NODE=Q005

b

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

NODE=Q005

Charge $= -\frac{1}{3}\ e$ Bottom $= -1$

b-QUARK MASS

NODE=Q005M

NODE=Q005M

b-quark mass corresponds to the "running mass" $\overline{m}_b(\mu = \overline{m}_b)$ in the $\overline{\mathrm{MS}}$ scheme. We have converted masses in other schemes to the $\overline{\mathrm{MS}}$ mass using two-loop QCD perturbation theory with $\alpha_s(\mu = \overline{m}_b) = 0.223 \pm 0.008$. The value $4.18^{+0.04}_{-0.03}$ GeV for the $\overline{\mathrm{MS}}$ mass corresponds to 4.78 ± 0.06 GeV for the pole mass, using the two-loop conversion formula. A discussion of masses in different schemes can be found in the "Note on Quark Masses."

NODE=Q005M

→ UNCHECKED ←

$\overline{\mathrm{MS}}$ MASS (GeV)	CL%	DOCUMENT ID		TECN
4.183±0.007 (CL = 90%) OUR EVALUATION of $\overline{\mathrm{MS}}$ Mass. See the ideogram below.				
$3.94\ ^{+0.46}_{-0.40}$		[1] APARISI	22	THEO
4.202±0.021		[2] HATTON	21	LATT
4.197±0.008		[3] NARISON	20	THEO
$4.049^{+0.138}_{-0.118}$		[4] ABRAMOWICZ	18	HERA
4.195±0.014		[5] BAZAVOV	18	LATT
4.186±0.037		[6] PESET	18	THEO
4.197±0.022		[7] KIYO	16	THEO
4.183±0.037		[8] ALBERTI	15	THEO
$4.203^{+0.016}_{-0.034}$		[9] BENEKE	15	THEO
4.196±0.023		[10] COLQUHOUN	15	LATT
4.176±0.023		[11] DEHNADI	15	THEO
4.21 ±0.11		[12] BERNARDONI	14	LATT
4.169±0.002±0.008		[13] PENIN	14	THEO
4.166±0.043		[14] LEE	13O	LATT
4.247±0.034		[15] LUCHA	13	THEO
4.171±0.009		[16] BODENSTEIN	12	THEO
4.29 ±0.14		[17] DIMOPOUL...	12	LATT
$4.18\ ^{+0.05}_{-0.04}$		[18] LASCHKA	11	THEO
4.186±0.044±0.015		[19] AUBERT	10A	BABR
4.163±0.016		[20] CHETYRKIN	09	THEO
4.243±0.049		[21] SCHWANDA	08	BELL
• • • We do not use the following data for averages, fits, limits, etc. • • •				
4.184±0.011		[22] NARISON	18A	THEO
4.188±0.008		[23] NARISON	18B	THEO
4.07 ±0.17		[24] ABRAMOWICZ	14A	ZEUS
4.201±0.043		[25] AYALA	14A	THEO
4.236±0.069		[26] NARISON	13	THEO
4.213±0.059		[27] NARISON	13A	THEO
4.235±0.003±0.055		[28] HOANG	12	THEO
4.212±0.032		[29] NARISON	12	THEO
4.177±0.011		[30] NARISON	12	THEO
4.171±0.014		[31] NARISON	12A	THEO
4.164±0.023		[32] MCNEILE	10	LATT
4.173±0.010		[33] NARISON	10	THEO
5.26 ±1.2		[34] ABDALLAH	08D	DLPH
4.42 ±0.06 ±0.08		[35] GUAZZINI	08	LATT
4.347±0.048±0.08		[36] DELLA-MOR...	07	LATT
4.164±0.025		[37] KUHN	07	THEO
4.19 ±0.40		[38] ABDALLAH	06D	DLPH
4.205±0.058		[39] BOUGHEZAL	06	THEO
4.20 ±0.04		[40] BUCHMUEL...	06	THEO
4.19 ±0.06		[41] PINEDA	06	THEO
4.4 ±0.3		[42] GRAY	05	LATT
4.22 ±0.06		[43] AUBERT	04X	THEO
4.17 ±0.03		[44] BAUER	04	THEO
4.22 ±0.11		[45] HOANG	04	THEO
4.25 ±0.11		[46] MCNEILE	04	LATT
4.22 ±0.09		[47] BAUER	03	THEO
4.19 ±0.05		[48] BORDES	03	THEO

