE [1] Measured in angular analysis, which takes into account S-, P- and D-wave. contributions. NODE=S086A09;LINKAGE=A

$\Gamma_{\parallel}/\Gamma$ in $B_s^0 \to K_2^*(1430)^0 \overline{K}^*(892)^0$

NODE=S086A13

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.24±0.10±0.14**	[1] AAIJ	18S	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured in angular analysis, which takes into account S-, P- and D-wave. contributions. NODE=S086A13;LINKAGE=A

Γ_L/Γ in $B_s^0 \to K_2^*(1430)^0 \overline{K}_2^*(1430)^0$

NODE=S086A10

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.25±0.14±0.18**	[1] AAIJ	18S	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured in angular analysis, which takes into account S-, P- and D-wave. contributions. NODE=S086A10;LINKAGE=A

$\Gamma_{\parallel 1}/\Gamma$ in $B_s^0 \to K_2^*(1430)^0 \overline{K}_2^*(1430)^0$

NODE=S086A18

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.17±0.11±0.14**	[1] AAIJ	18S	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured in angular analysis, which takes into account S-, P- and D-wave. contributions. NODE=S086A18;LINKAGE=A

$\Gamma_{\perp 1}/\Gamma$ in $B_s^0 \to K_2^*(1430)^0 \overline{K}_2^*(1430)^0$

NODE=S086A19

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.30±0.18±0.21**	[1] AAIJ	18S	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured in angular analysis, which takes into account S-, P- and D-wave. contributions. NODE=S086A19;LINKAGE=A

$\Gamma_{\parallel 2}/\Gamma$ in $B_s^0 \to K_2^*(1430)^0 \overline{K}_2^*(1430)^0$

NODE=S086A20

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.015±0.033±0.107**	[1] AAIJ	18S	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured in angular analysis, which takes into account S-, P- and D-wave . contributions. NODE=S086A20;LINKAGE=A

CP VIOLATION PARAMETERS in B_s^0

NODE=S086240

CP Violation phase β_s

NODE=S086PHS

NODE=S086PHS

$-2\beta_s$ is the weak phase difference between B_s^0 mixing amplitude and the $B_s^0 \to J/\psi\phi$ decay amplitude driven by the $b \to c\overline{c}s$ transition (such as $B_s \to J/\psi\phi$, $J/\psi K^+K^-$, $J/\psi\pi^+\pi^-$, and $D_s^+D_s^-$). The Standard Model value of β_s is $\arg(-\frac{V_{ts}V_{tb}^*}{V_{cs}V_{cb}^*})$ if penguin contributions are neglected.

"OUR EVALUATION" is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at http://www.slac.stanford.edu/xorg/hflav/. The averaging/scaling procedure takes into account correlation between the measurements.

NODE=S086PHS

→ UNCHECKED ←

	VALUE (10^{-2} rad)	DOCUMENT ID		TECN	COMMENT
	1.1 ± 1.6 OUR EVALUATION				
	1.8 ± 1.7 OUR AVERAGE				
	11.9 ±10.7 ±3.4	[1] AAIJ	17V	LHCB	pp at 7, 8 TeV
	4.5 ± 3.9 ±2.1	[2] AAD	16AP	ATLS	pp at 7, 8 TeV
	$-11.5\ ^{+14}_{-14.5}\ \pm1$	[3] AAIJ	16AK	LHCB	pp at 7, 8 TeV
	3.75± 4.85±1.55	[4] KHACHATRY...	16S	CMS	pp at 8 TeV
	2.9 ± 2.5 ±0.3	[5] AAIJ	15I	LHCB	pp at 7, 8 TeV
	− 1 ± 9 ±1	[6] AAIJ	14AY	LHCB	pp at 7, 8 TeV
	− 3.5 ± 3.4 ±0.4	[7] AAIJ	14S	LHCB	pp at 7, 8 TeV
		[8] AALTONEN	12AJ	CDF	$p\overline{p}$ at 1.96 TeV
	$28\ ^{+18}_{-19}$	[9] ABAZOV	12D	D0	$p\overline{p}$ at 1.96 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
YOUR DATA	5.0 ± 6.5 ±7.0	[10] AAIJ	18S	LHCB	pp at 7, 8 TeV
	$6\ ^{+8}_{-7}$	[11,12] AAIJ	15K	LHCB	pp at 7, 8 TeV
	− 6 ±13 ±3	[13] AAD	14U	ATLS	Repl. by AAD 16AP
	−17 ±15 ±3	[14] AAIJ	14AE	LHCB	pp at 7, 8 TeV
	− 0.5 ± 3.5 ±0.5	[15] AAIJ	13AR	LHCB	Repl. by AAIJ 15I
		[16] AAIJ	13AY	LHCB	pp at 7 TeV
	−11.0 ±20.5 ±5.0	[17] AAD	12CV	ATLS	Repl. by AAD 14U

OCCUR=3

22	± 22	± 1	[18] AAIJ	12B	LHCB	Repl. by AAIJ 12Q	
-8	± 9	± 3	[19] AAIJ	12D	LHCB	Repl. by AAIJ 13AR	
$0.95^{+8.70}_{-8.65}$		${}^{+0.15}_{-0.20}$	[20] AAIJ	12Q	LHCB	Repl. by AAIJ 13AR	
			[21] AALTONEN	12D	CDF	Repl. by AALTONEN 12AJ	
			[22] AALTONEN	08G	CDF	Repl. by AALTONEN 12D	
28	${}^{+12}_{-15}$	${}^{+4}_{-1}$	[9,23] ABAZOV	08AM	D0	Repl. by ABAZOV 12D	
39.5	± 28.0	${}^{+0.5}_{-7.0}$	[24,25] ABAZOV	07	D0	Repl. by ABAZOV 07N	
35	${}^{+20}_{-24}$		[25,26] ABAZOV	07N	D0	Repl. by ABAZOV 08AM	

[1] Measured using time-dependent angular analysis of $B^0_s \to J/\psi K^+ K^-$ in the region m$(K K) > 1.05$ GeV. NODE=S086PHS;LINKAGE=L

[2] AAD 16AP reports $\phi_s = -2\,\beta_s = -0.090 \pm 0.078 \pm 0.041$ rad. that was measured using a time-dependent angular analysis of $B^0_s \to J/\psi \phi$ decays. NODE=S086PHS;LINKAGE=J

[3] AAIJ 16AK reports $\phi_s = -2\,\beta_s = 0.23^{+0.29}_{-0.28} \pm 0.02$ rad. that was measured using a time-dependent angular analysis of $B^0_s \to \psi(2S)\phi$ decays. NODE=S086PHS;LINKAGE=K

[4] KHACHATRYAN 16S reports $\phi_s = -2\,\beta_s = -0.075 \pm 0.097 \pm 0.031$ rad. that was measured using a time-dependent angular analysis of $B^0_s \to J/\psi \phi$ decays. NODE=S086PHS;LINKAGE=I

[5] AAIJ 15I reports $\phi_s = -2\,\beta_s = -0.058 \pm 0.049 \pm 0.006$ rad. that was measured using a time-dependent angular analysis of $B^0_s \to J/\psi K^+ K^-$ decays. It also combines this result with that of AAIJ 14S and quotes $\phi_s = -2\,\beta_s = -0.010 \pm 0.039$ rad. NODE=S086PHS;LINKAGE=H

[6] AAIJ 14AY reports $\phi_s = -2\,\beta_s = 0.02 \pm 0.17 \pm 0.02$ rad. in a time-dependent fit to $B^0_s \to D^+_s D^-_s$, while allowing CP violation in decay. NODE=S086PHS;LINKAGE=G

[7] AAIJ 14S reports $\phi_s = -2\,\beta_s = 0.070 \pm 0.068 \pm 0.008$ rad. and $|\lambda| = 0.89 \pm 0.05 \pm 0.01$, when direct CP violation is allowed. Measured using a time-dependent fit to $B^0_s \to J/\psi \pi^+ \pi^-$ decays. NODE=S086PHS;LINKAGE=D

[8] AALTONEN 12AJ reports $-\pi/2 < \beta_s < -1.51$ or $-0.06 < \beta_s < 0.30$, or $1.26 < \beta_s < \pi/2$ rad. at 68% CL. Measured using the time-dependent angular analysis $B^0_s \to J/\psi \phi$ decays. NODE=S086PHS;LINKAGE=AL

[9] ABAZOV 12D reports $\phi_s = -2\,\beta_s = -0.55^{+0.38}_{-0.36}$ rad. that was measured using a time-dependent angular analysis of $B^0_s \to J/\psi \phi$ decays. A single error includes both statistical and systematic uncertainties. NODE=S086PHS;LINKAGE=OV

YOUR NOTE [10] AAIJ 18S reports $\phi_s = -2\,\beta_s = -0.10 \pm 0.13 \pm 0.14$ rad measured in $B^0_s \to (K^+\pi^-)(K^-\pi^+)$ in the region $0.75 <$ m$(K^\pm \pi^\mp) < 1.6$ GeV. This is a $b \to d\overline{d}s$ transition with a decay amplitude phase different from that of $b \to c\overline{c}s$ transition. NODE=S086PHS;LINKAGE=M

[11] AAIJ 15K reports $-2\beta_s = -0.12^{+0.14}_{-0.16}$ rad. The value was obtained by measuring time-dependent CP asymmetry in $B^0_s \to K^+ K^-$ and using a U-spin relation between $B^0_s \to K^+ K^-$ and $B^0 \to \pi^+ \pi^-$. NODE=S086PHS;LINKAGE=F

[12] Results are also presented using additional inputs on $B^0 \to \pi^0 \pi^0$ and $B^+ \to \pi^+ \pi^0$ decays from other experiments and isospin symmetry assumptions. The dependence of the results on the maximum allowed amount of U-spin breaking up to 50% is also included. NODE=S086PHS;LINKAGE=GB

[13] AAD 14U reports $\phi_s = -2\,\beta_s = 0.12 \pm 0.25 \pm 0.05$ rad. that was measured using a time-dependent angular analysis of $B^0_s \to J/\psi \phi$ decays. NODE=S086PHS;LINKAGE=B

[14] Measured in $B^0_s \to \phi \phi$ decays. This is a $b \to s\overline{s}s$ transition with a decay amplitude phase different from that of $b \to c\overline{c}s$ transition. NODE=S086PHS;LINKAGE=JA

[15] AAIJ 13AR reports $\phi_s = -2\beta_s = 0.01 \pm 0.07 \pm 0.01$ rad. obtained from combined fit to $B^0_s \to J/\psi K^+ K^-$ and $B^0_s \to J/\psi \pi^+ \pi^-$ data sets. Also reports separate results of $\phi_s = 0.07 \pm 0.09 \pm 0.01$ rad. from $B^0_s \to J/\psi K^+ K^-$ decays and $\phi_s = -0.14^{+0.17}_{-0.16} \pm 0.01$ rad. from $B^0_s \to J/\psi \pi^+ \pi^-$ decays. NODE=S086PHS;LINKAGE=AR

[16] AAIJ 13AY uses $B^0_s \to \phi\phi$ mode, and reports the 68% CL interval of $\phi_s = -2\,\beta_s$ as $[-2.46, -0.76]$ rad. NODE=S086PHS;LINKAGE=A

[17] AAD 12CV reports $\phi_s = -2\,\beta_s = 0.22 \pm 0.41 \pm 0.10$ rad. that was measured using a time-dependent angular analysis of $B^0_s \to J/\psi \phi$ decays. NODE=S086PHS;LINKAGE=AD

[18] Reports $\phi_s = -2\,\beta_s = -0.44 \pm 0.44 \pm 0.02$ rad. that was measured using a time-dependent fit to $B^0_s \to J/\psi f_0(980)$ decays. NODE=S086PHS;LINKAGE=AI

[19] Reports $\phi_s = -2\,\beta_s = 0.15 \pm 0.18 \pm 0.06$ rad. that was measured using a time-dependent angular analysis of $B^0_s \to J/\psi \phi$ decays. NODE=S086PHS;LINKAGE=AJ

[20] Reports $\phi_s = -2\,\beta_s = -0.019^{+0.173}_{-0.174}{}^{+0.004}_{-0.003}$ rad. which was measured using a time-dependent fit to $B^0_s \to J/\psi \pi^+ \pi^-$ decays, with the $\pi^+ \pi^-$ mass within 775–1550 NODE=S086PHS;LINKAGE=IA

MeV. Searches for, but finds no evidence, for direct CP violation in $B_s^0 \to J/\psi\pi\pi$ decays.

[21] Reports $0.02 < \phi_s < 0.52$ or $1.08 < \phi_s < 1.55$ rad. at 68% C.L. confidence regions in the two-dimensional space of ϕ_s and $\Delta\Gamma_{B_s^0}$ from $B_s^0 \to J/\psi\phi$ decays. NODE=S086PHS;LINKAGE=AT

[22] Reports $0.32 < 2\beta_s < 2.82$ rad. at 68% C.L. and confidence regions in the two-dimensional space of $2\beta_s$ and $\Delta\Gamma$ from the first measurement of $B_s^0 \to J/\psi\phi$ decays using flavor tagging. The probability of a deviation from SM prediction as large as the level of observed data is 15%. NODE=S086PHS;LINKAGE=AA

[23] Reports $\phi_s = -2\,\beta_s$ and obtains 90% CL interval $-0.03 < \beta_s < 0.60$ rad. NODE=S086PHS;LINKAGE=ZV

[24] The first direct measurement of the CP-violating mixing phase is reported from the time-dependent analysis of flavor untagged $B_s^0 \to J/\psi\phi$ decays. NODE=S086PHS;LINKAGE=AZ

[25] Reports ϕ_s which equals to $-2\beta_s$. NODE=S086PHS;LINKAGE=RP

[26] Combines D0 collaboration measurements of time-dependent angular distributions in $B_s^0 \to J/\psi\phi$ and charge asymmetry in semileptonic decays. There is a 4-fold ambiguity in the solution. NODE=S086PHS;LINKAGE=ZO

$|\lambda|$

NODE=S086LAM
NODE=S086LAM

VALUE	DOCUMENT ID	TECN	COMMENT
1.002±0.017 OUR AVERAGE			
[1.001 ± 0.017 OUR 2018 AVERAGE]			
$1.035 \pm 0.034 \pm 0.089$	[1] AAIJ 18S	LHCB	pp at 7, 8 TeV
$0.994 \pm 0.018 \pm 0.006$	[2] AAIJ 17V	LHCB	pp at 7, 8 TeV
$1.045^{+0.069}_{-0.050} \pm 0.007$	[3] AAIJ 16AK	LHCB	pp at 7, 8 TeV
$1.04 \pm 0.07 \pm 0.03$	[4] AAIJ 14AE	LHCB	pp at 7, 8 TeV
$0.91 \ {}^{+0.18}_{-0.15} \pm 0.02$	[5] AAIJ 14AY	LHCB	pp at 7, 8 TeV

NEW

YOUR DATA

YOUR NOTE

[1] Measured in $B_s^0 \to (K^+\pi^-)(K^-\pi^+)$ in the region $0.75 < \mathrm{m}(K^\pm\pi^\mp) < 1.6$ GeV. NODE=S086LAM;LINKAGE=C

[2] Measured using time-dependent angular analysis of $B_s^0 \to J/\psi K^+ K^-$ in the region $\mathrm{m}(KK) > 1.05$ GeV. NODE=S086LAM;LINKAGE=B

[3] Measured using time-dependent angular analysis of $B_s^0 \to \psi(2S)\phi$ decays. NODE=S086LAM;LINKAGE=A

[4] Measured in $B_s^0 \to \phi\phi$ decays. NODE=S086LAM;LINKAGE=AI

[5] Measured in $B_s^0 \to D_s^+ D_s^-$ decays. NODE=S086LAM;LINKAGE=AA

B_s^0 REFERENCES

NODE=S086

YOUR PAPER

AAIJ	18S	JHEP 1803 140	R. Aaij *et al.*	(LHCb Collab.)	REFID=59085
AAIJ	17V	JHEP 1708 037	R. Aaij *et al.*	(LHCb Collab.)	REFID=57828
AAD	16AP	JHEP 1608 147	G. Aad *et al.*	(ATLAS Collab.)	REFID=57350
AAIJ	16AK	PL B762 253	R. Aaij *et al.*	(LHCb Collab.)	REFID=57573
KHACHATRY...	16S	PL B757 97	V. Khachatryan *et al.*	(CMS Collab.)	REFID=57215
AAIJ	15AF	JHEP 1507 166	R. Aaij *et al.*	(LHCb Collab.)	REFID=56639
AAIJ	15I	PRL 114 041801	R. Aaij *et al.*	(LHCb Collab.)	REFID=56377
AAIJ	15K	PL B741 1	R. Aaij *et al.*	(LHCb Collab.)	REFID=56383
AAD	14U	PR D90 052007	G. Aad *et al.*	(ATLAS Collab.)	REFID=55883
AAIJ	14AE	PR D90 052011	R. Aaij *et al.*	(LHCb Collab.)	REFID=55889
AAIJ	14AY	PRL 113 211801	R. Aaij *et al.*	(LHCb Collab.)	REFID=56119
AAIJ	14S	PL B736 186	R. Aaij *et al.*	(LHCb Collab.)	REFID=55761
AAIJ	13AR	PR D87 112010	R. Aaij *et al.*	(LHCb Collab.)	REFID=55159
AAIJ	13AY	PRL 110 241802	R. Aaij *et al.*	(LHCb Collab.)	REFID=55209
AAD	12CV	JHEP 1212 072	G. Aad *et al.*	(ATLAS Collab.)	REFID=54785
AAIJ	12B	PL B707 497	R. Aaij *et al.*	(LHCb Collab.)	REFID=54034
AAIJ	12D	PRL 108 101803	R. Aaij *et al.*	(LHCb Collab.)	REFID=54036
AAIJ	12F	PL B709 50	R. Aaij *et al.*	(LHCb Collab.)	REFID=54044
AAIJ	12Q	PL B713 378	R. Aaij *et al.*	(LHCb Collab.)	REFID=54190
AALTONEN	12AJ	PRL 109 171802	T. Aaltonen *et al.*	(CDF Collab.)	REFID=54598
AALTONEN	12D	PR D85 072002	T. Aaltonen *et al.*	(CDF Collab.)	REFID=54070
ABAZOV	12D	PR D85 032006	V.M. Abazov *et al.*	(D0 Collab.)	REFID=54062
AALTONEN	08G	PRL 100 161802	T. Aaltonen *et al.*	(CDF Collab.)	REFID=52228
ABAZOV	08AM	PRL 101 241801	V.M. Abazov *et al.*	(D0 Collab.)	REFID=52604
ABAZOV	07	PRL 98 121801	V.M. Abazov *et al.*	(D0 Collab.)	REFID=51664
ABAZOV	07N	PR D76 057101	V.M. Abazov *et al.*	(D0 Collab.)	REFID=51936

Reference = AAIJ 18T; JHEP 1803 078
Verifier code = LHCB

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Matthew Charles

EMAIL: matthew.john.charles@cern.ch

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
$(B = \pm 1)$

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^\pm$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^\pm$ section.

NODE=S042220

$\Gamma(e^\pm\mu^\mp)/\Gamma_{\text{total}}$ Γ_{540}/Γ

NODE=S042R8

Test of lepton family number conservation. Allowed by higher-order electroweak interactions.

NODE=S042R8

NODE=S042R8

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
	$< 1.0 \times 10^{-9}$ (CL = 90%)		[$<2.8 \times 10^{-9}$ (CL = 90%) OUR 2018 BEST LIMIT]			
YOUR DATA	**$< 1.0 \times 10^{-9}$**	90	[1] AAIJ	18T	LHCB	pp at 7, 8 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •					
	$< 2.8 \times 10^{-9}$	90	[2] AAIJ	13BM	LHCB	Repl. by AAIJ 18T
	$< 6.4 \times 10^{-8}$	90	AALTONEN	09P	CDF	$p\overline{p}$ at 1.96 TeV
	$< 9.2 \times 10^{-8}$	90	[3] AUBERT	08P	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	$< 1.8 \times 10^{-7}$	90	[3] AUBERT	05W	BABR	$e^+e^- \rightarrow \Upsilon(4S)$
	$< 1.7 \times 10^{-7}$	90	[3] CHANG	03	BELL	$e^+e^- \rightarrow \Upsilon(4S)$
	$<15 \times 10^{-7}$	90	[3] BERGFELD	00B	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
	$< 3.5 \times 10^{-6}$	90	ABE	98V	CDF	$p\overline{p}$ at 1.8 TeV
	$< 1.6 \times 10^{-5}$	90	[4] ACCIARRI	97B	L3	$e^+e^- \rightarrow Z$
	$< 5.9 \times 10^{-6}$	90	AMMAR	94	CLE2	$e^+e^- \rightarrow \Upsilon(4S)$
	$< 3.4 \times 10^{-5}$	90	[5] AVERY	89B	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
	$< 4.5 \times 10^{-5}$	90	[6] ALBRECHT	87D	ARG	$e^+e^- \rightarrow \Upsilon(4S)$
	$< 7.7 \times 10^{-5}$	90	[7] AVERY	87	CLEO	$e^+e^- \rightarrow \Upsilon(4S)$
	$< 3 \times 10^{-4}$	90	GILES	84	CLEO	Repl. by AVERY 87

YOUR NOTE [1] Uses normalization modes $B(B^0 \rightarrow K^+\pi^-) = (19.6 \pm 0.5) \times 10^{-6}$ and $B(B^+ \rightarrow J/\psi K^+) = (1.026 \pm 0.031) \times 10^{-3}$. NODE=S042R8;LINKAGE=A

[2] Uses normalization mode $B(B^0 \rightarrow K^+\pi^-) = (19.4 \pm 0.6) \times 10^{-6}$. NODE=S042R8;LINKAGE=AA

[3] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. NODE=S042R8;LINKAGE=EP

[4] ACCIARRI 97B assume PDG 96 production fractions for B^+, B^0, B_s, and Λ_b. NODE=S042R8;LINKAGE=BQ

[5] Paper assumes the $\Upsilon(4S)$ decays 43% to $B^0\overline{B}^0$. We rescale to 50%. NODE=S042R8;LINKAGE=A1

[6] ALBRECHT 87D reports $< 5 \times 10^{-5}$ assuming the $\Upsilon(4S)$ decays 45% to $B^0\overline{B}^0$. We rescale to 50%. NODE=S042R8;LINKAGE=W

[7] AVERY 87 reports $< 9 \times 10^{-5}$ assuming the $\Upsilon(4S)$ decays 40% to $B^0\overline{B}^0$. We rescale to 50%. NODE=S042R8;LINKAGE=Y

B^0 REFERENCES

NODE=S042

YOUR PAPER AAIJ 18T JHEP 1803 078 R. Aaij *et al.* (LHCb Collab.) REFID=59088
AAIJ 13BM PRL 111 141801 R. Aaij *et al.* (LHCb Collab.) REFID=55413
AALTONEN 09P PRL 102 201801 T. Aaltonen *et al.* (CDF Collab.) REFID=52855
AUBERT 08P PR D77 032007 B. Aubert *et al.* (BABAR Collab.) REFID=52225
AUBERT 05W PRL 94 221803 B. Aubert *et al.* (BABAR Collab.) REFID=50658
CHANG 03 PR D68 111101 M.-C. Chang *et al.* (BELLE Collab.) REFID=49640
BERGFELD 00B PR D62 091102 T. Bergfeld *et al.* (CLEO Collab.) REFID=47814
ABE 98V PRL 81 5742 F. Abe *et al.* (CDF Collab.) REFID=46697

ACCIARRI	97B	PL B391 474	M. Acciarri *et al.*	(L3 Collab.)	REFID=45248
PDG	96	PR D54 1	R. M. Barnett *et al.*	(PDG Collab.)	REFID=44495
AMMAR	94	PR D49 5701	R. Ammar *et al.*	(CLEO Collab.)	REFID=43736
AVERY	89B	PL B223 470	P. Avery *et al.*	(CLEO Collab.)	REFID=40820
ALBRECHT	87D	PL B199 451	H. Albrecht *et al.*	(ARGUS Collab.)	REFID=40325
AVERY	87	PL B183 429	P. Avery *et al.*	(CLEO Collab.)	REFID=40387
GILES	84	PR D30 2279	R. Giles *et al.*	(CLEO Collab.)	REFID=11570

BOTTOM, STRANGE MESONS $(B = \pm1,\ S = \mp1)$

NODE=MXXX046

$B_s^0 = s\overline{b}$, $\overline{B}_s^0 = \overline{s}\,b$, similarly for B_s^*'s

NODE=MXXX046

NODE=S086

B_s^0

$I(J^P) = 0(0^-)$

I, J, P need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S086

B_s^0 BRANCHING RATIOS

NODE=S086230

$\Gamma(e^\pm\mu^\mp)/\Gamma_{total}$ **Γ_{135}/Γ**

NODE=S086R22

Test of lepton family number conservation.

