B_c^+

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

Quantum numbers shown are quark-model predictions.

B_c^+ MASS

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
6274.47± 0.27± 0.17	[1] AAIJ	20R	LHCB	pp at 7, 8, 13 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
6274.28± 1.40± 0.32	[2] AAIJ	17L	LHCB	Repl. by AAIJ 20R
6274.0 ± 1.8 ± 0.4	[3] AAIJ	14AQ	LHCB	Repl. by AAIJ 20R
6276.28± 1.44± 0.36	[4] AAIJ	13AS	LHCB	Repl. by AAIJ 20R
6273.7 ± 1.3 ± 1.6	[5] AAIJ	12AV	LHCB	Repl. by AAIJ 20R
6275.6 ± 2.9 ± 2.5	[6] AALTONEN	08M	CDF	$p\overline{p}$ at 1.96 TeV
6300 ± 14 ± 5	[6] ABAZOV	08T	D0	$p\overline{p}$ at 1.96 TeV
6285.7 ± 5.3 ± 1.2	[6] ABULENCIA	06C	CDF	Repl. by AALTONEN 08M
6400 ±390 ±130	[7] ABE	98M	CDF	$p\overline{p}$ at 1.8 TeV
6320 ± 60	[8] ACKERSTAFF	98O	OPAL	$e^+e^- \to Z$

[1] AAIJ 20R uses the $B_c^+ \to J/\psi\pi^+$, $J/\psi\pi^+\pi^-\pi^+$, $J/\psi p\overline{p}\pi^+$, $J/\psi D_s^+$, $J/\psi D^0 K^+$ and $B_s^0\pi^+$ modes.

[2] Measured using $B_c^+ \to J/\psi D^0 K^+$ decays.

[3] Uses $B_c^+ \to J/\psi p\overline{p}\pi^+$ decays.

[4] AAIJ 13AS uses the $B_c^+ \to J/\psi D_s^+$.

[5] AAIJ 12AV uses the $B_c^+ \to J/\psi\pi^+$ mode and also measures the mass difference $M(B_c^+) - M(B^+) = 994.6 \pm 1.3 \pm 0.6$ MeV/c^2.

[6] Measured using a fully reconstructed decay mode of $B_c \to J/\psi\pi$.

[7] ABE 98M observed $20.4^{+6.2}_{-5.5}$ events in the $B_c^+ \to J/\psi(1s)\ell\nu_\ell$ with a significance of > 4.8 standard deviations. The mass value is estimated from $m(J/\psi(1S)\ell)$.

[8] ACKERSTAFF 98O observed 2 candidate events in the $B_c^+ \to J/\psi(1S)\pi^+$ channel with an estimated background of 0.63 ± 0.20 events.

$m_{B_c^+} - m_{B_s^0}$

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
907.75±0.37±0.27	[1] AAIJ	20R	LHCB	pp at 7, 8, 13 TeV

[1] AAIJ 20R uses the $B_c^+ \to J/\psi\pi^+$, $J/\psi\pi^+\pi^-\pi^+$, $J/\psi p\overline{p}\pi^+$, $J/\psi D_s^+$, $J/\psi D^0 K^+$ and $B_s^0\pi^+$ modes.

B_c^+ MEAN LIFE

VALUE (10^{-12} s)	DOCUMENT ID		TECN	COMMENT
0.510 ±0.009 OUR EVALUATION	(Produced by HFLAV)			
0.510 ±0.009 OUR AVERAGE				
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	$^{+0.038}_{-0.036}$	± 0.032	[5] ABAZOV	09H	D0	$p\overline{p}$ at 1.96 TeV
0.463	$^{+0.073}_{-0.065}$	± 0.036	[5] ABULENCIA	06O	CDF	$p\overline{p}$ at 1.96 TeV
0.46	$^{+0.18}_{-0.16}$	± 0.03	[5] ABE	98M	CDF	$p\overline{p}$ 1.8 TeV

[1] The lifetime is measured using the decays $B_c^+ \to J/\psi\pi^+$ and $B^+ \to J/\psi K^+$.

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

[3] Uses fully reconstructed $B_c^+ \to J/\psi\pi^+$ decays.

[4] Measured using $B_c^+ \to J/\psi\mu^+\nu_\mu X$ decays.

[5] The lifetime is measured from the $J/\psi e$ decay vertices.

B_c^+ DECAY MODES × B($\overline{b} \to B_c$)

The following quantities are not pure branching ratios; rather the fractions $\Gamma_i/\Gamma \times$ B($\overline{b} \to B_c$). B_c^- modes are charge conjugates of the modes below.

	Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1	$J/\psi(1S)\ell^+\nu_\ell$ anything	seen	
Γ_2	$J/\psi(1S)\mu^+\nu_\mu$	seen	
Γ_3	$J/\psi(1S)\tau^+\nu_\tau$	seen	
Γ_4	$J/\psi(1S)\pi^+$	seen	
Γ_5	$J/\psi(1S)K^+$	seen	
Γ_6	$J/\psi(1S)\pi^+\pi^0$		
Γ_7	$J/\psi(1S)\pi^+\pi^+\pi^-$	seen	
Γ_8	$J/\psi(1S)K^+\pi^-\pi^+$		
Γ_9	$J/\psi(1S)K^+K^-K^+$		
Γ_{10}	$J/\psi(1S)a_1(1260)$	not seen	
Γ_{11}	$J/\psi(1S)K^+K^-\pi^+$	seen	
Γ_{12}	$J/\psi(1S)\pi^+\pi^+\pi^+\pi^-\pi^-$	seen	
Γ_{13}	$\psi(2S)\pi^+$	seen	
Γ_{14}	$\psi(2S)\pi^+\pi^-\pi^+$		
Γ_{15}	$\psi(2S)K^+K^-\pi^+$		
Γ_{16}	$J/\psi(1S)D^0K^+$	seen	
Γ_{17}	$J/\psi(1S)D^*(2007)^0K^+$	seen	
Γ_{18}	$J/\psi(1S)D^*(2010)^+K^{*0}$	seen	
Γ_{19}	$J/\psi(1S)D^+K^{*0}$	seen	
Γ_{20}	$J/\psi(1S)D_s^+$	seen	
Γ_{21}	$J/\psi(1S)D_s^{*+}$	seen	
Γ_{22}	$J/\psi(1S)p\overline{p}\pi^+$	seen	
Γ_{23}	$\chi_{c0}\pi^+$		
Γ_{24}	$\chi_{c1}\pi^+$		

