\[ \Sigma(1660) 1/2^+ \quad I(J^P) = 1(1/2^+) \quad \text{Status:} \quad *** \]


### Σ(1660) MASS

<table>
<thead>
<tr>
<th>Value (MeV)</th>
<th>Document ID</th>
<th>TECN</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1630 to 1690 (≈ 1660) OUR ESTIMATE</td>
<td>1633 ± 3</td>
<td>GAO 12</td>
<td>DPWA ( \bar{K}N \to \Lambda \pi )</td>
</tr>
<tr>
<td>1665.1 ± 11.2</td>
<td>1 KOISO 85</td>
<td>DPWA ( K^- \rho \to \Sigma \pi )</td>
<td></td>
</tr>
<tr>
<td>1670 ± 10</td>
<td>GOPAL 80</td>
<td>DPWA ( \bar{K}N \to \bar{K}N )</td>
<td></td>
</tr>
<tr>
<td>1679 ± 10</td>
<td>ALSTON-... 78</td>
<td>DPWA ( \bar{K}N ) multichannel</td>
<td></td>
</tr>
<tr>
<td>1676 ± 15</td>
<td>GOPAL 77</td>
<td>DPWA ( \bar{K}N ) multichannel</td>
<td></td>
</tr>
<tr>
<td>1668 ± 25</td>
<td>VANHORN 75</td>
<td>DPWA ( K^- \rho \to \Lambda \pi^0 )</td>
<td></td>
</tr>
<tr>
<td>1670 ± 20</td>
<td>KANE 74</td>
<td>DPWA ( K^- \rho \to \Sigma \pi )</td>
<td></td>
</tr>
</tbody>
</table>

---

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

1565 or 1597 | 2 MARTIN 77 | DPWA \( \bar{K}N \) multichannel |
| 1660 ± 30 | 3 BAILLON 75 | IPWA \( \bar{K}N \to \Lambda \pi \) |
| 1671 ± 2 | 4 PONTE 75 | DPWA \( K^- \rho \to \Lambda \pi^0 \) |

### Σ(1660) WIDTH

<table>
<thead>
<tr>
<th>Value (MeV)</th>
<th>Document ID</th>
<th>TECN</th>
<th>Comment</th>
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<tr>
<td>40 to 200 (≈ 100) OUR ESTIMATE</td>
<td>121 ± 4</td>
<td>GAO 12</td>
<td>DPWA ( \bar{K}N \to \Lambda \pi )</td>
</tr>
<tr>
<td>81.5 ± 22.2</td>
<td>1 KOISO 85</td>
<td>DPWA ( K^- \rho \to \Sigma \pi )</td>
<td></td>
</tr>
<tr>
<td>152 ± 20</td>
<td>GOPAL 80</td>
<td>DPWA ( \bar{K}N \to \bar{K}N )</td>
<td></td>
</tr>
<tr>
<td>38 ± 10</td>
<td>ALSTON-... 78</td>
<td>DPWA ( \bar{K}N \to \bar{K}N )</td>
<td></td>
</tr>
<tr>
<td>120 ± 20</td>
<td>GOPAL 77</td>
<td>DPWA ( \bar{K}N ) multichannel</td>
<td></td>
</tr>
<tr>
<td>230 ± 165</td>
<td>VANHORN 75</td>
<td>DPWA ( K^- \rho \to \Lambda \pi^0 )</td>
<td></td>
</tr>
<tr>
<td>250 ± 110</td>
<td>KANE 74</td>
<td>DPWA ( K^- \rho \to \Sigma \pi )</td>
<td></td>
</tr>
</tbody>
</table>

---

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

202 or 217 | 2 MARTIN 77 | DPWA \( \bar{K}N \) multichannel |
| 80 ± 40 | 3 BAILLON 75 | IPWA \( \bar{K}N \to \Lambda \pi \) |
| 81 ± 10 | 4 PONTE 75 | DPWA \( K^- \rho \to \Lambda \pi^0 \) |

### Σ(1660) DECAY MODES

<table>
<thead>
<tr>
<th>Mode</th>
<th>Fraction ( (\Gamma_i/\Gamma) )</th>
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</thead>
<tbody>
<tr>
<td>( \Gamma_1 )</td>
<td>( \bar{N}\bar{K} )</td>
</tr>
<tr>
<td>( \Gamma_2 )</td>
<td>( \Lambda\pi )</td>
</tr>
<tr>
<td>( \Gamma_3 )</td>
<td>( \Sigma\pi )</td>
</tr>
</tbody>
</table>
**Σ(1660) BRANCHING RATIOS**

See “Sign conventions for resonance couplings” in the Note on Λ and Σ Resonances.