NODE=S086R22

NODE=S086R22

	VALUE	CL%	DOCUMENT ID	TECN	COMMENT
	$<5.4 \times 10^{-9}$ (CL = 90%)		[$<1.1 \times 10^{-8}$ (CL = 90%) OUR 2018 BEST LIMIT]		
YOUR DATA	**$<5.4 \times 10^{-9}$**	90	[1] AAIJ 18T	LHCB	pp at 7, 8 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	$<1.1 \times 10^{-8}$	90	[2] AAIJ 13BM	LHCB	Repl. by AAIJ 18T
	$<2.0 \times 10^{-7}$	90	AALTONEN 09P	CDF	$p\overline{p}$ at 1.96 TeV
	$<6.1 \times 10^{-6}$	90	ABE 98V	CDF	Repl. by AALTONEN 09P
	$<4.1 \times 10^{-5}$	90	[3] ACCIARRI 97B	L3	$e^+e^- \to Z$

YOUR NOTE [1] Uses normalization modes $B(B^0 \to K^+\pi^-) = (19.6 \pm 0.5) \times 10^{-6}$ and $B(B^+ \to J/\psi K^+) = (1.026 \pm 0.031) \times 10^{-3}$ with B production ratio $f(\overline{b} \to B_s^0)/f(\overline{b} \to B_d^0) = 0.259 \pm 0.015$. The upper limit increases to 6×10^{-9} in the assumption of B_L-dominated decay amplitude.

NODE=S086R22;LINKAGE=A

[2] Uses normalization mode $B(B^0 \to K^+\pi^-) = (19.4 \pm 0.6) \times 10^{-6}$ and B production ratio $f(\overline{b} \to B_s^0)/f(\overline{b} \to B_d^0) = 0.256 \pm 0.020$.

NODE=S086R22;LINKAGE=AA

[3] ACCIARRI 97B assume PDG 96 production fractions for B^+, B^0, B_s, and Λ_b.

NODE=S086R22;LINKAGE=BQ

B_s^0 REFERENCES

NODE=S086

YOUR PAPER	AAIJ	18T	JHEP 1803 078	R. Aaij *et al.*	(LHCb Collab.)	REFID=59088
	AAIJ	13BM	PRL 111 141801	R. Aaij *et al.*	(LHCb Collab.)	REFID=55413
	AALTONEN	09P	PRL 102 201801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=52855
	ABE	98V	PRL 81 5742	F. Abe *et al.*	(CDF Collab.)	REFID=46697
	ACCIARRI	97B	PL B391 474	M. Acciarri *et al.*	(L3 Collab.)	REFID=45248
	PDG	96	PR D54 1	R. M. Barnett *et al.*	(PDG Collab.)	REFID=44495

Reference = AAIJ 18U; JHEP 1803 059
Verifier code = LHCB

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PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Matthew Charles

EMAIL: matthew.john.charles@cern.ch

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

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(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

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Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
($B = \pm 1$)

NODE=MXXX045

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=S041

$B^{\pm}$

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S041

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

CP VIOLATION

NODE=S041220

A_{CP} is defined as

NODE=S041220

$$\frac{B(B^- \rightarrow \overline{f}) - B(B^+ \rightarrow f)}{B(B^- \rightarrow \overline{f}) + B(B^+ \rightarrow f)},$$

the *CP*-violation charge asymmetry of exclusive B^- and B^+ decay.

CP VIOLATION PARAMETERS IN $B^+ \rightarrow DK^+$ AND SIMILAR DECAYS

NODE=S041320

The parameters r_{B^+} and δ_{B^+} are the magnitude ratio and strong phase difference between the amplitudes of A($B^+ \rightarrow \overline{D}^{(*)0} K^{(*)+}$) and A($B^- \rightarrow D^{(*)0} K^{(*)-}$). The measured observables are defined as $x_{\pm} = r_{B^+} \cos(\delta_{B^+} \pm \gamma)$ and $y_{\pm} = r_{B^+} \sin(\delta_{B^+} \pm \gamma)$, and can be used to measure the CKM angle γ.

NODE=S041320

"OUR EVALUATION" is provided by the Heavy Flavor Averaging Group (HFLAV). It is derived from combinations of their results on $B^+ \rightarrow DK^+$ and related processes.

γ

NODE=S041GGM

For angle $\gamma(\phi_3)$ of the CKM unitarity triangle, see the review on "*CP* Violation" in the Reviews section.

NODE=S041GGM

NODE=S041GGM

VALUE (°)	CL%	DOCUMENT ID	TECN	COMMENT
$73.5^{+4.3}_{-5.0}$ OUR EVALUATION				
87 ±12 OUR AVERAGE [(72 ± 7)° OUR 2017 AVERAGE]				
87^{+11}_{-12}		[1] AAIJ	18AD LHCB	pp at 13 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
128^{+17}_{-22}		[2] AAIJ	18U LHCB	pp at 7, 8 TeV
5–86 or 185–266		[3] AAIJ	18Z LHCB	pp at 7, 8 TeV
80^{+21}_{-22}		[4] AAIJ	16AA LHCB	Repl. by AAIJ 16Z
$72.2^{+6.8}_{-7.3}$		[5] AAIJ	16AQ LHCB	pp at 7, 8 TeV
71 ±20		[6,7] AAIJ	16Z LHCB	pp at 7, 8 TeV
74^{+20}_{-19}		AAIJ	15BC LHCB	pp at 7, 8 TeV
$63.5^{+7.2}_{-6.7}$		[8,9] AAIJ	15K LHCB	pp at 7, 8 TeV
62^{+15}_{-14}		[10] AAIJ	14BA LHCB	pp at 7, 8 TeV
84^{+49}_{-42}		[11] AAIJ	14BE LHCB	Repl. by AAIJ 14BA
115^{+28}_{-43}		[12] AAIJ	14BF LHCB	Repl. by AAIJ 18U
$72.6^{+9.7}_{-17.2}$		[13] AAIJ	13AK LHCB	pp at 7 TeV
69^{+17}_{-16}		[14] LEES	13B BABR	$e^+e^- \rightarrow \Upsilon(4S)$
44^{+43}_{-38}		[15,16] AAIJ	12AQ LHCB	Repl. by AAIJ 13AK

→ UNCHECKED ← NEW

YOUR DATA

$77.3^{+15.1}_{-14.9} \pm 5.9$		[16,17] AIHARA	12	BELL	$e^+e^- \to \Upsilon(4S)$
$68 \pm 14 \pm 5$		[18] DEL-AMO-SA...	10F	BABR	Repl. by LEES 13B
7 to 173	95	[19] DEL-AMO-SA...	10G	BABR	$e^+e^- \to \Upsilon(4S)$
$78.4^{+10.8}_{-11.6} \pm 9.6$		[20] POLUEKTOV	10	BELL	$e^+e^- \to \Upsilon(4S)$
162 ± 56		[21] AUBERT	09R	BABR	$e^+e^- \to \Upsilon(4S)$
$76\ ^{+22}_{-23} \pm 7.1$		[22] AUBERT	08AL	BABR	Repl. by DEL-AMO-SANCHEZ 10F
$53\ ^{+15}_{-18} \pm 10$		[23] POLUEKTOV	06	BELL	Repl. by POLUEKTOV 10
$70 \pm 31\ ^{+18}_{-15}$		[24] AUBERT,B	05Y	BABR	Repl. by AUBERT 08AL
$77\ ^{+17}_{-19} \pm 17$		[25] POLUEKTOV	04	BELL	Repl. by POLUEKTOV 06

[1] Uses binned Dalitz plot analysis of $D \to K^0_S \pi^+ \pi^-$ and $K^0_S K^+ K^-$ from $B^\pm \to D K^\pm$ modes. Strong phase measurements from CLEO-c of the D decay over the Dalitz plot are used as input. NODE=S041GGM;LINKAGE=I

YOUR NOTE

[2] Measured in $B^0_s \to D^\mp_s K^\pm$ decays, constraining $-2\beta_s$ by the measurement of $\phi_s = 0.030 \pm 0.033$ from HFLAV. The value is modulo 180°. NODE=S041GGM;LINKAGE=J

[3] AAIJ 18Z reports the intervals (5–86)° or (185–266)° at 68% C.L. The extraction uses the time dependent CP violation measurement in $B^0 \to D^\mp \pi^\pm$ decays with external input and some theoretical assumptions. NODE=S041GGM;LINKAGE=K

[4] Uses Dalitz plot analysis of $D \to K^0_S \pi^+ \pi^-$ decays coming from $B^0 \to D K^*(892)^0$ modes. Measures $r_{B^0} = 0.39 \pm 0.13$, and $\delta_{B^0} = 197^{+24}_{-20}$ degrees. NODE=S041GGM;LINKAGE=C

[5] A combination of measurements from analyses of time-integrated $B^+ \to D K^+$, $B^0 \to D K^{(*)0}$, $B^0 \to D K^+ \pi^-$, and $B^+ \to D K^+ \pi^+ \pi^-$ tree-level decays. In addition, results from a time-dependent analysis of $B^0_s \to D_s K$ decays are included. NODE=S041GGM;LINKAGE=B

[6] A model-independent binned Dalitz plot analysis of the decays $B^0 \to D K^{*0}$, with $D \to K^0_S \pi^+ \pi^-$ and $D \to K^0_S K^+ K^-$. The results cannot be combined with the model-dependent analysis of the same dataset reported in AAIJ 16AA. NODE=S041GGM;LINKAGE=E

[7] Angle γ required to satisfy $0 < \gamma < 180$ degrees. NODE=S041GGM;LINKAGE=F

[8] Obtained by measuring time-dependent CP asymmetry in $B^0_s \to K^+ K^-$ and using a U-spin relation between $B^0_s \to K^+ K^-$ and $B^0 \to \pi^+ \pi^-$. NODE=S041GGM;LINKAGE=H

[9] Results are also presented using additional inputs on $B^0 \to \pi^0 \pi^0$ and $B^+ \to \pi^+ \pi^0$ decays from other experiments and isospin symmetry assumptions. The dependence of the results on the maximum allowed amount of U-spin breaking up to 50% is also included. NODE=S041GGM;LINKAGE=IH

[10] Uses binned Dalitz plot analysis of $B^+ \to D K^+$ decays, with $D \to K^0_S \pi^+ \pi^-$ and $D \to K^0_S K^+ K^-$. Strong phase measurements from CLEO-c (LIBBY 10) of the D decay over the Dalitz plot are used as input. Solution that satisfies $0 < \gamma < 180$ is chosen. NODE=S041GGM;LINKAGE=A

[11] AAIJ 14BE uses model-dependent analysis of $D \to K^0_S \pi^+ \pi^-$ amplitudes. The model is the same as in DEL-AMO-SANCHEZ 10F. NODE=S041GGM;LINKAGE=IA

[12] Measured in $B^0_s \to D^\mp_s K^\pm$ decays, constraining $-2\beta_s$ by the measurement of $\phi_s = 0.01 \pm 0.07 \pm 0.0$ from AAIJ 13AR. The value is modulo 180° at 68% CL. NODE=S041GGM;LINKAGE=G

[13] Presents a confidence region $55.4° < \gamma < 82.3°$ at 68% CL with best fit value 72.6° and includes both statistical and systematic uncertainties. The corresponding 95% CL is $40.2° < \gamma < 92.7°$. The value is determined from combination of measuremets using D meson decaying to $K^+ K^-$, $\pi^+ \pi^-$, $K^\pm \pi^\mp$, $K^0_S \pi^+ \pi^-$, $K^0_S K^+ K^-$, and $K^\pm \pi^\mp \pi^\pm \pi^\mp$. Combines $B^\pm \to D K^\pm$ and $B^\pm \to D \pi^\pm$. NODE=S041GGM;LINKAGE=AJ

[14] Reports combination of published measurements using GGSZ, GLW, and ADS methods. Reports also 2σ range of 41–102° and a 5.9σ significance for $\gamma(B^+ \to D^{(*)0} K^{(*)+}) \neq 0$ hypothesis. NODE=S041GGM;LINKAGE=LE

[15] Reports combined statistical and systematic uncertainties. NODE=S041GGM;LINKAGE=AA

[16] Uses binned Dalitz plot of $\overline{D}^0 \to K^0_S \pi^+ \pi^-$ decays from $B^+ \to \overline{D}^0 K^+$. Measurement of strong phases in $\overline{D}^0 \to K^0_S \pi^+ \pi^-$ Dalitz plot from LIBBY 10 is used as input. NODE=S041GGM;LINKAGE=AH

[17] We combined the systematics in quadrature. The authors report separately the contribution to the systematic uncertainty due to the uncertainty on the bin-averaged strong phase difference between D^0 and $\overline{D}^0$ amplitudes. NODE=S041GGM;LINKAGE=AI

[18] Uses Dalitz plot analysis of $\overline{D}^0 \to K^0_S \pi^+ \pi^-$, $K^0_S K^+ K^-$ decays from $B^+ \to D^{(*)} K^+$, $D K^{*+}$ modes. The corresponding two standard deviation interval for γ is $39° < \gamma < 98°$. CP conservation in the combined result is ruled out with a significance of 3.5 standard deviations. NODE=S041GGM;LINKAGE=DE

[19] Reports confidence intervals for the CKM angle γ from the measured values of the GLW parameters using $B^\pm \to D K^\pm$ decays with D mesons decaying to non-$CP(K\pi)$, CP-even ($K^+ K^-$, $\pi^+ \pi^-$), and CP-odd ($K^0_S \pi^0$, $K^0_S \omega$) states. NODE=S041GGM;LINKAGE=DA

[20] Uses Dalitz plot analysis of $\overline{D}^0 \rightarrow K^0_S \pi^+ \pi^-$ decays from $B^+ \rightarrow D^{(*)} K^+$ modes. The corresponding two standard deviation interval for γ is $54.2^\circ < \gamma < 100.5^\circ$. CP conservation in the combined result is ruled out with a significance of 3.5 standard deviations. NODE=S041GGM;LINKAGE=PU

[21] Uses Dalitz plot analysis of $D^0 \rightarrow K^0_S \pi^+ \pi^-$ decays coming from $B^0 \rightarrow D^0 K^{*0}$ modes. The corresponding 95% CL interval is $77^\circ < \gamma < 247^\circ$. A 180 degree ambiguity is implied. NODE=S041GGM;LINKAGE=D

[22] Uses Dalitz plot analysis of $\overline{D}^0 \rightarrow K^0_S \pi^+ \pi^-$ and $\overline{D}^0 \rightarrow K^0_S K^+ K^-$ decays coming from $B^\pm \rightarrow D^{(*)} K^{(*)\pm}$ modes. The corresponding two standard deviation interval is $29^\circ < \gamma < 122^\circ$. NODE=S041GGM;LINKAGE=AB

[23] Uses a Dalitz plot analysis of the $\overline{D}^0 \rightarrow K^0_S \pi^+ \pi^-$ decays; Combines the $D K^+$, $D^* K^+$ and $D K^{*+}$ modes. The corresponding two standard deviations interval for gamma is $8^\circ < \gamma < 111^\circ$. NODE=S041GGM;LINKAGE=PL

[24] Uses a Dalitz plot analysis of neutral $D \rightarrow K^0_S \pi^+ \pi^-$ decays coming from $B^\pm \rightarrow D K^\pm$ and $B^\pm \rightarrow D^{*0} K^\pm$ followed by $D^{*0} \rightarrow D \pi^0$, $D \gamma$. The corresponding two standard deviations interval for gamma is $12^\circ < \gamma < 137^\circ$. AUBERT,B 05Y also reports the amplitude ratios and the strong phases. NODE=S041GGM;LINKAGE=AU

[25] Uses a Dalitz plot analysis of the 3-body $D \rightarrow K^0_S \pi^+ \pi^-$ decays coming from $B^\pm \rightarrow D K^\pm$ and $B^\pm \rightarrow D^* K^\pm$ followed by $D^* \rightarrow D \pi^0$; here we use D to denote that the neutral D meson produced in the decay is an admixture of D^0 and $\overline{D}^0$. The corresponding two standard deviations interval for γ is $26^\circ < \gamma < 126^\circ$. POLUEKTOV 04 also reports the amplitude ratios and the strong phases. NODE=S041GGM;LINKAGE=PO

$B^\pm$ REFERENCES

NODE=S041

	AAIJ	18AD	JHEP 1808 176	R. Aaij *et al.*	(LHCb Collab.)	REFID=59138
	Also		JHEP 1810 107 (errat.)	R. Aaij *et al.*	(LHCb Collab.)	REFID=59352
YOUR PAPER	AAIJ	18U	JHEP 1803 059	R. Aaij *et al.*	(LHCb Collab.)	REFID=59090
	AAIJ	18Z	JHEP 1806 084	R. Aaij *et al.*	(LHCb Collab.)	REFID=59118
	AAIJ	16AA	JHEP 1608 137	R. Aaij *et al.*	(LHCb Collab.)	REFID=57349
	AAIJ	16AQ	JHEP 1612 087	R. Aaij *et al.*	(LHCb Collab.)	REFID=57665
	AAIJ	16Z	JHEP 1606 131	R. Aaij *et al.*	(LHCb Collab.)	REFID=57338
	AAIJ	15BC	PR D92 112005	R. Aaij *et al.*	(LHCb Collab.)	REFID=57012
	AAIJ	15K	PL B741 1	R. Aaij *et al.*	(LHCb Collab.)	REFID=56383
	AAIJ	14BA	JHEP 1410 097	R. Aaij *et al.*	(LHCb Collab.)	REFID=56167
	AAIJ	14BE	NP B888 169	R. Aaij *et al.*	(LHCb Collab.)	REFID=56187
	AAIJ	14BF	JHEP 1411 060	R. Aaij *et al.*	(LHCb Collab.)	REFID=56197
	AAIJ	13AK	PL B726 151	R. Aaij *et al.*	(LHCb Collab.)	REFID=55097
	AAIJ	13AR	PR D87 112010	R. Aaij *et al.*	(LHCb Collab.)	REFID=55159
	LEES	13B	PR D87 052015	J.P. Lees *et al.*	(BABAR Collab.)	REFID=54948
	AAIJ	12AQ	PL B718 43	R. Aaij *et al.*	(LHCb Collab.)	REFID=54594
	AIHARA	12	PR D85 112014	H. Aihara *et al.*	(BELLE Collab.)	REFID=54412
	DEL-AMO-SA...	10F	PRL 105 121801	P. del Amo Sanchez *et al.*	(BABAR Collab.)	REFID=53413
	DEL-AMO-SA...	10G	PR D82 072004	P. del Amo Sanchez *et al.*	(BABAR Collab.)	REFID=53455
	LIBBY	10	PR D82 112006	J. Libby *et al.*	(CLEO Collab.)	REFID=53583
	POLUEKTOV	10	PR D81 112002	A. Poluektov *et al.*	(BELLE Collab.)	REFID=53340
	AUBERT	09R	PR D79 072003	B. Aubert *et al.*	(BABAR Collab.)	REFID=52798
	AUBERT	08AL	PR D78 034023	B. Aubert *et al.*	(BABAR Collab.)	REFID=52361
	POLUEKTOV	06	PR D73 112009	A. Poluektov *et al.*	(BELLE Collab.)	REFID=51287
	AUBERT,B	05Y	PRL 95 121802	B. Aubert *et al.*	(BABAR Collab.)	REFID=50919
	POLUEKTOV	04	PR D70 072003	A. Poluektov *et al.*	(BELLE Collab.)	REFID=50223

BOTTOM, STRANGE MESONS
$(B = \pm1,\ S = \mp1)$

NODE=MXXX046

$B^0_s = s\overline{b}$, $\overline{B}^0_s = \overline{s}\,b$, similarly for B^*_s's

NODE=MXXX046

NODE=S086

B^0_s

$I(J^P) = 0(0^-)$

I, *J*, *P* need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S086

CP VIOLATION PARAMETERS in B^0_s

NODE=S086240

$r_B(B^0_s \rightarrow D^\mp_s K^\pm)$

NODE=S086ARX

r_B and δ_B are the amplitude ratio and relative strong phase between the amplitudes of $A(B^0_s \rightarrow D^+_s K^-)$ and $A(B^0_s \rightarrow D^-_s K^+)$,

NODE=S086ARX

VALUE	DOCUMENT ID	TECN	COMMENT	
$0.37^{+0.10}_{-0.09}$ OUR AVERAGE [0.53 ± 0.17 OUR 2018 AVERAGE]				NODE=S086ARX NEW
YOUR DATA **$0.37^{+0.10}_{-0.09}$**	[1] AAIJ	18U	LHCB	pp at 7, 8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.53^{+0.17}_{-0.16}$	[2] AAIJ	14BF	LHCB	Repl. by AAIJ 18U

YOUR NOTE [1] Measured in $B^0_s \to D^\mp_s K^\pm$ decays, constraining $-2\beta_s$ by the measurement of $\phi_s = -0.030 \pm 0.033$ from HFLAV. NODE=S086ARX;LINKAGE=B

[2] Measured in $B^0_s \to D^\mp_s K^\pm$ decays, constraining $-2\beta_s$ by the measurement of $\phi_s = 0.01 \pm 0.07 \pm 0.0$ from AAIJ 13AR. At 68% CL. NODE=S086ARX;LINKAGE=A

$\delta_B(B^0_s \to D^\pm_s K^\mp)$

NODE=S086DRX
NODE=S086DRX

VALUE (°)	DOCUMENT ID	TECN	COMMENT	
358±14 OUR AVERAGE [(3 ± 20)° OUR 2018 AVERAGE]				NEW
YOUR DATA **358^{+13}_{-14}**	[1] AAIJ	18U	LHCB	pp at 7, 8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3^{+19}_{-20}	[2] AAIJ	14BF	LHCB	Repl. by AAIJ 18U

YOUR NOTE [1] Measured in $B^0_s \to D^\mp_s K^\pm$ decays, constraining $-2\beta_s$ by the measurement of $\phi_s = 0.030 \pm 0.033$ from HFLAV. The value is modulo 180°. NODE=S086DRX;LINKAGE=C

[2] Measured in $B^0_s \to D^\mp_s K^\pm$ decays, constraining $-2\beta_s$ by the measurement of $\phi_s = 0.01 \pm 0.07 \pm 0.0$ from AAIJ 13AR. The value is modulo 180° at 68% CL. NODE=S086DRX;LINKAGE=A

B^0_s REFERENCES

NODE=S086

YOUR PAPER AAIJ 18U JHEP 1803 059 R. Aaij *et al.* (LHCb Collab.) REFID=59090
AAIJ 14BF JHEP 1411 060 R. Aaij *et al.* (LHCb Collab.) REFID=56197
AAIJ 13AR PR D87 112010 R. Aaij *et al.* (LHCb Collab.) REFID=55159

Reference = AAIJ 18W; JHEP 1805 160
Verifier code = LHCB

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Matthew Charles

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April 5, 2019

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Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

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A_{CP} is defined as

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the *CP*-violation charge asymmetry of exclusive B^- and B^+ decay.