Γ_{25}	$\chi_{c2}\pi^+$		
Γ_{26}	$p\overline{p}\pi^+$	not seen	
Γ_{27}	$D^0 K^+$	seen	
Γ_{28}	$D^0\pi^+$	not seen	
Γ_{29}	$D^{*0}\pi^+$	not seen	
Γ_{30}	$D^{*0}K^+$	not seen	
Γ_{31}	$D_s^+\overline{D}^0$	$<7.2\times10^{-4}$	90%
Γ_{32}	$D_s^+ D^0$	$<3.0\times10^{-4}$	90%
Γ_{33}	$D^+\overline{D}^0$	$<1.9\times10^{-4}$	90%
Γ_{34}	$D^+ D^0$	$<1.4\times10^{-4}$	90%
Γ_{35}	$D_s^{*+}\overline{D}^0$	$<5.3\times10^{-4}$	90%
Γ_{36}	$D_s^+\overline{D}^*(2007)^0$	$<4.6\times10^{-4}$	90%
Γ_{37}	$D_s^{*+} D^0$	$<9\times10^{-4}$	90%
Γ_{38}	$D_s^+ D^*(2007)^0$	$<6.6\times10^{-4}$	90%
Γ_{39}	$D^*(2010)^+\overline{D}^0$	$<3.8\times10^{-4}$	90%
Γ_{40}	$D^*(2010)^+\overline{D}^0,\ D^{*+}\to D^+\pi^0/\gamma$	not seen	
Γ_{41}	$D^+\overline{D}^*(2007)^0$	$<6.5\times10^{-4}$	90%
Γ_{42}	$D^*(2007)^+ D^0$	$<2.0\times10^{-4}$	90%
Γ_{43}	$D^*(2010)^+ D^0,\ D^{*+}\to D^+\pi^0/\gamma$	not seen	
Γ_{44}	$D^+ D^*(2007)^0$	$<3.7\times10^{-4}$	90%
Γ_{45}	$D_s^{*+}\overline{D}^*(2007)^0$	$<1.3\times10^{-3}$	90%
Γ_{46}	$D_s^{*+} D^*(2007)^0$	$<1.3\times10^{-3}$	90%
Γ_{47}	$D^*(2010)^+\overline{D}^*(2007)^0$	$<1.0\times10^{-3}$	90%
Γ_{48}	$D^*(2010)^+ D^*(2007)^0$	$<7.7\times10^{-4}$	90%
Γ_{49}	$D^+ K^{*0}$	not seen	
Γ_{50}	$D^+\overline{K}^{*0}$	not seen	
Γ_{51}	$D_s^+ K^{*0}$	not seen	
Γ_{52}	$D_s^+\overline{K}^{*0}$	not seen	
Γ_{53}	$D_s^+\phi$	not seen	
Γ_{54}	$K^+ K^0$	not seen	
Γ_{55}	$B_s^0\pi^+$ / B($\overline{b}\to B_s$)	seen	
Γ_{56}	$B_s^0\pi^+$		
Γ_{57}	$\pi^+\mu^+\mu^-$		
Γ_{58}	$D_s^+\mu^+\mu^-$		

B_c^+ BRANCHING RATIOS

$\Gamma(J/\psi(1S)\ell^+\nu_\ell\,\text{anything})/\Gamma_{\text{total}}\times B(\overline{b}\to B_c)$ $\Gamma_1/\Gamma\times B$

VALUE (units 10^{-5})	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
8.2±1.3 OUR AVERAGE	Error includes scale factor of 1.4.				
$8.8\pm1.0\pm0.2$		[1,2] AALTONEN	16A	CDF	$p\overline{p}$ at 1.96 TeV
$5.2^{+2.4}_{-2.1}$		[3] ABE	98M	CDF	$p\overline{p}$ 1.8 TeV

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

<16	90	[4] ACKERSTAFF	98O	OPAL	$e^+e^- \to Z$
<19	90	[5] ABREU	97E	DLPH	$e^+e^- \to Z$
<12	90	[6] BARATE	97H	ALEP	$e^+e^- \to Z$

[1] AALTONEN 16A reports $[\Gamma(B_c^+ \to J/\psi(1S)\ell^+\nu_\ell \text{anything})/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)]$ / $[\text{B}(\overline{b} \to B^+)]$ / $[\text{B}(B^+ \to J/\psi(1S)K^+)] = 0.211 \pm 0.012^{+0.021}_{-0.020}$ which we multiply by our best values $\text{B}(\overline{b} \to B^+) = (40.8 \pm 0.7) \times 10^{-2}$, $\text{B}(B^+ \to J/\psi(1S)K^+) = (1.020 \pm 0.019) \times 10^{-3}$. Our first error is their experiment's error and our second error is the systematic error from using our best values.

[2] AALTONEN 16A also measures the cross-section $\sigma(B_c) \times \text{B}(B_c \to J/\psi\mu\nu_\mu) = 0.60 \pm 0.09$ nb and estimates the total cross-section $\sigma(B_c)$ to be in the range 25 ± 4 to 52 ± 8 nb for $p_T(B_c) > 6$ GeV/c and $|y(B_c)| < 1$.

[3] ABE 98M result is derived from the measurement of $[\sigma(B_c) \times \text{B}(B_c \to J/\psi(1S)\ell\nu_\ell)]$ / $[\sigma(B^+) \times \text{B}(B^+ \to J/\psi(1S)K^+)] = 0.132^{+0.041}_{-0.037}(\text{stat}) \pm 0.031(\text{sys})^{+0.032}_{-0.020}(\text{lifetime})$ by using PDG 98 values of $\text{B}(b \to B^+)$ and $\text{B}(B^+ \to J/\psi(1S)K^+)$.

[4] ACKERSTAFF 98O reports $\text{B}(Z \to B_c X)/\text{B}(Z \to q\overline{q}) \times \text{B}(B_c \to J/\psi(1S)\ell\nu_\ell) < 6.95 \times 10^{-5}$ at 90%CL. We rescale to our PDG 98 values of $\text{B}(Z \to b\overline{b})$.

[5] ABREU 97E value listed is for an assumed $\tau_{B_c} = 0.4$ ps and improves to 1.6×10^{-4} for $\tau_{B_c} = 1.4$ ps.

[6] BARATE 97H reports $\text{B}(Z \to B_c X)/\text{B}(Z \to q\overline{q}) \cdot \text{B}(B_c \to J/\psi(1S)\ell\nu_\ell) < 5.2 \times 10^{-5}$ at 90%CL. We rescale to our PDG 96 values of $\text{B}(Z \to b\overline{b})$. A $B_c^+ \to J/\psi(1S)\mu^+\nu_\mu$ candidate event is found, compared to all the known background sources 2×10^{-3}, which gives $m_{B_c} = 5.96^{+0.25}_{-0.19}$ GeV and $\tau_{B_c} = 1.77 \pm 0.17$ ps.

