



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

$I, J, P$  need confirmation.

Quantum numbers shown are quark-model predictions.

### $B_c^\pm$ MASS

VALUE (GeV)	DOCUMENT ID	TECN	COMMENT
<b><math>6.4 \pm 0.39 \pm 0.13</math></b>	<sup>1</sup> ABE	98M CDF	$p\bar{p}$ 1.8 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$6.32 \pm 0.06$	<sup>2</sup> ACKERSTAFF	98O OPAL	$e^+e^- \rightarrow Z$
<sup>1</sup> 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 $m(J/\psi(1S)\ell)$ .			
<sup>2</sup> ACKERSTAFF 98O observed 2 candidate events in the $B_c \rightarrow J/\psi(1S)\pi^+$ channel with an estimated background of $0.63 \pm 0.20$ events.			

### $B_c^\pm$ MEAN LIFE

VALUE ( $10^{-12}$ s)	DOCUMENT ID	TECN	COMMENT
<b><math>0.46^{+0.18}_{-0.16} \pm 0.03</math></b>	<sup>3</sup> ABE	98M CDF	$p\bar{p}$ 1.8 TeV
<sup>3</sup> The lifetime is measured from the $J/\psi(1S)\ell$ decay vertices.			

### $B_c^+$ DECAY MODES $\times B(\bar{b} \rightarrow B_c)$

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

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level
The following quantities are not pure branching ratios; rather the fraction $\Gamma_i/\Gamma \times B(\bar{b} \rightarrow B_c)$ .		
$\Gamma_1$ $J/\psi(1S)\ell^+\nu_\ell$ anything	$(5.2^{+2.4}_{-2.1}) \times 10^{-5}$	
$\Gamma_2$ $J/\psi(1S)\pi^+$	$< 8.2 \times 10^{-5}$	90%
$\Gamma_3$ $J/\psi(1S)\pi^+\pi^+\pi^-$	$< 5.7 \times 10^{-4}$	90%
$\Gamma_4$ $J/\psi(1S)a_1(1260)$	$< 1.2 \times 10^{-3}$	90%
$\Gamma_5$ $D^*(2010)^+\bar{D}^0$	$< 6.2 \times 10^{-3}$	90%

## $B_c^+$ BRANCHING RATIOS

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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$(5.2^{+2.4}_{-2.1}) \times 10^{-5}$		<sup>4</sup> ABE	98M CDF	$p\bar{p}$ 1.8 TeV
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 1.6 \times 10^{-4}$	90	<sup>5</sup> ACKERSTAFF	98O OPAL	$e^+e^- \rightarrow Z$
$< 1.9 \times 10^{-4}$	90	<sup>6</sup> ABREU	97E DLPH	$e^+e^- \rightarrow Z$
$< 1.2 \times 10^{-4}$	90	<sup>7</sup> BARATE	97H ALEP	$e^+e^- \rightarrow Z$

<sup>4</sup> ABE 98M result is derived from the measurement of  $[\sigma(B_c) \times B(B_c \rightarrow J/\psi(1S)\ell\nu_\ell)] / [\sigma(B^+) \times B(B^+ \rightarrow J/\psi(1S)K^+)] = 0.132^{+0.041}_{-0.037}(\text{stat}) \pm 0.031(\text{sys})^{+0.032}_{-0.020}(\text{lifetime})$  by using PDG 98 values of  $B(b \rightarrow B^+)$  and  $B(B^+ \rightarrow J/\psi(1S)K^+)$ .

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

<sup>6</sup> ABREU 97E value listed is for an assumed  $\tau_{B_c} = 0.4$  ps and improves to  $1.6 \times 10^{-4}$  for  $\tau_{B_c} = 1.4$  ps.

<sup>7</sup> BARATE 97H reports  $B(Z \rightarrow B_c X)/B(Z \rightarrow qq) \cdot B(B_c \rightarrow J/\psi(1S)\ell\nu_\ell) < 5.2 \times 10^{-5}$  at 90%CL. We rescale to our PDG 96 values of  $B(Z \rightarrow b\bar{b})$ . A  $B_c^+ \rightarrow J/\psi(1S)\mu^+\nu_\mu$  candidate event is found, compared to all the known background sources  $2 \times 10^{-3}$ , which gives  $m_{B_c} = 5.96^{+0.25}_{-0.19}$  GeV and  $\tau_{B_c} = 1.77 \pm 0.17$  ps.