$A_{CP}(B^+ \to D_s^+ \overline{D}^0)$

NODE=S041A10
NODE=S041A10

	VALUE (%)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**−0.4±0.5±0.5**	AAIJ	18W	LHCB	pp at 7, 8 TeV

$A_{CP}(B^+ \to D^+ \overline{D}^0)$

NODE=S041AS4
NODE=S041AS4
NEW

	VALUE	DOCUMENT ID		TECN	COMMENT
	0.016±0.025 OUR AVERAGE				
	[−0.03 ± 0.07 OUR 2018 AVERAGE]				
YOUR DATA	0.023±0.027±0.004	AAIJ	18W	LHCB	pp at 7, 8 TeV
	0.00 ±0.08 ±0.02	ADACHI	08	BELL	$e^+e^- \to \Upsilon(4S)$
	−0.13 ±0.14 ±0.02	AUBERT,B	06A	BABR	$e^+e^- \to \Upsilon(4S)$

$B^{\pm}$ REFERENCES

NODE=S041

YOUR PAPER AAIJ 18W JHEP 1805 160 R. Aaij *et al.* (LHCb Collab.) REFID=59099
ADACHI 08 PR D77 091101 I. Adachi *et al.* (BELLE Collab.) REFID=52344
AUBERT,B 06A PR D73 112004 B. Aubert *et al.* (BABAR Collab.) REFID=51283

Reference = AAIJ 18X; JHEP 1805 067
Verifier code = LHCB

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EMAIL: wmyao@lbl.gov

BOTTOM MESONS
$(B = \pm 1)$

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S041

$B^{\pm}$

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S041

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

B^+ BRANCHING RATIOS

NODE=S041215

$\Gamma(D_{CP(+1)}K^*(892)^+)/\Gamma(\overline{D}^0 K^*(892)^+)$ **Γ_{95}/Γ_{93}**

NODE=S041Q62
NODE=S041Q62
NEW

	VALUE	DOCUMENT ID		TECN	COMMENT
	1.16 ±0.08 OUR AVERAGE				
	[1.16 ± 0.07 OUR 2018 AVERAGE]				
YOUR DATA	1.18 ±0.08 ±0.02	[1] AAIJ	18X	LHCB	$p\,p$ at 7, 8, 13 TeV
	1.085±0.175±0.045	[2] AUBERT	09AJ	BABR	$e^+e^- \to \Upsilon(4S)$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	1.18 ±0.08 ±0.01	[3] AAIJ	17BO	LHCB	Repl. by AAIJ 18X
	0.98 ±0.20 ±0.055	[4] AUBERT,B	05U	BABR	Repl. by AUBERT 09AJ

YOUR NOTE [1] Measures the ratio separately for K^+K^- and $\pi^+\pi^-$ final states, $R_{KK} = 1.22 \pm 0.09 \pm 0.02$ and $R_{\pi\pi} = 1.08 \pm 0.14 \pm 0.03$, and combines the two results.

NODE=S041Q62;LINKAGE=B

[2] The authors report $R_{CP+} = 2.17 \pm 0.35 \pm 0.09$ which is, assuming CP conservation, twice the value of the quoted above branching ratio,

NODE=S041Q62;LINKAGE=AB

[3] Measures the ratio separately for K^+K^- and $\pi^+\pi^-$ final states, $R_{KK} = 1.22 \pm 0.09 \pm 0.01$ and $R_{\pi\pi} = 1.08 \pm 0.14 \pm 0.03$, and combines the two results.

NODE=S041Q62;LINKAGE=A

[4] The authors report $R_{CP+} = 1.96 \pm 0.40 \pm 0.11$ which is, assuming CP conservation, twice the value of the quoted above branching ratio.

NODE=S041Q62;LINKAGE=AU

$B^{\pm}$ REFERENCES

NODE=S041

YOUR PAPER AAIJ 18X JHEP 1805 067 R. Aaij *et al.* (LHCb Collab.) REFID=59105
AAIJ 17BO JHEP 1711 156 R. Aaij *et al.* (LHCb Collab.) REFID=58343
AUBERT 09AJ PR D80 092001 B. Aubert *et al.* (BABAR Collab.) REFID=53077
AUBERT,B 05U PR D72 071103 B. Aubert *et al.* (BABAR Collab.) REFID=50897

Reference = AAIJ 18Z; JHEP 1806 084
Verifier code = LHCB

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

Matthew Charles

EMAIL: matthew.john.charles@cern.ch

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
$(B = \pm 1)$

NODE=MXXX045

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=S041

$B^{\pm}$

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S041

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B^0_s/b$-baryon ADMIXTURE sections.

CP VIOLATION

NODE=S041220

A_{CP} is defined as

NODE=S041220

$$\frac{B(B^- \to \overline{f}) - B(B^+ \to f)}{B(B^- \to \overline{f}) + B(B^+ \to f)},$$

the *CP*-violation charge asymmetry of exclusive B^- and B^+ decay.

CP VIOLATION PARAMETERS IN $B^+ \to DK^+$ AND SIMILAR DECAYS

NODE=S041320

The parameters r_{B^+} and δ_{B^+} are the magnitude ratio and strong phase difference between the amplitudes of A($B^+ \to \overline{D}^{(*)0} K^{(*)+}$) and A($B^- \to D^{(*)0} K^{(*)-}$). The measured observables are defined as $x_{\pm} = r_{B^+} \cos(\delta_{B^+} \pm \gamma)$ and $y_{\pm} = r_{B^+} \sin(\delta_{B^+} \pm \gamma)$, and can be used to measure the CKM angle γ.

NODE=S041320

"OUR EVALUATION" is provided by the Heavy Flavor Averaging Group (HFLAV). It is derived from combinations of their results on $B^+ \to DK^+$ and related processes.

γ

NODE=S041GGM

For angle $\gamma(\phi_3)$ of the CKM unitarity triangle, see the review on "*CP* Violation" in the Reviews section.

NODE=S041GGM

NODE=S041GGM

VALUE (°)	CL%	DOCUMENT ID		TECN	COMMENT
$73.5^{+4.3}_{-5.0}$ OUR EVALUATION					
87 ± 12 OUR AVERAGE [$(72 \pm 7)^\circ$ OUR 2017 AVERAGE]					
87^{+11}_{-12}		[1] AAIJ	18AD	LHCB	pp at 13 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
128^{+17}_{-22}		[2] AAIJ	18U	LHCB	pp at 7, 8 TeV
5–86 or 185–266		[3] AAIJ	18Z	LHCB	pp at 7, 8 TeV
80^{+21}_{-22}		[4] AAIJ	16AA	LHCB	Repl. by AAIJ 16Z
$72.2^{+6.8}_{-7.3}$		[5] AAIJ	16AQ	LHCB	pp at 7, 8 TeV
71 ± 20		[6,7] AAIJ	16Z	LHCB	pp at 7, 8 TeV
74^{+20}_{-19}		AAIJ	15BC	LHCB	pp at 7, 8 TeV
$63.5^{+7.2}_{-6.7}$		[8,9] AAIJ	15K	LHCB	pp at 7, 8 TeV
62^{+15}_{-14}		[10] AAIJ	14BA	LHCB	pp at 7, 8 TeV
84^{+49}_{-42}		[11] AAIJ	14BE	LHCB	Repl. by AAIJ 14BA
115^{+28}_{-43}		[12] AAIJ	14BF	LHCB	Repl. by AAIJ 18U
$72.6^{+9.7}_{-17.2}$		[13] AAIJ	13AK	LHCB	pp at 7 TeV
69^{+17}_{-16}		[14] LEES	13B	BABR	$e^+e^- \to \Upsilon(4S)$
44^{+43}_{-38}		[15,16] AAIJ	12AQ	LHCB	Repl. by AAIJ 13AK

→ UNCHECKED ← NEW

YOUR DATA

$77.3^{+15.1}_{-14.9} \pm 5.9$		[16,17] AIHARA	12	BELL	$e^+e^- \to \Upsilon(4S)$
$68 \pm 14 \pm 5$		[18] DEL-AMO-SA..10F	BABR	Repl. by LEES 13B
7 to 173	95	[19] DEL-AMO-SA..10G	BABR	$e^+e^- \to \Upsilon(4S)$
$78.4^{+10.8}_{-11.6} \pm 9.6$		[20] POLUEKTOV 10	BELL	$e^+e^- \to \Upsilon(4S)$
162 ± 56		[21] AUBERT 09R	BABR	$e^+e^- \to \Upsilon(4S)$
$76\ ^{+22}_{-23} \pm 7.1$		[22] AUBERT 08AL	BABR	Repl. by DEL-AMO-SANCHEZ 10F
$53\ ^{+15}_{-18} \pm 10$		[23] POLUEKTOV 06	BELL	Repl. by POLUEKTOV 10
$70 \pm 31\ ^{+18}_{-15}$		[24] AUBERT,B 05Y	BABR	Repl. by AUBERT 08AL
$77\ ^{+17}_{-19} \pm 17$		[25] POLUEKTOV 04	BELL	Repl. by POLUEKTOV 06

[1] Uses binned Dalitz plot analysis of $D \to K^0_S \pi^+\pi^-$ and $K^0_S K^+K^-$ from $B^\pm \to D K^\pm$ modes. Strong phase measurements from CLEO-c of the D decay over the Dalitz plot are used as input. NODE=S041GGM;LINKAGE=I

[2] Measured in $B^0_s \to D^\mp_s K^\pm$ decays, constraining $-2\beta_s$ by the measurement of $\phi_s = 0.030 \pm 0.033$ from HFLAV. The value is modulo 180°. NODE=S041GGM;LINKAGE=J

YOUR NOTE [3] AAIJ 18Z reports the intervals (5–86)° or (185–266)° at 68% C.L. The extraction uses the time dependent CP violation measurement in $B^0 \to D^\mp \pi^\pm$ decays with external input and some theoretical assumptions. NODE=S041GGM;LINKAGE=K

[4] Uses Dalitz plot analysis of $D \to K^0_S \pi^+\pi^-$ decays coming from $B^0 \to D K^*(892)^0$ modes. Measures $r_{B^0} = 0.39 \pm 0.13$, and $\delta_{B^0} = 197^{+24}_{-20}$ degrees. NODE=S041GGM;LINKAGE=C

[5] A combination of measurements from analyses of time-integrated $B^+ \to D K^+$, $B^0 \to D K^{(*)0}$, $B^0 \to D K^+\pi^-$, and $B^+ \to D K^+\pi^+\pi^-$ tree-level decays. In addition, results from a time-dependent analysis of $B^0_s \to D_s K$ decays are included. NODE=S041GGM;LINKAGE=B

[6] A model-independent binned Dalitz plot analysis of the decays $B^0 \to D K^{*0}$, with $D \to K^0_S \pi^+\pi^-$ and $D \to K^0_S K^+K^-$. The results cannot be combined with the model-dependent analysis of the same dataset reported in AAIJ 16AA. NODE=S041GGM;LINKAGE=E

[7] Angle γ required to satisfy $0 < \gamma < 180$ degrees. NODE=S041GGM;LINKAGE=F

[8] Obtained by measuring time-dependent CP asymmetry in $B^0_s \to K^+K^-$ and using a U-spin relation between $B^0_s \to K^+K^-$ and $B^0 \to \pi^+\pi^-$. NODE=S041GGM;LINKAGE=H

[9] Results are also presented using additional inputs on $B^0 \to \pi^0\pi^0$ and $B^+ \to \pi^+\pi^0$ decays from other experiments and isospin symmetry assumptions. The dependence of the results on the maximum allowed amount of U-spin breaking up to 50% is also included. NODE=S041GGM;LINKAGE=IH

[10] Uses binned Dalitz plot analysis of $B^+ \to D K^+$ decays, with $D \to K^0_S \pi^+\pi^-$ and $D \to K^0_S K^+K^-$. Strong phase measurements from CLEO-c (LIBBY 10) of the D decay over the Dalitz plot are used as input. Solution that satisfies $0 < \gamma < 180$ is chosen. NODE=S041GGM;LINKAGE=A

[11] AAIJ 14BE uses model-dependent analysis of $D \to K^0_S \pi^+\pi^-$ amplitudes. The model is the same as in DEL-AMO-SANCHEZ 10F. NODE=S041GGM;LINKAGE=IA

[12] Measured in $B^0_s \to D^\mp_s K^\pm$ decays, constraining $-2\beta_s$ by the measurement of $\phi_s = 0.01 \pm 0.07 \pm 0.0$ from AAIJ 13AR. The value is modulo 180° at 68% CL. NODE=S041GGM;LINKAGE=G

[13] Presents a confidence region $55.4° < \gamma < 82.3°$ at 68% CL with best fit value 72.6° and includes both statistical and systematic uncertainties. The corresponding 95% CL is $40.2° < \gamma < 92.7°$. The value is determined from combination of measuremets using D meson decaying to K^+K^-, $\pi^+\pi^-$, $K^\pm\pi^\mp$, $K^0_S\pi^+\pi^-$, $K^0_S K^+K^-$, and $K^\pm\pi^\mp\pi^\pm\pi^\mp$. Combines $B^\pm \to D K^\pm$ and $B^\pm \to D\pi^\pm$. NODE=S041GGM;LINKAGE=AJ

[14] Reports combination of published measurements using GGSZ, GLW, and ADS methods. Reports also 2σ range of 41–102° and a 5.9σ significance for $\gamma(B^+ \to D^{(*)0} K^{(*)+}) \neq 0$ hypothesis. NODE=S041GGM;LINKAGE=LE

[15] Reports combined statistical and systematic uncertainties. NODE=S041GGM;LINKAGE=AA

[16] Uses binned Dalitz plot of $\overline{D}^0 \to K^0_S \pi^+\pi^-$ decays from $B^+ \to \overline{D}^0 K^+$. Measurement of strong phases in $\overline{D}^0 \to K^0_S \pi^+\pi^-$ Dalitz plot from LIBBY 10 is used as input. NODE=S041GGM;LINKAGE=AH

[17] We combined the systematics in quadrature. The authors report separately the contribution to the systematic uncertainty due to the uncertainty on the bin-averaged strong phase difference between D^0 and $\overline{D}^0$ amplitudes. NODE=S041GGM;LINKAGE=AI

[18] Uses Dalitz plot analysis of $\overline{D}^0 \to K^0_S \pi^+\pi^-$, $K^0_S K^+K^-$ decays from $B^+ \to D^{(*)} K^+$, $D K^{*+}$ modes. The corresponding two standard deviation interval for γ is $39° < \gamma < 98°$. CP conservation in the combined result is ruled out with a significance of 3.5 standard deviations. NODE=S041GGM;LINKAGE=DE

[19] Reports confidence intervals for the CKM angle γ from the measured values of the GLW parameters using $B^\pm \to D K^\pm$ decays with D mesons decaying to non-$CP(K\pi)$, CP-even (K^+K^-, $\pi^+\pi^-$), and CP-odd ($K^0_S\pi^0$, $K^0_S\omega$) states. NODE=S041GGM;LINKAGE=DA

[20] Uses Dalitz plot analysis of $\overline{D}^0 \to K^0_S \pi^+ \pi^-$ decays from $B^+ \to D^{(*)} K^+$ modes. The corresponding two standard deviation interval for γ is $54.2^\circ < \gamma < 100.5^\circ$. CP conservation in the combined result is ruled out with a significance of 3.5 standard deviations. NODE=S041GGM;LINKAGE=PU

[21] Uses Dalitz plot analysis of $D^0 \to K^0_S \pi^+ \pi^-$ decays coming from $B^0 \to D^0 K^{*0}$ modes. The corresponding 95% CL interval is $77^\circ < \gamma < 247^\circ$. A 180 degree ambiguity is implied. NODE=S041GGM;LINKAGE=D

[22] Uses Dalitz plot analysis of $\overline{D}^0 \to K^0_S \pi^+ \pi^-$ and $\overline{D}^0 \to K^0_S K^+ K^-$ decays coming from $B^\pm \to D^{(*)} K^{(*)\pm}$ modes. The corresponding two standard deviation interval is $29^\circ < \gamma < 122^\circ$. NODE=S041GGM;LINKAGE=AB

[23] Uses a Dalitz plot analysis of the $\overline{D}^0 \to K^0_S \pi^+ \pi^-$ decays; Combines the $D K^+$, $D^* K^+$ and $D K^{*+}$ modes. The corresponding two standard deviations interval for gamma is $8^\circ < \gamma < 111^\circ$. NODE=S041GGM;LINKAGE=PL

[24] Uses a Dalitz plot analysis of neutral $D \to K^0_S \pi^+ \pi^-$ decays coming from $B^\pm \to D K^\pm$ and $B^\pm \to D^{*0} K^\pm$ followed by $D^{*0} \to D \pi^0$, $D\gamma$. The corresponding two standard deviations interval for gamma is $12^\circ < \gamma < 137^\circ$. AUBERT,B 05Y also reports the amplitude ratios and the strong phases. NODE=S041GGM;LINKAGE=AU

[25] Uses a Dalitz plot analysis of the 3-body $D \to K^0_S \pi^+ \pi^-$ decays coming from $B^\pm \to D K^\pm$ and $B^\pm \to D^* K^\pm$ followed by $D^* \to D \pi^0$; here we use D to denote that the neutral D meson produced in the decay is an admixture of D^0 and $\overline{D}^0$. The corresponding two standard deviations interval for γ is $26^\circ < \gamma < 126^\circ$. POLUEKTOV 04 also reports the amplitude ratios and the strong phases. NODE=S041GGM;LINKAGE=PO

$B^\pm$ REFERENCES

NODE=S041

	AAIJ	18AD	JHEP 1808 176	R. Aaij *et al.*	(LHCb Collab.)	REFID=59138
	Also		JHEP 1810 107 (errat.)	R. Aaij *et al.*	(LHCb Collab.)	REFID=59352
	AAIJ	18U	JHEP 1803 059	R. Aaij *et al.*	(LHCb Collab.)	REFID=59090
YOUR PAPER	AAIJ	18Z	JHEP 1806 084	R. Aaij *et al.*	(LHCb Collab.)	REFID=59118
	AAIJ	16AA	JHEP 1608 137	R. Aaij *et al.*	(LHCb Collab.)	REFID=57349
	AAIJ	16AQ	JHEP 1612 087	R. Aaij *et al.*	(LHCb Collab.)	REFID=57665
	AAIJ	16Z	JHEP 1606 131	R. Aaij *et al.*	(LHCb Collab.)	REFID=57338
	AAIJ	15BC	PR D92 112005	R. Aaij *et al.*	(LHCb Collab.)	REFID=57012
	AAIJ	15K	PL B741 1	R. Aaij *et al.*	(LHCb Collab.)	REFID=56383
	AAIJ	14BA	JHEP 1410 097	R. Aaij *et al.*	(LHCb Collab.)	REFID=56167
	AAIJ	14BE	NP B888 169	R. Aaij *et al.*	(LHCb Collab.)	REFID=56187
	AAIJ	14BF	JHEP 1411 060	R. Aaij *et al.*	(LHCb Collab.)	REFID=56197
	AAIJ	13AK	PL B726 151	R. Aaij *et al.*	(LHCb Collab.)	REFID=55097
	AAIJ	13AR	PR D87 112010	R. Aaij *et al.*	(LHCb Collab.)	REFID=55159
	LEES	13B	PR D87 052015	J.P. Lees *et al.*	(BABAR Collab.)	REFID=54948
	AAIJ	12AQ	PL B718 43	R. Aaij *et al.*	(LHCb Collab.)	REFID=54594
	AIHARA	12	PR D85 112014	H. Aihara *et al.*	(BELLE Collab.)	REFID=54412
	DEL-AMO-SA...	10F	PRL 105 121801	P. del Amo Sanchez *et al.*	(BABAR Collab.)	REFID=53413
	DEL-AMO-SA...	10G	PR D82 072004	P. del Amo Sanchez *et al.*	(BABAR Collab.)	REFID=53455
	LIBBY	10	PR D82 112006	J. Libby *et al.*	(CLEO Collab.)	REFID=53583
	POLUEKTOV	10	PR D81 112002	A. Poluektov *et al.*	(BELLE Collab.)	REFID=53340
	AUBERT	09R	PR D79 072003	B. Aubert *et al.*	(BABAR Collab.)	REFID=52798
	AUBERT	08AL	PR D78 034023	B. Aubert *et al.*	(BABAR Collab.)	REFID=52361
	POLUEKTOV	06	PR D73 112009	A. Poluektov *et al.*	(BELLE Collab.)	REFID=51287
	AUBERT,B	05Y	PRL 95 121802	B. Aubert *et al.*	(BABAR Collab.)	REFID=50919
	POLUEKTOV	04	PR D70 072003	A. Poluektov *et al.*	(BELLE Collab.)	REFID=50223

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions. NODE=S042

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^\pm$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

CP VIOLATION PARAMETERS

NODE=S042229

S_+ ($B^0 \to D^- \pi^+$)

NODE=S042A06

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.058±0.020±0.011**	[1] AAIJ	18Z	LHCB	pp at 7, 8 TeV

NODE=S042A06

YOUR NOTE [1] Measured in the simultaneous analysis of $B^0 \to D^\mp \pi^\pm$ decays. AAIJ 18Z reports a statistical (systematic) correlation of 0.6 (-0.41) with the measured value of $S_-(B^0 \to D^+ \pi^-)$. NODE=S042A06;LINKAGE=A

S_- ($B^0 \to D^+ \pi^-$)

NODE=S042A07

NODE=S042A07

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.038±0.020±0.007**	[1] AAIJ	18Z	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured in the simultaneous analysis of $B^0 \to D^{\mp}\pi^{\pm}$ decays. AAIJ 18Z reports a statistical (systematic) correlation of 0.6 (−0.41) with the measured value of $S_+(B^0 \to D^- \pi^+)$.

