Reference = BHARDWAJ 16; PR D93 052016
Verifier code = BELLE

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PLEASE READ NOW

PLEASE REPLY WITHIN ONE WEEK

Karim Trabelsi

EMAIL: karim.trabelsi@kek.jp

March 20, 2017

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

Sincerely,

Simon Eidelman
BINP, Budker Inst. of Nuclear Physics
Prospekt Lavrent'eva 11
RU-630090 Novosibirsk
Russian Federation

EMAIL: simon.eidelman@cern.ch

$c\overline{c}$ MESONS

NODE=MXXX025

NODE=M176

$X(3872)$

$I^G(J^{PC}) = 0^+(1^{++})$

First observed by CHOI 03 in $B \to K\pi^+\pi^- J/\psi(1S)$ decays as a narrow peak in the invariant mass distribution of the $\pi^+\pi^- J/\psi(1S)$ final state. Isovector hypothesis excluded by AUBERT 05B and CHOI 11.

NODE=M176

AAIJ 13Q perform a full five-dimensional amplitude analysis of the angular correlations between the decay products in $B^+ \to X(3872) K^+$ decays, where $X(3872) \to J/\psi\pi^+\pi^-$ and $J/\psi \to \mu^+\mu^-$, which unambiguously gives the $J^{PC} = 1^{++}$ assignment under the assumption that the $\pi^+\pi^-$ and J/ψ are in an S-wave. AAIJ 15AO extend this analysis with more data to limit D-wave contributions to $< 4\%$ at 95% CL.

See our note on "Developments in Heavy Quarkonium Spectroscopy".

$X(3872)$ BRANCHING RATIOS

NODE=M176235

$\Gamma(\pi^+\pi^-\chi_{c1})/\Gamma_{total}$ **Γ_{15}/Γ**

NODE=M176R00
NODE=M176R00

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**not seen**	[1] BHARDWAJ	16	BELL	$B^+ \to \pi^+\pi^-\chi_{c1} K^+$

YOUR NOTE [1] BHARDWAJ 16 quotes $B(B^+ \to X(3872) K^+) \cdot B(X(3872) \to \pi^+\pi^-\chi_{c1}) < 1.5 \times 10^{-6}$ at 90% CL.

NODE=M176R00;LINKAGE=A

$X(3872)$ REFERENCES

NODE=M176

YOUR PAPER	BHARDWAJ	16	PR D93 052016	V. Bhardwaj *et al.*	(BELLE Collab.)	REFID=57272
	AAIJ	15AO	PR D92 011102	R. Aaij *et al.*	(LHCb Collab.)	REFID=56771
	AAIJ	13Q	PRL 110 222001	R. Aaij *et al.*	(LHCb Collab.) JP	REFID=54985
	CHOI	11	PR D84 052004	S.-K. Choi *et al.*	(BELLE Collab.)	REFID=53934
	AUBERT	05B	PR D71 031501	B. Aubert *et al.*	(BABAR Collab.)	REFID=50498
	CHOI	03	PRL 91 262001	S.-K. Choi *et al.*	(BELLE Collab.)	REFID=49628

Reference = SHEN 16; PR D93 112013
Verifier code = BELLE

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$b\overline{b}$ MESONS

NODE=MXXX030

NODE=M049

$\Upsilon(1S)$

$I^G(J^{PC}) = 0^-(1^{--})$

$\Upsilon(1S)$ BRANCHING RATIOS

NODE=M049225

$\Gamma(J/\psi(1S)\text{ anything})/\Gamma_{\text{total}}$ Γ_7/Γ

NODE=M049R12
NODE=M049R12

	VALUE (units 10^{-4})	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
	5.4 ±0.4 OUR AVERAGE Error includes scale factor of 1.5.						
YOUR DATA	5.25±0.13±0.25		3k	SHEN	16	BELL	$e^+e^- \to J/\psi X$
	6.4 ±0.4 ±0.6		730	BRIERE	04	CLEO	$e^+e^- \to J/\psi X$
	11 ±4 ±2			[14] FULTON	89	CLEO	$e^+e^- \to \mu^+\mu^- X$
	• • • We do not use the following data for averages, fits, limits, etc. • • •						
	<6.8	90		ALBRECHT	92J	ARG	$e^+e^- \to e^+e^- X$, $\mu^+\mu^- X$
	<17	90		MASCHMANN	90	CBAL	$e^+e^- \to$ hadrons
	<200	90		NICZYPORUK	83	LENA	

[14] Using $B((J/\psi) \to \mu^+\mu^-) = (6.9 \pm 0.9)\%$.

NODE=M049R12;LINKAGE=K

$\Gamma(X(4350)\text{ anything}, X \to J/\psi(1S)\phi)/\Gamma_{\text{total}}$ Γ_{15}/Γ

NODE=M049P05
NODE=M049P05

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<8.1 × 10^{-6}**	90	SHEN	16	BELL	$\Upsilon(1S) \to J/\psi K^+K^- X$

$\Gamma(X(3900)^{\pm}\text{ anything}, X \to J/\psi(1S)\pi^{\pm})/\Gamma_{\text{total}}$ Γ_{16}/Γ

NODE=M049P06
NODE=M049P06

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<1.3 × 10^{-5}**	90	SHEN	16	BELL	$\Upsilon(1S) \to J/\psi\pi^{\pm} X$

$\Gamma(X(4200)^{\pm}\text{ anything}, X \to J/\psi(1S)\pi^{\pm})/\Gamma_{\text{total}}$ Γ_{17}/Γ

NODE=M049P07
NODE=M049P07

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<6.0 × 10^{-5}**	90	SHEN	16	BELL	$\Upsilon(1S) \to J/\psi\pi^{\pm} X$

$\Gamma(X(4430)^{\pm}\text{ anything}, X \to J/\psi(1S)\pi^{\pm})/\Gamma_{\text{total}}$ Γ_{18}/Γ

NODE=M049P08
NODE=M049P08

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<4.9 × 10^{-5}**	90	SHEN	16	BELL	$\Upsilon(1S) \to J/\psi\pi^{\pm} X$

$\Gamma(X_{cs}^{\pm}\text{ anything}, X \to J/\psi K^{\pm})/\Gamma_{\text{total}}$ Γ_{19}/Γ

NODE=M049P11
NODE=M049P11

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<5.7 × 10^{-6}**	90	SHEN	16	BELL	$\Upsilon(1S) \to J/\psi K^- X$

$\Gamma(X(3872)\text{ anything}, X \to J/\psi(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{20}/Γ

NODE=M049R00
NODE=M049R00

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<9.5 × 10^{-6}**	90	SHEN	16	BELL	$\Upsilon(1S) \to J/\psi\pi^+\pi^- X$

$\Gamma(X(4260)\text{ anything}, X \to J/\psi(1S)\pi^+\pi^-)/\Gamma_{\text{total}}$ Γ_{21}/Γ