$\Gamma(J/\psi(1S)\tau^+\nu_\tau)/\Gamma(J/\psi(1S)\mu^+\nu_\mu)$ Γ_3/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
0.71±0.17±0.18	[1] AAIJ	18C	LHCB	pp at 7, 8 TeV

[1] AAIJ 18C uses $\tau^+ \to \mu^+\nu_\mu\overline{\nu}_\tau$ mode to obtain the ratio value.

$\Gamma(J/\psi(1S)\pi^+)/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)$ $\Gamma_4/\Gamma \times \text{B}$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
seen		[1] AABOUD	21	ATLS	pp at 8 TeV
seen		[2] AAIJ	15M	LHCB	pp at 8 TeV
seen		[3] KHACHATRY...	15AA	CMS	pp at 7 TeV
seen		AALTONEN	13	CDF	$p\overline{p}$ at 1.96 TeV
seen		[4] AAIJ	12AV	LHCB	pp at 7 TeV
seen		AALTONEN	08M	CDF	$p\overline{p}$ at 1.96 TeV
seen		ABAZOV	08T	D0	$p\overline{p}$ at 1.96 TeV

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

$<2.4 \times 10^{-4}$	90	[5] ACKERSTAFF	98O	OPAL	$e^+e^- \to Z$
$<3.4 \times 10^{-4}$	90	[6] ABREU	97E	DLPH	$e^+e^- \to Z$
$<8.2 \times 10^{-5}$	90	[7] BARATE	97H	ALEP	$e^+e^- \to Z$
$<2.0 \times 10^{-5}$	95	[8] ABE	96R	CDF	$p\overline{p}$ 1.8 TeV

[1] AABOUD 21 reports a measurement of $\text{B}(B_c^+ \to J/\psi\pi^+)$ / $\text{B}(B^+ \to J/\psi K^+)$ $\cdot f_c/f_u = (0.34 \pm 0.04^{+0.06}_{-0.02} \pm 0.01)$ %, at $p_T > 13$ GeV and $|y| < 2.3$.

[2] AAIJ 15M reports a measurement of $B(B_c^+ \to J/\psi\pi^+)$ / $B(B^+ \to J/\psi K^+) \cdot f_c/f_u$ = (0.683 ± 0.018 ± 0.009)% at $p_T(B) < 20$ GeV and $2.0 < y(B) < 4.5$.

[3] KHACHATRYAN 15AA reports a measurement of $B(B_c^+ \to J/\psi\pi^+)$ / $B(B^+ \to J/\psi K^+) \cdot f_c/f_u$ = (0.48 ± 0.05 ± 0.03 ± 0.05)%, at $p_T > 15$ GeV and $|\eta(B)| < 1.6$.

[4] AAIJ 12AV reports a measurement of $B(B_c^+ \to J/\psi\pi^+)/B(B^+ \to J/\psi K^+)\ f_c/f_u$ = (0.68 ± 0.10 ± 0.03 ± 0.05)% at $p_T(B) > 4$ GeV and $2.5 < \eta(B) < 4.5$.

[5] ACKERSTAFF 98O reports $B(Z \to B_c X)/B(Z \to q\bar{q}) \times B(B_c \to J/\psi(1S)\pi^+) < 1.06 \times 10^{-4}$ at 90%CL. We rescale to our PDG 98 values of $B(Z \to b\bar{b})$.

[6] ABREU 97E value listed is for an assumed $\tau_{B_c} = 0.4$ ps and improves to 2.7×10^{-4} for $\tau_{B_c} = 1.4$ ps.

[7] BARATE 97H reports $B(Z \to B_c X)/B(Z \to q\bar{q}) \cdot B(B_c \to J/\psi(1S)\pi) < 3.6 \times 10^{-5}$ at 90%CL. We rescale to our PDG 96 values of $B(Z \to b\bar{b})$.

[8] ABE 96R reports $B(b \to B_c X)/B(b \to B^+ X) \cdot B(B_c^+ \to J/\psi(1S)\pi^+)/B(B^+ \to J/\psi(1S)K^+) < 0.053$ at 95%CL for $\tau_{B_c} = 0.8$ ps. It changes from 0.15 to 0.04 for 0.17 ps$< \tau_{B_c} < 1.6$ ps. We rescale to our PDG 96 values of $B(b \to B^+) = 0.378 \pm 0.022$ and $B(B^+ \to J/\psi(1S)K^+) = 0.00101 \pm 0.00014$.

$\Gamma(J/\psi(1S)\pi^+)/\Gamma(J/\psi(1S)\mu^+\nu_\mu)$ Γ_4/Γ_2

VALUE (units 10^{-2})	DOCUMENT ID		TECN	COMMENT
4.69±0.28±0.46	[1] AAIJ	14W	LHCB	pp at 7 TeV

[1] AAIJ 14W reports also a measurement $B(B_c^+ \to J/\psi\pi^+)$ / $B(B_c^+ \to J/\psi\mu^+\nu_\mu)$ = 0.271 ± 0.016 ± 0.016 in the region $m_{J/\psi\mu^+} > 5.3$ GeV.

$\Gamma(J/\psi(1S)K^+)/\Gamma(J/\psi(1S)\pi^+)$ Γ_5/Γ_4

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
0.079±0.007±0.003		AAIJ	16AF	LHCB	pp at 7, 8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.069±0.019±0.005	50	AAIJ	13BY	LHCB	Repl. by AAIJ 16AF

$\Gamma(J/\psi(1S)\pi^+\pi^0)/\Gamma(J/\psi(1S)\pi^+)$ Γ_6/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
2.80±0.15±0.19	AAIJ	24L	LHCB	pp at 7, 8, 13 TeV

$\Gamma(J/\psi(1S)\pi^+\pi^+\pi^-)/\Gamma_{total} \times B(\bar{b} \to B_c)$ $\Gamma_7/\Gamma \times B$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
seen		AAIJ	12Y	LHCB	pp at 7 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$<5.7 \times 10^{-4}$	90	[1] ABREU	97E	DLPH	$e^+e^- \to Z$

[1] ABREU 97E value listed is independent of 0.4 ps$< \tau_{B_c} < 1.4$ ps.

$\Gamma(J/\psi(1S)\pi^+\pi^+\pi^-)/\Gamma(J/\psi(1S)\pi^+)$ Γ_7/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
2.4 ±0.4 OUR AVERAGE				
$2.55 \pm 0.80 \pm 0.33^{+0.04}_{-0.01}$	KHACHATRY...15AA		CMS	pp at 7 TeV
2.41±0.30±0.33	AAIJ	12Y	LHCB	pp at 7 TeV

$\Gamma(J/\psi(1S)a_1(1260))/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{10}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.2 \times 10^{-3}$	90	[1] ACKERSTAFF	98O	OPAL	$e^+e^- \to Z$

[1] ACKERSTAFF 98O reports $B(Z \to B_c X)/B(Z \to q\,q) \times B(B_c \to J/\psi(1S)\,a_1(1260)) < 5.29 \times 10^{-4}$ at 90%CL. We rescale to our PDG 98 values of $B(Z \to b\overline{b})$.