NODE=S042A07;LINKAGE=A

$|\sin(2\beta + \gamma)|$

NODE=S042BGA

β (ϕ_1) and γ (ϕ_3) are angles of CKM unitarity triangle, see the review on "*CP* Violation" in the Reviews section.

NODE=S042BGA

NODE=S042BGA

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT	
	>0.40	90	[1] AUBERT	06Y	BABR	$e^+e^- \to \Upsilon(4S)$	
	• • • We do not use the following data for averages, fits, limits, etc. • • •						
YOUR DATA	>0.77	68	[2] AAIJ	18Z	LHCB	pp at 7, 8 TeV	
	>0.13	95	[3] RONGA	06	BELL	$e^+e^- \to \Upsilon(4S)$	
	>0.07	95	[3] RONGA	06	BELL	$e^+e^- \to \Upsilon(4S)$	OCCUR=2
	>0.35	90	[4] AUBERT	05Z	BABR	$e^+e^- \to \Upsilon(4S)$	
	>0.69	68	[5] AUBERT	04V	BABR	$e^+e^- \to \Upsilon(4S)$	
	>0.58	95	[6] AUBERT	04W	BABR	Repl. by AUBERT 05Z	

[1] Uses fully reconstructed $B^0 \to D^{(*)\pm}\pi^{\mp}$ and $D^{\pm}\rho^{\mp}$ decays and some theoretical assumptions. NODE=S042BGA;LINKAGE=AE

YOUR NOTE [2] Uses a time dependent CP violation measurement in $B^0 \to D^{\mp}\pi^{\pm}$ decays with external input and some theoretical assumptions. NODE=S042BGA;LINKAGE=A

[3] Combines the results from fully reconstructed and partially reconstructed $D^{(*)}\pi$ events by taking weighted averages. Assumes that systematic errors from physics parameters and fit biases in the two measurements are 100% correlated. NODE=S042BGA;LINKAGE=RO

[4] Uses partially reconstructed $B^0 \to D^{*\pm}\pi^{\mp}$ decays and some theoretical assumptions. NODE=S042BGA;LINKAGE=AP

[5] Uses fully reconstructed $B^0 \to D^{(*)\pm}\pi^{\mp}$ decays and some theoretical assumptions, such as the SU(3) symmetry relation. NODE=S042BGA;LINKAGE=AU

[6] Combining this measurement with the results from AUBERT 04V for fully reconstructed $B^0 \to D^{(*)\pm}\pi^{\mp}$ and some theoretical assumptions, such as the SU(3) symmetry relation. NODE=S042BGA;LINKAGE=AB

B^0 REFERENCES

NODE=S042

YOUR PAPER	AAIJ	18Z	JHEP 1806 084	R. Aaij *et al.*	(LHCb Collab.)	REFID=59118
	AUBERT	06Y	PR D73 111101	B. Aubert *et al.*	(BABAR Collab.)	REFID=51275
	RONGA	06	PR D73 092003	F.J. Ronga *et al.*	(BELLE Collab.)	REFID=51307
	AUBERT	05Z	PR D71 112003	B. Aubert *et al.*	(BABAR Collab.)	REFID=50665
	AUBERT	04V	PRL 92 251801	B. Aubert *et al.*	(BABAR Collab.)	REFID=49986
	AUBERT	04W	PRL 92 251802	B. Aubert *et al.*	(BABAR Collab.)	REFID=49987

Reference = AAIJ 18AB; JHEP 1807 020
Verifier code = LHCB

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Matthew Charles

EMAIL: matthew.john.charles@cern.ch

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM, STRANGE MESONS
($B = \pm1$, $S = \mp1$)

NODE=MXXX046

$B_s^0 = s\overline{b}$, $\overline{B}_s^0 = \overline{s}\,b$, similarly for B_s^*'s

NODE=MXXX046

NODE=S086

B_s^0

$I(J^P) = 0(0^-)$

I, *J*, *P* need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S086

B_s^0 BRANCHING RATIOS

NODE=S086230

$\Gamma(\overline{K}^*(892)^0\mu^+\mu^-)/\Gamma_{total}$ Γ_{132}/Γ

NODE=S086P36
NODE=S086P36

	VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**2.9±1.0±0.4**	[1] AAIJ 18AB	LHCB	pp at 7, 8, 13 TeV

YOUR NOTE [1] Normalizes to B($B^0 \to J/\psi K^{*0}$) = 1.19 ± 0.01 ± 0.08% and B($J/\psi \to \mu^+\mu^-$) = 5.96 ± 0.03%, and uses $f_s/f_d = 0.259 \pm 0.015$.

NODE=S086P36;LINKAGE=B

B_s^0 REFERENCES

NODE=S086

YOUR PAPER AAIJ 18AB JHEP 1807 020 R. Aaij *et al.* (LHCb Collab.)

REFID=59133

Reference = AAIJ 18AC; JHEP 1808 191
Verifier code = LHCB

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Matthew Charles

EMAIL: matthew.john.charles@cern.ch

April 5, 2019

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(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM, STRANGE MESONS
$(B = \pm1, S = \mp1)$

$B_s^0 = s\overline{b}$, $\overline{B}_s^0 = \overline{s}\,b$, similarly for B_s^*'s

NODE=MXXX046

NODE=MXXX046

NODE=S086

B_s^0

$I(J^P) = 0(0^-)$

I, J, P need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S086

B_s^0 MASS

NODE=S086M

	VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT	
	5366.84± 0.21 OUR AVERAGE						NODE=S086M NEW
	[5366.84 ± 0.30 MeV OUR 2018 AVERAGE Scale factor = 1.2]						
YOUR DATA	5366.83± 0.25±0.27		[1] AAIJ	18AC	LHCB	pp at 7, 8, 13 TeV	
	5367.08± 0.38±0.15	128	[2] AAIJ	16U	LHCB	pp at 7, 8 TeV	
	5366.90± 0.28±0.23		[3] AAIJ	12E	LHCB	pp at 7 TeV	
	5364.4 ± 1.3 ±0.7		LOUVOT	09	BELL	$e^+e^- \rightarrow \Upsilon(5S)$	
	5366.01± 0.73±0.33		[4] ACOSTA	06	CDF	$p\overline{p}$ at 1.96 TeV	
	5369.9 ± 2.3 ±1.3	32	[5] ABE	96B	CDF	$p\overline{p}$ at 1.8 TeV	
	5374 ±16 ±2	3	ABREU	94D	DLPH	$e^+e^- \rightarrow Z$	
	5359 ±19 ±7	1	[5] AKERS	94J	OPAL	$e^+e^- \rightarrow Z$	
	5368.6 ± 5.6 ±1.5	2	BUSKULIC	93G	ALEP	$e^+e^- \rightarrow Z$	
	• • • We do not use the following data for averages, fits, limits, etc. • • •						
	5370 ± 1 ±3		DRUTSKOY	07A	BELL	Repl. by LOUVOT 09	
	5370 ±40	6	[6] AKERS	94J	OPAL	$e^+e^- \rightarrow Z$	OCCUR=2
	5383.3 ± 4.5 ±5.0	14	ABE	93F	CDF	Repl. by ABE 96B	

YOUR NOTE [1] Uses $B_s \rightarrow \chi_{c1} K^+ K^-$ mode. NODE=S086M;LINKAGE=D

[2] Uses $J/\psi \rightarrow \mu^+\mu^-$, $\phi \rightarrow K^+K^-$ decays, and observes 128 ± 13 events of $B_s^0 \rightarrow J/\psi\phi\phi$. NODE=S086M;LINKAGE=C

[3] Uses $B_s^0 \rightarrow J/\psi\phi$ fully reconstructed decays. NODE=S086M;LINKAGE=AA

[4] Uses exclusively reconstructed final states containing a $J/\psi \rightarrow \mu^+\mu^-$ decays. NODE=S086M;LINKAGE=AT

[5] From the decay $B_s \rightarrow J/\psi(1S)\phi$. NODE=S086M;LINKAGE=A

[6] From the decay $B_s \rightarrow D_s^- \pi^+$. NODE=S086M;LINKAGE=B

B_s^0 BRANCHING RATIOS

NODE=S086230

$\Gamma(\chi_{c2} K^+ K^-)/\Gamma(\chi_{c1} K^+ K^-)$ Γ_{88}/Γ_{87}

NODE=S086P37
NODE=S086P37

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**17.1±3.1±1.0**	[1] AAIJ	18AC	LHCB	pp at 7, 8, 13 TeV

YOUR NOTE [1] Measures the ratio for ±15 MeV window around ϕ mass. NODE=S086P37;LINKAGE=A

B_s^0 REFERENCES

NODE=S086

YOUR PAPER	AAIJ	18AC	JHEP 1808 191	R. Aaij *et al.*	(LHCb Collab.)	REFID=59136
	AAIJ	16U	JHEP 1603 040	R. Aaij *et al.*	(LHCb Collab.)	REFID=57321
	AAIJ	12E	PL B708 241	R. Aaij *et al.*	(LHCb Collab.)	REFID=54043
	LOUVOT	09	PRL 102 021801	R. Louvot *et al.*	(BELLE Collab.)	REFID=52646
	DRUTSKOY	07A	PR D76 012002	A. Drutskoy *et al.*	(BELLE Collab.)	REFID=51852
	ACOSTA	06	PRL 96 202001	D. Acosta *et al.*	(CDF Collab.)	REFID=51231
	ABE	96B	PR D53 3496	F. Abe *et al.*	(CDF Collab.)	REFID=44688
	ABREU	94D	PL B324 500	P. Abreu *et al.*	(DELPHI Collab.)	REFID=43729
	AKERS	94J	PL B337 196	R. Akers *et al.*	(OPAL Collab.)	REFID=44014
	ABE	93F	PRL 71 1685	F. Abe *et al.*	(CDF Collab.)	REFID=43508
	BUSKULIC	93G	PL B311 425	D. Buskulic *et al.*	(ALEPH Collab.)	REFID=43439

Reference = AAIJ 18AD; JHEP 1808 176
Verifier code = LHCB

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USA

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FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
($B = \pm 1$)

NODE=MXXX045

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=S041

$B^{\pm}$

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S041

See also the $B^{\pm}/B^0$ ADMIXTURE and $B^{\pm}/B^0/B_s^0/b$-baryon ADMIXTURE sections.

CP VIOLATION

NODE=S041220

A_{CP} is defined as

NODE=S041220

$$\frac{B(B^- \to \overline{f}) - B(B^+ \to f)}{B(B^- \to \overline{f}) + B(B^+ \to f)},$$

the *CP*-violation charge asymmetry of exclusive B^- and B^+ decay.

CP VIOLATION PARAMETERS IN $B^+ \to DK^+$ AND SIMILAR DECAYS

NODE=S041320

The parameters r_{B^+} and δ_{B^+} are the magnitude ratio and strong phase difference between the amplitudes of A($B^+ \to \overline{D}^{(*)0} K^{(*)+}$) and A($B^- \to D^{(*)0} K^{(*)-}$). The measured observables are defined as $x_{\pm} = r_{B^+} \cos(\delta_{B^+} \pm \gamma)$ and $y_{\pm} = r_{B^+} \sin(\delta_{B^+} \pm \gamma)$, and can be used to measure the CKM angle γ.

NODE=S041320

"OUR EVALUATION" is provided by the Heavy Flavor Averaging Group (HFLAV). It is derived from combinations of their results on $B^+ \to DK^+$ and related processes.

γ

NODE=S041GGM

For angle $\gamma(\phi_3)$ of the CKM unitarity triangle, see the review on "*CP* Violation" in the Reviews section.

NODE=S041GGM

NODE=S041GGM

→ UNCHECKED ← NEW

VALUE (°)	CL%	DOCUMENT ID		TECN	COMMENT
$73.5^{+4.3}_{-5.0}$ OUR EVALUATION					
87 ±12 OUR AVERAGE [(72 ± 7)° OUR 2017 AVERAGE]					
YOUR DATA **87^{+11}_{-12}**		[1] AAIJ	18AD	LHCB	pp at 13 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
128^{+17}_{-22}		[2] AAIJ	18U	LHCB	pp at 7, 8 TeV
5–86 or 185–266		[3] AAIJ	18Z	LHCB	pp at 7, 8 TeV
80^{+21}_{-22}		[4] AAIJ	16AA	LHCB	Repl. by AAIJ 16Z
$72.2^{+6.8}_{-7.3}$		[5] AAIJ	16AQ	LHCB	pp at 7, 8 TeV
71 ±20		[6,7] AAIJ	16Z	LHCB	pp at 7, 8 TeV
74^{+20}_{-19}		AAIJ	15BC	LHCB	pp at 7, 8 TeV
$63.5^{+7.2}_{-6.7}$		[8,9] AAIJ	15K	LHCB	pp at 7, 8 TeV
62^{+15}_{-14}		[10] AAIJ	14BA	LHCB	pp at 7, 8 TeV
84^{+49}_{-42}		[11] AAIJ	14BE	LHCB	Repl. by AAIJ 14BA
115^{+28}_{-43}		[12] AAIJ	14BF	LHCB	Repl. by AAIJ 18U
$72.6^{+9.7}_{-17.2}$		[13] AAIJ	13AK	LHCB	pp at 7 TeV
69^{+17}_{-16}		[14] LEES	13B	BABR	$e^+e^- \to \Upsilon(4S)$
44^{+43}_{-38}		[15,16] AAIJ	12AQ	LHCB	Repl. by AAIJ 13AK

$77.3^{+15.1}_{-14.9} \pm 5.9$		16,17 AIHARA	12	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
$68 \pm 14 \pm 5$		18 DEL-AMO-SA...	10F	BABR	Repl. by LEES 13B
7 to 173	95	19 DEL-AMO-SA...	10G	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
$78.4^{+10.8}_{-11.6} \pm 9.6$		20 POLUEKTOV	10	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
162 ± 56		21 AUBERT	09R	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
$76\ ^{+22}_{-23} \pm 7.1$		22 AUBERT	08AL	BABR	Repl. by DEL-AMO-SANCHEZ 10F
$53\ ^{+15}_{-18} \pm 10$		23 POLUEKTOV	06	BELL	Repl. by POLUEKTOV 10
$70 \pm 31\ ^{+18}_{-15}$		24 AUBERT,B	05Y	BABR	Repl. by AUBERT 08AL
$77\ ^{+17}_{-19} \pm 17$		25 POLUEKTOV	04	BELL	Repl. by POLUEKTOV 06

YOUR NOTE

[1] Uses binned Dalitz plot analysis of $D \rightarrow K^0_S \pi^+ \pi^-$ and $K^0_S K^+ K^-$ from $B^\pm \rightarrow D K^\pm$ modes. Strong phase measurements from CLEO-c of the D decay over the Dalitz plot are used as input. NODE=S041GGM;LINKAGE=I

[2] Measured in $B^0_s \rightarrow D^\mp_s K^\pm$ decays, constraining $-2\beta_s$ by the measurement of $\phi_s = 0.030 \pm 0.033$ from HFLAV. The value is modulo 180°. NODE=S041GGM;LINKAGE=J

[3] AAIJ 18Z reports the intervals (5–86)° or (185–266)° at 68% C.L. The extraction uses the time dependent CP violation measurement in $B^0 \rightarrow D^\mp \pi^\pm$ decays with external input and some theoretical assumptions. NODE=S041GGM;LINKAGE=K

[4] Uses Dalitz plot analysis of $D \rightarrow K^0_S \pi^+ \pi^-$ decays coming from $B^0 \rightarrow D K^*(892)^0$ modes. Measures $r_{B^0} = 0.39 \pm 0.13$, and $\delta_{B^0} = 197^{+24}_{-20}$ degrees. NODE=S041GGM;LINKAGE=C

[5] A combination of measurements from analyses of time-integrated $B^+ \rightarrow D K^+$, $B^0 \rightarrow D K^{(*)0}$, $B^0 \rightarrow D K^+ \pi^-$, and $B^+ \rightarrow D K^+ \pi^+ \pi^-$ tree-level decays. In addition, results from a time-dependent analysis of $B^0_s \rightarrow D_s K$ decays are included. NODE=S041GGM;LINKAGE=B

[6] A model-independent binned Dalitz plot analysis of the decays $B^0 \rightarrow D K^{*0}$, with $D \rightarrow K^0_S \pi^+ \pi^-$ and $D \rightarrow K^0_S K^+ K^-$. The results cannot be combined with the model-dependent analysis of the same dataset reported in AAIJ 16AA. NODE=S041GGM;LINKAGE=E

[7] Angle γ required to satisfy $0 < \gamma < 180$ degrees. NODE=S041GGM;LINKAGE=F

[8] Obtained by measuring time-dependent CP asymmetry in $B^0_s \rightarrow K^+ K^-$ and using a U-spin relation between $B^0_s \rightarrow K^+ K^-$ and $B^0 \rightarrow \pi^+ \pi^-$. NODE=S041GGM;LINKAGE=H

[9] Results are also presented using additional inputs on $B^0 \rightarrow \pi^0 \pi^0$ and $B^+ \rightarrow \pi^+ \pi^0$ decays from other experiments and isospin symmetry assumptions. The dependence of the results on the maximum allowed amount of U-spin breaking up to 50% is also included. NODE=S041GGM;LINKAGE=IH

[10] Uses binned Dalitz plot analysis of $B^+ \rightarrow D K^+$ decays, with $D \rightarrow K^0_S \pi^+ \pi^-$ and $D \rightarrow K^0_S K^+ K^-$. Strong phase measurements from CLEO-c (LIBBY 10) of the D decay over the Dalitz plot are used as input. Solution that satisfies $0 < \gamma < 180$ is chosen. NODE=S041GGM;LINKAGE=A

[11] AAIJ 14BE uses model-dependent analysis of $D \rightarrow K^0_S \pi^+ \pi^-$ amplitudes. The model is the same as in DEL-AMO-SANCHEZ 10F. NODE=S041GGM;LINKAGE=IA

[12] Measured in $B^0_s \rightarrow D^\mp_s K^\pm$ decays, constraining $-2\beta_s$ by the measurement of $\phi_s = 0.01 \pm 0.07 \pm 0.0$ from AAIJ 13AR. The value is modulo 180° at 68% CL. NODE=S041GGM;LINKAGE=G

[13] Presents a confidence region $55.4° < \gamma < 82.3°$ at 68% CL with best fit value 72.6° and includes both statistical and systematic uncertainties. The corresponding 95% CL is $40.2° < \gamma < 92.7°$. The value is determined from combination of measuremets using D meson decaying to $K^+ K^-$, $\pi^+ \pi^-$, $K^\pm \pi^\mp$, $K^0_S \pi^+ \pi^-$, $K^0_S K^+ K^-$, and $K^\pm \pi^\mp \pi^\pm \pi^\mp$. Combines $B^\pm \rightarrow D K^\pm$ and $B^\pm \rightarrow D \pi^\pm$. NODE=S041GGM;LINKAGE=AJ

[14] Reports combination of published measurements using GGSZ, GLW, and ADS methods. Reports also 2σ range of 41–102° and a 5.9σ significance for $\gamma(B^+ \rightarrow D^{(*)0} K^{(*)+}) \neq 0$ hypothesis. NODE=S041GGM;LINKAGE=LE

[15] Reports combined statistical and systematic uncertainties. NODE=S041GGM;LINKAGE=AA

[16] Uses binned Dalitz plot of $\overline{D}^0 \rightarrow K^0_S \pi^+ \pi^-$ decays from $B^+ \rightarrow \overline{D}^0 K^+$. Measurement of strong phases in $\overline{D}^0 \rightarrow K^0_S \pi^+ \pi^-$ Dalitz plot from LIBBY 10 is used as input. NODE=S041GGM;LINKAGE=AH

[17] We combined the systematics in quadrature. The authors report separately the contribution to the systematic uncertainty due to the uncertainty on the bin-averaged strong phase difference between D^0 and $\overline{D}^0$ amplitudes. NODE=S041GGM;LINKAGE=AI

[18] Uses Dalitz plot analysis of $\overline{D}^0 \rightarrow K^0_S \pi^+ \pi^-$, $K^0_S K^+ K^-$ decays from $B^+ \rightarrow D^{(*)} K^+$, $D K^{*+}$ modes. The corresponding two standard deviation interval for γ is $39° < \gamma < 98°$. CP conservation in the combined result is ruled out with a significance of 3.5 standard deviations. NODE=S041GGM;LINKAGE=DE

[19] Reports confidence intervals for the CKM angle γ from the measured values of the GLW parameters using $B^\pm \rightarrow D K^\pm$ decays with D mesons decaying to non-$CP(K\pi)$, CP-even ($K^+ K^-$, $\pi^+ \pi^-$), and CP-odd ($K^0_S \pi^0$, $K^0_S \omega$) states. NODE=S041GGM;LINKAGE=DA

[20] Uses Dalitz plot analysis of $\overline{D}^0 \rightarrow K^0_S \pi^+ \pi^-$ decays from $B^+ \rightarrow D^{(*)} K^+$ modes. The corresponding two standard deviation interval for γ is $54.2^\circ < \gamma < 100.5^\circ$. CP conservation in the combined result is ruled out with a significance of 3.5 standard deviations. NODE=S041GGM;LINKAGE=PU

[21] Uses Dalitz plot analysis of $D^0 \rightarrow K^0_S \pi^+ \pi^-$ decays coming from $B^0 \rightarrow D^0 K^{*0}$ modes. The corresponding 95% CL interval is $77^\circ < \gamma < 247^\circ$. A 180 degree ambiguity is implied. NODE=S041GGM;LINKAGE=D

[22] Uses Dalitz plot analysis of $\overline{D}^0 \rightarrow K^0_S \pi^+ \pi^-$ and $\overline{D}^0 \rightarrow K^0_S K^+ K^-$ decays coming from $B^\pm \rightarrow D^{(*)} K^{(*)\pm}$ modes. The corresponding two standard deviation interval is $29^\circ < \gamma < 122^\circ$. NODE=S041GGM;LINKAGE=AB

[23] Uses a Dalitz plot analysis of the $\overline{D}^0 \rightarrow K^0_S \pi^+ \pi^-$ decays; Combines the $D K^+$, $D^* K^+$ and $D K^{*+}$ modes. The corresponding two standard deviations interval for gamma is $8^\circ < \gamma < 111^\circ$. NODE=S041GGM;LINKAGE=PL