NODE=M049R99
NODE=M049R99

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<3.8 × 10^{-5}**	90	SHEN	16	BELL	$\Upsilon(1S) \to J/\psi\pi^+\pi^- X$

$\Gamma(X(4260)\text{ anything}, X \to J/\psi(1S)K^+K^-)/\Gamma_{\text{total}}$ Γ_{22}/Γ

NODE=M049P03
NODE=M049P03

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<7.5 × 10^{-6}**	90	SHEN	16	BELL	$\Upsilon(1S) \to J/\psi K^+K^- X$

$\Gamma(X(4140)\text{ anything}, X \to J/\psi(1S)\phi)/\Gamma_{\text{total}}$ Γ_{23}/Γ

NODE=M049P04
NODE=M049P04

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**<5.2 × 10^{-6}**	90	SHEN	16	BELL	$\Upsilon(1S) \to J/\psi K^+K^- X$

$\Gamma(\psi(2S)\text{ anything})/\Gamma_{\text{total}}$ Γ_{27}/Γ

NODE=M049P12
NODE=M049P12

	VALUE (units 10^{-4})	EVTS	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**1.23±0.17±0.11**	215	SHEN	16	BELL	$e^+e^- \to \psi(2S) X$

$\Gamma\big(X(4260)$ anything, $X \to \psi(2S)\pi^+\pi^-\big)/\Gamma_{total}$ Γ_{35}/Γ

NODE=M049P00
NODE=M049P00

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**$<7.9 \times 10^{-5}$**	90	SHEN	16	BELL	$\Upsilon(1S) \to \psi(2S)\pi^+\pi^- X$

$\Gamma\big(X(4360)$ anything, $X \to \psi(2S)\pi^+\pi^-\big)/\Gamma_{total}$ Γ_{36}/Γ

NODE=M049P01
NODE=M049P01

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**$<5.2 \times 10^{-5}$**	90	SHEN	16	BELL	$\Upsilon(1S) \to \psi(2S)\pi^+\pi^- X$

$\Gamma\big(X(4660)$ anything, $X \to \psi(2S)\pi^+\pi^-\big)/\Gamma_{total}$ Γ_{37}/Γ

NODE=M049P02
NODE=M049P02

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**$<2.2 \times 10^{-5}$**	90	SHEN	16	BELL	$\Upsilon(1S) \to \psi(2S)\pi^+\pi^- X$

$\Gamma\big(X(4050)^\pm$ anything, $X \to \psi(2S)\pi^\pm\big)/\Gamma_{total}$ Γ_{38}/Γ

NODE=M049P09
NODE=M049P09

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**$<8.8 \times 10^{-5}$**	90	SHEN	16	BELL	$\Upsilon(1S) \to \psi(2S)\pi^\pm X$

$\Gamma\big(X(4430)^\pm$ anything, $X \to \psi(2S)\pi^\pm\big)/\Gamma_{total}$ Γ_{39}/Γ

NODE=M049P10
NODE=M049P10

	VALUE	CL%	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**$<6.7 \times 10^{-5}$**	90	SHEN	16	BELL	$\Upsilon(1S) \to \psi(2S)\pi^\pm X$

$\Upsilon(1S)$ REFERENCES

NODE=M049

YOUR PAPER	SHEN	16	PR D93 112013	C.P. Shen *et al.*	(BELLE Collab.)	REFID=57515
	BRIERE	04	PR D70 072001	R.A. Briere *et al.*	(CLEO Collab.)	REFID=50183
	ALBRECHT	92J	ZPHY C55 25	H. Albrecht *et al.*	(ARGUS Collab.)	REFID=42167
	MASCHMANN	90	ZPHY C46 555	W.S. Maschmann *et al.*	(Crystal Ball Collab.)	REFID=41224
	FULTON	89	PL B224 445	R. Fulton *et al.*	(CLEO Collab.)	REFID=40918
	NICZYPORUK	83	ZPHY C17 197	B. Niczyporuk *et al.*	(LENA Collab.)	REFID=12488

Reference = GARMASH 16; PRL 116 212001
Verifier code = BELLE

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$b\overline{b}$ MESONS

NODE=MXXX030

NODE=M207

$X(10610)^{\pm}$

$I^G(J^P) = 1^+(1^+)$

Observed by BONDAR 12 in $\Upsilon(5S)$ decays to $\Upsilon(nS)\pi^+\pi^-$ (n = 1, 2, 3) and $h_b(mP)\pi^+\pi^-$ (m = 1, 2). $J^P = 1^+$ is favored from angular analyses. Isospin = 1 is favored due to observation by KROKOVNY 13 of a corresponding neutral state produced in $\Upsilon(10860) \to \Upsilon(2S)/\Upsilon(3S)\pi^0\pi^0$ decays at a consistent mass.

NODE=M207

$X(10610)^{\pm}$ BRANCHING RATIOS

NODE=M207225

$\Gamma(\Upsilon(1S)\pi^+)/\Gamma_{total}$ — Γ_1/Γ

NODE=M207R01
NODE=M207R01

	VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{5.4^{+1.6+1.1}_{-1.3-0.8}}$	[7] GARMASH	16	BELL	$e^+e^- \to \pi^- B^+ \overline{B}^{*0}$, $\pi^- \overline{B}^0 B^{*+}$

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

seen	GARMASH	15	BELL	$e^+e^- \to \Upsilon(1S)\pi^+\pi^-$
seen	BONDAR	12	BELL	$e^+e^- \to \Upsilon(1S)\pi^+\pi^-$

YOUR NOTE [7] Assuming the $X(10610)^{\pm}$ decay width is saturated by the channels $\pi^+\Upsilon(1S, 2S, 3S)$, $\pi^+ h_b(1P, 2P)$, and $B^+\overline{B}^{*0} + \overline{B}^0 B^{*+}$, and using the results from BONDAR 12 and MIZUK 16.

NODE=M207R01;LINKAGE=A

$\Gamma(\Upsilon(2S)\pi^+)/\Gamma_{total}$ — Γ_2/Γ

NODE=M207R02
NODE=M207R02

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{3.62^{+0.76+0.79}_{-0.59-0.53}}$	[8] GARMASH	16	BELL	$e^+e^- \to \pi^- B^+ \overline{B}^{*0}$, $\pi^- \overline{B}^0 B^{*+}$

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

seen	GARMASH	15	BELL	$e^+e^- \to \Upsilon(2S)\pi^+\pi^-$
seen	BONDAR	12	BELL	$e^+e^- \to \Upsilon(2S)\pi^+\pi^-$

YOUR NOTE [8] Assuming the $X(10610)^{\pm}$ decay width is saturated by the channels $\pi^+\Upsilon(1S, 2S, 3S)$, $\pi^+ h_b(1P, 2P)$, and $B^+\overline{B}^{*0} + \overline{B}^0 B^{*+}$, and using the results from BONDAR 12 and MIZUK 16.