$\Gamma(J/\psi(1S)K^+K^-\pi^+)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{11}/\Gamma \times B$

VALUE	DOCUMENT ID		TECN	COMMENT
seen	[1] AAIJ	13CA	LHCB	pp at 7, 8 TeV

[1] A signal yield of 78 ± 14 decays is reported with a significance of 6.2 standard deviations using an integrated luminosity of 3 fb^{-1} data.

$\Gamma(J/\psi(1S)K^+K^-\pi^+)/\Gamma(J/\psi(1S)\pi^+)$ Γ_{11}/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
$0.53 \pm 0.10 \pm 0.05$	[1] AAIJ	13CA	LHCB	pp at 7, 8 TeV

[1] A signal yield of 78 ± 14 decays is reported with a significance of 6.2 standard deviations using an integrated luminosity of 3 fb^{-1} data.

$\Gamma(J/\psi(1S)\pi^+\pi^+\pi^+\pi^-\pi^-)/\Gamma(J/\psi(1S)\pi^+)$ Γ_{12}/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
$1.74 \pm 0.44 \pm 0.24$	[1] AAIJ	14P	LHCB	pp at 7, 8 TeV

[1] A signal yield of 32 ± 8 decays is reported with a significance of 4.5 standard deviations.

$\Gamma(J/\psi(1S)D_s^+)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{20}/\Gamma \times B$

VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
$6.7 \pm 0.8 \pm 0.1$	[1] AAIJ	24F	LHCB	pp at 7, 8, 13 TeV

[1] AAIJ 24F reports $[\Gamma(B_c^+ \to J/\psi(1S)D_s^+)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] = (1.63 \pm 0.15 \pm 0.13) \times 10^{-5}$ which we multiply by our best value $B(\overline{b} \to B^+) = (40.8 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(J/\psi(1S)D_s^{*+})/\Gamma(J/\psi(1S)D_s^+)$ Γ_{21}/Γ_{20}

VALUE	DOCUMENT ID		TECN	COMMENT
$1.91 \pm 0.20 \pm 0.07$	AAIJ	24F	LHCB	pp at 7, 8, 13 TeV

$\Gamma(\psi(2S)\pi^+)/\Gamma(J/\psi(1S)\pi^+)$ Γ_{13}/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
$0.254 \pm 0.018 \pm 0.006$	[1,2] AAIJ	24W	LHCB	pp at 7, 8 and 13 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.268 \pm 0.032 \pm 0.007 \pm 0.006$	[3,4] AAIJ	15AY	LHCB	pp at 7, 8 TeV
$0.250 \pm 0.068 \pm 0.014 \pm 0.006$	[3] AAIJ	13AM	LHCB	Repl. by AAIJ 15AY

[1] The last uncertainty includes the uncertainties on the branching fractions of the leptonic J/ψ and $\psi(2S)$ decays (± 0.005).

[2] Supersedes AAIJ 15AY.

[3] The last uncertainty is due to the uncertainty of the $B(\psi(2S) \to \mu^+\mu^-)/B(J/\psi \to \mu^+\mu^-)$ ratio measurement.

[4] Replaced by AAIJ 24W.

$\Gamma(\psi(2S)\pi^+)/\Gamma(J/\psi(1S)\pi^+\pi^+\pi^-)$ Γ_{13}/Γ_7

VALUE	DOCUMENT ID		TECN	COMMENT
$(3.5\pm0.6\pm0.2)\times10^{-2}$	AAIJ	22P	LHCB	pp at 7, 8, 13 TeV

$\Gamma(\psi(2S)K^+K^-\pi^+)/\Gamma(J/\psi(1S)K^+K^-\pi^+)$ Γ_{15}/Γ_{11}

VALUE	DOCUMENT ID		TECN	COMMENT
$(3.7\pm1.2\pm0.1)\times10^{-2}$	AAIJ	22P	LHCB	pp at 7, 8, 13 TeV

$\Gamma(J/\psi(1S)K^+K^-K^+)/\Gamma(J/\psi(1S)K^+K^-\pi^+)$ Γ_9/Γ_{11}

VALUE	DOCUMENT ID		TECN	COMMENT
$(7.0\pm1.8\pm0.2)\times10^{-2}$	AAIJ	22P	LHCB	pp at 7, 8, 13 TeV

$\Gamma(J/\psi(1S)K^+\pi^-\pi^+)/\Gamma(J/\psi(1S)K^+K^-\pi^+)$ Γ_8/Γ_{11}

VALUE	DOCUMENT ID		TECN	COMMENT
$0.35\pm0.06\pm0.01$	AAIJ	22P	LHCB	pp at 7, 8, 13 TeV

$\Gamma(J/\psi(1S)K^+K^-\pi^+)/\Gamma(J/\psi(1S)\pi^+\pi^+\pi^-)$ Γ_{11}/Γ_7

VALUE	DOCUMENT ID		TECN	COMMENT
$0.185\pm0.013\pm0.006$	AAIJ	22P	LHCB	pp at 7, 8, 13 TeV

$\Gamma(\psi(2S)\pi^+\pi^-\pi^+)/\Gamma(J/\psi(1S)\pi^+\pi^+\pi^-)$ Γ_{14}/Γ_7

VALUE	DOCUMENT ID		TECN	COMMENT
$(1.9\pm0.4\pm0.1)\times10^{-2}$	AAIJ	22P	LHCB	pp at 7, 8, 13 TeV

$\Gamma(J/\psi(1S)D^0K^+)/\Gamma(J/\psi(1S)\pi^+)$ Γ_{16}/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
$0.432\pm0.136\pm0.028$	AAIJ	17L	LHCB	pp at 7, 8 TeV