OCCUR=2

OCCUR=2

4.20 ±0.09	[49] CORCELLA	03	THEO
4.33 ±0.10	[50] DEDIVITIIS	03	LATT
4.24 ±0.10	[51] EIDEMULLER	03	THEO
4.207±0.03	[52] ERLER	03	THEO
4.33 ±0.06 ±0.10	[53] MAHMOOD	03	CLEO
4.190±0.032	[54] BRAMBILLA	02	THEO
4.346±0.070	[55] PENIN	02	THEO

[1] APARISI 22 determine m_b at the Higgs mass, $\overline{m}_b(m_H) = 2.60^{+0.36}_{-0.31}$ GeV from Higgs boson decay rates at the LHC, which is used to obtain $\overline{m}_b(\overline{m}_b)$. NODE=Q005M;LINKAGE=PA

[2] HATTON 21 determine $\overline{m}_b(3\text{ GeV}) = 4.513 \pm 0.026$ GeV using a lattice QCD + quenched QED simulation using the HISQ action and including $n_f = 2+1+1$ flavors of sea quarks, by combining their $\overline{m}_b/\overline{m}_c$ and $\overline{m}_c$ determinations. NODE=Q005M;LINKAGE=KA

[3] NARISON 20 determines the quark mass using QCD Laplace sum rules from the B_c mass, combined with previous determinations of the QCD condensates and c and b masses. NODE=Q005M;LINKAGE=JA

[4] ABRAMOWICZ 18 determine $\overline{m}_b(\overline{m}_b) = 4.049^{+0.104}_{-0.109}{}^{+0.090}_{-0.032}{}^{+0.001}_{-0.031}$ from the production of b quarks in $e p$ collisions at HERA using combined H1 and ZEUS data. The experimental/fitting errors, and those from modeling and parameterization have been combined in quadrature. NODE=Q005M;LINKAGE=Z

[5] BAZAVOV 18 determine the b mass using a lattice computation with staggered fermions and five active quark flavors. NODE=Q005M;LINKAGE=AA

[6] PESET 18 determine $\overline{m}_c(\overline{m}_c)$ and $\overline{m}_b(\overline{m}_b)$ using an N3LO calculation of the η_c, η_b and B_c masses. NODE=Q005M;LINKAGE=EA

[7] KIYO 16 determine $\overline{m}_b(\overline{m}_b)$ from the $\Upsilon(1S)$ mass at order α_s^3 (N3LO). NODE=Q005M;LINKAGE=X

[8] ALBERTI 15 determine $\overline{m}_b(\overline{m}_b)$ from fits to inclusive $B \to X_c e \overline{\nu}$ decay. They also find $m_b^{\text{kin}}(1\text{ GeV}) = 4.553 \pm 0.020$ GeV. NODE=Q005M;LINKAGE=W

[9] BENEKE 15 determine $\overline{m}_b(\overline{m}_b)$ using sum rules for $e^+ e^- \to$ hadrons at order N3LO including finite m_c effects. They find $m_b^{\text{PS}}(2\text{ GeV}) = 4.532^{+0.013}_{-0.039}$ GeV, and $\overline{m}_b(\overline{m}_b) = 4.193^{+0.022}_{-0.035}$ GeV. The value quoted is obtained using the four-loop conversion given in BENEKE 16. NODE=Q005M;LINKAGE=V

[10] COLQUHOUN 15 determine $\overline{m}_b(\overline{m}_b)$ from moments of the vector current correlator computed with a lattice simulation using the NRQCD action. NODE=Q005M;LINKAGE=IA