NODE=M207R02;LINKAGE=A

$\Gamma(\Upsilon(3S)\pi^+)/\Gamma_{total}$ — Γ_3/Γ

NODE=M207R03
NODE=M207R03

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{2.15^{+0.55+0.60}_{-0.42-0.43}}$	[9] GARMASH	16	BELL	$e^+e^- \to \pi^- B^+ \overline{B}^{*0}$, $\pi^- \overline{B}^0 B^{*+}$

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

seen	GARMASH	15	BELL	$e^+e^- \to \Upsilon(3S)\pi^+\pi^-$
seen	BONDAR	12	BELL	$e^+e^- \to \Upsilon(3S)\pi^+\pi^-$

YOUR NOTE [9] Assuming the $X(10610)^{\pm}$ decay width is saturated by the channels $\pi^+\Upsilon(1S, 2S, 3S)$, $\pi^+ h_b(1P, 2P)$, and $B^+\overline{B}^{*0} + \overline{B}^0 B^{*+}$, and using the results from BONDAR 12 and MIZUK 16.

NODE=M207R03;LINKAGE=A

$\Gamma(h_b(1P)\pi^+)/\Gamma_{total}$ — Γ_4/Γ

NODE=M207R04
NODE=M207R04

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{3.45^{+0.87+0.86}_{-0.71-0.63}}$	[10] GARMASH	16	BELL	$e^+e^- \to \pi^- B^+ \overline{B}^{*0}$, $\pi^- \overline{B}^0 B^{*+}$

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

possibly seen	[11] MIZUK	16	BELL	$e^+e^- \to h_b(1P)\pi^+\pi^-$
seen	[12] BONDAR	12	BELL	$e^+e^- \to h_b(1P)\pi^+\pi^-$

YOUR NOTE [10] Assuming the $X(10610)^{\pm}$ decay width is saturated by the channels $\pi^+\Upsilon(1S, 2S, 3S)$, $\pi^+ h_b(1P, 2P)$, and $B^+\overline{B}^{*0} + \overline{B}^0 B^{*+}$, and using the results from BONDAR 12 and MIZUK 16.

NODE=M207R04;LINKAGE=C

[11] Using e^+e^- energies near the $\Upsilon(11020)$.

NODE=M207R04;LINKAGE=A

[12] Using e^+e^- energies near the $\Upsilon(10860)$.

NODE=M207R04;LINKAGE=B

$\Gamma(h_b(2P)\pi^+)/\Gamma_{total}$ — Γ_5/Γ

NODE=M207R05

	VALUE (units 10^{-2})	DOCUMENT ID	TECN	COMMENT
YOUR DATA	$\mathbf{4.67^{+1.24+1.18}_{-1.00-0.89}}$	[13] GARMASH 16	BELL	$e^+e^- \to \pi^- B^+ \overline{B}^{*0}$, $\pi^- \overline{B}^0 B^{*+}$
	• • • We do not use the following data for averages, fits, limits, etc. • • •			
	possibly seen	[14] MIZUK 16	BELL	$e^+e^- \to h_b(2P)\pi^+\pi^-$
	seen	[15] BONDAR 12	BELL	$e^+e^- \to h_b(2P)\pi^+\pi^-$

YOUR NOTE [13] Assuming the $X(10610)^\pm$ decay width is saturated by the channels $\pi^+\Upsilon(1S,2S,3S)$, $\pi^+ h_b(1P,2P)$, and $B^+\overline{B}^{*0} + \overline{B}^0 B^{*+}$, and using the results from BONDAR 12 and MIZUK 16. NODE=M207R05;LINKAGE=C

[14] Using e^+e^- energies near the $\Upsilon(11020)$. NODE=M207R05;LINKAGE=A

[15] Using e^+e^- energies near the $\Upsilon(10860)$. NODE=M207R05;LINKAGE=B

$\Gamma(B^+\overline{B}^0)/\Gamma_{total}$ — Γ_6/Γ

NODE=M207R08

	VALUE	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**not seen**	GARMASH 16	BELL	$e^+e^- \to \pi^- B^+ \overline{B}^0$

$\left[\Gamma(B^+\overline{B}^{*0}) + \Gamma(B^{*+}\overline{B}^0)\right]/\Gamma_{total}$ — Γ_7/Γ

NODE=M207R00

	VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
YOUR DATA	$\mathbf{85.6^{+1.5+1.5}_{-2.0-2.1}}$	357	[16] GARMASH 16	BELL	$e^+e^- \to \pi^- B^+ \overline{B}^{*0}$, $\pi^- B^{*+} \overline{B}^0$

YOUR NOTE [16] Assuming the $X(10610)^\pm$ decay width is saturated by the channels $\pi^+\Upsilon(1S,2S,3S)$, $\pi^+ h_b(1P,2P)$, and $B^+\overline{B}^{*0} + B^{*+}\overline{B}^0$, and using the results from BONDAR 12 and MIZUK 16. Using the mass and width of the $X(10610)^\pm$ from BONDAR 12. NODE=M207R00;LINKAGE=A

$\Gamma(B^{*+}\overline{B}^{*0})/\Gamma_{total}$ — Γ_8/Γ

NODE=M207R06

	VALUE	DOCUMENT ID	TECN	COMMENT
YOUR DATA	**not seen**	GARMASH 16	BELL	$e^+e^- \to \pi^- B^{*+} \overline{B}^{*0}$

$\left[\Gamma(B^+\overline{B}^{*0}) + \Gamma(B^{*+}\overline{B}^0)\right]/\left[\Gamma(\Upsilon(1S)\pi^+) + \Gamma(\Upsilon(2S)\pi^+) + \Gamma(\Upsilon(3S)\pi^+) + \Gamma(h_b(1P)\pi^+) + \Gamma(h_b(2P)\pi^+)\right]$ — $\Gamma_7/(\Gamma_1+\Gamma_2+\Gamma_3+\Gamma_4+\Gamma_5)$

NODE=M207R07

	VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
YOUR DATA	$5.93^{+0.99+1.01}_{-0.69-0.73}$	357	[17] GARMASH 16	BELL	$e^+e^- \to \pi^- B^+ \overline{B}^{*0}$, $\pi^- \overline{B}^0 B^{*+}$

YOUR NOTE [17] Combined with the results of BONDAR 12 and MIZUK 16. Not independent from $X(10610)^\pm$ branching fractions to $\pi^+\Upsilon(1S,2S,3S)$, $\pi^+ h_b(1P,2P)$, and $B^+\overline{B}^{*0} + \overline{B}^0 B^{*+}$. NODE=M207R07;LINKAGE=A

$X(10610)^\pm$ REFERENCES

NODE=M207

YOUR PAPER

GARMASH	16	PRL 116 212001	A. Garmash *et al.*	(BELLE Collab.)	REFID=57446
MIZUK	16	PRL 117 142001	R. Mizuk *et al.*	(BELLE Collab.)	REFID=57465
GARMASH	15	PR D91 072003	A. Garmash *et al.*	(BELLE Collab.)	REFID=56811
KROKOVNY	13	PR D88 052016	P. Krokovny *et al.*	(BELLE Collab.)	REFID=55588
BONDAR	12	PRL 108 122001	A. Bondar *et al.*	(BELLE Collab.)	REFID=53963