$\Gamma(J/\psi(1S)D^*(2007)^0K^+)/\Gamma(J/\psi(1S)D^0K^+)$ Γ_{17}/Γ_{16}

VALUE	DOCUMENT ID		TECN	COMMENT
$5.1\pm1.8\pm0.4$	AAIJ	17L	LHCB	pp at 7, 8 TeV

$\Gamma(J/\psi(1S)D^*(2010)^+K^{*0})/\Gamma(J/\psi(1S)D^0K^+)$ Γ_{18}/Γ_{16}

VALUE	DOCUMENT ID		TECN	COMMENT
$2.10\pm1.08\pm0.34$	AAIJ	17L	LHCB	pp at 7, 8 TeV

$\Gamma(J/\psi(1S)D^+K^{*0})/\Gamma(J/\psi(1S)D^0K^+)$ Γ_{19}/Γ_{16}

VALUE	DOCUMENT ID		TECN	COMMENT
$0.63\pm0.39\pm0.08$	AAIJ	17L	LHCB	pp at 7, 8 TeV

$\Gamma(J/\psi(1S)D_s^+)/\Gamma(J/\psi(1S)\pi^+)$ Γ_{20}/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
$2.8\ \pm0.4$ OUR AVERAGE				
$2.76\pm0.33\pm0.33$	[1] AAD	22O	ATLS	pp at 13 TeV
$2.90\pm0.57\pm0.24$	AAIJ	13AS	LHCB	pp at 7, 8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$3.8\ \pm1.1\ \pm0.4$	AAD	16H	ATLS	pp at 7, 8 TeV

[1] Supersedes the measurement of AAD 16H.

$\Gamma(J/\psi(1S)D_s^{*+})/\Gamma(J/\psi(1S)\pi^+)$ Γ_{21}/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
5.33±0.61±0.74	AAD	22O	ATLS	pp at 13 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
10.4 ±3.1 ±1.6	AAD	16H	ATLS	Repl. by AAD 22O

$\Gamma(J/\psi(1S)D_s^{*+})/\Gamma(J/\psi(1S)D_s^{+})$ Γ_{21}/Γ_{20}

VALUE	DOCUMENT ID		TECN	COMMENT
2.00±0.23 OUR AVERAGE				
1.93±0.24±0.09	[1] AAD	22O	ATLS	pp at 13 TeV
2.37±0.56±0.10	AAIJ	13AS	LHCB	pp at 7, 8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$2.8\ ^{+1.2}_{-0.8}\ \pm0.3$	AAD	16H	ATLS	pp at 7, 8 TeV

[1] Supersedes the measurement of AAD 16H.

$\Gamma(J/\psi(1S)p\overline{p}\pi^+)/\Gamma(J/\psi(1S)\pi^+)$ Γ_{22}/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
$\mathbf{0.143^{+0.041}_{-0.036}}$	AAIJ	14AQ	LHCB	pp at 7, 8 TeV

$\Gamma(\chi_{c0}\pi^+)/\Gamma_{\text{total}}\times \text{B}(\overline{b}\to B_c)$ $\Gamma_{23}/\Gamma\times \text{B}$

VALUE (units 10^{-6})	DOCUMENT ID		TECN	COMMENT
$\mathbf{24.0^{+8.6}_{-7.6}\pm0.4}$	[1,2] AAIJ	16AT	LHCB	pp at 7 and 8 TeV

[1] AAIJ 16AT reports $[\Gamma(B_c^+\to\ \chi_{c0}\pi^+)/\Gamma_{\text{total}}\times \text{B}(\overline{b}\to\ B_c)]\times[\Gamma(\overline{b}\to\ B^+)/\Gamma_{\text{total}}]$ $=(9.8^{+3.4}_{-3.0}\pm0.8)\times10^{-6}$ which we divide by our best value $\Gamma(\overline{b}\to\ B^+)/\Gamma_{\text{total}}=$ 0.408 ± 0.007. Our first error is their experiment's error and our second error is the systematic error from using our best value.

[2] The significance of the observed signal is 4.0 standard deviations.

$\Gamma(\chi_{c1}\pi^+)/\Gamma(\chi_{c2}\pi^+)$ Γ_{24}/Γ_{25}

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
<0.49	90	AAIJ	24I	LHCB	pp at 7, 8 and 13 TeV

$\Gamma(\chi_{c2}\pi^+)/\Gamma(J/\psi(1S)\pi^+)$ Γ_{25}/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
0.37±0.06±0.022	[1] AAIJ	24I	LHCB	pp at 7, 8 and 13 TeV

[1] The last uncertainty includes the knowledge of the $\chi_{c2}\to\ J/\psi\gamma$ branching fraction (±0.01).

$\Gamma(p\overline{p}\pi^+)/\Gamma_{\text{total}}$ Γ_{26}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	[1] AAIJ	16K	LHCB	pp at 7, 8 TeV

[1] Measures the ratio $(f_c/f_u)\times \text{B}(B_c^+\to\ p\overline{p}\pi^+)<\ 3.6\times10^{-8}$ at 95% CL, in the region $m(p\overline{p})<2.85$ GeV/c^2, where f_c (f_u) represents the fragmentation fraction of the b-quark into the B_c^+ (B_u^+) meson.

$\Gamma(D^0 K^+)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{27}/\Gamma \times B$

VALUE (units 10^{-7})	DOCUMENT ID		TECN	COMMENT
$3.8^{+1.2}_{-1.0} \pm 0.1$	[1] AAIJ	17AG	LHCB	pp at 7, 8 TeV

[1] AAIJ 17AG reports $[\Gamma(B_c^+ \to D^0 K^+)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] = (9.3^{+2.8}_{-2.5} \pm 0.6) \times 10^{-7}$ which we multiply by our best value $B(\overline{b} \to B^+) = (40.8 \pm 0.7) \times 10^{-2}$. Our first error is their experiment's error and our second error is the systematic error from using our best value.

$\Gamma(D^0 \pi^+)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{28}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 1.6 \times 10^{-7}$	95	[1] AAIJ	17AG	LHCB	pp at 7, 8 TeV

[1] AAIJ 17AG reports $[\Gamma(B_c^+ \to D^0 \pi^+)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] < 3.9 \times 10^{-7}$ which we multiply by our best value $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$.

$\Gamma(D^{*0} \pi^+)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{29}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 4 \times 10^{-7}$	95	[1] AAIJ	17AG	LHCB	pp at 7, 8 TeV

[1] AAIJ 17AG reports $[\Gamma(B_c^+ \to D^{*0} \pi^+)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] < 1.1 \times 10^{-6}$ which we multiply by our best value $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$.

$\Gamma(D^{*0} K^+)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{30}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 4 \times 10^{-7}$	95	[1] AAIJ	17AG	LHCB	pp at 7, 8 TeV

[1] AAIJ 17AG reports $[\Gamma(B_c^+ \to D^{*0} K^+)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] < 1.1 \times 10^{-6}$ which we multiply by our best value $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$.