[11] DEHNADI 15 determine $\overline{m}_b(\overline{m}_b)$ using sum rules for $e^+ e^- \to$ hadrons at order α_s^3 (N3LO), and fitting to both experimental data and lattice results. NODE=Q005M;LINKAGE=U

[12] BERNARDONI 14 determine m_b from $n_f = 2$ lattice calculations using heavy quark effective theory non-perturbatively renormalized and matched to QCD at $1/m$ order. NODE=Q005M;LINKAGE=T

[13] PENIN 14 determine $\overline{m}_b(\overline{m}_b) = 4.169 \pm 0.008 \pm 0.002 \pm 0.002$ using an estimate of the order α_s^3 b-quark vacuum polarization function in the threshold region, including finite m_c effects. The errors of ± 0.008 from theoretical uncertainties, and ± 0.002 from α_s have been combined in quadrature. NODE=Q005M;LINKAGE=PE

[14] LEE 13O determines m_b using lattice calculations of the Υ and B_s binding energies in NRQCD, including three light dynamical quark flavors. The quark mass shift in NRQCD is determined to order α_s^2, with partial α_s^3 contributions. NODE=Q005M;LINKAGE=LE

[15] LUCHA 13 determines m_b from QCD sum rules for heavy-light currents using the lattice value for f_B of 191.5 ± 7.3 GeV. NODE=Q005M;LINKAGE=LU

[16] BODENSTEIN 12 determine m_b using sum rules for the vector current correlator and the $e^+ e^- \to Q\overline{Q}$ total cross-section. NODE=Q005M;LINKAGE=BD

[17] DIMOPOULOS 12 determine quark masses from a lattice computation using $n_f = 2$ dynamical flavors of twisted mass fermions. NODE=Q005M;LINKAGE=DI

[18] LASCHKA 11 determine the b mass from the charmonium spectrum. The theoretical computation uses the heavy $Q\overline{Q}$ potential to order $1/m_Q$ obtained by matching the short-distance perturbative result onto lattice QCD result at larger scales. NODE=Q005M;LINKAGE=LA

[19] AUBERT 10A determine the b- and c-quark masses from a fit to the inclusive decay spectra in semileptonic B decays in the kinetic scheme (and convert it to the $\overline{\text{MS}}$ scheme). NODE=Q005M;LINKAGE=AB

[20] CHETYRKIN 09 determine m_c and m_b from the $e^+ e^- \to Q\overline{Q}$ cross-section and sum rules, using an order α_s^3 (N3LO) computation of the heavy quark vacuum polarization. NODE=Q005M;LINKAGE=CH

[21] SCHWANDA 08 measure moments of the inclusive photon spectrum in $B \to X_s \gamma$ decay to determine m_b^{1S}. We have converted this to $\overline{\text{MS}}$ scheme. NODE=Q005M;LINKAGE=SC

[22] NARISON 18A determines $\overline{m}_b(\overline{m}_b)$ as a function of α_s using QCD exponential sum rules and their ratios evaluated at the optimal scale $\mu = 9.5$ GeV at N2LO-N3LO of perturbative QCD and including condensates up to dimension 6–8 in the (axial-)vector and (pseudo-)scalar bottomonium channels. NODE=Q005M;LINKAGE=FA

[23] NARISON 18B determines $\overline{m}_b(\overline{m}_b)$ using QCD vector moment sum rules and their ratios at N2LO-N3LO of perturbative QCD and including condensates up to dimension 8. NODE=Q005M;LINKAGE=CA

[24] ABRAMOWICZ 14A determine $\overline{m}_b(\overline{m}_b) = 4.07 \pm 0.14^{+0.01}_{-0.07}{}^{+0.05}_{-0.00}{}^{+0.08}_{-0.05}$ from the production of b quarks in $e p$ collisions at HERA. The errors due to fitting, modeling, PDF parameterization, and theoretical QCD uncertainties due to the values of α_s, m_c, and the renormalization scale μ have been combined in quadrature. NODE=Q005M;LINKAGE=S