[24] Uses a Dalitz plot analysis of neutral $D \rightarrow K^0_S \pi^+ \pi^-$ decays coming from $B^\pm \rightarrow D K^\pm$ and $B^\pm \rightarrow D^{*0} K^\pm$ followed by $D^{*0} \rightarrow D \pi^0$, $D\gamma$. The corresponding two standard deviations interval for gamma is $12^\circ < \gamma < 137^\circ$. AUBERT,B 05Y also reports the amplitude ratios and the strong phases. NODE=S041GGM;LINKAGE=AU

[25] Uses a Dalitz plot analysis of the 3-body $D \rightarrow K^0_S \pi^+ \pi^-$ decays coming from $B^\pm \rightarrow D K^\pm$ and $B^\pm \rightarrow D^* K^\pm$ followed by $D^* \rightarrow D \pi^0$; here we use D to denote that the neutral D meson produced in the decay is an admixture of D^0 and $\overline{D}^0$. The corresponding two standard deviations interval for γ is $26^\circ < \gamma < 126^\circ$. POLUEKTOV 04 also reports the amplitude ratios and the strong phases. NODE=S041GGM;LINKAGE=PO

$r_B(B^+ \rightarrow D^0 K^+)$

NODE=S041ARX

r_B and δ_B are the amplitude ratio and relative strong phase between the amplitudes of $A(B^+ \rightarrow D^0 K^+)$ and $A(B^+ \rightarrow \overline{D}^0 K^+)$, NODE=S041ARX

NODE=S041ARX
→ UNCHECKED ←
NEW

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
0.103±0.005 OUR EVALUATION					
0.093±0.007 OUR AVERAGE					
[0.095 ± 0.008 OUR 2018 AVERAGE]					
YOUR DATA $0.086^{+0.013}_{-0.014}$		[1] AAIJ	18AD	LHCB	pp at 13 TeV
$0.080^{+0.019}_{-0.021}$		[2] AAIJ	14BA	LHCB	pp at 7, 8 TeV
0.097 ± 0.011		[3] AAIJ	13AE	LHCB	pp at 7 TeV
$0.092^{+0.013}_{-0.012}$		[4] LEES	13B	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
$0.160^{+0.040}_{-0.038}{}^{+0.051}_{-0.015}$		[5] POLUEKTOV	10	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.06 ± 0.04		[6] AAIJ	14BE	LHCB	Repl. by AAIJ 14BA
0.07 ± 0.04		[7,8] AAIJ	12AQ	LHCB	pp at 7 TeV
$0.145 \pm 0.030 \pm 0.015$		[8,9] AIHARA	12	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
<0.13	90	[10] LEES	11D	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
$0.096 \pm 0.029 \pm 0.006$		[11] DEL-AMO-SA...	10F	BABR	Repl. by LEES 13B
$0.095^{+0.051}_{-0.041}$		[12] DEL-AMO-SA...	10H	BABR	Repl. by LEES 13B
$0.086 \pm 0.032 \pm 0.015$		[13] AUBERT	08AL	BABR	Repl. by DEL-AMO-SANCHEZ 10F
<0.19	90	HORII	08	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
$0.159^{+0.054}_{-0.050} \pm 0.050$		[14] POLUEKTOV	06	BELL	Repl. by POLUEKTOV 10
$0.12 \pm 0.08 \pm 0.05$		[15] AUBERT,B	05Y	BABR	Repl. by AUBERT 08AL

YOUR NOTE [1] Uses binned Dalitz plot analysis of $D \rightarrow K^0_S \pi^+ \pi^-$ and $K^0_S K^+ K^-$ from $B^\pm \rightarrow D K^\pm$ modes. Strong phase measurements from CLEO-c of the D decay over the Dalitz plot are used as input. NODE=S041ARX;LINKAGE=B

[2] Uses binned Dalitz plot analysis of $B^+ \rightarrow D K^+$ decays, with $D \rightarrow K^0_S \pi^+ \pi^-$ and $D \rightarrow K^0_S K^+ K^-$. Strong phase measurements from CLEO-c (LIBBY 10) of the D decay over the Dalitz plot are used as input. NODE=S041ARX;LINKAGE=A

[3] Uses $B^\pm \rightarrow [K^\pm \pi^\mp \pi^+ \pi^-]_D h^\pm$ mode. NODE=S041ARX;LINKAGE=AJ

[4] Reports combination of published measurements using GGSZ, GLW, and ADS methods. NODE=S041ARX;LINKAGE=LS

[5] Uses Dalitz plot analysis of $\overline{D}^0 \rightarrow K^0_S \pi^+ \pi^-$ decays from $B^+ \rightarrow D^0 K^+$ modes. The corresponding two standard deviation interval is $0.084 < r_B < 0.239$. NODE=S041ARX;LINKAGE=PU

[6] AAIJ 14BE uses model-dependent analysis of $D \rightarrow K^0_S \pi^+ \pi^-$ amplitudes. The model is the same as in DEL-AMO-SANCHEZ 10F. NODE=S041ARX;LINKAGE=IA

[7] Reports combined statistical and systematic uncertainties. NODE=S041ARX;LINKAGE=AA

[8] Uses binned Dalitz plot of $\overline{D}^0 \rightarrow K^0_S \pi^+ \pi^-$ decays from $B^+ \rightarrow \overline{D}^0 K^+$. Measurement of strong phases in $\overline{D}^0 \rightarrow K^0_S \pi^+ \pi^-$ Dalitz plot from LIBBY 10 is used as input. NODE=S041ARX;LINKAGE=AH

[9] We combined the systematics in quadrature. The authors report separately the contribution to the systematic uncertainty due to the uncertainty on the bin-averaged strong phase difference between D^0 and $\overline{D}^0$ amplitudes. NODE=S041ARX;LINKAGE=AI

[10] Uses decays of neutral D to $K^- \pi^+ \pi^0$. NODE=S041ARX;LINKAGE=LE

[11] Uses Dalitz plot analysis of $\overline{D}^0 \to K^0_S \pi^+ \pi^-$, $K^0_S K^+ K^-$ decays from $B^+ \to D^{(*)} K^{(*)+}$ modes. The corresponding two standard deviation interval is $0.037 < r_B < 0.155$. NODE=S041ARX;LINKAGE=DE

[12] Uses the Cabibbo suppressed decay of $B^+ \to \overline{D} K^+$ followed by $\overline{D} \to K^- \pi^+$. NODE=S041ARX;LINKAGE=DL

[13] Uses Dalitz plot analysis of $\overline{D}^0 \to K^0_S \pi^+ \pi^-$ and $\overline{D}^0 \to K^0_S K^+ K^-$ decays coming from $B^\pm \to D^{(*)} K^{(*)\pm}$ modes. NODE=S041ARX;LINKAGE=AB

[14] Uses a Dalitz plot analysis of the $\overline{D}^0 \to K^0_S \pi^+ \pi^-$ decays; Combines the $D K^+$, $D^* K^+$ and $D K^{*+}$ modes. NODE=S041ARX;LINKAGE=PO

[15] Uses a Dalitz analysis of neutral D decays to $K^0_S \pi^+ \pi^-$ in the processes $B^\pm \to D^{(*)} K^\pm$, $D^* \to D \pi^0$, $D \gamma$. NODE=S041ARX;LINKAGE=AU

$\delta_B(B^+ \to D^0 K^+)$

NODE=S041DRX
NODE=S041DRX

VALUE (°)		DOCUMENT ID		TECN	COMMENT
$136.9^{+4.6}_{-5.2}$ OUR EVALUATION					
113 ± 9 OUR AVERAGE Error includes scale factor of 1.2. [(123 ± 10)° OUR 2018 AVERAGE]					
101 ±11	[1]	AAIJ	18AD	LHCB	pp at 13 TeV
134 $^{+14}_{-15}$	[2]	AAIJ	14BA	LHCB	pp at 7, 8 TeV
105 $^{+16}_{-17}$	[3]	LEES	13B	BABR	$e^+ e^- \to \Upsilon(4S)$
136.7 $^{+13.0}_{-15.8}$ ±23.2	[4]	POLUEKTOV	10	BELL	$e^+ e^- \to \Upsilon(4S)$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
115 $^{+41}_{-51}$	[5]	AAIJ	14BE	LHCB	Repl. by AAIJ 14BA
137 $^{+35}_{-46}$	[6,7]	AAIJ	12AQ	LHCB	pp at 7 TeV
129.9±15.0± 6.0	[7,8]	AIHARA	12	BELL	$e^+ e^- \to \Upsilon(4S)$
119 $^{+19}_{-20}$ ± 4	[9]	DEL-AMO-SA...	10F	BABR	Repl. by LEES 13B
109 $^{+27}_{-30}$ ± 8	[10]	AUBERT	08AL	BABR	Repl. by DEL-AMO-SANCHEZ 10F
145.7 $^{+19.0}_{-19.7}$ ±23.1	[11]	POLUEKTOV	06	BELL	Repl. by POLUEKTOV 10
104 ±45 $^{+23}_{-32}$	[12]	AUBERT,B	05Y	BABR	Repl. by AUBERT 08AL

→ UNCHECKED ←
NEW
YOUR DATA

YOUR NOTE

[1] Uses binned Dalitz plot analysis of $D \to K^0_S \pi^+ \pi^-$ and $K^0_S K^+ K^-$ from $B^\pm \to D K^\pm$ modes. Strong phase measurements from CLEO-c of the D decay over the Dalitz plot are used as input. NODE=S041DRX;LINKAGE=B

[2] Uses binned Dalitz plot analysis of $B^+ \to D K^+$ decays, with $D \to K^0_S \pi^+ \pi^-$ and $D \to K^0_S K^+ K^-$. Strong phase measurements from CLEO-c (LIBBY 10) of the D decay over the Dalitz plot are used as input. NODE=S041DRX;LINKAGE=A

[3] Reports combination of published measurements using GGSZ, GLW, and ADS methods. NODE=S041DRX;LINKAGE=LE

[4] Uses Dalitz plot analysis of $\overline{D}^0 \to K^0_S \pi^+ \pi^-$ decays from $B^+ \to \overline{D}^0 K^+$ modes. The corresponding two standard deviation interval is $102.2° < \delta_B < 162.3°$. NODE=S041DRX;LINKAGE=PU

[5] AAIJ 14BE uses model-dependent analysis of $D \to K^0_S \pi^+ \pi^-$ amplitudes. The model is the same as in DEL-AMO-SANCHEZ 10F. NODE=S041DRX;LINKAGE=IA

[6] Reports combined statistical and systematic uncertainties. NODE=S041DRX;LINKAGE=AA

[7] Uses binned Dalitz plot of $\overline{D}^0 \to K^0_S \pi^+ \pi^-$ decays from $B^+ \to \overline{D}^0 K^+$. Measurement of strong phases in $\overline{D}^0 \to K^0_S \pi^+ \pi^-$ Dalitz plot from LIBBY 10 is used as input. NODE=S041DRX;LINKAGE=AH

[8] We combined the systematics in quadrature. The authors report separately the contribution to the systematic uncertainty due to the uncertainty on the bin-averaged strong phase difference between D^0 and $\overline{D}^0$ amplitudes. NODE=S041DRX;LINKAGE=AI

[9] Uses Dalitz plot analysis of $\overline{D}^0 \to K^0_S \pi^+ \pi^-$, $K^0_S K^+ K^-$ decays from $B^+ \to D^{(*)} K^{(*)+}$ modes. The corresponding two standard deviation interval is $75° < \delta_B < 157°$. NODE=S041DRX;LINKAGE=DE

[10] Uses Dalitz plot analysis of $\overline{D}^0 \to K^0_S \pi^+ \pi^-$ and $\overline{D}^0 \to K^0_S K^+ K^-$ decays coming from $B^\pm \to D^{(*)} K^{(*)\pm}$ modes. NODE=S041DRX;LINKAGE=AB

[11] Uses a Dalitz plot analysis of the $\overline{D}^0 \to K^0_S \pi^+ \pi^-$ decays; Combines the $D K^+$, $D^* K^+$ and $D K^{*+}$ modes. NODE=S041DRX;LINKAGE=PO

[12] Uses a Dalitz analysis of neutral D decays to $K^0_S \pi^+ \pi^-$ in the processes $B^\pm \rightarrow D^{(*)} K^\pm$, $D^* \rightarrow D \pi^0$, $D \gamma$. NODE=S041DRX;LINKAGE=AU

$B^\pm$ REFERENCES

NODE=S041

YOUR PAPER	AAIJ	18AD	JHEP 1808 176	R. Aaij *et al.*	(LHCb Collab.)	REFID=59138
	Also		JHEP 1810 107 (errat.)	R. Aaij *et al.*	(LHCb Collab.)	REFID=59352
	AAIJ	18U	JHEP 1803 059	R. Aaij *et al.*	(LHCb Collab.)	REFID=59090
	AAIJ	18Z	JHEP 1806 084	R. Aaij *et al.*	(LHCb Collab.)	REFID=59118
	AAIJ	16AA	JHEP 1608 137	R. Aaij *et al.*	(LHCb Collab.)	REFID=57349
	AAIJ	16AQ	JHEP 1612 087	R. Aaij *et al.*	(LHCb Collab.)	REFID=57665
	AAIJ	16Z	JHEP 1606 131	R. Aaij *et al.*	(LHCb Collab.)	REFID=57338
	AAIJ	15BC	PR D92 112005	R. Aaij *et al.*	(LHCb Collab.)	REFID=57012
	AAIJ	15K	PL B741 1	R. Aaij *et al.*	(LHCb Collab.)	REFID=56383
	AAIJ	14BA	JHEP 1410 097	R. Aaij *et al.*	(LHCb Collab.)	REFID=56167
	AAIJ	14BE	NP B888 169	R. Aaij *et al.*	(LHCb Collab.)	REFID=56187
	AAIJ	14BF	JHEP 1411 060	R. Aaij *et al.*	(LHCb Collab.)	REFID=56197
	AAIJ	13AE	PL B723 44	R. Aaij *et al.*	(LHCb Collab.)	REFID=55082
	AAIJ	13AK	PL B726 151	R. Aaij *et al.*	(LHCb Collab.)	REFID=55097
	AAIJ	13AR	PR D87 112010	R. Aaij *et al.*	(LHCb Collab.)	REFID=55159
	LEES	13B	PR D87 052015	J.P. Lees *et al.*	(BABAR Collab.)	REFID=54948
	AAIJ	12AQ	PL B718 43	R. Aaij *et al.*	(LHCb Collab.)	REFID=54594
	AIHARA	12	PR D85 112014	H. Aihara *et al.*	(BELLE Collab.)	REFID=54412
	LEES	11D	PR D84 012002	J.P. Lees *et al.*	(BABAR Collab.)	REFID=53751
	DEL-AMO-SA...	10F	PRL 105 121801	P. del Amo Sanchez *et al.*	(BABAR Collab.)	REFID=53413
	DEL-AMO-SA...	10G	PR D82 072004	P. del Amo Sanchez *et al.*	(BABAR Collab.)	REFID=53455
	DEL-AMO-SA...	10H	PR D82 072006	P. del Amo Sanchez *et al.*	(BABAR Collab.)	REFID=53456
	LIBBY	10	PR D82 112006	J. Libby *et al.*	(CLEO Collab.)	REFID=53583
	POLUEKTOV	10	PR D81 112002	A. Poluektov *et al.*	(BELLE Collab.)	REFID=53340
	AUBERT	09R	PR D79 072003	B. Aubert *et al.*	(BABAR Collab.)	REFID=52798
	AUBERT	08AL	PR D78 034023	B. Aubert *et al.*	(BABAR Collab.)	REFID=52361
	HORII	08	PR D78 071901	Y. Horii *et al.*	(BELLE Collab.)	REFID=52533
	POLUEKTOV	06	PR D73 112009	A. Poluektov *et al.*	(BELLE Collab.)	REFID=51287
	AUBERT,B	05Y	PRL 95 121802	B. Aubert *et al.*	(BABAR Collab.)	REFID=50919
	POLUEKTOV	04	PR D70 072003	A. Poluektov *et al.*	(BELLE Collab.)	REFID=50223

Reference = AAIJ 18AF; JHEP 1808 131
Verifier code = LHCB

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PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Matthew Charles

EMAIL: matthew.john.charles@cern.ch

April 5, 2019

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Thank you for helping us make the Review accurate and useful.

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1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM BARYONS
$(B = -1)$

NODE=BXXX045

$\Lambda_b^0 = udb$, $\Xi_b^0 = usb$, $\Xi_b^- = dsb$, $\Omega_b^- = ssb$

NODE=BXXX045

NODE=S040

Λ_b^0

$I(J^P) = 0(\frac{1}{2}^+)$ Status: ∗∗∗

In the quark model, a Λ_b^0 is an isospin-0 udb state. The lowest Λ_b^0 ought to have $J^P = 1/2^+$. None of I, J, or P have actually been measured.

NODE=S040

Λ_b^0 BRANCHING RATIOS

NODE=S040215

$\Gamma(\psi(2S)p\pi^-)/\Gamma(p\psi(2S)K^-)$ **Γ_{18}/Γ_{17}**

NODE=S040R50
NODE=S040R50

	VALUE (%)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**11.4±1.3±0.2**	AAIJ	18AF	LHCB	pp at 7, 8, 13 TeV

Λ_b^0 REFERENCES

NODE=S040

YOUR PAPER AAIJ 18AF JHEP 1808 131 R. Aaij *et al.* (LHCb Collab.)

REFID=59141

Reference = AAIJ 18AG; JHEP 1808 039
Verifier code = LHCB

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BOTTOM BARYONS
($B = -1$)

NODE=BXXX045

$\Lambda_b^0 = u\,d\,b$, $\Xi_b^0 = u\,s\,b$, $\Xi_b^- = d\,s\,b$, $\Omega_b^- = s\,s\,b$

NODE=BXXX045

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Λ_b^0

$I(J^P) = 0(\frac{1}{2}^+)$ Status: ∗∗∗

In the quark model, a Λ_b^0 is an isospin-0 $u\,d\,b$ state. The lowest Λ_b^0 ought to have $J^P = 1/2^+$. None of I, J, or P have actually been measured.

NODE=S040

CP VIOLATION

NODE=S040230

A_{CP} is defined as

NODE=S040230

$$A_{CP} = \frac{B(\Lambda_b^0 \to f) - B(\overline{\Lambda}_b^0 \to \overline{f})}{B(\Lambda_b^0 \to f) + B(\overline{\Lambda}_b^0 \to \overline{f})},$$

the *CP*-violation asymmetry of exclusive Λ_b^0 and $\overline{\Lambda}_b^0$ decay.

$a_P(\Lambda_b^0 \to pK^-\pi^+\pi^-)$

NODE=S040A16

Observable calculated as average of the triple products for Λ_b^0 and $\overline{\Lambda}_b^0$, which is sensitive to parity violation.

NODE=S040A16

NODE=S040A16

	VALUE (%)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**−0.60±0.84±0.31**	[1] AAIJ	18AG	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured over full phase space of the decay.

NODE=S040A16;LINKAGE=A

$a_P(\Lambda_b^0 \to pK^-K^+K^-)$

NODE=S040A17

Observable calculated as average of the triple products for Λ_b^0 and $\overline{\Lambda}_b^0$, which is sensitive to parity violation.

NODE=S040A17

NODE=S040A17

	VALUE (%)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**−1.56±1.51±0.32**	[1] AAIJ	18AG	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured over full phase space of the decay.

NODE=S040A17;LINKAGE=A

$a_{CP}(\Lambda_b^0 \to pK^-\pi^+\pi^-)$

NODE=S040A14

Observable calculated as half of the difference between triple products for Λ_b^0 and $\overline{\Lambda}_b^0$, which is sensitive to *CP* violation.

NODE=S040A14

NODE=S040A14

	VALUE (%)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**−0.81±0.84±0.31**	[1] AAIJ	18AG	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured over full phase space of the decay.

NODE=S040A14;LINKAGE=A

$a_{CP}(\Lambda_b^0 \to pK^-K^+K^-)$

NODE=S040A15

Observable calculated as half of the difference between triple products for Λ_b^0 and $\overline{\Lambda}_b^0$, which is sensitive to *CP* violation.

NODE=S040A15

NODE=S040A15

	VALUE (%)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**1.12±1.51±0.32**	[1] AAIJ	18AG	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured over full phase space of the decay.

NODE=S040A15;LINKAGE=A

Λ_b^0 REFERENCES

NODE=S040

YOUR PAPER AAIJ 18AG JHEP 1808 039 R. Aaij *et al.* (LHCb Collab.)

REFID=59146
NODE=S060

Ξ_b^0, Ξ_b^-

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$ Status: ∗∗∗
I, J, P need confirmation.

In the quark model, Ξ_b^0 and Ξ_b^- are an isodoublet (*usb*, *dsb*) state; the lowest Ξ_b^0 and Ξ_b^- ought to have $J^P = 1/2^+$. None of I, J, or P have actually been measured.

NODE=S060

MEAN LIFE RATIOS

NODE=S060212

$a_P(\Xi_b^0 \to pK^- K^- \pi^+)$ NODE=S060A01

Observable calculated as average of the triple products for Ξ_b^0 and $\overline{\Xi}_b^0$, which is sensitive to parity violation. NODE=S060A01

	VALUE (%)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**−3.04±5.19±0.36**	[1] AAIJ	18AG	LHCB	pp at 7, 8 TeV

NODE=S060A01

YOUR NOTE [1] Measured over full phase space of the decay. NODE=S060A01;LINKAGE=A

$a_{CP}(\Xi_b^0 \to pK^- K^- \pi^+)$ NODE=S060A02

Observable calculated as half of the difference between triple products for Ξ_b^0 and $\overline{\Xi}_b^0$, which is sensitive to CP violation. NODE=S060A02

	VALUE (%)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**−3.58±5.19±0.36**	[1] AAIJ	18AG	LHCB	pp at 7, 8 TeV

NODE=S060A02

YOUR NOTE [1] Measured over full phase space of the decay. NODE=S060A02;LINKAGE=A

Ξ_b REFERENCES NODE=S060

YOUR PAPER AAIJ 18AG JHEP 1808 039 R. Aaij *et al.* (LHCb Collab.) REFID=59146

Reference = AAIJ 18AJ; PRL 120 061801
Verifier code = LHCB

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SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON NEUTRAL PARTICLE PRODUCTION

NODE=S015415

Heavy Particle Production Cross Section

NODE=S015CS
NODE=S015CS

YOUR DATA

• • • We do not use the following data for averages, fits, limits, etc. • • •

VALUE (cm^2/N)	CL%	DOCUMENT ID		TECN	COMMENT
		[1] AABOUD	18CJ	ATLS	$pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$
		[2] AABOUD	18CM	ATLS	$pp \to e\mu/e\tau/\mu\tau$
		[3] AAIJ	18AJ	LHCB	$pp \to A' \to \mu^+\mu^-$; dark photon
		[4] BANERJEE	18	NA64	$eZ \to eZX(A')$
		[5] BANERJEE	18A	NA64	$eZ \to eZA'$, $A' \to \chi\chi$
		[6] MARSICANO	18	E137	$e^+e^- \to A'(\gamma)$ visible decay
		[7] SIRUNYAN	18BB	CMS	$pp \to Z' \to \ell^+\ell^-$ at 13 TeV
		[8] SIRUNYAN	18DA	CMS	$pp \to$ Black Hole, string ball, sphaleron
		[9] SIRUNYAN	18DD	CMS	$pp \to jj$
		[10] SIRUNYAN	18DR	CMS	$pp \to b\mu\overline{\mu}$
		[11] SIRUNYAN	18DU	CMS	$pp \to \gamma\gamma$
		[12] SIRUNYAN	18ED	CMS	$pp \to V \to Wh$; $h \to b\overline{b}$; $W \to l\nu$
		[13] AABOUD	17B	ATLS	WH, ZH resonance
		[14] AAIJ	17BR	LHCB	$pp \to \pi_v\pi_v$, $\pi_v \to jj$
		[15] AAD	16O	ATLS	ℓ + (ℓs or jets)
		[16] AAD	16R	ATLS	WW, WZ, ZZ resonance
		[17] KRASZNAHO...	16		$p^7\text{Li} \to {}^8\text{Be} \to X(17)N$, $X(17) \to e^+e^-$
		[18] LEES	15E	BABR	e^+e^- collisions
		[19] ADAMS	97B	KTEV	m= 1.2–5 GeV
$< 10^{-36}$–10^{-33}	90	[20] GALLAS	95	TOF	m= 0.5–20 GeV
$<(4$–$0.3) \times 10^{-31}$	95	[21] AKESSON	91	CNTR	m = 0–5 GeV
$<2 \times 10^{-36}$	90	[22] BADIER	86	BDMP	$\tau = (0.05$–$1.) \times 10^{-8}$s
$<2.5 \times 10^{-35}$		[23] GUSTAFSON	76	CNTR	$\tau > 10^{-7}$ s

YOUR NOTE

[1] AABOUD 18CJ make multichannel search for $pp \to VV/\ell\ell/\ell\nu$, $V = W,Z,h$ at 13 TeV, 36.1 fb^{-1}; no signal found; limits placed for several BSM models.