$\Gamma(D_s^+ \overline{D}^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{31}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 1.4 \times 10^{-7}$	90	[1] AAIJ	18P	LHCB	pp at 7, 8 TeV

[1] AAIJ 18P reports $[\Gamma(B_c^+ \to D_s^+ \overline{D}^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 0.9 \times 10^{-3}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

$\Gamma(D_s^+ D^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{32}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 6 \times 10^{-8}$	90	[1] AAIJ	18P	LHCB	pp at 7, 8 TeV

[1] AAIJ 18P reports $[\Gamma(B_c^+ \to D_s^+ D^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 3.7 \times 10^{-4}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

$\Gamma(D^+ \overline{D}^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{33}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 3.0 \times 10^{-6}$	90	[1] AAIJ	18P	LHCB	pp at 7, 8 TeV

[1] AAIJ 18P reports $[\Gamma(B_c^+ \to D^+\overline{D}^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 1.9 \times 10^{-2}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

$\Gamma(D^+ D^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{34}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<1.9 \times 10^{-6}$	90	[1] AAIJ	18P LHCB	Repl. by AAIJ 21AF

[1] AAIJ 18P reports $[\Gamma(B_c^+ \to D^+ D^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 1.2 \times 10^{-2}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

$\left[\Gamma(D_s^{*+}\overline{D}^0) + \Gamma(D_s^+ \overline{D}^*(2007)^0)\right]/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $(\Gamma_{35}+\Gamma_{36})/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<4 \times 10^{-7}$	90	[1] AAIJ	18P LHCB	Repl. by AAIJ 21AF

[1] AAIJ 18P reports $[\left[\Gamma(B_c^+ \to D_s^{*+}\overline{D}^0) + \Gamma(B_c^+ \to D_s^+ \overline{D}^*(2007)^0)\right]/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 2.8 \times 10^{-3}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

$\left[\Gamma(D_s^{*+} D^0) + \Gamma(D_s^+ D^*(2007)^0)\right]/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $(\Gamma_{37}+\Gamma_{38})/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<5 \times 10^{-7}$	90	[1] AAIJ	18P LHCB	Repl. by AAIJ 21AF

[1] AAIJ 18P reports $[\left[\Gamma(B_c^+ \to D_s^{*+} D^0) + \Gamma(B_c^+ \to D_s^+ D^*(2007)^0)\right]/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 3.0 \times 10^{-3}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

$\Gamma(D^*(2010)^+ \overline{D}^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{39}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<6.2 \times 10^{-3}$	90	[1] BARATE	98Q ALEP	$e^+ e^- \to Z$

[1] BARATE 98Q reports $B(Z \to B_c X) \times B(B_c \to D^*(2010)^+ \overline{D}^0) < 1.9 \times 10^{-3}$ at 90%CL. We rescale to our PDG 98 values of $B(Z \to b\overline{b})$.

$\left[\Gamma(D^*(2010)^+ \overline{D}^0,\ D^{*+} \to D^+ \pi^0/\gamma) + \Gamma(D^+ \overline{D}^*(2007)^0)\right]/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $(\Gamma_{40}+\Gamma_{41})/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<9 \times 10^{-6}$	90	[1] AAIJ	18P LHCB	Repl. by AAIJ 21AF

[1] AAIJ 18P reports $[\left[\Gamma(B_c^+ \to D^*(2010)^+ \overline{D}^0,\ D^{*+} \to D^+ \pi^0/\gamma) + \Gamma(B_c^+ \to D^+ \overline{D}^*(2007)^0)\right]/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 5.5 \times 10^{-2}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

$\left[\Gamma\left(D^*(2010)^+ D^0,\ D^{*+} \to D^+\pi^0/\gamma\right) + \Gamma\left(D^+ D^*(2007)^0\right)\right]/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $(\Gamma_{43}+\Gamma_{44})/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<3.4 \times 10^{-6}$	90	[1] AAIJ	18P LHCB	Repl. by AAIJ 21AF

[1] AAIJ 18P reports $[\left[\Gamma(B_c^+ \to D^*(2010)^+ D^0,\ D^{*+} \to D^+\pi^0/\gamma) + \Gamma(B_c^+ \to D^+ D^*(2007)^0)\right]/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 2.2 \times 10^{-2}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

$\Gamma\left(D_s^{*+}\overline{D}^*(2007)^0\right)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{45}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<1.7 \times 10^{-6}$	90	[1] AAIJ	18P LHCB	Repl. by AAIJ 21AF

[1] AAIJ 18P reports $[\Gamma(B_c^+ \to D_s^{*+}\overline{D}^*(2007)^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 1.1 \times 10^{-2}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

$\Gamma\left(D_s^{*+} D^*(2007)^0\right)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{46}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<3.1 \times 10^{-6}$	90	[1] AAIJ	18P LHCB	Repl. by AAIJ 21AF

[1] AAIJ 18P reports $[\Gamma(B_c^+ \to D_s^{*+} D^*(2007)^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 2.0 \times 10^{-2}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

$\Gamma\left(D^*(2010)^+\overline{D}^*(2007)^0\right)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{47}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<1.0 \times 10^{-4}$	90	[1] AAIJ	18P LHCB	Repl. by AAIJ 21AF

[1] AAIJ 18P reports $[\Gamma(B_c^+ \to D^*(2010)^+ \overline{D}^*(2007)^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 6.5 \times 10^{-1}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

$\Gamma\left(D^*(2010)^+ D^*(2007)^0\right)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{48}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<2.0 \times 10^{-5}$	90	[1] AAIJ	18P LHCB	Repl. by AAIJ 21AF

[1] AAIJ 18P reports $[\Gamma(B_c^+ \to D^*(2010)^+ D^*(2007)^0)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)] / [B(\overline{b} \to B^+)] / [B(B^+ \to \overline{D}^0 D^+)] < 1.3 \times 10^{-1}$ which we multiply by our best values $B(\overline{b} \to B^+) = 40.8 \times 10^{-2}$, $B(B^+ \to \overline{D}^0 D^+) = 3.8 \times 10^{-4}$.

$\Gamma\left(D^+ K^{*0}\right)/\Gamma_{\text{total}} \times B(\overline{b} \to B_c)$ $\Gamma_{49}/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<2.0 \times 10^{-7}$	90	[1] AAIJ	13R LHCB	pp at 7 TeV

[1] AAIJ 13R reports $[\Gamma(B_c^+ \to D^+ K^{*0})/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)] / [\text{B}(\overline{b} \to B^+)] < 0.5 \times 10^{-6}$ which we multiply by our best value $\text{B}(\overline{b} \to B^+) = 40.8 \times 10^{-2}$.

$\Gamma(D^+ \overline{K}^{*0})/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)$ $\Gamma_{50}/\Gamma \times \text{B}$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 1.6 \times 10^{-7}$	90	[1] AAIJ	13R	LHCB	pp at 7 TeV

[1] AAIJ 13R reports $[\Gamma(B_c^+ \to D^+ \overline{K}^{*0})/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)] / [\text{B}(\overline{b} \to B^+)] < 0.4 \times 10^{-6}$ which we multiply by our best value $\text{B}(\overline{b} \to B^+) = 40.8 \times 10^{-2}$.