[25] AYALA 14A determine $\overline{m}_b(\overline{m}_b)$ from the $\Upsilon(1S)$ mass computed to N3LO order in perturbation theory using a renormalon subtracted scheme. NODE=Q005M;LINKAGE=R

[26] NARISON 13 determines m_b using QCD spectral sum rules to order α_s^2 (NNLO) and including condensates up to dimension 6. NODE=Q005M;LINKAGE=NR

[27] NARISON 13A determines m_b using HQET sum rules to order α_s^2 (NNLO) and the B meson mass and decay constant. NODE=Q005M;LINKAGE=NI

[28] HOANG 12 determine m_b using non-relativistic sum rules for the Υ system at order α_s^2 (NNLO) with renormalization group improvement. NODE=Q005M;LINKAGE=HA

[29] NARISON 12 determines m_b using exponential sum rules for the vector current correlator to order α_s^3, including the effect of gluon condensates up to dimension eight. NODE=Q005M;LINKAGE=AI

[30] Determines m_b to order α_s^3 (N3LO), including the effect of gluon condensates up to dimension eight combining the methods of NARISON 12 and NARISON 12A. NODE=Q005M;LINKAGE=IS

[31] NARISON 12A determines m_b using sum rules for the vector current correlator to order α_s^3, including the effect of gluon condensates up to dimension eight. NODE=Q005M;LINKAGE=SO

[32] MCNEILE 10 determines m_b by comparing order α_s^3 (N3LO) perturbative results for the pseudo-scalar current to lattice simulations with n_f = 2+1 sea-quarks by the HPQCD collaboration. NODE=Q005M;LINKAGE=NE

[33] NARISON 10 determines m_b from ratios of moments of vector current correlators computed to order α_s^3 and including the dimension-six gluon condensate. These values are taken from the erratum to that reference. NODE=Q005M;LINKAGE=NA

[34] ABDALLAH 08D determine $\overline{m}_b(M_Z) = 3.76 \pm 1.0$ GeV from a leading order study of four-jet rates at LEP. NODE=Q005M;LINKAGE=AH

[35] GUAZZINI 08 determine $\overline{m}_b(\overline{m}_b)$ from a quenched lattice simulation of heavy meson masses. The ± 0.08 is an estimate of the quenching error. NODE=Q005M;LINKAGE=GU

[36] DELLA-MORTE 07 determine $\overline{m}_b(\overline{m}_b)$ from a computation of the spin-averaged B meson mass using quenched lattice HQET at order $1/m$. The ± 0.08 is an estimate of the quenching error. NODE=Q005M;LINKAGE=DM

[37] KUHN 07 determine $\overline{m}_b(\mu = 10\text{ GeV}) = 3.609 \pm 0.025$ GeV and $\overline{m}_b(\overline{m}_b)$ from a four-loop sum-rule computation of the cross-section for $e^+ e^- \to$ hadrons in the bottom threshold region. NODE=Q005M;LINKAGE=KU

[38] ABDALLAH 06D determine $m_b(M_Z) = 2.85 \pm 0.32$ GeV from Z-decay three-jet events containing a b-quark. NODE=Q005M;LINKAGE=DA

[39] BOUGHEZAL 06 $\overline{\text{MS}}$ scheme result comes from the first moment of the hadronic production cross-section to order α_s^3. NODE=Q005M;LINKAGE=UG

[40] BUCHMUELLER 06 determine m_b and m_c by a global fit to inclusive B decay spectra. NODE=Q005M;LINKAGE=BL

[41] PINEDA 06 $\overline{\text{MS}}$ scheme result comes from a partial NNLL evaluation (complete at order α_s^2 (NNLO)) of sum rules of the bottom production cross-section in $e^+ e^-$ annihilation. NODE=Q005M;LINKAGE=PI

[42] GRAY 05 determines $\overline{m}_b(\overline{m}_b)$ from a lattice computation of the Υ spectrum. The simulations have 2+1 dynamical light flavors. The b quark is implemented using NRQCD. NODE=Q005M;LINKAGE=GR