NODE=M208

$X(10650)^\pm$

$I^G(J^P) = ?^+(1^+)$

OMITTED FROM SUMMARY TABLE

Observed by BONDAR 12 in $\Upsilon(5S)$ decays to $\Upsilon(\mathrm{nS})\pi^+\pi^-$ (n = 1, 2, 3) and $h_b(\mathrm{mP})\pi^+\pi^-$ (m = 1, 2). $J^P = 1^+$ is favored from angular analyses. NODE=M208

$X(10650)^\pm$ BRANCHING RATIOS

NODE=M208225

$\Gamma(\Upsilon(1S)\pi^+)/\Gamma_{total}$ — Γ_1/Γ

NODE=M208R01

	VALUE (units 10^{-3})	DOCUMENT ID	TECN	COMMENT
YOUR DATA	$\mathbf{1.7^{+0.7+0.3}_{-0.6-0.2}}$	[7] GARMASH 16	BELL	$e^+e^- \to \pi^- B^{*+} \overline{B}^{*0}$
	• • • We do not use the following data for averages, fits, limits, etc. • • •			
	seen	GARMASH 15	BELL	$e^+e^- \to \Upsilon(1S)\pi^+\pi^-$
	seen	BONDAR 12	BELL	$e^+e^- \to \Upsilon(1S)\pi^+\pi^-$

YOUR NOTE [7] Assuming the $X(10650)^{\pm}$ decay width is saturated by the channels $\pi^+ \Upsilon(1S, 2S, 3S)$, $\pi^+ h_b(1P, 2P)$, and $B^{*+} \overline{B}^{*0}$, and using the results from BONDAR 12 and MIZUK 16. NODE=M208R01;LINKAGE=A

$\Gamma(\Upsilon(2S)\pi^+)/\Gamma_{total}$ Γ_2/Γ

NODE=M208R02
NODE=M208R02

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{1.39^{+0.48+0.34}_{-0.38-0.23}}$	[8] GARMASH	16		$e^+ e^- \to \pi^- B^{*+} \overline{B}^{*0}$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	seen	GARMASH	15	BELL	$e^+ e^- \to \Upsilon(2S)\pi^+\pi^-$
	seen	BONDAR	12	BELL	$e^+ e^- \to \Upsilon(2S)\pi^+\pi^-$

YOUR NOTE [8] Assuming the $X(10650)^{\pm}$ decay width is saturated by the channels $\pi^+ \Upsilon(1S, 2S, 3S)$, $\pi^+ h_b(1P, 2P)$, and $B^{*+} \overline{B}^{*0}$, and using the results from BONDAR 12 and MIZUK 16. NODE=M208R02;LINKAGE=A

$\Gamma(\Upsilon(3S)\pi^+)/\Gamma_{total}$ Γ_3/Γ

NODE=M208R03
NODE=M208R03

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{1.63^{+0.53+0.39}_{-0.42-0.28}}$	[9] GARMASH	16	BELL	$e^+ e^- \to \pi^- B^{*+} \overline{B}^{*0}$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	seen	GARMASH	15	BELL	$e^+ e^- \to \Upsilon(3S)\pi^+\pi^-$
	seen	BONDAR	12	BELL	$e^+ e^- \to \Upsilon(3S)\pi^+\pi^-$

YOUR NOTE [9] Assuming the $X(10650)^{\pm}$ decay width is saturated by the channels $\pi^+ \Upsilon(1S, 2S, 3S)$, $\pi^+ h_b(1P, 2P)$, and $B^{*+} \overline{B}^{*0}$, and using the results from BONDAR 12 and MIZUK 16. NODE=M208R03;LINKAGE=A

$\Gamma(h_b(1P)\pi^+)/\Gamma_{total}$ Γ_4/Γ

NODE=M208R04
NODE=M208R04

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{8.41^{+2.43+1.49}_{-2.12-1.06}}$	[10] GARMASH	16	BELL	$e^+ e^- \to \pi^- B^{*+} \overline{B}^{*0}$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	seen	[11] MIZUK	16	BELL	$e^+ e^- \to h_b(1P)\pi^+\pi^-$
	seen	[12] BONDAR	12	BELL	$e^+ e^- \to h_b(1P)\pi^+\pi^-$

YOUR NOTE [10] Assuming the $X(10650)^{\pm}$ decay width is saturated by the channels $\pi^+ \Upsilon(1S, 2S, 3S)$, $\pi^+ h_b(1P, 2P)$, and $B^{*+} \overline{B}^{*0}$, and using the results from BONDAR 12 and MIZUK 16. NODE=M208R04;LINKAGE=C

[11] Using $e^+ e^-$ energies near the $\Upsilon(11020)$. NODE=M208R04;LINKAGE=A

[12] Using $e^+ e^-$ energies near the $\Upsilon(10860)$. NODE=M208R04;LINKAGE=B

$\Gamma(h_b(2P)\pi^+)/\Gamma_{total}$ Γ_5/Γ

NODE=M208R05
NODE=M208R05

	VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{14.7^{+3.2+2.8}_{-2.8-2.3}}$	[13] GARMASH	16	BELL	$e^+ e^- \to \pi^- B^{*+} \overline{B}^{*0}$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
	possibly seen	[14] MIZUK	16	BELL	$e^+ e^- \to h_b(2P)\pi^+\pi^-$
	seen	[15] BONDAR	12	BELL	$e^+ e^- \to h_b(2P)\pi^+\pi^-$

YOUR NOTE [13] Assuming the $X(10650)^{\pm}$ decay width is saturated by the channels $\pi^+ \Upsilon(1S, 2S, 3S)$, $\pi^+ h_b(1P, 2P)$, and $B^{*+} \overline{B}^{*0}$, and using the results from BONDAR 12 and MIZUK 16. NODE=M208R05;LINKAGE=C

[14] Using $e^+ e^-$ energies near the $\Upsilon(11020)$. NODE=M208R05;LINKAGE=A

[15] Using $e^+ e^-$ energies near the $\Upsilon(10860)$. NODE=M208R05;LINKAGE=B

$\Gamma(B^+ \overline{B}^0)/\Gamma_{total}$ Γ_6/Γ

NODE=M208R08
NODE=M208R08

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**not seen**	GARMASH	16	BELL	$e^+ e^- \to \pi^- B^+ \overline{B}^0$

$\left[\Gamma(B^+ \overline{B}^{*0}) + \Gamma(B^{*+} \overline{B}^0)\right]/\Gamma_{total}$ Γ_7/Γ

