

$B_J(5970)$

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

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> |
| 5965±5 OUR FIT | |

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

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

685 ±5 OUR AVERAGE

| | | | | |
|----------------|------|-----------------------|-----------|------------------------|
| 685.3±4.1± 2.5 | 2k | ¹ AAIJ | 15AB LHCb | pp at 7, 8 TeV |
| 681 ±5 ±12 | 1.4k | ² 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 | ³ AAIJ | 15AB LHCb | pp at 7, 8 TeV |
|----------------|----|-------------------|-----------|------------------|

¹ AAIJ 15AB reports $[m_{B_J^+} - m_{B^0}] - m_{\pi^+} = 545.8 \pm 4.1 \pm 2.5$ MeV which we adjust by the π^+ 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.

² AALTONEN 14l reports $m_{B_J(5970)^+} - m_{B^0} - m_{\pi^+} = 541 \pm 5 \pm 12$ MeV which we adjusted by the π^+ mass.

³ AAIJ 15AB reports $[m_{B_J^+} - m_{B^0}] - m_{\pi^+} = 547 \pm 5 \pm 3$ MeV which we adjust by the π^+ 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 | ¹ AAIJ | 15AB LHCb | pp at 7, 8 TeV |
|---------------|----|-------------------|-----------|------------------|

¹ AAIJ 15AB reports $[m_{B_J^+} - m_{B^0}] - (m_{B^{*+}} - m_{B^+}) - m_{\pi^+} = 547 \pm 4 \pm 3$ MeV which we adjust by the π^+ 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.

 $B_J(5970)^0$ MASSOUR 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> |
| 5971±5 OUR FIT | |

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

| VALUE (MeV) | EVTS | DOCUMENT ID | TECN | COMMENT |
|-------------|------|-------------|------|---------|
|-------------|------|-------------|------|---------|

691 ±5 OUR FIT**691 ±5 OUR AVERAGE**

689.9 ± 2.9 ± 5.1 10k ¹ AAIJ 15AB LHCB pp at 7, 8 TeV

698 ± 5 ± 12 2.6k ² AALTONEN 14l CDF $p\bar{p}$ at 1.96 TeV

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

714.3 ± 6.4 ± 5.1 10k ³ AAIJ 15AB LHCB pp at 7, 8 TeV

¹ 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 π^- 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.

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

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

the π^- 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 |
|-------------|------|-------------|------|---------|
|-------------|------|-------------|------|---------|

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

691.6 ± 3.7 ± 5.1 10k ¹ AAIJ 15AB LHCB pp at 7, 8 TeV

¹ 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 π^- 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 |
|-------------|------|-------------|------|---------|
|-------------|------|-------------|------|---------|

62 ± 20 OUR AVERAGE

63 ± 15 ± 17 2k ¹ AAIJ 15AB LHCB pp at 7, 8 TeV

60 ⁺³⁰ ₋₂₀ ± 40 1.4k AALTONEN 14l CDF $p\bar{p}$ at 1.96 TeV

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

61 ± 14 ± 17 2k ² AAIJ 15AB LHCB pp at 7, 8 TeV

61 ± 15 ± 17 2k ³ AAIJ 15AB LHCB pp at 7, 8 TeV

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

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

³ 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> |
|---|-------------|--------------------|-------------|------------------------|
| 81±12 OUR AVERAGE | | | | |
| 82± 8± 9 | 10k | ¹ AAIJ | 15AB LHCB | pp at 7, 8 TeV |
| 70 ⁺³⁰ ₋₂₀ ±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 | ² AAIJ | 15AB LHCB | pp at 7, 8 TeV |
| 82±10± 9 | 10k | ³ AAIJ | 15AB LHCB | pp at 7, 8 TeV |
| ¹ Assuming $P = (-1)^J$ and using two relativistic Breit-Wigner functions in the fit for mass difference. | | | | |
| ² Assuming $P = (-1)^J$ and using three relativistic Breit-Wigner functions in the fit for mass difference. | | | | |
| ³ Assuming $P = -(-1)^J$ and using three relativistic Breit-Wigner functions in the fit for mass difference. | | | | |

$B_J(5970)$ DECAY MODES

| Mode | Fraction (Γ_i/Γ) |
|---------------------|--------------------------------|
| Γ_1 $B\pi$ | possibly seen |
| Γ_2 $B^*\pi$ | seen |

$B_J(5970)$ BRANCHING RATIOS

| $\Gamma(B\pi)/\Gamma_{\text{total}}$ | | | | | Γ_1/Γ |
|--|-------------|--------------------|-------------|------------|------------------------|
| <u>VALUE</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>CHG</u> | <u>COMMENT</u> |
| possibly seen | 2k | ¹ AAIJ | 15AB LHCB | ± | pp at 7, 8 TeV |
| possibly seen | 10k | ¹ AAIJ | 15AB LHCB | 0 | pp at 7, 8 TeV |
| possibly seen | 2.6k | AALTONEN | 14i CDF | 0 | $p\bar{p}$ at 1.96 TeV |
| possibly seen | 1.4k | AALTONEN | 14i CDF | ± | $p\bar{p}$ at 1.96 TeV |
| ¹ A $B\pi$ decay is forbidden from a $P = -(-1)^J$ parent, whereas $B^*\pi$ is allowed. | | | | | |
| $\Gamma(B^*\pi)/\Gamma_{\text{total}}$ | | | | | Γ_2/Γ |
| <u>VALUE</u> | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>CHG</u> | <u>COMMENT</u> |
| seen | 10k | AAIJ | 15AB LHCB | 0 | pp at 7, 8 TeV |
| seen | 2k | AAIJ | 15AB LHCB | ± | pp at 7, 8 TeV |
| seen | 2.6k | AALTONEN | 14i CDF | 0 | $p\bar{p}$ at 1.96 TeV |
| seen | 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.) |