[43] AUBERT 04X obtain m_b from a fit to the hadron mass and lepton energy distributions in semileptonic B decay. The paper quotes values in the kinetic scheme. The $\overline{\text{MS}}$ value has been provided by the BABAR collaboration. NODE=Q005M;LINKAGE=AU

[44] BAUER 04 determine m_b, m_c and $m_b - m_c$ by a global fit to inclusive B decay spectra. NODE=Q005M;LINKAGE=BU

[45] HOANG 04 determines $\overline{m}_b(\overline{m}_b)$ from moments at order α_s^2 of the bottom production cross-section in $e^+ e^-$ annihilation. NODE=Q005M;LINKAGE=HO

[46] MCNEILE 04 use lattice QCD with dynamical light quarks and a static heavy quark to compute the masses of heavy-light mesons. NODE=Q005M;LINKAGE=MC

[47] BAUER 03 determine the b quark mass by a global fit to B decay observables. The experimental data includes lepton energy and hadron invariant mass moments in semileptonic $B \to X_c \ell \nu_\ell$ decay, and the inclusive photon spectrum in $B \to X_s \gamma$ decay. The theoretical expressions used are of order $1/\text{m}^3$, and $\alpha_s^2 \beta_0$. NODE=Q005M;LINKAGE=BA

[48] BORDES 03 determines m_b using QCD finite energy sum rules to order α_s^2. NODE=Q005M;LINKAGE=BO

[49] CORCELLA 03 determines $\overline{m}_b$ using sum rules computed to order α_s^2. Includes charm quark mass effects. NODE=Q005M;LINKAGE=CO

[50] DEDIVITIIS 03 use a quenched lattice computation of heavy-heavy and heavy-light meson masses. NODE=Q005M;LINKAGE=DE

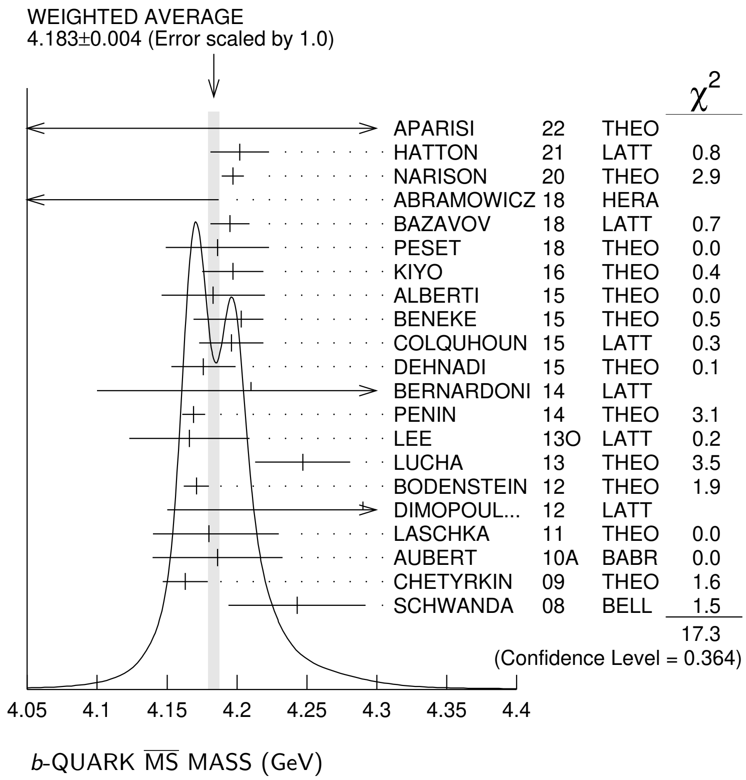
[51] EIDEMULLER 03 determines $\overline{m}_b$ and $\overline{m}_c$ using QCD sum rules. NODE=Q005M;LINKAGE=EI

[52] ERLER 03 determines $\overline{m}_b$ and $\overline{m}_c$ using QCD sum rules. Includes recent BES data. NODE=Q005M;LINKAGE=ER