$\Gamma(D_s^+ K^{*0})/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)$ $\Gamma_{51}/\Gamma \times \text{B}$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 2.9 \times 10^{-7}$	90	[1] AAIJ	13R	LHCB	pp at 7 TeV

[1] AAIJ 13R reports $[\Gamma(B_c^+ \to D_s^+ K^{*0})/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)] / [\text{B}(\overline{b} \to B^+)] < 0.7 \times 10^{-6}$ which we multiply by our best value $\text{B}(\overline{b} \to B^+) = 40.8 \times 10^{-2}$.

$\Gamma(D_s^+ \overline{K}^{*0})/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)$ $\Gamma_{52}/\Gamma \times \text{B}$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 4 \times 10^{-7}$	90	[1] AAIJ	13R	LHCB	pp at 7 TeV

[1] AAIJ 13R reports $[\Gamma(B_c^+ \to D_s^+ \overline{K}^{*0})/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)] / [\text{B}(\overline{b} \to B^+)] < 1.1 \times 10^{-6}$ which we multiply by our best value $\text{B}(\overline{b} \to B^+) = 40.8 \times 10^{-2}$.

$\Gamma(D_s^+ \phi)/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)$ $\Gamma_{53}/\Gamma \times \text{B}$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 3.3 \times 10^{-7}$	90	[1] AAIJ	13R	LHCB	pp at 7 TeV

[1] AAIJ 13R reports $[\Gamma(B_c^+ \to D_s^+ \phi)/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)] / [\text{B}(\overline{b} \to B^+)] < 0.8 \times 10^{-6}$ which we multiply by our best value $\text{B}(\overline{b} \to B^+) = 40.8 \times 10^{-2}$.

$\Gamma(K^+ K^0)/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)$ $\Gamma_{54}/\Gamma \times \text{B}$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 4.6 \times 10^{-7}$	90	[1] AAIJ	13BS	LHCB	pp at 7 TeV

[1] Derived from $\Gamma(K^+ K^0)/\Gamma \times \text{B}(\overline{b} \to B_c) / (\text{B}(B^+ \to K^0 \pi^+)\ \text{B}(\overline{b} \to B^+)) < 5.8\%$ at 90% CL using normalization mode $\text{B}(B^+ \to K^0 \pi^+) = (23.97 \pm 0.53 \pm 0.71) \times 10^{-6}$ and assuming a B production ratio $\text{f}(\overline{b} \to B_u^+) = 0.33$.

$\Gamma(B_s^0 \pi^+ / \text{B}(\overline{b} \to B_s))/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)$ $\Gamma_{55}/\Gamma \times \text{B}$

VALUE (units 10^{-3})	DOCUMENT ID		TECN	COMMENT
$2.37 \pm 0.31 \pm 0.11 {}^{+0.17}_{-0.13}$	[1] AAIJ	13BU	LHCB	pp at 7, 8 TeV

[1] The last uncertinty is due to the uncertainty of the B_c^+ lifetime measurument.

$\Gamma(D_s^+ \overline{D}^0)/\Gamma_{\text{total}}$ Γ_{31}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$< 7.2 \times 10^{-4}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $\text{B}(\overline{b} \to B_c)/\text{B}(\overline{b} \to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D_s^+ D^0)/\Gamma_{total}$ Γ_{32}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.0 \times 10^{-4}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b} \to B_c)/B(\overline{b} \to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D^+ \overline{D}^0)/\Gamma_{total}$ Γ_{33}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.9 \times 10^{-4}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b} \to B_c)/B(\overline{b} \to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D^+ D^0)/\Gamma_{total}$ Γ_{34}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.4 \times 10^{-4}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b} \to B_c)/B(\overline{b} \to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D_s^{*+} \overline{D}^0)/\Gamma_{total}$ Γ_{35}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<5.3 \times 10^{-4}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b} \to B_c)/B(\overline{b} \to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D_s^+ \overline{D}^*(2007)^0)/\Gamma_{total}$ Γ_{36}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<4.6 \times 10^{-4}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b} \to B_c)/B(\overline{b} \to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D_s^{*+} D^0)/\Gamma_{total}$ Γ_{37}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<0.9 \times 10^{-3}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b} \to B_c)/B(\overline{b} \to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D_s^+ D^*(2007)^0)/\Gamma_{total}$ Γ_{38}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<6.6 \times 10^{-4}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b} \to B_c)/B(\overline{b} \to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D^*(2010)^+ \overline{D}^0)/\Gamma_{total}$ Γ_{39}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.8 \times 10^{-4}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b} \to B_c)/B(\overline{b} \to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D^*(2007)^+ D^0)/\Gamma_{total}$ Γ_{42}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.0 \times 10^{-4}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b} \to B_c)/B(\overline{b} \to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D^+\overline{D}^*(2007)^0)/\Gamma_{total}$ Γ_{41}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<6.5\times10^{-4}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b}\to B_c)/B(\overline{b}\to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D^+D^*(2007)^0)/\Gamma_{total}$ Γ_{44}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.7\times10^{-4}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b}\to B_c)/B(\overline{b}\to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D_s^{*+}\overline{D}^*(2007)^0)/\Gamma_{total}$ Γ_{45}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.3\times10^{-3}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b}\to B_c)/B(\overline{b}\to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D_s^{*+}D^*(2007)^0)/\Gamma_{total}$ Γ_{46}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.3\times10^{-3}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b}\to B_c)/B(\overline{b}\to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D^*(2010)^+\overline{D}^*(2007)^0)/\Gamma_{total}$ Γ_{47}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<1.0\times10^{-3}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b}\to B_c)/B(\overline{b}\to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(D^*(2010)^+D^*(2007)^0)/\Gamma_{total}$ Γ_{48}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<7.7\times10^{-4}$	90	[1] AAIJ	21AF	LHCB	pp at 13 TeV

[1] Uses $B(\overline{b}\to B_c)/B(\overline{b}\to B^+) = 0.76\%$ determined by AAIJ 19AI.

$\Gamma(B_s^0\pi^+)/\Gamma(J/\psi(1S)\pi^+)$ Γ_{56}/Γ_4

VALUE	DOCUMENT ID		TECN	COMMENT
$91\pm10\pm8.5$	[1] AAIJ	23M	LHCB	pp at 13 TeV

[1] The B_s^0 mesons are reconstructed via the decays $B_s^0\to J/\psi\phi$ and $B_s^0\to D_s^-\pi^+$. The third uncertainty includes systematic (±8) and imprecise knowledge of the branching fractions (±3).

