

**$B_J(5970)$** 

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

$I, J, P$  need confirmation.

Quantum numbers shown are quark-model predictions.

 **$B_J(5970)$  MASS** **$B_J(5970)^+$  MASS**OUR FIT uses  $m_{B^0}$  and  $m_{B_J(5970)^+} - m_{B^0}$  to determine  $m_{B_J(5970)^+}$ .

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>
<b>5965 ± 5 OUR FIT</b>	

 **$m_{B_J(5970)^+} - m_{B^0}$** 

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>685 ± 5 OUR FIT</b>				
<b>685 ± 5 OUR AVERAGE</b>				

685.3 ± 4.1 ± 2.5      2k      <sup>1</sup> AAIJ      15AB LHCB       $pp$  at 7, 8 TeV681 ± 5 ± 12      1.4k      <sup>2</sup> AALTONEN      14l      CDF       $p\bar{p}$  at 1.96 TeV

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

686.8 ± 4.5 ± 2.5      2k      <sup>3</sup> AAIJ      15AB LHCB       $pp$  at 7, 8 TeV<sup>1</sup> AAIJ 15AB reports  $[m_{B_J^+} - m_{B^0}] - m_{\pi^+} = 545.8 \pm 4.1 \pm 2.5$  MeV which we adjust bythe  $\pi^+$  mass. The masses inside the square brackets were measured for each candidate event. The result assumes  $P = (-1)^J$  and uses two relativistic Breit-Wigner functions in the fit for mass difference.<sup>2</sup> AALTONEN 14l reports  $m_{B_J(5970)^+} - m_{B^0} - m_{\pi^+} = 541 \pm 5 \pm 12$  MeV which we adjusted by the  $\pi^+$  mass.<sup>3</sup> AAIJ 15AB reports  $[m_{B_J^+} - m_{B^0}] - m_{\pi^+} = 547 \pm 5 \pm 3$  MeV which we adjust bythe  $\pi^+$  mass. The masses inside the square brackets were measured for each candidate event. The result assumes  $P = (-1)^J$  and uses three relativistic Breit-Wigner functions in the fit for mass difference. **$m_{B_J(5970)^+} - m_{B^{*0}}$** 

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
• • • We do not use the following data for averages, fits, limits, etc. • • •				

686.0 ± 4.0 ± 2.5      2k      <sup>1</sup> AAIJ      15AB LHCB       $pp$  at 7, 8 TeV<sup>1</sup> AAIJ 15AB reports  $[m_{B_J^+} - m_{B^0}] - (m_{B^{*+}} - m_{B^+}) - m_{\pi^+} = 547 \pm 4 \pm 3$  MeV whichwe adjust by the  $\pi^+$  mass. The masses inside the square brackets were measured for each candidate event. The result assumes  $P = -(-1)^J$ ,  $(m_{B^{*0}} - m_{B^0}) = (m_{B^{*+}} - m_{B^+}) = 45.01 \pm 0.30 \pm 0.23$  MeV, and uses three relativistic Breit-Wigner functions in the fit for mass difference. **$B_J(5970)^0$  MASS**OUR FIT uses  $m_{B^+}$  and  $m_{B_J(5970)^0} - m_{B^+}$  to determine  $m_{B_J(5970)^0}$ .

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>
<b>5971 ± 5 OUR FIT</b>	

**$m_{B_J(5970)^0} - m_{B^+}$** 

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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**691 ±5 OUR FIT****691 ±5 OUR AVERAGE**

689.9±2.9± 5.1	10k	<sup>1</sup> AAIJ	15AB LHCB	$pp$ at 7, 8 TeV
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698 ±5 ±12	2.6k	<sup>2</sup> AALTONEN	14l CDF	$p\bar{p}$ at 1.96 TeV
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• • • We do not use the following data for averages, fits, limits, etc. • • •

714.3±6.4± 5.1	10k	<sup>3</sup> AAIJ	15AB LHCB	$pp$ at 7, 8 TeV
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<sup>1</sup> AAIJ 15AB reports  $[m_{B_J^0} - m_{B^+}] - m_{\pi^-} = 550.4 \pm 2.9 \pm 5.1$  MeV which we adjust by

the  $\pi^-$  mass. The masses inside the square brackets were measured for each candidate event. The result assumes  $P = (-1)^J$  and uses two relativistic Breit-Wigner functions in the fit for mass difference.

<sup>2</sup> AALTONEN 14l reports  $m_{B_J(5970)^0} - m_{B^+} - m_{\pi^-} = 558 \pm 5 \pm 12$  MeV which we adjusted by the  $\pi^-$  mass.

<sup>3</sup> AAIJ 15AB reports  $[m_{B_J^0} - m_{B^+}] - m_{\pi^-} = 575 \pm 6 \pm 5$  MeV which we adjust by

the  $\pi^-$  mass. The masses inside the square brackets were measured for each candidate event. The result assumes  $P = (-1)^J$  and uses three relativistic Breit-Wigner functions in the fit for mass difference.