### $\Gamma(J/\psi(1S)\pi^+)/\Gamma_{\text{total}} \times B(\bar{b} \rightarrow B_c)$ $\Gamma_2/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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$< 8.2 \times 10^{-5}$	90	<sup>8</sup> BARATE	97H ALEP	$e^+e^- \rightarrow Z$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$< 2.4 \times 10^{-4}$	90	<sup>9</sup> ACKERSTAFF	98O OPAL	$e^+e^- \rightarrow Z$
$< 3.4 \times 10^{-4}$	90	<sup>10</sup> ABREU	97E DLPH	$e^+e^- \rightarrow Z$
$< 2.0 \times 10^{-5}$	95	<sup>11</sup> ABE	96R CDF	$p\bar{p}$ 1.8 TeV

<sup>8</sup> BARATE 97H reports  $B(Z \rightarrow B_c X)/B(Z \rightarrow qq) \cdot B(B_c \rightarrow J/\psi(1S)\pi) < 3.6 \times 10^{-5}$  at 90%CL. We rescale to our PDG 96 values of  $B(Z \rightarrow b\bar{b})$ .

<sup>9</sup> ACKERSTAFF 98O reports  $B(Z \rightarrow B_c X)/B(Z \rightarrow qq) \times B(B_c \rightarrow J/\psi(1S)\pi^+) < 1.06 \times 10^{-4}$  at 90%CL. We rescale to our PDG 98 values of  $B(Z \rightarrow b\bar{b})$ .

<sup>10</sup> ABREU 97E value listed is for an assumed  $\tau_{B_c} = 0.4$  ps and improves to  $2.7 \times 10^{-4}$  for  $\tau_{B_c} = 1.4$  ps.

<sup>11</sup> ABE 96R reports  $B(b \rightarrow B_c X)/B(b \rightarrow B^+ X) \cdot B(B_c^+ \rightarrow J/\psi(1S)\pi^+)/B(B^+ \rightarrow J/\psi(1S)K^+) < 0.053$  at 95%CL for  $\tau_{B_c} = 0.8$  ps. It changes from 0.15 to 0.04 for  $0.17 \text{ ps} < \tau_{B_c} < 1.6$  ps. We rescale to our PDG 96 values of  $B(b \rightarrow B^+) = 0.378 \pm 0.022$  and  $B(B^+ \rightarrow J/\psi(1S)K^+) = 0.00101 \pm 0.00014$ .

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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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$< 5.7 \times 10^{-4}$	90	<sup>12</sup> ABREU	97E DLPH	$e^+e^- \rightarrow Z$
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<sup>12</sup> ABREU 97E value listed is independent of  $0.4 \text{ ps} < \tau_{B_c} < 1.4$  ps.

$\Gamma(J/\psi(1S)a_1(1260))/\Gamma_{\text{total}} \times B(\bar{b} \rightarrow B_c)$   $\Gamma_4/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.2 \times 10^{-3}$	90	<sup>13</sup> ACKERSTAFF 980	OPAL	$e^+e^- \rightarrow Z$

<sup>13</sup> ACKERSTAFF 980 reports  $B(Z \rightarrow B_c X)/B(Z \rightarrow qq) \times B(B_c \rightarrow J/\psi(1S)a_1(1260)) < 5.29 \times 10^{-4}$  at 90%CL. We rescale to our PDG 98 values of  $B(Z \rightarrow b\bar{b})$ .

$\Gamma(D^*(2010)^+\bar{D}^0)/\Gamma_{\text{total}} \times B(\bar{b} \rightarrow B_c)$   $\Gamma_5/\Gamma \times B$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<6.2 \times 10^{-3}$	90	<sup>14</sup> BARATE	98Q ALEP	$e^+e^- \rightarrow Z$

<sup>14</sup> BARATE 98Q reports  $B(Z \rightarrow B_c X) \times B(B_c \rightarrow D^*(2010)^+\bar{D}^0) < 1.9 \times 10^{-3}$  at 90%CL. We rescale to our PDG 98 values of  $B(Z \rightarrow b\bar{b})$ .

**$B_c^\pm$  REFERENCES**

ABE	98M	PRL 81 2432	F. Abe <i>et al.</i>	(CDF Collab.)
Also	98R	PR D58 112004	F. Abe <i>et al.</i>	(CDF Collab.)
ACKERSTAFF	98O	PL B420 157	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
BARATE	98Q	EPJ C4 387	R. Barate <i>et al.</i>	(ALEPH Collab.)
PDG	98	EPJ C3 1	C. Caso <i>et al.</i>	
ABREU	97E	PL B398 207	P. Abreu <i>et al.</i>	(DELPHI Collab.)
BARATE	97H	PL B402 213	R. Barate <i>et al.</i>	(ALEPH Collab.)
ABE	96R	PRL 77 5176	F. Abe <i>et al.</i>	(CDF Collab.)
PDG	96	PR D54 1	R. M. Barnett <i>et al.</i>	