$B_c^{\pm}$

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

Quantum numbers shown are quark-model predictions.

$B_c^{\pm}$ MASS

VALUE (GeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
6.286 ±0.005 OUR AVERAGE				
6.2857±0.0053±0.0012	[1] ABULENCIA	06C	CDF	$p\overline{p}$ 1.96 TeV
6.4 ±0.39 ±0.13	[2] ABE	98M	CDF	$p\overline{p}$ 1.8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
6.32 ±0.06	[3] ACKERSTAFF	98O	OPAL	$e^+ e^- \rightarrow Z$

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

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

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

$B_c^{\pm}$ MEAN LIFE

VALUE (10^{-12} s)	*DOCUMENT ID*		*TECN*	*COMMENT*
$\mathbf{0.46^{+0.18}_{-0.16}\pm0.03}$	[4] ABE	98M	CDF	$p\overline{p}$ 1.8 TeV

[4] The lifetime is measured from the $J/\psi(1S)\ell$ decay vertices.

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

B_c^- modes are charge conjugates of the modes below.

	Mode	Fraction (Γ_i/Γ)	Confidence level
	The following quantities are not pure branching ratios; rather the fraction $\Gamma_i/\Gamma \times$ B($\overline{b} \rightarrow B_c$).		
Γ_1	$J/\psi(1S)\ell^+\nu_\ell$ anything	$(5.2^{+2.4}_{-2.1}) \times 10^{-5}$	
Γ_2	$J/\psi(1S)\pi^+$	$< 8.2 \times 10^{-5}$	90%
Γ_3	$J/\psi(1S)\pi^+\pi^+\pi^-$	$< 5.7 \times 10^{-4}$	90%
Γ_4	$J/\psi(1S)a_1(1260)$	$< 1.2 \times 10^{-3}$	90%
Γ_5	$D^*(2010)^+\overline{D}^0$	$< 6.2 \times 10^{-3}$	90%

B_c^+ BRANCHING RATIOS

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$\mathbf{(5.2^{+2.4}_{-2.1}) \times 10^{-5}}$		[5] ABE 98M	CDF	$p\overline{p}$ 1.8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$< 1.6 \times 10^{-4}$	90	[6] ACKERSTAFF 98O	OPAL	$e^+e^- \to Z$
$< 1.9 \times 10^{-4}$	90	[7] ABREU 97E	DLPH	$e^+e^- \to Z$
$< 1.2 \times 10^{-4}$	90	[8] BARATE 97H	ALEP	$e^+e^- \to Z$

[5] ABE 98M result is derived from the measurement of $[\sigma(B_c)\times\text{B}(B_c \to J/\psi(1S)\ell\nu_\ell)]$ / $[\sigma(B^+)\times\text{B}(B^+ \to J/\psi(1S)K^+)] = 0.132^{+0.041}_{-0.037}(\text{stat})\pm0.031(\text{sys})^{+0.032}_{-0.020}(\text{lifetime})$ by using PDG 98 values of $\text{B}(b \to B^+)$ and $\text{B}(B^+ \to J/\psi(1S)K^+)$.

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

[7] 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.

[8] BARATE 97H reports $\text{B}(Z \to B_c X)/\text{B}(Z \to qq)\cdot\text{B}(B_c \to J/\psi(1S)\ell\nu_\ell) < 5.2\times10^{-5}$ 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.

$\Gamma(J/\psi(1S)\pi^+)/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)$ — $\Gamma_2/\Gamma \times \text{B}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$\mathbf{<8.2 \times 10^{-5}}$	90	[9] BARATE 97H	ALEP	$e^+e^- \to Z$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$<2.4 \times 10^{-4}$	90	[10] ACKERSTAFF 98O	OPAL	$e^+e^- \to Z$
$<3.4 \times 10^{-4}$	90	[11] ABREU 97E	DLPH	$e^+e^- \to Z$
$<2.0 \times 10^{-5}$	95	[12] ABE 96R	CDF	$p\overline{p}$ 1.8 TeV

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

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

[11] 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.

[12] ABE 96R reports $\text{B}(b \to B_c X)/\text{B}(b \to B^+ X)\cdot\text{B}(B_c^+ \to J/\psi(1S)\pi^+)/\text{B}(B^+ \to J/\psi(1S)K^+) < 0.053$ 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 $\text{B}(b \to B^+) = 0.378\pm0.022$ and $\text{B}(B^+ \to J/\psi(1S)K^+) = 0.00101 \pm 0.00014$.

$\Gamma(J/\psi(1S)\pi^+\pi^+\pi^-)/\Gamma_{\text{total}} \times \text{B}(\overline{b} \to B_c)$ — $\Gamma_3/\Gamma \times \text{B}$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$\mathbf{<5.7 \times 10^{-4}}$	90	[13] ABREU 97E	DLPH	$e^+e^- \to Z$

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

$\Gamma\big(J/\psi(1S)\,a_1(1260)\big)/\Gamma_{\rm total} \times B\big(\overline{b} \to B_c\big)$ — $\Gamma_4/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.2 \times 10^{-3}$	90	[14] ACKERSTAFF 98O	OPAL	$e^+e^- \to Z$

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

$\Gamma\big(D^*(2010)^+\overline{D}^0\big)/\Gamma_{\rm total} \times B\big(\overline{b} \to B_c\big)$ — $\Gamma_5/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<6.2 \times 10^{-3}$	90	[15] BARATE 98Q	ALEP	$e^+e^- \to Z$

[15] 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 $B(Z \to b\overline{b})$.

$B_c^\pm$ REFERENCES

ABULENCIA	06C	PRL 96 082002	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.*	
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.*	