 **$m_{B_J(5970)^0} - m_{B^{*+}}$** 

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

691.6±3.7±5.1	10k	<sup>1</sup> AAIJ	15AB LHCB	$pp$ at 7, 8 TeV
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<sup>1</sup> AAIJ 15AB reports  $[m_{B_J^0} - m_{B^+}] - (m_{B^{*+}} - m_{B^+}) - m_{\pi^-} = 552 \pm 4 \pm 5$  MeV

which we adjust by the  $\pi^-$  mass. The masses inside the square brackets were measured for each candidate event. The result assumes  $P = -(-1)^J$ ,  $(m_{B^{*+}} - m_{B^+}) = 45.01 \pm 0.30 \pm 0.23$  MeV, and uses three relativistic Breit-Wigner functions in the fit for mass difference.

 **$B_J(5970)$  WIDTH** **$B_J(5970)^+$  WIDTH**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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**62±20 OUR AVERAGE**

63±15±17	2k	<sup>1</sup> AAIJ	15AB LHCB	$pp$ at 7, 8 TeV
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60 <sup>+30</sup> <sub>-20</sub> ±40	1.4k	AALTONEN	14l CDF	$p\bar{p}$ at 1.96 TeV
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• • • We do not use the following data for averages, fits, limits, etc. • • •

61±14±17	2k	<sup>2</sup> AAIJ	15AB LHCB	$pp$ at 7, 8 TeV
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61±15±17	2k	<sup>3</sup> AAIJ	15AB LHCB	$pp$ at 7, 8 TeV
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<sup>1</sup> Assuming  $P = (-1)^J$  and using two relativistic Breit-Wigner functions in the fit for mass difference.

<sup>2</sup> Assuming  $P = (-1)^J$  and using three relativistic Breit-Wigner functions in the fit for mass difference.

<sup>3</sup> Assuming  $P = -(-1)^J$  and using three relativistic Breit-Wigner functions in the fit for mass difference.

**$B_J(5970)^0$  WIDTH**

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>81 ± 12 OUR AVERAGE</b>				
82 ± 8 ± 9	10k	<sup>1</sup> AAIJ	15AB LHCB	$pp$ at 7, 8 TeV
70 <sup>+30</sup> <sub>-20</sub> ± 30	2.6k	AALTONEN	14i CDF	$p\bar{p}$ at 1.96 TeV

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

56 ± 7 ± 9	10k	<sup>2</sup> AAIJ	15AB LHCB	$pp$ at 7, 8 TeV
82 ± 10 ± 9	10k	<sup>3</sup> AAIJ	15AB LHCB	$pp$ at 7, 8 TeV

<sup>1</sup> Assuming  $P = (-1)^J$  and using two relativistic Breit-Wigner functions in the fit for mass difference.

<sup>2</sup> Assuming  $P = (-1)^J$  and using three relativistic Breit-Wigner functions in the fit for mass difference.

<sup>3</sup> Assuming  $P = -(-1)^J$  and using three relativistic Breit-Wigner functions in the fit for mass difference.

 **$B_J(5970)$  DECAY MODES**

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $B\pi$	possibly seen
$\Gamma_2$ $B^*\pi$	seen

 **$B_J(5970)$  BRANCHING RATIOS**

<u><math>\Gamma(B\pi)/\Gamma_{\text{total}}</math></u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	<u><math>\Gamma_1/\Gamma</math></u>
possibly seen	2k	<sup>1</sup> AAIJ	15AB LHCB	±	$pp$ at 7, 8 TeV	
possibly seen	10k	<sup>1</sup> AAIJ	15AB LHCB	0	$pp$ at 7, 8 TeV	
<b>possibly seen</b>	2.6k	AALTONEN	14i CDF	0	$p\bar{p}$ at 1.96 TeV	
<b>possibly seen</b>	1.4k	AALTONEN	14i CDF	±	$p\bar{p}$ at 1.96 TeV	

<sup>1</sup> A  $B\pi$  decay is forbidden from a  $P = -(-1)^J$  parent, whereas  $B^*\pi$  is allowed.

<u><math>\Gamma(B^*\pi)/\Gamma_{\text{total}}</math></u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	<u><math>\Gamma_2/\Gamma</math></u>
seen	10k	AAIJ	15AB LHCB	0	$pp$ at 7, 8 TeV	
seen	2k	AAIJ	15AB LHCB	±	$pp$ at 7, 8 TeV	
<b>seen</b>	2.6k	AALTONEN	14i CDF	0	$p\bar{p}$ at 1.96 TeV	
<b>seen</b>	1.4k	AALTONEN	14i CDF	±	$p\bar{p}$ at 1.96 TeV	

 **$B_J(5970)$  REFERENCES**

AAIJ	15AB JHEP 1504 024	R. Aaij <i>et al.</i>	(LHCb Collab.)
AALTONEN	14i PR D90 012013	T. Aaltonen <i>et al.</i>	(CDF Collab.)