[53] MAHMOOD 03 determines m_b^{1S} by a fit to the lepton energy moments in $B \to X_c \ell \nu_\ell$ decay. The theoretical expressions used are of order $1/\text{m}^3$ and $\alpha_s^2 \beta_0$. We have converted their result to the $\overline{\text{MS}}$ scheme. NODE=Q005M;LINKAGE=MA

[54] BRAMBILLA 02 determine $\overline{m}_b(\overline{m}_b)$ from a computation of the $\Upsilon(1S)$ mass to order α_s^4, including finite m_c corrections. NODE=Q005M;LINKAGE=BI

[55] PENIN 02 determines $\overline{m}_b$ from the spectrum of the Υ system. NODE=Q005M;LINKAGE=NP



m_b/m_s MASS RATIO

NODE=Q005A00
NODE=Q005A00

VALUE	DOCUMENT ID		TECN
53.88±0.12 OUR AVERAGE			
53.94±0.12	[1] BAZAVOV	18	LATT
52.55±0.55	[2] CHAKRABOR...	15	LATT

[1] BAZAVOV 18 determine the quark masses using a lattice computation with staggered fermions and four active quark flavors for the u, d, s, c quarks and five active flavors for the b quark.

NODE=Q005A00;LINKAGE=A

[2] CHAKRABORTY 15 determine m_b/m_s from lattice QCD using the HISQ action and including $n_f = 2+1+1$ flavors of sea quarks.

NODE=Q005A00;LINKAGE=B

b-QUARK REFERENCES

NODE=Q005

APARISI	22	PRL 128 122001	J. Aparisi *et al.*	(VALE, WIEN, PSI+)	REFID=62633
HATTON	21	PR D103 114508	D. Hatton *et al.*	(HPQCD Collab.)	REFID=62042
NARISON	20	PL B802 135221	S. Narison	(MONP)	REFID=60207
ABRAMOWICZ	18	EPJ C78 473	H. Abramowicz *et al.*	(H1 and ZEUS Collabs.)	REFID=59184
BAZAVOV	18	PR D98 054517	A. Bazavov *et al.*	(Fermilab Lattice, MILC, TUMQCD)	REFID=59445
NARISON	18A	IJMP A33 1850045	S. Narison	(MONP)	REFID=59054
NARISON	18B	PL B784 261	S. Narison	(MONP)	REFID=59398
PESET	18	JHEP 1809 167	C. Peset, A. Pineda, J. Segovia	(BARC, TUM)	REFID=59348
BENEKE	16	PoS RADCOR2015 035	M. Beneke *et al.*		REFID=57165
KIYO	16	PL B752 122	Y. Kiyo, G. Mishima, Y. Sumino		REFID=57096
ALBERTI	15	PRL 114 061802	A. Alberti *et al.*		REFID=56438
BENEKE	15	NP B891 42	M. Beneke *et al.*		REFID=56714
CHAKRABOR...	15	PR D91 054508	B. Chakraborty *et al.*	(HPQCD Collab.)	REFID=56729
COLQUHOUN	15	PR D91 074514	B. Colquhoun *et al.*	(HPQCD Collab.)	REFID=59979
DEHNADI	15	JHEP 1508 155	B. Dehnadi, A.H. Hoang, V. Mateu		REFID=56708
ABRAMOWICZ	14A	JHEP 1409 127	H. Abramowicz *et al.*	(ZEUS Collab.)	REFID=56011
AYALA	14A	JHEP 1409 045	C. Ayala, G. Cvetic, A. Pineda		REFID=56015
BERNARDONI	14	PL B730 171	F. Bernardoni *et al.*	(ALPHA Collab.)	REFID=56072
PENIN	14	JHEP 1404 120	A.A. Penin, N. Zerf		REFID=55981
LEE	13O	PR D87 074018	A.J. Lee *et al.*	(HPQCD Collab.)	REFID=55285
LUCHA	13	PR D88 056011	W. Lucha, D. Melikhov, S. Simula	(VIEN, MOSU+)	REFID=55548
NARISON	13	PL B718 1321	S. Narison	(MONP)	REFID=54845
NARISON	13A	PL B721 269	S. Narison	(MONP)	REFID=55340
BODENSTEIN	12	PR D85 034003	S. Bodenstein *et al.*	(CAPE, VALE, MAINZ+)	REFID=54071
DIMOPOUL...	12	JHEP 1201 046	P. Dimopoulos *et al.*	(ETM Collab.)	REFID=54040
HOANG	12	JHEP 1210 188	A.H. Hoang, P. Ruiz-Femenia, M. Stahlhofen	(WIEN+)	REFID=54818
NARISON	12	PL B707 259	S. Narison	(MONP)	REFID=54030
NARISON	12A	PL B706 412	S. Narison	(MONP)	REFID=53887
LASCHKA	11	PR D83 094002	A. Laschka, N. Kaiser, W. Weise		REFID=16545
AUBERT	10A	PR D81 032003	B. Aubert *et al.*	(BABAR Collab.)	REFID=53198
MCNEILE	10	PR D82 034512	C. McNeile *et al.*	(HPQCD Collab.)	REFID=53407
NARISON	10	PL B693 559	S. Narison	(MONP)	REFID=53258
Also		PL B705 544 (errat.)	S. Narison	(MONP)	REFID=53886
CHETYRKIN	09	PR D80 074010	K.G. Chetyrkin *et al.*	(KARL, BNL)	REFID=53069
ABDALLAH	08D	EPJ C55 525	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=52482
GUAZZINI	08	JHEP 0801 076	D. Guazzini, R. Sommer, N. Tantalo		REFID=53255