NODE=M208R00
NODE=M208R00

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**not seen**	GARMASH	16	BELL	$e^+ e^- \to \pi^- B^+ \overline{B}^{*0}$, $\pi^- \overline{B}^0 B^{*+}$

$\Gamma(B^{*+} \overline{B}^{*0})/\Gamma_{total}$ Γ_8/Γ

NODE=M208R06
NODE=M208R06

	VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
YOUR DATA	$\mathbf{73.7^{+3.4+2.7}_{-4.4-3.5}}$	161	[16] GARMASH	16	BELL	$e^+ e^- \to \pi^- B^{*+} \overline{B}^{*0}$

YOUR NOTE [16] Assuming the $X(10650)^{\pm}$ decay width is saturated by the channels $\pi^+ \Upsilon(1S, 2S, 3S)$, $\pi^+ h_b(1P, 2P)$, and $B^{*+} \overline{B}^{*0}$, and using the results from BONDAR 12 and MIZUK 16. Using the mass and width of the $X(10650)^{\pm}$ from BONDAR 12. NODE=M208R06;LINKAGE=A

$\Gamma\big(B^{*+}\overline{B}^{*0}\big)/\big[\Gamma\big(\Upsilon(1S)\pi^+\big)+\Gamma\big(\Upsilon(2S)\pi^+\big)+\Gamma\big(\Upsilon(3S)\pi^+\big)+\Gamma\big(h_b(1P)\pi^+\big)+\Gamma\big(h_b(2P)\pi^+\big)\big]$ $\Gamma_8/(\Gamma_1+\Gamma_2+\Gamma_3+\Gamma_4+\Gamma_5)$

NODE=M208R07

NODE=M208R07

	VALUE (units 10^{-2})	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
YOUR DATA	$2.80^{+0.69}_{-0.40}{}^{+0.54}_{-0.36}$	161	[17] GARMASH 16	BELL	$e^+e^- \to \pi^- B^{*+}\overline{B}^{*0}$

YOUR NOTE [17] Combined with the results of BONDAR 12 and MIZUK 16. Not independent from $X(10650)^{\pm}$ branching fractions to $\pi^+\Upsilon(1S,2S,3S)$, $\pi^+ h_b(1P,2P)$, and $B^{*+}\overline{B}^{*0}$.

NODE=M208R07;LINKAGE=A

$X(10650)^{\pm}$ REFERENCES

NODE=M208

YOUR PAPER GARMASH 16 PRL 116 212001 A. Garmash *et al.* (BELLE Collab.) REFID=57446
MIZUK 16 PRL 117 142001 R. Mizuk *et al.* (BELLE Collab.) REFID=57465
GARMASH 15 PR D91 072003 A. Garmash *et al.* (BELLE Collab.) REFID=56811
BONDAR 12 PRL 108 122001 A. Bondar *et al.* (BELLE Collab.) REFID=53963

Reference = MIZUK 16; PRL 117 142001
Verifier code = BELLE

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis co-ordinator, 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

Karim Trabelsi

EMAIL: karim.trabelsi@kek.jp

March 20, 2017

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,

Simon Eidelman
BINP, Budker Inst. of Nuclear Physics
Prospekt Lavrent'eva 11
RU-630090 Novosibirsk
Russian Federation

EMAIL: simon.eidelman@cern.ch

$b\overline{b}$ MESONS

NODE=MXXX030

NODE=M207

$X(10610)^{\pm}$

$I^G(J^P) = 1^+(1^+)$

Observed by BONDAR 12 in $\Upsilon(5S)$ decays to $\Upsilon(nS)\pi^+\pi^-$ (n = 1, 2, 3) and $h_b(mP)\pi^+\pi^-$ (m = 1, 2). $J^P = 1^+$ is favored from angular analyses. Isospin = 1 is favored due to observation by KROKOVNY 13 of a corresponding neutral state produced in $\Upsilon(10860) \to \Upsilon(2S)/\Upsilon(3S)\pi^0\pi^0$ decays at a consistent mass.

NODE=M207

$X(10610)^{\pm}$ BRANCHING RATIOS

NODE=M207225

$\Gamma(h_b(1P)\pi^+)/\Gamma_{total}$ **Γ_4/Γ**

NODE=M207R04
NODE=M207R04

	VALUE (units 10^{-2})	*DOCUMENT ID*		*TECN*	*COMMENT*
	$\mathbf{3.45^{+0.87+0.86}_{-0.71-0.63}}$	[10] GARMASH	16	BELL	$e^+e^- \to \pi^- B^+ \overline{B}^{*0}$, $\pi^- \overline{B}^0 B^{*+}$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
YOUR DATA	possibly seen	[11] MIZUK	16	BELL	$e^+e^- \to h_b(1P)\pi^+\pi^-$
	seen	[12] BONDAR	12	BELL	$e^+e^- \to h_b(1P)\pi^+\pi^-$

[10] Assuming the $X(10610)^{\pm}$ decay width is saturated by the channels $\pi^+\Upsilon(1S,2S,3S)$, $\pi^+ h_b(1P,2P)$, and $B^+\overline{B}^{*0} + \overline{B}^0 B^{*+}$, and using the results from BONDAR 12 and MIZUK 16.
NODE=M207R04;LINKAGE=C

YOUR NOTE [11] Using e^+e^- energies near the $\Upsilon(11020)$.
NODE=M207R04;LINKAGE=A

[12] Using e^+e^- energies near the $\Upsilon(10860)$.
NODE=M207R04;LINKAGE=B

$\Gamma(h_b(2P)\pi^+)/\Gamma_{total}$ **Γ_5/Γ**

NODE=M207R05
NODE=M207R05

	VALUE (units 10^{-2})	*DOCUMENT ID*		*TECN*	*COMMENT*
	$\mathbf{4.67^{+1.24+1.18}_{-1.00-0.89}}$	[13] GARMASH	16	BELL	$e^+e^- \to \pi^- B^+ \overline{B}^{*0}$, $\pi^- \overline{B}^0 B^{*+}$
	• • • We do not use the following data for averages, fits, limits, etc. • • •				
YOUR DATA	possibly seen	[14] MIZUK	16	BELL	$e^+e^- \to h_b(2P)\pi^+\pi^-$
	seen	[15] BONDAR	12	BELL	$e^+e^- \to h_b(2P)\pi^+\pi^-$

[13] Assuming the $X(10610)^{\pm}$ decay width is saturated by the channels $\pi^+\Upsilon(1S,2S,3S)$, $\pi^+ h_b(1P,2P)$, and $B^+\overline{B}^{*0} + \overline{B}^0 B^{*+}$, and using the results from BONDAR 12 and MIZUK 16.
NODE=M207R05;LINKAGE=C

YOUR NOTE [14] Using e^+e^- energies near the $\Upsilon(11020)$.
NODE=M207R05;LINKAGE=A

[15] Using e^+e^- energies near the $\Upsilon(10860)$.
NODE=M207R05;LINKAGE=B

$X(10610)^{\pm}$ REFERENCES

NODE=M207

	GARMASH	16	PRL 116 212001	A. Garmash *et al.*	(BELLE Collab.)	REFID=57446
YOUR PAPER	MIZUK	16	PRL 117 142001	R. Mizuk *et al.*	(BELLE Collab.)	REFID=57465
	KROKOVNY	13	PR D88 052016	P. Krokovny *et al.*	(BELLE Collab.)	REFID=55588
	BONDAR	12	PRL 108 122001	A. Bondar *et al.*	(BELLE Collab.)	REFID=53963

NODE=M208

$X(10650)^{\pm}$

$I^G(J^P) = ?^+(1^+)$

OMITTED FROM SUMMARY TABLE

Observed by BONDAR 12 in $\Upsilon(5S)$ decays to $\Upsilon(nS)\pi^+\pi^-$ (n = 1, 2, 3) and $h_b(mP)\pi^+\pi^-$ (m = 1, 2). $J^P = 1^+$ is favored from angular analyses.