NODE=S015CS;LINKAGE=R

[2] AABOUD 18CM search for lepton-flavor violating resonance in $pp \to e\mu/e\tau/\mu\tau$ at 13 TeV, 36.1 fb^{-1}; no signal is found and limits placed for various BSM models.

NODE=S015CS;LINKAGE=S

[3] AAIJ 18AJ search for prompt and delayed dark photon decay $A' \to \mu^+\mu^-$ at LHCb detector using 1.6 fb^{-1} of pp collisions at 13 TeV; limits on m(A') vs. kinetic mixing are set.

NODE=S015CS;LINKAGE=K

[4] BANERJEE 18 search for dark photon A'/16.7 MeV boson X at NA64 via $eZ \to eZX(A')$; no signal found and limits set on the X-e^- coupling ϵ_e in the range $1.3 \times 10^{-4} \le \epsilon_e \le 4.2 \times 10^{-4}$ excluding part of the allowed parameter space.

NODE=S015CS;LINKAGE=L

[5] BANERJEE 18A search for invisibly decaying dark photons in $eZ \to eZA'$, $A' \to$ invisible; no signal found and limits set on mixing for m(A') $<$ 1 GeV.

NODE=S015CS;LINKAGE=M

[6] MARSICANO 18 search for dark photon $e^+e^- \to A'(\gamma)$ visible decay in SLAC E137 e beam dump data. No signal observed and limits set in ϵ coupling vs m(A') plane, see their figure 7.

NODE=S015CS;LINKAGE=P

[7] SIRUNYAN 18BB search for high mass dilepton resonance; no signal found and exclude portions of p-space of Z', KK graviton models.

NODE=S015CS;LINKAGE=O

[8] SIRUNYAN 18DA search for $pp \to$ Black Hole, string ball, sphaleron via high multiplicity events at 13 TeV, 35.9 fb^{-1}; no signal, require e.g. m(BH)¿10.1 TeV

NODE=S015CS;LINKAGE=T

[9] SIRUNYAN 18DD search for $pp \to jj$ deviations in dijet angular distribution. No signal observed. Set limits on large extra dimensions, black holes and DM mediators e.g. m(BH) $>$ 5.9–8.2 TeV.

NODE=S015CS;LINKAGE=U

[10] SIRUNYAN 18DR search for dimuon resonance in $pp \to b\mu\overline{\mu}$ at 8 and 13 TeV. Slight excess seen at m($\mu\overline{\mu}$) $\sim$ 28 GeV in some channels.

NODE=S015CS;LINKAGE=V

[11] SIRUNYAN 18DU search for high mass diphoton resonance in $pp \rightarrow \gamma\gamma$ at 13 TeV using 35.9 fb^{-1}; no signal; limits placed on RS Graviton, LED, and clockwork. NODE=S015CS;LINKAGE=W

[12] SIRUNYAN 18ED search for $pp \rightarrow V \rightarrow Wh$; $h \rightarrow b\overline{b}$; $W \rightarrow l\nu$ at 13 TeV with 35.9 fb^{-1}; no signal; limits set on m($W^{'}$)¿2.9 TeV. NODE=S015CS;LINKAGE=X

[13] AABOUD 17B exclude m(W', Z') $<$ 1.49–2.31 TeV depending on the couplings and W'/Z' degeneracy assumptions via WH, ZH search in pp collisions at 13 TeV with 3.2 fb^{-1} of data. NODE=S015CS;LINKAGE=I

[14] AAIJ 17BR search for long-lived hidden valley pions from Higgs decay. Limits are set on the signal strength as a function of the mass and lifetime of the long-lived particle in their Fig. 4 and Tab. 4. NODE=S015CS;LINKAGE=J

[15] AAD 16O search for high E_T ℓ + (ℓs or jets) with 3.2 fb^{-1} at 13 TeV; exclude micro black holes mass $<$ 8 TeV (Fig. 3) for models with two extra dimensions. NODE=S015CS;LINKAGE=G

[16] AAD 16R search for WW, WZ, ZZ resonance in 20.3 fb^{-1} at 8 TeV data; limits placed on massive RS graviton (Fig. 4). NODE=S015CS;LINKAGE=H

[17] KRASZNAHORKAY 16 report pLi $\rightarrow$ Be $\rightarrow$ $e\overline{e}N$ 5σ resonance at 16.7 MeV– possible evidence for nuclear interference or new light boson . However, such nuclear interference was ruled out already by ZANG 17. NODE=S015CS;LINKAGE=Q

[18] LEES 15E search for long-lived neutral particles produced in e^+e^- collisions in the Upsilon region, which decays into e^+e^-, $\mu^+\mu^-$, $e^\pm\mu^\mp$, $\pi^+\pi^-$, K^+K^-, or $\pi^\pm K^\mp$. See their Fig. 2 for cross section limits. NODE=S015CS;LINKAGE=F

[19] ADAMS 97B search for a hadron-like neutral particle produced in pN interactions, which decays into a ρ^0 and a weakly interacting massive particle. Upper limits are given for the ratio to K_L production for the mass range 1.2–5 GeV and lifetime 10^{-9}–10^{-4} s. See also our Light Gluino Section. NODE=S015CS;LINKAGE=E

[20] GALLAS 95 limit is for a weakly interacting neutral particle produced in 800 GeV/c pN interactions decaying with a lifetime of 10^{-4}–10^{-8} s. See their Figs. 8 and 9. Similar limits are obtained for a stable particle with interaction cross section 10^{-29}–10^{-33} cm^2. See Fig. 10. NODE=S015CS;LINKAGE=C

[21] AKESSON 91 limit is from weakly interacting neutral long-lived particles produced in pN reaction at 450 GeV/c performed at CERN SPS. Bourquin-Gaillard formula is used as the production model. The above limit is for $\tau > 10^{-7}$ s. For $\tau > 10^{-9}$ s, $\sigma < 10^{-30}$ cm^{-2}/nucleon is obtained. NODE=S015CS;LINKAGE=B

[22] BADIER 86 looked for long-lived particles at 300 GeV π^- beam dump. The limit applies for nonstrongly interacting neutral or charged particles with mass $>$2 GeV. The limit applies for particle modes, $\mu^+\pi^-$, $\mu^+\mu^-$, $\pi^+\pi^-$X, $\pi^+\pi^-\pi^\pm$ etc. See their figure 5 for the contours of limits in the mass-τ plane for each mode. NODE=S015CS;LINKAGE=D

[23] GUSTAFSON 76 is a 300 GeV FNAL experiment looking for heavy ($m >$2 GeV) long-lived neutral hadrons in the M4 neutral beam. The above typical value is for m = 3 GeV and assumes an interaction cross section of 1 mb. Values as a function of mass and interaction cross section are given in figure 2. NODE=S015CS;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

	AABOUD	18CJ	PR D98 052008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59441
	AABOUD	18CM	PR D98 092008	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=59474
YOUR PAPER	AAIJ	18AJ	PRL 120 061801	R. Aaij *et al.*	(LHCb Collab.)	REFID=59199
	BANERJEE	18	PRL 120 231802	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58838
	BANERJEE	18A	PR D97 072002	D. Banerjee *et al.*	(NA64 Collab.)	REFID=58916
	MARSICANO	18	PR D98 015031	L. Marsicano *et al.*		REFID=58967
	SIRUNYAN	18BB	JHEP 1806 120	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59112
	SIRUNYAN	18DA	JHEP 1811 042	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59306
	SIRUNYAN	18DD	EPJ C78 789	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59318
	SIRUNYAN	18DR	JHEP 1811 161	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59367
	SIRUNYAN	18DU	PR D98 092001	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59469
	SIRUNYAN	18ED	JHEP 1811 172	A.M. Sirunyan *et al.*	(CMS Collab.)	REFID=59566
	AABOUD	17B	PL B765 32	M. Aaboud *et al.*	(ATLAS Collab.)	REFID=57706
	AAIJ	17BR	EPJ C77 812	R. Aaij *et al.*	(LHCb Collab.)	REFID=58366
	ZANG	17	PL B773 159	X. Zang, G.A. Miller	(WASH)	REFID=59311
	AAD	16O	PL B760 520	G. Aad *et al.*	(ATLAS Collab.)	REFID=57169
	AAD	16R	PL B755 285	G. Aad *et al.*	(ATLAS Collab.)	REFID=57172
	KRASZNAHO...	16	PRL 116 042501	A.J. Krasznahorkay *et al.*	(HINR, ANIK+)	REFID=59302
	LEES	15E	PRL 114 171801	J.P. Lees *et al.*	(BABAR Collab.)	REFID=56467
	ADAMS	97B	PRL 79 4083	J. Adams *et al.*	(FNAL KTeV Collab.)	REFID=45722
	GALLAS	95	PR D52 6	E. Gallas *et al.*	(MSU, FNAL, MIT, FLOR)	REFID=44291
	AKESSON	91	ZPHY C52 219	T. Akesson *et al.*	(HELIOS Collab.)	REFID=41739
	BADIER	86	ZPHY C31 21	J. Badier *et al.*	(NA3 Collab.)	REFID=10622
	GUSTAFSON	76	PRL 37 474	H.R. Gustafson *et al.*	(MICH)	REFID=12580

Reference = AAIJ 18AN; EPJ C78 1019
Verifier code = LHCB

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USA

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FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
($B = \pm 1$)

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^\pm$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

NODE=S042

B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^\pm$ section.

NODE=S042220

$\Gamma(\eta_c(1S)K^+\pi^-)/\Gamma_{\text{total}}$ $\quad\Gamma_{180}/\Gamma$

NODE=S042P28
NODE=S042P28

	VALUE (units 10^{-4})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**5.73±0.24±0.67**	[1] AAIJ	18AN	LHCB	pp at 7, 8 and 13 TeV

YOUR NOTE [1] Measured relative to that of the $B^0 \to J/\psi K^+\pi^-$ as normalization where J/ψ and η_c reconstructed in the $p\overline{p}$ mode with B($B^0 \to J/\psi K^+\pi^-$) = $(1.15 \pm 0.05) \times 10^{-3}$, B($J/\psi \to p\overline{p}$) = $(2.121 \pm 0.029) \times 10^{-3}$, and B($\eta_c \to p\overline{p}$) = $(1.52 \pm 0.16) \times 10^{-3}$.

NODE=S042P28;LINKAGE=A

$\Gamma(\eta_c K^*(1410)^0,\ K^*(1410)^0 \to K^+\pi^-)/\Gamma(\eta_c(1S)K^+\pi^-)$ $\quad\Gamma_{181}/\Gamma_{180}$

NODE=S042P32
NODE=S042P32

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**2.1±1.1±1.1**	AAIJ	18AN	LHCB	pp at 7, 8, 13 TeV

$\Gamma(\eta_c K^+\pi^-(\text{NR}))/\Gamma(\eta_c(1S)K^+\pi^-)$ $\quad\Gamma_{182}/\Gamma_{180}$

NODE=S042P33
NODE=S042P33

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{10.3 \pm 1.4^{+1.0}_{-1.2}}$	AAIJ	18AN	LHCB	pp at 7, 8, 13 TeV

$\Gamma(\eta_c K^*_0(1430)^0,\ K^*_0(1430)^0 \to K^+\pi^-)/\Gamma(\eta_c(1S)K^+\pi^-)$ $\quad\Gamma_{183}/\Gamma_{180}$

NODE=S042P34
NODE=S042P34

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{25.3 \pm 3.5^{+3.5}_{-2.8}}$	AAIJ	18AN	LHCB	pp at 7, 8, 13 TeV

$\Gamma(\eta_c K^*_2(1430)^0,\ K^*_2(1430)^0 \to K^+\pi^-)/\Gamma(\eta_c(1S)K^+\pi^-)$ $\quad\Gamma_{184}/\Gamma_{180}$

NODE=S042P35
NODE=S042P35

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{4.1 \pm 1.5^{+1.0}_{-1.6}}$	AAIJ	18AN	LHCB	pp at 7, 8, 13 TeV

$\Gamma(\eta_c K^*(1680)^0,\ K^*(1680)^0 \to K^+\pi^-)/\Gamma(\eta_c(1S)K^+\pi^-)$ $\quad\Gamma_{185}/\Gamma_{180}$

NODE=S042P36
NODE=S042P36

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{2.2 \pm 2.0^{+1.5}_{-1.7}}$	AAIJ	18AN	LHCB	pp at 7, 8, 13 TeV

$\Gamma(\eta_c K^*_0(1950)^0,\ K^*_0(1950)^0 \to K^+\pi^-)/\Gamma(\eta_c(1S)K^+\pi^-)$ $\quad\Gamma_{186}/\Gamma_{180}$

NODE=S042P37
NODE=S042P37

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{3.8 \pm 1.8^{+1.4}_{-2.5}}$	AAIJ	18AN	LHCB	pp at 7, 8, 13 TeV

$\Gamma(X(4100)^- K^+,\ X^- \to \eta_c\pi^-)/\Gamma(\eta_c(1S)K^+\pi^-)$ $\quad\Gamma_{187}/\Gamma_{180}$

NODE=S042P38
NODE=S042P38

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{3.3 \pm 1.1^{+1.2}_{-1.1}}$	AAIJ	18AN	LHCB	pp at 7, 8, 13 TeV

$\Gamma(\eta_c K^*(892)^0)/\Gamma_{total}$ — Γ_{188}/Γ

NODE=S042B43
NODE=S042B43

VALUE (units 10^{-4})	DOCUMENT ID	TECN	COMMENT
5.2 ±0.8 OUR AVERAGE Error includes scale factor of 1.5. See the ideogram below.			
$[(0.69 \pm 0.09) \times 10^{-3}$ OUR 2018 AVERAGE]			
$4.42 \pm 0.24^{+0.54}_{-0.66}$	[1] AAIJ	18AN LHCB	pp at 7, 8, 13 TeV
$6.7 \pm 0.8 \pm 0.5$	[2,3] AUBERT	08AB BABR	$e^+ e^- \to \Upsilon(4S)$
$6.8 ^{+2.1}_{-1.9} \pm 0.7$	[4,5] AUBERT	07AV BABR	$e^+ e^- \to \Upsilon(4S)$
$16.2 \pm 3.2 ^{+5.5}_{-6.0}$	[5] FANG	03 BELL	$e^+ e^- \to \Upsilon(4S)$

NEW

YOUR DATA

YOUR NOTE

[1] AAIJ 18AN reports $B(B^0 \to \eta_c K^*(892)^0,\ K^*(892)^0 \to K^+\pi^-) = (2.95 \pm 0.16^{+0.36}_{-0.44}) \times 10^{-4}$ using the fitted Dalitz fraction of $0.541 \pm 0.019^{+0.017}_{-0.048}$ and corrected for $B(K^*(892)^0 \to K^+\pi^-) = 2/3$. NODE=S042B43;LINKAGE=A

[2] AUBERT 08AB reports $[\Gamma(B^0 \to \eta_c K^*(892)^0)/\Gamma_{total}] / [B(B^+ \to \eta_c K^+)] = 0.62 \pm 0.06 \pm 0.05$ which we multiply by our best value $B(B^+ \to \eta_c K^+) = (1.09 \pm 0.09) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=S042B43;LINKAGE=AB

[3] Uses the production ratio of $(B^+ B^-)/(B^0 \overline{B}^0) = 1.026 \pm 0.032$ at $\Upsilon(4S)$. NODE=S042B43;LINKAGE=PR

[4] AUBERT 07AV reports $[\Gamma(B^0 \to \eta_c K^*(892)^0)/\Gamma_{total}] \times [B(\eta_c(1S) \to p\overline{p})] = (1.03^{+0.27}_{-0.24} \pm 0.17) \times 10^{-6}$ which we divide by our best value $B(\eta_c(1S) \to p\overline{p}) = (1.51 \pm 0.16) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=S042B43;LINKAGE=AU

[5] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$. NODE=S042B43;LINKAGE=EP

B^0 REFERENCES

NODE=S042

YOUR PAPER

AAIJ	18AN	EPJ C78 1019	R. Aaij *et al.*	(LHCb Collab.)	REFID=59335
AUBERT	08AB	PR D78 012006	B. Aubert *et al.*	(BABAR Collab.)	REFID=52267
AUBERT	07AV	PR D76 092004	B. Aubert *et al.*	(BABAR Collab.)	REFID=51990
FANG	03	PRL 90 071801	F. Fang *et al.*	(BELLE Collab.)	REFID=49206

Reference = AAIJ 18AO; JHEP 1809 145 (errat.)
Verifier code = LHCB

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BOTTOM BARYONS
$(B = -1)$

NODE=BXXX045

$\Lambda_b^0 = u\,d\,b$, $\Xi_b^0 = u\,s\,b$, $\Xi_b^- = d\,s\,b$, $\Omega_b^- = s\,s\,b$

NODE=BXXX045

NODE=S040

Λ_b^0

$I(J^P) = 0(\frac{1}{2}^+)$ Status: ∗∗∗

In the quark model, a Λ_b^0 is an isospin-0 $u\,d\,b$ state. The lowest Λ_b^0 ought to have $J^P = 1/2^+$. None of I, J, or P have actually been measured.

NODE=S040

Λ_b^0 DECAY PARAMETERS

NODE=S040250

See the note on "Baryon Decay Parameters" in the neutron Listings.

NODE=S040250

A($A_{FB}^{\ell}(\mu\mu)$) in $\Lambda_b \to \Lambda\mu^+\mu^-$

NODE=S040A21
NODE=S040A21

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**−0.05±0.09±0.03**	[1] AAIJ	18AO	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Difference of asymmetries $A_{FB}^{\ell}(\mu\mu)$ in $\Lambda_b \to \Lambda\mu^+\mu^-$ between Λ_b and $\overline{\Lambda}_b$

NODE=S040A21;LINKAGE=A

Λ_b^0 REFERENCES

NODE=S040

YOUR PAPER AAIJ 18AO JHEP 1809 145 (errat.) R. Aaij *et al.* (LHCb Collab.)

REFID=59343

Reference = AAIJ 18AP; JHEP 1809 146
Verifier code = LHCB

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$(B=-1)$

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NODE=BXXX045

NODE=BXXX045

NODE=S040

Λ_b^0

$I(J^P) = 0(\frac{1}{2}^+)$ Status: ∗∗∗

In the quark model, a Λ_b^0 is an isospin-0 $u\,d\,b$ state. The lowest Λ_b^0 ought to have $J^P = 1/2^+$. None of I, J, or P have actually been measured.

NODE=S040

Λ_b^0 DECAY PARAMETERS

NODE=S040250

See the note on "Baryon Decay Parameters" in the neutron Listings.

NODE=S040250

$A_{FB}^{\ell}(\mu\mu)$ in $\Lambda_b \to \Lambda\mu^+\mu^-$

NODE=S040A02

NODE=S040A02

	VALUE	DOCUMENT ID		TECN	COMMENT
	−0.39±0.04 OUR AVERAGE [−0.05 ± 0.09 OUR 2018 AVERAGE]				
YOUR DATA	**−0.39±0.04±0.01**	[1] AAIJ	18AP	LHCB	pp at 7, 8 and 13 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	−0.05±0.09±0.03	[2] AAIJ	15AE	LHCB	Repl. by AAIJ 18AP.

NEW

YOUR NOTE [1] The measurement covers $15.0 < q^2 < 20.0$ GeV^2/c^4.

[2] AAIJ 15AE measurement covers $15.0 < q^2 < 20.0$ GeV^2/c^4.

NODE=S040A02;LINKAGE=C

NODE=S040A02;LINKAGE=A

$A_{FB}^{h}(p\pi)$ in $\Lambda_b \to \Lambda(p\pi)\mu^+\mu^-$

NODE=S040A03

NODE=S040A03

	VALUE	DOCUMENT ID		TECN	COMMENT
	−0.30±0.05 OUR AVERAGE [−0.29 ± 0.08 OUR 2018 AVERAGE]				
YOUR DATA	**−0.30±0.05±0.02**	[1] AAIJ	18AP	LHCB	pp at 7, 8 and 13 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	−0.29±0.07±0.03	[2] AAIJ	15AE	LHCB	Repl. by AAIJ 18AP.

NEW

YOUR NOTE [1] The measurement covers $15.0 < q^2 < 20.0$ GeV^2/c^4.

[2] AAIJ 15AE measurement covers $15.0 < q^2 < 20.0$ GeV^2/c^4.

NODE=S040A03;LINKAGE=C

NODE=S040A03;LINKAGE=A

$A_{FB}^{\ell h}$ in $\Lambda_b \to \Lambda\mu^+\mu^-$

NODE=S040A18

NODE=S040A18

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**+0.25±0.04±0.01**	[1] AAIJ	18AP	LHCB	pp at 7, 8 and 13 TeV

YOUR NOTE [1] The measurement covers $15.0 < q^2 < 20.0$ GeV^2/c^4.