SCHWANDA	08	PR D78 032016	C. Schwanda *et al.*	(BELLE Collab.)	REFID=52422
DELLA-MOR...	07	JHEP 0701 007	M. Della Morte *et al.*		REFID=51767
KUHN	07	NP B778 192	J.H. Kuhn, M. Steinhauser, C. Sturm		REFID=51771
ABDALLAH	06D	EPJ C46 569	J. Abdallah *et al.*	(DELPHI Collab.)	REFID=51226
BOUGHEZAL	06	PR D74 074006	R. Boughezal, M. Czakon, T. Schutzmeier		REFID=51476
BUCHMUEL...	06	PR D73 073008	O.L. Buchmueller, H.U. Flacher	(RHBL)	REFID=52217
PINEDA	06	PR D73 111501	A. Pineda, A. Signer		REFID=51309
GRAY	05	PR D72 094507	A. Gray *et al.*	(HPQCD and UKQCD Collab.)	REFID=50947
AUBERT	04X	PRL 93 011803	B. Aubert *et al.*	(BABAR Collab.)	REFID=49991
BAUER	04	PR D70 094017	C. Bauer *et al.*		REFID=50494
HOANG	04	PL B594 127	A.H. Hoang, M. Jamin		REFID=50106
MCNEILE	04	PL B600 77	C. McNeile, C. Michael, G. Thompson	(UKQCD Collab.)	REFID=50130
BAUER	03	PR D67 054012	C.W. Bauer *et al.*		REFID=49340
BORDES	03	PL B562 81	J. Bordes, J. Penarrocha, K. Schilcher		REFID=49446
CORCELLA	03	PL B554 133	G. Corcella, A.H. Hoang		REFID=49362
DEDIVITIIS	03	NP B675 309	G.M. de Divitiis *et al.*		REFID=50029
EIDEMULLER	03	PR D67 113002	M. Eidemuller		REFID=49496
ERLER	03	PL B558 125	J. Erler, M. Luo		REFID=49259
MAHMOOD	03	PR D67 072001	A.H. Mahmood *et al.*	(CLEO Collab.)	REFID=49211
BRAMBILLA	02	PR D65 034001	N. Brambilla, Y. Sumino, A. Vairo		REFID=51730
PENIN	02	PL B538 335	A. Penin, M. Steinhauser		REFID=48951