NODE=M208

$X(10650)^{\pm}$ BRANCHING RATIOS

NODE=M208225

$\Gamma(h_b(1P)\pi^+)/\Gamma_{total}$ — Γ_4/Γ

NODE=M208R04
NODE=M208R04

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
$8.41^{+2.43+1.49}_{-2.12-1.06}$	[10] GARMASH	16	BELL	$e^+e^- \to \pi^- B^{*+}\overline{B}^{*0}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	[11] MIZUK	16	BELL	$e^+e^- \to h_b(1P)\pi^+\pi^-$
seen	[12] BONDAR	12	BELL	$e^+e^- \to h_b(1P)\pi^+\pi^-$

YOUR DATA

[10] Assuming the $X(10650)^\pm$ decay width is saturated by the channels $\pi^+ \Upsilon(1S, 2S, 3S)$, $\pi^+ h_b(1P, 2P)$, and $B^{*+}\overline{B}^{*0}$, and using the results from BONDAR 12 and MIZUK 16. NODE=M208R04;LINKAGE=C

YOUR NOTE

[11] Using e^+e^- energies near the $\Upsilon(11020)$. NODE=M208R04;LINKAGE=A

[12] Using e^+e^- energies near the $\Upsilon(10860)$. NODE=M208R04;LINKAGE=B

$\Gamma(h_b(2P)\pi^+)/\Gamma_{total}$ — Γ_5/Γ

NODE=M208R05
NODE=M208R05

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
$14.7^{+3.2+2.8}_{-2.8-2.3}$	[13] GARMASH	16	BELL	$e^+e^- \to \pi^- B^{*+}\overline{B}^{*0}$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
possibly seen	[14] MIZUK	16	BELL	$e^+e^- \to h_b(2P)\pi^+\pi^-$
seen	[15] BONDAR	12	BELL	$e^+e^- \to h_b(2P)\pi^+\pi^-$

YOUR DATA

[13] Assuming the $X(10650)^\pm$ decay width is saturated by the channels $\pi^+ \Upsilon(1S, 2S, 3S)$, $\pi^+ h_b(1P, 2P)$, and $B^{*+}\overline{B}^{*0}$, and using the results from BONDAR 12 and MIZUK 16. NODE=M208R05;LINKAGE=C

YOUR NOTE

[14] Using e^+e^- energies near the $\Upsilon(11020)$. NODE=M208R05;LINKAGE=A

[15] Using e^+e^- energies near the $\Upsilon(10860)$. NODE=M208R05;LINKAGE=B

$X(10650)^\pm$ REFERENCES

NODE=M208

YOUR PAPER

GARMASH	16	PRL 116 212001	A. Garmash *et al.*	(BELLE Collab.)
MIZUK	16	PRL 117 142001	R. Mizuk *et al.*	(BELLE Collab.)
BONDAR	12	PRL 108 122001	A. Bondar *et al.*	(BELLE Collab.)

REFID=57446
REFID=57465
REFID=53963
NODE=M092

$\Upsilon(10860)$

$I^G(J^{PC}) = 0^-(1^{--})$

$\Upsilon(10860)$ MASS

NODE=M092M

NODE=M092M

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT	
$10889.9^{+3.2}_{-2.6}$ OUR AVERAGE					
$10884.7^{+3.6+8.9}_{-3.4-1.0}$	[1] MIZUK	16	BELL	$e^+e^- \to h_b(1P, 2P)\pi^+\pi^-$	
$10891.1\pm 3.2^{+1.2}_{-2.0}$	[2] SANTEL	16	BELL	$e^+e^- \to \Upsilon(1S, 2S, 3S)\pi^+\pi^-$	OCCUR=2
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$10881.8^{+1.0}_{-1.1}\pm 1.2$	[3,4] SANTEL	16	BELL	$e^+e^- \to$ hadrons	
10879 ± 3	[5,6] CHEN	10	BELL	$e^+e^- \to$ hadrons	
$10888.4^{+2.7}_{-2.6}\pm 1.2$	[7] CHEN	10	BELL	$e^+e^- \to \Upsilon(1S, 2S, 3S)\pi^+\pi^-$	OCCUR=2
10876 ± 2	[5] AUBERT	09E	BABR	$e^+e^- \to$ hadrons	
10869 ± 2	[8] AUBERT	09E	BABR	$e^+e^- \to$ hadrons	OCCUR=2
$10868 \pm 6 \pm 5$	[9] BESSON	85	CLEO	$e^+e^- \to$ hadrons	
10845 ± 20	[10] LOVELOCK	85	CUSB	$e^+e^- \to$ hadrons	

YOUR DATA

YOUR NOTE

[1] From a simultaneous fit to the $h_b(\mathrm{nP})\pi^+\pi^-$, $n = 1$, 2 cross sections at 22 energy points within $\sqrt{s} = 10.77$–11.02 GeV to a pair of interfering Breit-Wigner amplitudes modified by phase space factors, with eight resonance parameters (a mass and width for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, a single relative phase, a single relative amplitude, and two overall normalization factors, one for each n). The systematic error estimate is dominated by possible interference with a small nonresonant continuum amplitude. NODE=M092M;LINKAGE=D

[2] From a simultaneous fit to the $\Upsilon(\mathrm{nS})\pi^+\pi^-$, $n = 1$, 2, 3 cross sections at 25 energy points within $\sqrt{s} = 10.6$–11.05 GeV to a pair of interfering Breit-Wigner amplitudes modified by phase space factors, with fourteen resonance parameters (a mass, width, and three amplitudes for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, a single universal relative phase, and three decoherence coefficients, one for each n). Continuum contributions were measured (and therefore fixed) to be zero. NODE=M092M;LINKAGE=C

[3] From a fit to the total hadronic cross sections measured at 60 energy points within $\sqrt{s} = 10.82$–11.05 GeV to a pair of interfering Breit-Wigner amplitudes and two floating continuum amplitudes with $1/\sqrt{s}$ dependence, one coherent with the resonances and NODE=M092M;LINKAGE=A

one incoherent, with six resonance parameters (a mass, width, and an amplitude for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, one relative phase, and one decoherence coefficient).