NODE=S040A18;LINKAGE=A

Λ_b^0 REFERENCES

NODE=S040

YOUR PAPER AAIJ 18AP JHEP 1809 146 R. Aaij *et al.* (LHCb Collab.) REFID=59344

AAIJ 15AE JHEP 1506 115 R. Aaji *et al.* (LHCb Collab.) REFID=56631

Also JHEP 1809 145 (errat.) R. Aaij *et al.* (LHCb Collab.) REFID=59343

Reference = AAIJ 18AW; PL B784 101
Verifier code = LHCB

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NODE=BXXX045

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NODE=S040

Λ_b^0

$I(J^P) = 0(\frac{1}{2}^+)$ Status: ∗∗∗

In the quark model, a Λ_b^0 is an isospin-0 $u\,d\,b$ state. The lowest Λ_b^0 ought to have $J^P = 1/2^+$. None of I, J, or P have actually been measured.

NODE=S040

Λ_b^0 BRANCHING RATIOS

NODE=S040215

$\Gamma(\Lambda_c^+ p\overline{p}\pi^-)/\Gamma(\Lambda_c^+\pi^-)$ **Γ_{31}/Γ_{21}**

NODE=S040R55
NODE=S040R55

	VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
YOUR DATA	**0.0540±0.0023±0.0032**	AAIJ	18AW	LHCB	pp at 7 and 8 TeV

$\Gamma(\Sigma_c(2455)^0 p\overline{p}, \Sigma_c(2455)^0 \to \Lambda_c^+\pi^-)/\Gamma(\Lambda_c^+ p\overline{p}\pi^-)$ **Γ_{32}/Γ_{31}**

NODE=S040R56
NODE=S040R56

	VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
YOUR DATA	**0.089±0.015±0.006**	AAIJ	18AW	LHCB	pp at 7 and 8 TeV

$\Gamma(\Sigma_c(2520)^0 p\overline{p}, \Sigma_c(2520)^0 \to \Lambda_c^+\pi^-)/\Gamma(\Lambda_c^+ p\overline{p}\pi^-)$ **Γ_{33}/Γ_{31}**

NODE=S040R57
NODE=S040R57

	VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
YOUR DATA	**0.119±0.020±0.014**	AAIJ	18AW	LHCB	pp at 7 and 8 TeV

Λ_b^0 REFERENCES

NODE=S040

YOUR PAPER AAIJ 18AW PL B784 101 R. Aaij *et al.* (LHCb Collab.) REFID=59397

Reference = AAIJ 18AX; PL B787 124
Verifier code = LHCB

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NODE=BXXX045

NODE=S040

Λ_b^0

$I(J^P) = 0(\frac{1}{2}^+)$ Status: ∗∗∗

In the quark model, a Λ_b^0 is an isospin-0 $u\,d\,b$ state. The lowest Λ_b^0 ought to have $J^P = 1/2^+$. None of I, J, or P have actually been measured.

NODE=S040

CP VIOLATION

NODE=S040230

A_{CP} is defined as

NODE=S040230

$$A_{CP} = \frac{B(\Lambda_b^0 \to f) - B(\overline{\Lambda}_b^0 \to \overline{f})}{B(\Lambda_b^0 \to f) + B(\overline{\Lambda}_b^0 \to \overline{f})},$$

the *CP*-violation asymmetry of exclusive Λ_b^0 and $\overline{\Lambda}_b^0$ decay.

$A_{CP}(\Lambda_b \to p\pi^-)$

NODE=S040CP1
NODE=S040CP1

	VALUE	DOCUMENT ID		TECN	COMMENT
	−0.025±0.029 OUR AVERAGE Error includes scale factor of 1.2. [0.06 ± 0.08 OUR 2018 AVERAGE]				
YOUR DATA	−0.035±0.017±0.020	AAIJ	18AX	LHCB	pp at 7 and 8 TeV
	0.06 ±0.07 ±0.03	AALTONEN	14P	CDF	$p\overline{p}$ at 1.96 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	0.03 ±0.17 ±0.05	AALTONEN	11N	CDF	Repl. by AALTONEN 14P

NEW

$A_{CP}(\Lambda_b \to pK^-)$

NODE=S040CP2
NODE=S040CP2

	VALUE	DOCUMENT ID		TECN	COMMENT
	−0.025±0.022 OUR AVERAGE [−0.10 ± 0.09 OUR 2018 AVERAGE]				
YOUR DATA	−0.020±0.013±0.019	AAIJ	18AX	LHCB	pp at 7 and 8 TeV
	−0.10 ±0.08 ±0.04	AALTONEN	14P	CDF	$p\overline{p}$ at 1.96 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	0.37 ±0.17 ±0.03	AALTONEN	11N	CDF	Repl. by AALTONEN 14P

NEW

$\Delta A_{CP}(pK^-/\pi^-) \equiv A_{CP}(pK^-) - A_{CP}(p\pi^-)$

NODE=S040A19
NODE=S040A19

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.014±0.022±0.010**	AAIJ	18AX	LHCB	pp at 7 and 8 TeV

Λ_b^0 REFERENCES

NODE=S040

YOUR PAPER AAIJ 18AX PL B787 124 R. Aaij *et al.* (LHCb Collab.) REFID=59409
AALTONEN 14P PRL 113 242001 T. Aaltonen *et al.* (CDF Collab.) REFID=56259
AALTONEN 11N PRL 106 181802 T. Aaltonen *et al.* (CDF Collab.) REFID=16447

Reference = AAIJ 18AY; PR D98 071103
Verifier code = LHCB

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PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Matthew Charles

EMAIL: matthew.john.charles@cern.ch

April 5, 2019

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Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

BOTTOM MESONS
($B = \pm 1$)

$B^+ = u\overline{b}$, $B^0 = d\overline{b}$, $\overline{B}^0 = \overline{d}\,b$, $B^- = \overline{u}\,b$, similarly for B^*'s

NODE=MXXX045

NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^\pm$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^\pm$ section.

NODE=S042220

$\Gamma(D^0\phi)/\Gamma_{\text{total}}$ **Γ_{150}/Γ**

NODE=S042T29
NODE=S042T29

	VALUE (units 10^{-6})	CL%	DOCUMENT ID	TECN	COMMENT
	< 2.3 (CL = 95%) [$<11.6 \times 10^{-6}$ (CL = 90%) OUR 2018 BEST LIMIT]				
YOUR DATA	**< 2.3**	95	AAIJ 18AY	LHCB	pp at 7 and 8 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	<11.6	90	[1] AUBERT 07AO	BABR	$e^+e^- \to \Upsilon(4S)$

[1] Assumes equal production of B^+ and B^0 at the $\Upsilon(4S)$.

NODE=S042T29;LINKAGE=EP

B^0 REFERENCES

NODE=S042

YOUR PAPER AAIJ 18AY PR D98 071103 R. Aaij *et al.* (LHCb Collab.)
AUBERT 07AO PR D76 051103 B. Aubert *et al.* (BABAR Collab.)

REFID=59452
REFID=51932

BOTTOM, STRANGE MESONS
($B = \pm 1$, $S = \mp 1$)

$B^0_s = s\overline{b}$, $\overline{B}^0_s = \overline{s}\,b$, similarly for B^*_s's

NODE=MXXX046

NODE=MXXX046

NODE=S086

B^0_s

$I(J^P) = 0(0^-)$

I, J, P need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S086

B^0_s BRANCHING RATIOS

NODE=S086230

$\Gamma(\overline{D}^0\phi)/\Gamma_{\text{total}}$ **Γ_{44}/Γ**

NODE=S086P39
NODE=S086P39

	VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**3.0±0.3±0.3**	[1,2] AAIJ 18AY	LHCB	pp at 7 and 8 TeV

YOUR NOTE [1] Measured from $B(B^0_s \to \bar{D}^0\phi)/B(B^0 \to \bar{D}^0\pi^+\pi^-) = (3.4 \pm 0.4 \pm 0.3)$

NODE=S086P39;LINKAGE=A

YOUR NOTE [2] The second uncertainty includes the uncertainty from the branching fraction of the normalization mode.

NODE=S086P39;LINKAGE=B

$\Gamma(\overline{D}^{*0}\phi)/\Gamma_{total}$ Γ_{45}/Γ

NODE=S086P38
NODE=S086P38

	VALUE	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**$(3.7\pm0.5\pm0.4)\times10^{-5}$**	[1,2] AAIJ 18AY	LHCB	pp at 7 and 8 TeV

YOUR NOTE [1] Measured from $B(B_s^0 \to \bar{D}^{*0}\phi)/B(B^0 \to \bar{D}^0\pi^+\pi^-) = (4.2 \pm 0.5 \pm 0.4)$ NODE=S086P38;LINKAGE=A

YOUR NOTE [2] The second uncertainty includes the uncertainty from the branching fraction of the normalization mode. NODE=S086P38;LINKAGE=B

POLARIZATION IN B_s^0 DECAY

NODE=S086233

NODE=S086233

In decays involving two vector mesons, one can distinguish among the states in which meson polarizations are both longitudinal (L), or both are transverse and parallel ($\parallel$), or perpendicular ($\perp$) to each other with the parameters Γ_L/Γ, $\Gamma_\perp/\Gamma$, and the relative phases $\phi_\parallel$ and $\phi_\perp$. In decays involving two tensor mesons, the transverse polarization states are described by parameters $\Gamma_{\parallel 1}$, $\Gamma_{\parallel 2}$, $\Gamma_{\perp 1}$, $\Gamma_{\perp 2}$ and their relative phases $\phi_{\parallel 1}$, $\phi_{\parallel 2}$, $\phi_{\perp 1}$, $\phi_{\perp 2}$. See also the review on "Polarization in B Decays."

Γ_L/Γ in $B_s^0 \to \overline{D}^{*0}\phi$

NODE=S086A22
NODE=S086A22

	VALUE	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**$0.73\pm0.15\pm0.04$**	AAIJ 18AY	LHCB	pp at 7 and 8 TeV

B_s^0 REFERENCES

NODE=S086

YOUR PAPER AAIJ 18AY PR D98 071103 R. Aaij *et al.* (LHCb Collab.) REFID=59452

Reference = AAIJ 18AZ; PR D98 072006
Verifier code = LHCB

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BOTTOM MESONS
($B = \pm1$)

NODE=MXXX045

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NODE=MXXX045

NODE=S042

B^0

$I(J^P) = \frac{1}{2}(0^-)$

Quantum numbers not measured. Values shown are quark-model predictions.

NODE=S042

See also the $B^\pm/B^0$ ADMIXTURE and $B^\pm/B^0/B^0_s/b$-baryon ADMIXTURE sections.

See the Note "Production and Decay of b-flavored Hadrons" at the beginning of the $B^\pm$ Particle Listings and the Note on "B^0-$\overline{B}^0$ Mixing" near the end of the B^0 Particle Listings.

B^0 BRANCHING RATIOS

NODE=S042220

For branching ratios in which the charge of the decaying B is not determined, see the $B^\pm$ section.

NODE=S042220

$\Gamma(\overline{D}^0 K^+ K^-)/\Gamma_{total}$ — Γ_{45}/Γ

NODE=S042P39
NODE=S042P39

	VALUE	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**$(6.1\pm0.4\pm0.4)\times10^{-5}$**	[1] AAIJ	18AZ LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Uses $B(B^0 \to \overline{D}^0 K^+ K^-)/B(B^0 \to \overline{D}^0 \pi^+ \pi^-) = 0.069 \pm 0.004 \pm 0.003$ measured by the same authors and the average value $B(B^0 \to \overline{D}^0 \pi^+ \pi^-) = (8.8 \pm 0.5) \times 10^{-4}$.

NODE=S042P39;LINKAGE=A

$\Gamma(\overline{D}^0 K^+ K^-)/\Gamma(\overline{D}^0 \pi^+ \pi^-)$ — Γ_{45}/Γ_{43}

NODE=S042T96
NODE=S042T96

	VALUE	DOCUMENT ID	TECN	COMMENT
	0.067 ± 0.005 OUR AVERAGE			
	[0.056 ± 0.013 OUR 2018 AVERAGE]			
YOUR DATA	$0.069\pm0.004\pm0.003$	AAIJ	18AZ LHCB	pp at 7, 8 TeV
	$0.056\pm0.011\pm0.007$	AAIJ	12AM LHCB	pp at 7 TeV

NEW

B^0 REFERENCES

NODE=S042

YOUR PAPER AAIJ 18AZ PR D98 072006 R. Aaij *et al.* (LHCb Collab.) REFID=59457
AAIJ 12AM PRL 109 131801 R. Aaij *et al.* (LHCb Collab.) REFID=54590

BOTTOM, STRANGE MESONS
($B = \pm1$, $S = \mp1$)

NODE=MXXX046

$B^0_s = s\overline{b}$, $\overline{B}^0_s = \overline{s}\,b$, similarly for B^*_s's

NODE=MXXX046

NODE=S086

B^0_s

$I(J^P) = 0(0^-)$

I, J, P need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S086

B^0_s BRANCHING RATIOS

NODE=S086230

$\Gamma(\overline{D}^0 K^+ K^-)/\Gamma_{total}$ — Γ_{42}/Γ

NODE=S086R03
NODE=S086R03

	VALUE (units 10^{-5})	DOCUMENT ID	TECN	COMMENT
	5.7 ± 0.9 OUR AVERAGE [$(4.4 \pm 2.0) \times 10^{-5}$ OUR 2018 AVERAGE]			
YOUR DATA	**$5.7\pm0.7\pm0.5$**	[1,2] AAIJ	18AZ LHCB	pp at 7, 8 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •			
	$5.5\pm2.0\pm0.5$	[3,4] AAIJ	12AM LHCB	Repl. by AAIJ 18AZ

NEW

YOUR NOTE [1] Uses B($B_s^0 \to \overline{D}^0 K^+ K^-$)/B($B^0 \to \overline{D}^0 K^+ K^-$) $= 0.930 \pm 0.089 \pm 0.069$ measured by the same authors. NODE=S086R03;LINKAGE=A

YOUR NOTE [2] AAIJ 18AZ reports $[\Gamma(B_s^0 \to \overline{D}^0 K^+ K^-)/\Gamma_{\text{total}}]$ / [B($B^0 \to \overline{D}^0 K^+ K^-$)] $= 0.930 \pm 0.089 \pm 0.069$ which we multiply by our best value B($B^0 \to \overline{D}^0 K^+ K^-$) $= (6.1 \pm 0.6) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=S086R03;LINKAGE=E

[3] AAIJ 12AM reports $[\Gamma(B_s^0 \to \overline{D}^0 K^+ K^-)/\Gamma_{\text{total}}]$ / [B($B^0 \to \overline{D}^0 K^+ K^-$)] $= 0.90 \pm 0.27 \pm 0.20$ which we multiply by our best value B($B^0 \to \overline{D}^0 K^+ K^-$) $= (6.1 \pm 0.6) \times 10^{-5}$. Our first error is their experiment's error and our second error is the systematic error from using our best value. NODE=S086R03;LINKAGE=AA

[4] Uses B($b \to B_s^0$)/B($b \to B^0$) $= 0.267^{+0.023}_{-0.020}$ measured by the same authors. NODE=S086R03;LINKAGE=AI

B_s^0 REFERENCES

NODE=S086

YOUR PAPER AAIJ 18AZ PR D98 072006 R. Aaij *et al.* (LHCb Collab.) REFID=59457
AAIJ 12AM PRL 109 131801 R. Aaij *et al.* (LHCb Collab.) REFID=54590

Reference = AAIJ 19A; PRL 122 012001
Verifier code = LHCB

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BOTTOM BARYONS
$(B = -1)$

$\Lambda_b^0 = udb$, $\Xi_b^0 = usb$, $\Xi_b^- = dsb$, $\Omega_b^- = ssb$

NODE=BXXX045

NODE=BXXX045

NODE=S026

Σ_b

$I(J^P) = 1(\frac{1}{2}^+)$ Status: ∗∗∗
I, J, P need confirmation.

In the quark model Σ_b^+, Σ_b^0, Σ_b^- are an isotriplet (uub, udb, ddb) state. The lowest Σ_b ought to have $J^P = 1/2^+$. None of I, J, or P have actually been measured.

NODE=S026

Σ_b MASS

NODE=S026205

Σ_b^+ MASS

NODE=S026M+
NODE=S026M+
NEW

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
	5810.56±0.25 OUR AVERAGE				
	[5811.3 ± 1.9 MeV OUR 2018 AVERAGE]				
YOUR DATA	$5810.55 \pm 0.11 \pm 0.23$	[1] AAIJ	19A	LHCB	pp at 7, 8 TeV
	$5811.3\ {}^{+0.9}_{-0.8}\ \pm 1.7$	[4] AALTONEN	12F	CDF	$p\overline{p}$ at 1.96 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	$5807.8\ {}^{+2.0}_{-2.2}\ \pm 1.7$	[5] AALTONEN	07K	CDF	Repl. by AALTONEN 12F

ERROR=1

YOUR NOTE [1] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \to pK^-\pi^+$ decays.

NODE=S026M+;LINKAGE=A

Σ_b^- MASS

NODE=S026M-
NODE=S026M-
NEW

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
	5815.64±0.27 OUR AVERAGE				
	[5815.5 ± 1.8 MeV OUR 2018 AVERAGE]				
YOUR DATA	$5815.64 \pm 0.14 \pm 0.24$	[2] AAIJ	19A	LHCB	pp at 7, 8 TeV
	$5815.5\ {}^{+0.6}_{-0.5}\ \pm 1.7$	[4] AALTONEN	12F	CDF	$p\overline{p}$ at 1.96 TeV
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	$5815.2\ \pm 1.0\ \pm 1.7$	[5] AALTONEN	07K	CDF	Repl. by AALTONEN 12F

YOUR NOTE [2] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \to pK^-\pi^+$ decays.

NODE=S026M-;LINKAGE=A

$m_{\Sigma_b^+} - m_{\Sigma_b^-}$

NODE=S026DMI
NODE=S026DMI
NEW

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
	−5.06±0.18 OUR AVERAGE				
	[−4.2 ± 1.1 MeV OUR 2018 AVERAGE]				
YOUR DATA	$-5.09 \pm 0.18 \pm 0.01$	[3] AAIJ	19A	LHCB	pp at 7, 8 TeV
	$-4.2\ {}^{+1.1}_{-1.0}\ \pm 0.1$	[4] AALTONEN	12F	CDF	$p\overline{p}$ at 1.96 TeV

YOUR NOTE [3] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \to pK^-\pi^+$ decays.

NODE=S026DMI;LINKAGE=A

[4] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \to K^-\pi^+$ decays.

NODE=S026M;LINKAGE=AL

[5] Observed four $\Lambda_b^0 \pi^\pm$ resonances in the fully reconstructed decay mode $\Lambda_b^0 \to \Lambda_c^+ \pi^-$, where $\Lambda_c^+ \to pK^-\pi^+$.

NODE=S026M;LINKAGE=AA

Σ_b WIDTH

NODE=S026210

Σ_b^+ WIDTH

NODE=S026W+
NODE=S026W+
NEW

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
	5.0 ±0.5 OUR AVERAGE				
	$[9.7^{+4.0}_{-3.0}$ MeV OUR 2018 AVERAGE]				
YOUR DATA	$4.83 \pm 0.31 \pm 0.37$	[6] AAIJ	19A	LHCB	pp at 7, 8 TeV
	$9.7\ {}^{+3.8}_{-2.8}\ {}^{+1.2}_{-1.1}$	[8] AALTONEN	12F	CDF	$p\overline{p}$ at 1.96 TeV

ERROR=2

YOUR NOTE [6] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \to pK^-\pi^+$ decays.

NODE=S026W+;LINKAGE=A

Σ_b^- WIDTH

NODE=S026W-
NODE=S026W-

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
5.3 ±0.5 OUR AVERAGE				
[$4.9^{+3.3}_{-2.4}$ MeV OUR 2018 AVERAGE]				
$5.33\pm0.42\pm0.37$	[7] AAIJ	19A	LHCB	pp at 7, 8 TeV
$4.9\ ^{+3.1}_{-2.1}\ \pm1.1$	[8] AALTONEN	12F	CDF	$p\overline{p}$ at 1.96 TeV

NEW

YOUR DATA

YOUR NOTE

[7] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+\pi^-$ and $\Lambda_c^+ \to pK^-\pi^+$ decays.

NODE=S026W-;LINKAGE=A

[8] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+\pi^-$ and $\Lambda_c^+ \to K^-\pi^+$ decays.

NODE=S026W;LINKAGE=AL

Σ_b REFERENCES

NODE=S026

YOUR PAPER

AAIJ 19A PRL 122 012001 R. Aaij *et al.* (LHCb Collab.)
AALTONEN 12F PR D85 092011 T. Aaltonen *et al.* (CDF Collab.)
AALTONEN 07K PRL 99 202001 T. Aaltonen *et al.* (CDF Collab.)

REFID=59550
REFID=54118
REFID=52023
NODE=S062

Σ_b^*

$I(J^P) = 1(\frac{3}{2}^+)$ Status: ∗∗∗
I, J, P need confirmation.

I, J, P need confirmation. Quantum numbers shown are quark-model predictions.

NODE=S062

Σ_b^* MASS

NODE=S062205

Σ_b^{*+} MASS

NODE=S062M+
NODE=S062M+

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
5830.32±0.27 OUR AVERAGE				
[5832.1 ± 1.9 MeV OUR 2018 AVERAGE]				
$5830.28\pm0.14\pm0.24$	[1] AAIJ	19A	LHCB	pp at 7, 8 TeV
$5832.1\ \pm0.7\ ^{+1.7}_{-1.8}$	[6] AALTONEN	12F	CDF	$p\overline{p}$ at 1.96 TeV

NEW

YOUR DATA

ERROR=3

YOUR NOTE

[1] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+\pi^-$ and $\Lambda_c^+ \to pK^-\pi^+$ decays.

NODE=S062M+;LINKAGE=A

Σ_b^{*-} MASS

NODE=S062M-
NODE=S062M-

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
5834.74±0.30 OUR AVERAGE				
[5835.1 ± 1.9 MeV OUR 2018 AVERAGE]				
$5834.73\pm0.17\pm0.25$	[2] AAIJ	19A	LHCB	pp at 7, 8 TeV
$5835.1\ \pm0.6\ ^{+1.7}_{-1.8}$	[6] AALTONEN	12F	CDF	$p\overline{p}$ at 1.96 TeV

NEW

YOUR DATA

YOUR NOTE

[2] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+\pi^-$ and $\Lambda_c^+ \to pK^-\pi^+$ decays.

NODE=S062M-;LINKAGE=A

$m_{\Sigma_b^{*+}} - m_{\Sigma_b^{*-}}$

NODE=S062DMI
NODE=S062DMI

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
−4.37±0.33 OUR AVERAGE Error includes scale factor of 1.6. [$-3.0^{+1.0}_{-0.9}$ MeV OUR 2018 AVERAGE]				
$-4.45\pm0.22\pm0.01$	[3] AAIJ	19A	LHCB	pp at 7, 8 TeV
$-3.0\ ^{+1.0}_{-0.9}\ \pm0.1$	[6] AALTONEN	12F	CDF	$p\overline{p}$ at 1.96 TeV

NEW

YOUR DATA

YOUR NOTE

[3] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+\pi^-$ and $\Lambda_c^+ \to pK^-\pi^+$ decays.