$\Gamma(\pi^+\mu^+\mu^-)/\Gamma(J/\psi(1S)\pi^+)$ Γ_{57}/Γ_4

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<2.1\times10^{-4}$	90	AAIJ	24W	LHCB	pp at 7, 8 and 13 TeV

$\Gamma(D_s^+\mu^+\mu^-)/\Gamma_{total}\times B(\overline{b}\to B_c)$ $\Gamma_{58}/\Gamma\times B$

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
$<3.1\times10^{-8}$	90	[1] AAIJ	24F	LHCB	pp at 7, 8, 13 TeV

[1] AAIJ 24F reports $[\Gamma(B_c^+\to D_s^+\mu^+\mu^-)/\Gamma_{total}\times B(\overline{b}\to B_c)]$ / $[B(\overline{b}\to B^+)]$ $< 7.5\times10^{-8}$ which we multiply by our best value $B(\overline{b}\to B^+) = 40.8\times10^{-2}$.

POLARIZATION IN B_c^+ DECAY

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 $\phi_\perp$. See the definitions in the note on "Polarization in B Decays" review in the B^0 Particle Listings.

Γ_L/Γ in $B_c^+ \to J/\psi D_s^{*+}$

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
0.34±0.09 OUR AVERAGE				
0.30±0.10±0.04	[1,2] AAD	22O	ATLS	pp at 13 TeV
0.48±0.20	[3] AAIJ	13AS	LHCB	pp at 7, 8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.62±0.24	[4] AAD	16H	ATLS	pp at 7, 8 TeV

[1] Supersedes the measurement of AAD 16H.
[2] AAD 22O measures $1 - \Gamma_L/\Gamma = 0.70 \pm 0.10 \pm 0.04$.
[3] AAIJ 13AS measures $1 - \Gamma_L/\Gamma = 0.52 \pm 0.20$.
[4] AAD 16H measures $1 - \Gamma_L/\Gamma = 0.38 \pm 0.24$.

$A_P(B_c^+)$

$A_P(B_c^+) = [\sigma(B_c^-) - \sigma(B_c^+)] \,/\, [\sigma(B_c^-) + \sigma(B_c^+)]$

VALUE (units 10^{-2})	*DOCUMENT ID*		*TECN*	*COMMENT*
−1.0±1.0 OUR AVERAGE				
−2.5±2.1±0.5	[1] AAIJ	19AI	LHCB	pp at 7 TeV
−0.5±1.1±0.4	[1] AAIJ	19AI	LHCB	pp at 13 TeV

[1] Measured using B_c^+ semileptonic decays.

B_c^+ REFERENCES

AAIJ	24F	JHEP 2402 032	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	24I	JHEP 2402 173	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	24L	JHEP 2404 151	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	24W	EPJ C84 468	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	23M	JHEP 2307 066	R. Aaij *et al.*	(LHCb Collab.)
AAD	22O	JHEP 2208 087	G. Aad *et al.*	(ATLAS Collab.)
AAIJ	22P	JHEP 2201 065	R. Aaij *et al.*	(LHCb Collab.)
AABOUD	21	PR D104 012010	M. Aaboud *et al.*	(ATLAS Collab.)
AAIJ	21AF	JHEP 2112 117	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	20R	JHEP 2007 123	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	19AI	PR D100 112006	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	18C	PRL 120 121801	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	18P	NP B930 563	R. Aaij *et al.*	(LHCb Collab.)
SIRUNYAN	18BY	EPJ C78 457	A.M. Sirunyan *et al.*	(CMS Collab.)
AAIJ	17AG	PRL 118 111803	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	17L	PR D95 032005	R. Aaij *et al.*	(LHCb Collab.)
AAD	16H	EPJ C76 4	G. Aad *et al.*	(ATLAS Collab.)
AAIJ	16AF	JHEP 1609 153	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	16AT	PR D94 091102	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	16K	PL B759 313	R. Aaij *et al.*	(LHCb Collab.)
AALTONEN	16A	PR D93 052001	T. Aaltonen *et al.*	(CDF Collab.)
AAIJ	15AY	PR D92 072007	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	15G	PL B742 29	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	15M	PRL 114 132001	R. Aaij *et al.*	(LHCb Collab.)
KHACHATRY...	15AA	JHEP 1501 063	V. Khachatryan *et al.*	(CMS Collab.)

AAIJ	14AQ	PRL 113 152003	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	14G	EPJ C74 2839	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	14P	JHEP 1405 148	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	14W	PR D90 032009	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	13AM	PR D87 071103	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	13AS	PR D87 112012	R. Aaij *et al.*	(LHCb Collab.)
Also		PR D89 019901 (errat.)	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	13BS	PL B726 646	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	13BU	PRL 111 181801	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	13BY	JHEP 1309 075	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	13CA	JHEP 1311 094	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	13R	JHEP 1302 043	R. Aaij *et al.*	(LHCb Collab.)
AALTONEN	13	PR D87 011101	T. Aaltonen *et al.*	(CDF Collab.)
AAIJ	12AV	PRL 109 232001	R. Aaij *et al.*	(LHCb Collab.)
AAIJ	12Y	PRL 108 251802	R. Aaij *et al.*	(LHCb Collab.)
ABAZOV	09H	PRL 102 092001	V.M. Abazov *et al.*	(D0 Collab.)
AALTONEN	08M	PRL 100 182002	T. Aaltonen *et al.*	(CDF Collab.)
ABAZOV	08T	PRL 101 012001	V.M. Abazov *et al.*	(D0 Collab.)
ABULENCIA	06C	PRL 96 082002	A. Abulencia *et al.*	(CDF Collab.)
ABULENCIA	06O	PRL 97 012002	A. Abulencia *et al.*	(CDF Collab.)
ABE	98M	PRL 81 2432	F. Abe *et al.*	(CDF Collab.)
Also		PR D58 112004	F. Abe *et al.*	(CDF Collab.)
ACKERSTAFF	98O	PL B420 157	K. Ackerstaff *et al.*	(OPAL Collab.)
BARATE	98Q	EPJ C4 387	R. Barate *et al.*	(ALEPH Collab.)
PDG	98	EPJ C3 1	C. Caso *et al.*	(PDG Collab.)
ABREU	97E	PL B398 207	P. Abreu *et al.*	(DELPHI Collab.)
BARATE	97H	PL B402 213	R. Barate *et al.*	(ALEPH Collab.)
ABE	96R	PRL 77 5176	F. Abe *et al.*	(CDF Collab.)
PDG	96	PR D54 1	R. M. Barnett *et al.*	(PDG Collab.)