[4] Not including uncertain and potentially large systematic errors due to assumed continuum amplitude $1/\sqrt{s}$ dependence and related interference contributions. NODE=M092M;LINKAGE=B

[5] In a model where a flat non-resonant $b\overline{b}$-continuum is incoherently added to a second flat component interfering with two Breit-Wigner resonances. Systematic uncertainties not estimated. NODE=M092M;LINKAGE=AU

[6] The parameters of the $\Upsilon(11020)$ are fixed to those in AUBERT 09E. NODE=M092M;LINKAGE=CH

[7] In a model where a flat nonresonant $\Upsilon(1S,2S,3S)\pi^+\pi^-$ continuum interferes with a single Breit-Wigner resonance. NODE=M092M;LINKAGE=CE

[8] In a model where a non-resonant $b\overline{b}$-continuum represented by a threshold function at $\sqrt{s}=2m_B$ is incoherently added to a flat component interfering with two Breit-Wigner resonances. Not independent of other AUBERT 09E results. Systematic uncertainties not estimated. NODE=M092M;LINKAGE=UB

[9] Assuming four Gaussians with radiative tails and a single step in R. NODE=M092M;LINKAGE=BE

[10] In a coupled-channel model with three resonances and a smooth step in R. NODE=M092M;LINKAGE=LO

$\Upsilon(10860)$ WIDTH

NODE=M092W

NODE=M092W

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT	
$51\ ^{+6}_{-7}$ OUR AVERAGE					
$40.6^{+12.7}_{-8.0}{}^{+1.1}_{-19.1}$	[11] MIZUK	16	BELL	$e^+e^- \rightarrow h_b(1P,2P)\pi^+\pi^-$	YOUR DATA
$53.7^{+7.1}_{-5.6}{}^{+1.3}_{-5.4}$	[12] SANTEL	16	BELL	$e^+e^- \rightarrow \Upsilon(1S,2S,3S)\pi^+\pi^-$	OCCUR=2
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$48.5^{+1.9}_{-1.8}{}^{+2.0}_{-2.8}$	[13,14] SANTEL	16	BELL	$e^+e^- \rightarrow$ hadrons	
$46\ ^{+9}_{-7}$	[15,16] CHEN	10	BELL	$e^+e^- \rightarrow$ hadrons	
$30.7^{+8.3}_{-7.0}\pm 3.1$	[17] CHEN	10	BELL	$e^+e^- \rightarrow \Upsilon(1S,2S,3S)\pi^+\pi^-$	OCCUR=2
43 ± 4	[15] AUBERT	09E	BABR	$e^+e^- \rightarrow$ hadrons	
74 ± 4	[18] AUBERT	09E	BABR	$e^+e^- \rightarrow$ hadrons	OCCUR=2
$112 \pm 17 \pm 23$	[19] BESSON	85	CLEO	$e^+e^- \rightarrow$ hadrons	
110 ± 15	[20] LOVELOCK	85	CUSB	$e^+e^- \rightarrow$ hadrons	

YOUR NOTE

[11] From a simultaneous fit to the $h_b(nP)\pi^+\pi^-$, $n = 1, 2$ cross sections at 22 energy points within $\sqrt{s}$ = 10.77–11.02 GeV to a pair of interfering Breit-Wigner amplitudes modified by phase space factors, with eight resonance parameters (a mass and width for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, a single relative phase, a single relative amplitude, and two overall normalization factors, one for each n). The systematic error estimate is dominated by possible interference with a small nonresonant continuum amplitude. NODE=M092W;LINKAGE=D

[12] From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, $n = 1, 2, 3$ cross sections at 25 energy points within $\sqrt{s}$ = 10.6–11.05 GeV to a pair of interfering Breit-Wigner amplitudes modified by phase space factors, with fourteen resonance parameters (a mass, width, and three amplitudes for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, a single universal relative phase, and three decoherence coefficients, one for each n). Continuum contributions were measured (and therefore fixed) to be zero. NODE=M092W;LINKAGE=C

[13] From a fit to the total hadronic cross sections measured at 60 energy points within $\sqrt{s}$ = 10.82–11.05 GeV to a pair of interfering Breit-Wigner amplitudes and two floating continuum amplitudes with $1/\sqrt{s}$ dependence, one coherent with the resonances and one incoherent, with six resonance parameters (a mass, width, and an amplitude for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, one relative phase, and one decoherence coefficient). NODE=M092W;LINKAGE=A

[14] Not including uncertain and potentially large systematic errors due to assumed continuum amplitude $1/\sqrt{s}$ dependence and related interference contributions. NODE=M092W;LINKAGE=B

[15] In a model where a flat non-resonant $b\overline{b}$-continuum is incoherently added to a second flat component interfering with two Breit-Wigner resonances. Systematic uncertainties not estimated. NODE=M092W;LINKAGE=AU

[16] The parameters of the $\Upsilon(11020)$ are fixed to those in AUBERT 09E. NODE=M092W;LINKAGE=CH

[17] In a model where a flat nonresonant $\Upsilon(1S,2S,3S)\pi^+\pi^-$ continuum interferes with a single Breit-Wigner resonance. NODE=M092W;LINKAGE=CE

[18] In a model where a non-resonant $b\overline{b}$-continuum represented by a threshold function at $\sqrt{s}=2m_B$ is incoherently added to a flat component interfering with two Breit-Wigner resonances. Not independent of other AUBERT 09E results. Systematic uncertainties not estimated. NODE=M092W;LINKAGE=UB

[19] Assuming four Gaussians with radiative tails and a single step in R. NODE=M092W;LINKAGE=BE

[20] In a coupled-channel model with three resonances and a smooth step in R. NODE=M092W;LINKAGE=LO

$\Upsilon(10860)$ BRANCHING RATIOS

NODE=M092230

"OUR EVALUATION" is obtained based on averages of rescaled data listed below. The averages and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at http://www.slac.stanford.edu/xorg/hfag/.