NODE=S062DMI;LINKAGE=A

$m_{\Sigma_b^{*+}} - m_{\Sigma_b^{+}}$

NODE=S062DMP
NODE=S062DMP

VALUE	DOCUMENT ID		TECN	COMMENT
19.73±0.18±0.01	[4] AAIJ	19A	LHCB	pp at 7, 8 TeV

YOUR DATA

YOUR NOTE

[4] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+\pi^-$ and $\Lambda_c^+ \to pK^-\pi^+$ decays.

NODE=S062DMP;LINKAGE=A

$m_{\Sigma_b^{*-}} - m_{\Sigma_b^{-}}$

NODE=S062DMM
NODE=S062DMM

VALUE	DOCUMENT ID		TECN	COMMENT
19.09±0.22±0.02	[5] AAIJ	19A	LHCB	pp at 7, 8 TeV

YOUR DATA

YOUR NOTE

[5] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+\pi^-$ and $\Lambda_c^+ \to pK^-\pi^+$ decays.

NODE=S062DMM;LINKAGE=A

[6] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+\pi^-$ and $\Lambda_c^+ \to K^-\pi^+$ decays.

NODE=S062M;LINKAGE=AL

Σ_b^* WIDTH

NODE=S062230

Σ_b^{*+} WIDTH

NODE=S062W+
NODE=S062W+

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT	
	9.4 ±0.5 OUR AVERAGE [11.5 ± 2.8 MeV OUR 2018 AVERAGE]					NEW
YOUR DATA	$9.34 \pm 0.47 \pm 0.26$	[7] AAIJ	19A	LHCB	pp at 7, 8 TeV	
	$11.5 \ {}^{+2.7}_{-2.2} \ {}^{+1.0}_{-1.5}$	[9] AALTONEN	12F	CDF	$p\overline{p}$ at 1.96 TeV	ERROR=4

YOUR NOTE [7] Measured using the fully reconstructed $\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \rightarrow pK^- \pi^+$ decays. NODE=S062W+;LINKAGE=A

Σ_b^{*-} WIDTH

NODE=S062W-
NODE=S062W-

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT	
	10.4 ±0.8 OUR AVERAGE Error includes scale factor of 1.3. [7.5 ± 2.3 MeV OUR 2018 AVERAGE]					NEW
YOUR DATA	$10.68 \pm 0.60 \pm 0.33$	[8] AAIJ	19A	LHCB	pp at 7, 8 TeV	
	$7.5 \ {}^{+2.2}_{-1.8} \ {}^{+0.9}_{-1.4}$	[9] AALTONEN	12F	CDF	$p\overline{p}$ at 1.96 TeV	

YOUR NOTE [8] Measured using the fully reconstructed $\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \rightarrow pK^- \pi^+$ decays. NODE=S062W-;LINKAGE=A

[9] Measured using the fully reconstructed $\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \rightarrow K^- \pi^+$ decays. NODE=S062W;LINKAGE=AL

Σ_b^* REFERENCES

NODE=S062

YOUR PAPER AAIJ 19A PRL 122 012001 R. Aaij *et al.* (LHCb Collab.) REFID=59550
AALTONEN 12F PR D85 092011 T. Aaltonen *et al.* (CDF Collab.) REFID=54118

NODE=B181

$\Sigma_b(6097)^+$

$J^P = ?^?$ Status: ∗∗∗

$\Sigma_b(6097)^+$ MASS

NODE=B181M

NODE=B181M

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{6095.8 \pm 1.7 \pm 0.4}$	[1] AAIJ	19A	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured using the fully reconstructed $\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \rightarrow pK^- \pi^+$ decays. NODE=B181M;LINKAGE=A

$m_{\Sigma_b(6097)^\pm} - m_{\Sigma_b(6097)^-}$

NODE=B181A00
NODE=B181A00

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	-2.2 +-2.4 +-0.3 MeV	[1] AAIJ	19A	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured using the fully reconstructed $\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \rightarrow pK^- \pi^+$ decays. NODE=B181A00;LINKAGE=A

$\Sigma_b(6097)^+$ WIDTH

NODE=B181W

NODE=B181W

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{31.0 \pm 5.5 \pm 0.7}$	[1] AAIJ	19A	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured using the fully reconstructed $\Lambda_b^0 \rightarrow \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \rightarrow pK^- \pi^+$ decays. NODE=B181W;LINKAGE=A

$\Sigma_b(6097)^+$ REFERENCES

NODE=B181

YOUR PAPER AAIJ 19A PRL 122 012001 R. Aaij *et al.* (LHCb Collab.) REFID=59550

NODE=B182

$\Sigma_b(6097)^-$

$J^P = ?^?$ Status: ∗∗∗

$\Sigma_b(6097)^-$ MASS

NODE=B182M

NODE=B182M

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{6098.0 \pm 1.7 \pm 0.5}$	[1] AAIJ	19A	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \to p K^- \pi^+$ decays. NODE=B182M;LINKAGE=A

$\Sigma_b(6097)^-$ WIDTH

NODE=B182W

NODE=B182W

	VALUE (MeV)	*DOCUMENT ID*	*TECN*	*COMMENT*
YOUR DATA	**28.9±4.2±0.9**	[1] AAIJ 19A	LHCB	pp at 7, 8 TeV

YOUR NOTE [1] Measured using the fully reconstructed $\Lambda_b^0 \to \Lambda_c^+ \pi^-$ and $\Lambda_c^+ \to p K^- \pi^+$ decays. NODE=B182W;LINKAGE=A

$\Sigma_b(6097)^-$ REFERENCES

NODE=B182

YOUR PAPER AAIJ 19A PRL 122 012001 R. Aaij *et al.* (LHCb Collab.) REFID=59550

Reference = ALVIS 18; PRL 120 211804
Verifier code = MASSARCZYK

PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

R. Massarczyk

EMAIL: massarczyk@lanl.gov

April 5, 2019

Dear Colleague,

(1) Please check the results of your experiment carefully. They are marked.

(2) Please reply within one week.

(3) Please reply even if everything is correct.

(4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.

(5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

LIMITS ON CHARGED PARTICLES IN COSMIC RAYS

NODE=S015435

Heavy Particle Flux in Cosmic Rays

NODE=S015F
NODE=S015F

VALUE ($cm^{-2}sr^{-1}s^{-1}$)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
			[1] ALVIS	18	MAJD	Fractionally charged
$< 1 \times 10^{-8}$	90	0	[2] AGNESE	15	CDM2	$Q = 1/6$
$\sim 6 \times 10^{-9}$		2	[3] SAITO	90		$Q \simeq 14$, $m \simeq 370 m_p$
$< 1.4 \times 10^{-12}$	90	0	[4] MINCER	85	CALO	$m \geq 1$ TeV
			[5] SAKUYAMA	83B	PLAS	$m \sim 1$ TeV
$< 1.7 \times 10^{-11}$	99	0	[6] BHAT	82	CC	
$< 1. \times 10^{-9}$	90	0	[7] MARINI	82	CNTR	$Q = 1$, $m \sim 4.5 m_p$
$2. \times 10^{-9}$		3	[8] YOCK	81	SPRK	$Q = 1$, $m \sim 4.5 m_p$
		3	[8] YOCK	81	SPRK	Fractionally charged
3.0×10^{-9}		3	[9] YOCK	80	SPRK	$m \sim 4.5\ m_p$
$(4 \pm 1) \times 10^{-11}$		3	GOODMAN	79	ELEC	$m \geq 5$ GeV
$< 1.3 \times 10^{-9}$	90		[10] BHAT	78	CNTR	$m > 1$ GeV
$< 1.0 \times 10^{-9}$		0	BRIATORE	76	ELEC	
$< 7. \times 10^{-10}$	90	0	YOCK	75	ELEC	$Q > 7e$ or $< -7e$
$> 6. \times 10^{-9}$		5	[11] YOCK	74	CNTR	$m > 6$ GeV
$< 3.0 \times 10^{-8}$		0	DARDO	72	CNTR	
$< 1.5 \times 10^{-9}$		0	TONWAR	72	CNTR	$m > 10$ GeV
$< 3.0 \times 10^{-10}$		0	BJORNBOE	68	CNTR	$m > 5$ GeV
$< 5.0 \times 10^{-11}$	90	0	JONES	67	ELEC	m=5–15 GeV

YOUR DATA

OCCUR=2

YOUR NOTE

[1] ALVIS 18 search for fractional charged flux of cosmic matter at Majorana demonstrator; no signal observed and limits are set on the flux of lightly ionizing particles for charge as low as e/1000. NODE=S015F;LINKAGE=J

[2] See AGNESE 15 Fig. 6 for limits extending down to Q = 1/200. NODE=S015F;LINKAGE=D

[3] SAITO 90 candidates carry about 450 MeV/nucleon. Cannot be accounted for by conventional backgrounds. Consistent with strange quark matter hypothesis. NODE=S015F;LINKAGE=K

[4] MINCER 85 is high statistics study of calorimeter signals delayed by 20–200 ns. Calibration with AGS beam shows they can be accounted for by rare fluctuations in signals from low-energy hadrons in the shower. Claim that previous delayed signals including BJORNBOE 68, DARDO 72, BHAT 82, SAKUYAMA 83B below may be due to this fake effect. NODE=S015F;LINKAGE=I

[5] SAKUYAMA 83B analyzed 6000 extended air shower events. Increase of delayed particles and change of lateral distribution above 10^{17} eV may indicate production of very heavy parent at top of atmosphere. NODE=S015F;LINKAGE=H

[6] BHAT 82 observed 12 events with delay $> 2. \times 10^{-8}$ s and with more than 40 particles. 1 eV has good hadron shower. However all events are delayed in only one of two detectors in cloud chamber, and could not be due to strongly interacting massive particle. NODE=S015F;LINKAGE=F

[7] MARINI 82 applied PEP-counter for TOF. Above limit is for velocity = 0.54 of light. Limit is inconsistent with YOCK 80 YOCK 81 events if isotropic dependence on zenith angle is assumed. NODE=S015F;LINKAGE=G

[8] YOCK 81 saw another 3 events with $Q = \pm 1$ and m about $4.5 m_p$ as well as 2 events with $m > 5.3 m_p$, $Q = \pm 0.75 \pm 0.05$ and $m > 2.8 m_p$, $Q = \pm 0.70 \pm 0.05$ and 1 event with $m = (9.3 \pm 3.) m_p$, $Q = \pm 0.89 \pm 0.06$ as possible heavy candidates. NODE=S015F;LINKAGE=E

[9] YOCK 80 events are with charge exactly or approximately equal to unity. NODE=S015F;LINKAGE=C

[10] BHAT 78 is at Kolar gold fields. Limit is for $\tau > 10^{-6}$ s. NODE=S015F;LINKAGE=B

[11] YOCK 74 events could be tritons. NODE=S015F;LINKAGE=A

REFERENCES FOR Other Particle Searches

NODE=S015

YOUR PAPER

ALVIS	18	PRL 120 211804	S.I. Alvis *et al.*	(MAJORANA Collab.)	REFID=58832
AGNESE	15	PRL 114 111302	R. Agnese *et al.*	(CDMS Collab.)	REFID=56445
SAITO	90	PRL 65 2094	T. Saito *et al.*	(ICRR, KOBE)	REFID=41713
MINCER	85	PR D32 541	A. Mincer *et al.*	(UMD, GMAS, NSF)	REFID=12660
SAKUYAMA	83B	LNC 37 17	H. Sakuyama, N. Suzuki	(MEIS)	REFID=12644
Also		LNC 36 389	H. Sakuyama, K. Watanabe	(MEIS)	REFID=12645
Also		NC 78A 147	H. Sakuyama, K. Watanabe	(MEIS)	REFID=12646
Also		NC 6C 371	H. Sakuyama, K. Watanabe	(MEIS)	REFID=12647
BHAT	82	PR D25 2820	P.N. Bhat *et al.*	(TATA)	REFID=12622
MARINI	82	PR D26 1777	A. Marini *et al.*	(FRAS, LBL, NWES, STAN+)	REFID=12625
YOCK	81	PR D23 1207	P.C.M. Yock	(AUCK)	REFID=12617
YOCK	80	PR D22 61	P.C.M. Yock	(AUCK)	REFID=12611
GOODMAN	79	PR D19 2572	J.A. Goodman *et al.*	(UMD)	REFID=12606
BHAT	78	PRAM 10 115	P.N. Bhat, P.V. Ramana Murthy	(TATA)	REFID=12591
BRIATORE	76	NC 31A 553	L. Briatore *et al.*	(LCGT, FRAS, FREIB)	REFID=12261
YOCK	75	NP B86 216	P.C.M. Yock	(AUCK, SLAC)	REFID=12575
YOCK	74	NP B76 175	P.C.M. Yock	(AUCK)	REFID=12569
DARDO	72	NC 9A 319	M. Dardo *et al.*	(TORI)	REFID=12281
TONWAR	72	JP A5 569	S.C. Tonwar, S. Naranan, B.V. Sreekantan	(TATA)	REFID=12283
BJORNBOE	68	NC B53 241	J. Bjornboe *et al.*	(BOHR, TATA, BERN+)	REFID=12303
JONES	67	PR 164 1584	L.W. Jones	(MICH, WISC, LBL, UCLA, MINN+)	REFID=12557

Reference	=	PORAYKO 18; PR D98 102002
Verifier code	=	PPTA

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Nataliya Porayako

EMAIL: nporayko@mpifr-bonn.mpg.de

April 5, 2019

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Sincerely,

Wei-Ming Yao
Lawrence Berkeley National Lab.
1 Cyclotron Road
Berkeley, CA 94720-8153
USA

PHONE: 1-(510)-486–5449
FAX: 1-(510)-486–4799
EMAIL: wmyao@lbl.gov

SEARCHES not in other sections

NODE=SXXX005

Other Particle Searches

NODE=S015

OMITTED FROM SUMMARY TABLE

GENERAL NEW PHYSICS SEARCHES

NODE=S015NPH

This subsection lists some of the search experiments which look for general signatures characteristic of new physics, independent of the framework of a specific model.

NODE=S015NPH

The observed events are compatible with Standard Model expectation, unless noted otherwise.

NODE=S015NPH

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
YOUR DATA	[1] PORAYKO	18	PPTA	pulsar timing search for fuzzy DM
	[2] AAD	15AT	ATLS	$t + \not\!\!E_T$
	[3] KHACHATRY...	15F	CMS	$t + \not\!\!E_T$
	[4] AALTONEN	14J	CDF	W + 2 jets
	[5] AAD	13A	ATLS	$W W \rightarrow \ell \nu \ell' \nu$
	[6] AAD	13C	ATLS	$\gamma + \not\!\!E_T$
	[7] AALTONEN	13I	CDF	Delayed $\gamma + \not\!\!E_T$
	[8] CHATRCHYAN	13	CMS	$\ell^+ \ell^-$ + jets + $\not\!\!E_T$
	[9] AAD	12C	ATLS	$t \overline{t} + \not\!\!E_T$
	[10] AALTONEN	12M	CDF	jet + $\not\!\!E_T$
	[11] CHATRCHYAN	12AP	CMS	jet + $\not\!\!E_T$
	[12] CHATRCHYAN	12Q	CMS	Z + jets + $\not\!\!E_T$
	[13] CHATRCHYAN	12T	CMS	$\gamma + \not\!\!E_T$
	[14] AAD	11S	ATLS	jet + $\not\!\!E_T$
	[15] AALTONEN	11AF	CDF	$\ell^{\pm} \ell^{\pm}$
	[16] CHATRCHYAN	11C	CMS	$\ell^+ \ell^-$ + jets + $\not\!\!E_T$
	[17] CHATRCHYAN	11U	CMS	jet + $\not\!\!E_T$
	[18] AALTONEN	10AF	CDF	$\gamma \gamma + \ell, \not\!\!E_T$
	[19] AALTONEN	09AF	CDF	$\ell \gamma b \not\!\!E_T$
	[20] AALTONEN	09G	CDF	$\ell \ell \ell \not\!\!E_T$

NODE=S015NPH

YOUR NOTE [1] PORAYKO 18 search for deviations in the residuals of pulsar timing data using PPTA; no signal; limits set on fuzzy DM with 3×10^{-24} <m(DM)< 2×10^{-22} eV.

NODE=S015NPH;LINKAGE=E

[2] AAD 15AT search for events with a top quark and mssing E_T in $p p$ collisions at $E_{\rm cm}$ = 8 TeV with L = 20.3 fb^{-1}.

NODE=S015NPH;LINKAGE=C

[3] KHACHATRYAN 15F search for events with a top quark and mssing E_T in $p p$ collisions at $E_{\rm cm}$ = 8 TeV with L = 19.7 fb^{-1}.

NODE=S015NPH;LINKAGE=D

[4] AALTONEN 14J examine events with a W and two jets in $p \overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV with L = 8.9 fb^{-1}. Invariant mass distributions of the two jets are consistent with the Standard Model expectation.

NODE=S015NPH;LINKAGE=B

[5] AAD 13A search for resonant $W W$ production in $p p$ collisions at $E_{\rm cm}$ = 7 TeV with L = 4.7 fb^{-1}.

NODE=S015NPH;LINKAGE=DD

[6] AAD 13C search for events with a photon and missing $\not\!\!E_T$ in $p p$ collisions at $E_{\rm cm}$ = 7 TeV with L = 4.6 fb^{-1}.

NODE=S015NPH;LINKAGE=GA

[7] AALTONEN 13I search for events with a photon and missing E_T, where the photon is detected after the expected timing, in $p \overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV with L = 6.3 fb^{-1}. The data are consistent with the Standard Model expectation.

NODE=S015NPH;LINKAGE=A

[8] CHATRCHYAN 13 search for events with an opposite-sign lepton pair, jets, and missing E_T in $p p$ collisions at $E_{\rm cm}$ = 7 TeV with L = 4.98 fb^{-1}.

NODE=S015NPH;LINKAGE=CY

[9] AAD 12C search for events with a $t \overline{t}$ pair and missing $\not\!\!E_T$ in $p p$ collisions at $E_{\rm cm}$ = 7 TeV with L = 1.04 fb^{-1}.

NODE=S015NPH;LINKAGE=DA

[10] AALTONEN 12M search for events with a jet and missing E_T in $p \overline{p}$ collisions at $E_{\rm cm}$ = 1.96 TeV with L = 6.7 fb^{-1}.

NODE=S015NPH;LINKAGE=AN

[11] CHATRCHYAN 12AP search for events with a jet and missing E_T in $p p$ collisions at $E_{\rm cm}$ = 7 TeV with L = 5.0 fb^{-1}.

NODE=S015NPH;LINKAGE=CC

[12] CHATRCHYAN 12Q search for events with a Z, jets, and missing $\not{E}_T$ in pp collisions at $E_{cm} = 7$ TeV with $L = 4.98$ fb^{-1}. NODE=S015NPH;LINKAGE=CT

[13] CHATRCHYAN 12T search for events with a photon and missing $\not{E}_T$ in pp collisions at $E_{cm} = 7$ TeV with $L = 5.0$ fb^{-1}. NODE=S015NPH;LINKAGE=CR

[14] AAD 11S search for events with one jet and missing E_T in pp collisions at $E_{cm} = 7$ TeV with $L = 33$ pb^{-1}. NODE=S015NPH;LINKAGE=AD

[15] AALTONEN 11AF search for high-p_T like-sign dileptons in $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV with $L = 6.1$ fb^{-1}. NODE=S015NPH;LINKAGE=AO

[16] CHATRCHYAN 11C search for events with an opposite-sign lepton pair, jets, and missing E_T in pp collisions at $E_{cm} = 7$ TeV with $L = 34$ pb^{-1}. NODE=S015NPH;LINKAGE=CA

[17] CHATRCHYAN 11U search for events with one jet and missing E_T in pp collisions at $E_{cm} = 7$ TeV with $L = 36$ pb^{-1}. NODE=S015NPH;LINKAGE=CH

[18] AALTONEN 10AF search for $\gamma\gamma$ events with e, μ, τ, or missing E_T in $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV with $L = 1.1$–2.0 fb^{-1}. NODE=S015NPH;LINKAGE=AT

[19] AALTONEN 09AF search for $\ell\gamma b$ events with missing E_T in $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV with $L = 1.9$ fb^{-1}. The observed events are compatible with Standard Model expectation including $t\bar{t}\gamma$ production. NODE=S015NPH;LINKAGE=AL

[20] AALTONEN 09G search for $\mu\mu\mu$ and $\mu\mu e$ events with missing E_T in $p\overline{p}$ collisions at $E_{cm} = 1.96$ TeV with $L = 976$ pb^{-1}. NODE=S015NPH;LINKAGE=AA

REFERENCES FOR Other Particle Searches

NODE=S015

YOUR PAPER	PORAYKO	18	PR D98 102002	N.K. Porayako *et al.*	(PPTA Collab.)	REFID=59488
	AAD	15AT	EPJ C75 79	G. Aad *et al.*	(ATLAS Collab.)	REFID=56661
	KHACHATRY...	15F	PRL 114 101801	V. Khachatryan *et al.*	(CMS Collab.)	REFID=56446
	AALTONEN	14J	PR D89 092001	T. Aaltonen *et al.*	(CDF Collab.)	REFID=56030
	AAD	13A	PL B718 860	G. Aad *et al.*	(ATLAS Collab.)	REFID=54789
	AAD	13C	PRL 110 011802	G. Aad *et al.*	(ATLAS Collab.)	REFID=54791
	AALTONEN	13I	PR D88 031103	T. Aaltonen *et al.*	(CDF Collab.)	REFID=55173
	CHATRCHYAN	13	PL B718 815	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54769
	AAD	12C	PRL 108 041805	G. Aad *et al.*	(ATLAS Collab.)	REFID=54080
	AALTONEN	12M	PRL 108 211804	T. Aaltonen *et al.*	(CDF Collab.)	REFID=54242
	CHATRCHYAN	12AP	JHEP 1209 094	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54572
	CHATRCHYAN	12Q	PL B716 260	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54184
	CHATRCHYAN	12T	PRL 108 261803	S. Chatrchyan *et al.*	(CMS Collab.)	REFID=54251
	AAD	11S	PL B705 294	G. Aad *et al.*	(ATLAS Collab.)	REFID=53851
	AALTONEN	11AF	PRL 107 181801	T. Aaltonen *et al.*	(CDF Collab.)	REFID=53833
	CHATRCHYAN	11C	JHEP 1106 026	S. Chatychyan *et al.*	(CMS Collab.)	REFID=16351
	CHATRCHYAN	11U	PRL 107 201804	S. Chatychyan *et al.*	(CMS Collab.)	REFID=53840
	AALTONEN	10AF	PR D82 052005	T. Aaltonen *et al.*	(CDF Collab.)	REFID=53618
	AALTONEN	09AF	PR D80 011102	T. Aaltonen *et al.*	(CDF Collab.)	REFID=52948
	AALTONEN	09G	PR D79 052004	T. Aaltonen *et al.*	(CDF Collab.)	REFID=52801