NODE=M092230

$\Gamma(h_b(1P)\pi^+\pi^-)/\Gamma(h_b(2P)\pi^+\pi^-)$ — Γ_{21}/Γ_{22}

NODE=M092R00

	VALUE	DOCUMENT ID		TECN	COMMENT
YOUR DATA	**0.616±0.052±0.017**	MIZUK	16	BELL	$e^+e^- \to h_b(1P,2P)\pi^+\pi^-$

NODE=M092R00

$\Upsilon(10860)$ REFERENCES

NODE=M092

YOUR PAPER

MIZUK	16	PRL 117 142001	R. Mizuk *et al.*	(BELLE Collab.)	REFID=57465
SANTEL	16	PR D93 011101	D. Santel *et al.*	(BELLE Collab.)	REFID=57121
CHEN	10	PR D82 091106	K.-F. Chen *et al.*	(BELLE Collab.)	REFID=53531
AUBERT	09E	PRL 102 012001	B. Aubert *et al.*	(BABAR Collab.)	REFID=52661
BESSON	85	PRL 54 381	D. Besson *et al.*	(CLEO Collab.)	REFID=22368
LOVELOCK	85	PRL 54 377	D.M.J. Lovelock *et al.*	(CUSB Collab.)	REFID=22369

NODE=M093

$\Upsilon(11020)$

$I^G(J^{PC}) = 0^-(1^{--})$

$\Upsilon(11020)$ MASS

NODE=M093M

NODE=M093M

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT	
	$10992.9^{+10.0}_{-3.1}$ OUR AVERAGE					
YOUR DATA	$10999.0^{+7.3}_{-7.8}{}^{+16.9}_{-1.0}$	[1] MIZUK	16	BELL	$e^+e^- \to h_b(1P,2P)\pi^+\pi^-$	
	$10987.5^{+6.4}_{-2.5}{}^{+9.1}_{-2.3}$	[2] SANTEL	16	BELL	$e^+e^- \to \Upsilon(1S,2S,3S)\pi^+\pi^-$	OCCUR=2
	• • • We do not use the following data for averages, fits, limits, etc. • • •					
	$11003.0\pm1.1^{+0.9}_{-1.0}$	[3,4] SANTEL	16	BELL	$e^+e^- \to$ hadrons	
	10996 ± 2	[5] AUBERT	09E	BABR	$e^+e^- \to$ hadrons	
	$11019 \pm 5 \pm 7$	BESSON	85	CLEO	$e^+e^- \to$ hadrons	
	11020 ± 30	LOVELOCK	85	CUSB	$e^+e^- \to$ hadrons	

YOUR NOTE

[1] From a simultaneous fit to the $h_b(nP)\pi^+\pi^-$, $n = 1$, 2 cross sections at 22 energy points within $\sqrt{s} = 10.77$–11.02 GeV to a pair of interfering Breit-Wigner amplitudes modified by phase space factors, with eight resonance parameters (a mass and width for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, a single relative phase, a single relative amplitude, and two overall normalization factors, one for each n). The systematic error estimate is dominated by possible interference with a small nonresonant continuum amplitude. NODE=M093M;LINKAGE=D

[2] From a simultaneous fit to the $\Upsilon(nS)\pi^+\pi^-$, $n = 1$, 2, 3 cross sections at 25 energy points within $\sqrt{s} = 10.6$–11.05 GeV to a pair of interfering Breit-Wigner amplitudes modified by phase space factors, with fourteen resonance parameters (a mass, width, and three amplitudes for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, a single universal relative phase, and three decoherence coefficients, one for each n). Continuum contributions were measured (and therefore fixed) to be zero. NODE=M093M;LINKAGE=C

[3] From a fit to the total hadronic cross sections measured at 60 energy points within $\sqrt{s} = 10.82$–11.05 GeV to a pair of interfering Breit-Wigner amplitudes and two floating continuum amplitudes with $1/\sqrt{s}$ dependence, one coherent with the resonances and one incoherent, with six resonance parameters (a mass, width, and an amplitude for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, one relative phase, and one decoherence coefficient). NODE=M093M;LINKAGE=A

[4] Not including uncertain and potentially large systematic errors due to assumed continuum amplitude $1/\sqrt{s}$ dependence and related interference contributions. NODE=M093M;LINKAGE=B

[5] In a model where a flat non-resonant $b\bar{b}$-continuum is incoherently added to a second flat component interfering with two Breit-Wigner resonances. Systematic uncertainties not estimated. NODE=M093M;LINKAGE=AU

$\Upsilon(11020)$ WIDTH

NODE=M093W

NODE=M093W

	VALUE (MeV)	DOCUMENT ID		TECN	COMMENT	
	49^{+9}_{-15} OUR AVERAGE					
YOUR DATA	$27^{+27}_{-11}{}^{+5}_{-12}$	[6] MIZUK	16	BELL	$e^+e^- \to h_b(1P,2P)\pi^+\pi^-$	
	$61^{+9}_{-19}{}^{+2}_{-20}$	[7] SANTEL	16	BELL	$e^+e^- \to \Upsilon(1S,2S,3S)\pi^+\pi^-$	OCCUR=2

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

$39.3^{+\ 1.7+\ 1.3}_{-\ 1.6-\ 2.4}$	[8,9] SANTEL	16	BELL	$e^+e^- \rightarrow$ hadrons
$37\ \pm\ 3$	[10] AUBERT	09E	BABR	$e^+e^- \rightarrow$ hadrons
$61\ \pm 13\ \pm 22$	BESSON	85	CLEO	$e^+e^- \rightarrow$ hadrons
$90\ \pm 20$	LOVELOCK	85	CUSB	$e^+e^- \rightarrow$ hadrons

YOUR NOTE

[6] From a simultaneous fit to the $h_b(\mathrm{nP})\pi^+\pi^-$, $n = 1$, 2 cross sections at 22 energy points within $\sqrt{s} = 10.77$–11.02 GeV to a pair of interfering Breit-Wigner amplitudes modified by phase space factors, with eight resonance parameters (a mass and width for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, a single relative phase, a single relative amplitude, and two overall normalization factors, one for each n). The systematic error estimate is dominated by possible interference with a small nonresonant continuum amplitude. NODE=M093W;LINKAGE=D

[7] From a simultaneous fit to the $\Upsilon(\mathrm{nS})\pi^+\pi^-$, n=1, 2, 3 cross sections at 25 energy points within $\sqrt{s} = 10.6$–11.05 GeV to a pair of interfering Breit-Wigner amplitudes modified by phase space factors, with fourteen resonance parameters (a mass, width, and three amplitudes for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, a single universal relative phase, and three decoherence coefficients, one for each n). Continuum contributions were measured (and therefore fixed) to be zero. NODE=M093W;LINKAGE=C

[8] From a fit to the total hadronic cross sections measured at 60 energy points within $\sqrt{s}$ = 10.82–11.05 GeV to a pair of interfering Breit-Wigner amplitudes and two floating continuum amplitudes with $1/\sqrt{s}$ dependence, one coherent with the resonances and one incoherent, with six resonance parameters (a mass, width, and an amplitude for each of $\Upsilon(10860)$ and $\Upsilon(11020)$, one relative phase, and one decoherence coefficient). NODE=M093W;LINKAGE=A

[9] Not including uncertain and potentially large systematic errors due to assumed continuum amplitude $1/\sqrt{s}$ dependence and related interference contributions. NODE=M093W;LINKAGE=B

[10] In a model where a flat non-resonant $b\overline{b}$-continuum is incoherently added to a second flat component interfering with two Breit-Wigner resonances. Systematic uncertainties not estimated. NODE=M093W;LINKAGE=AU

Υ(11020) REFERENCES

NODE=M093

YOUR PAPER

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