<table>
<thead>
<tr>
<th>( \frac{\Gamma(N\overline{K})}{\Gamma_{\text{total}}} )</th>
<th>( \frac{\Gamma_1}{\Gamma} )</th>
<th>( \frac{(\Gamma_1 \Gamma_2)^{1/2}}{\Gamma} )</th>
<th>( \frac{(\Gamma_1 \Gamma_3)^{1/2}}{\Gamma} )</th>
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</thead>
<tbody>
<tr>
<td><strong>0.1 to 0.3 OUR ESTIMATE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( 0.12 \pm 0.03 )</td>
<td>GOPAL 80</td>
<td>DPWA ( \overline{K}N \to \overline{K}N )</td>
<td></td>
</tr>
<tr>
<td>( 0.10 \pm 0.05 )</td>
<td>ALSTON-... 78</td>
<td>DPWA ( \overline{K}N \to \overline{K}N )</td>
<td></td>
</tr>
<tr>
<td>( \bullet \bullet \bullet ) We do not use the following data for averages, fits, limits, etc. ( \bullet \bullet \bullet )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( &lt; 0.04 )</td>
<td>GOPAL 77</td>
<td>DPWA See GOPAL 80</td>
<td></td>
</tr>
<tr>
<td>( 0.27 ) or ( 0.29 )</td>
<td>2 MARTIN 77</td>
<td>DPWA ( \overline{K}N ) multichannel</td>
<td></td>
</tr>
<tr>
<td>( \frac{(\Gamma_1 \Gamma_2)^{1/2}}{\Gamma} ) in ( N\overline{K} \to \Sigma(1660) \to \Lambda \pi )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( -0.064 \pm 0.005 )</td>
<td>GAO 12</td>
<td>DPWA ( \overline{K}N \to \Lambda \pi )</td>
<td></td>
</tr>
<tr>
<td>( &lt; 0.04 )</td>
<td>GOPAL 77</td>
<td>DPWA ( \overline{K}N ) multichannel</td>
<td></td>
</tr>
<tr>
<td>( 0.12 \pm 0.12 )</td>
<td>VANHORN 75</td>
<td>DPWA ( K^- \pi \to \Lambda \pi^0 )</td>
<td></td>
</tr>
<tr>
<td>( \bullet \bullet \bullet ) We do not use the following data for averages, fits, limits, etc. ( \bullet \bullet \bullet )</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>( -0.10 ) or ( -0.11 )</td>
<td>2 MARTIN 77</td>
<td>DPWA ( \overline{K}N ) multichannel</td>
<td></td>
</tr>
<tr>
<td>( -0.04 \pm 0.02 )</td>
<td>3 BAILLON 75</td>
<td>IPWA ( \overline{K}N \to \Lambda \pi )</td>
<td></td>
</tr>
<tr>
<td>( +0.16 \pm 0.01 )</td>
<td>4 PONTE 75</td>
<td>DPWA ( K^- \pi \to \Lambda \pi^0 )</td>
<td></td>
</tr>
<tr>
<td>( \frac{(\Gamma_1 \Gamma_3)^{1/2}}{\Gamma} ) in ( N\overline{K} \to \Sigma(1660) \to \Sigma \pi )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( -0.13 \pm 0.04 )</td>
<td>1 KOISO 85</td>
<td>DPWA ( K^- \pi \to \Sigma \pi )</td>
<td></td>
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<tr>
<td>( -0.16 \pm 0.03 )</td>
<td>GOPAL 77</td>
<td>DPWA ( \overline{K}N ) multichannel</td>
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</tr>
<tr>
<td>( -0.11 \pm 0.01 )</td>
<td>KANE 74</td>
<td>DPWA ( K^- \pi \to \Sigma \pi )</td>
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<tr>
<td>( \bullet \bullet \bullet ) We do not use the following data for averages, fits, limits, etc. ( \bullet \bullet \bullet )</td>
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<td></td>
</tr>
<tr>
<td>( -0.34 ) or ( -0.37 )</td>
<td>2 MARTIN 77</td>
<td>DPWA ( \overline{K}N ) multichannel</td>
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<tr>
<td>not seen</td>
<td>HEPP 76B</td>
<td>DPWA ( K^- N \to \Sigma \pi )</td>
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</tbody>
</table>

**Σ(1660) FOOTNOTES**

1 The evidence of KOISO 85 is weak.
2 The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
3 From solution 1 of BAILLON 75; not present in solution 2.
4 From solution 2 of PONTE 75; not present in solution 1.

**Σ(1660) REFERENCES**

GAO 12 PR C86 025201
KOISO 85 NP A433 619
PDG 82 PL 111B 1
ALSTON-... 78 PR D18 182
Also 82 PRL 38 1007
Gopal 77 NP B119 362
Also 80 Toronto Conf. 159
Also 80 PRL 38 1007

P. Gao, J. Shi, B.S. Zou (BHEP, BEIJT)
P. Gao, B.S. Zou, A. Sibirtsev (BHEP, BEIJT+)
H. Koiso et al. (TOKY, MASA)
M. Roos et al. (HELS, CIT, CERN)
G.P. Gopal (RHEL) IUP
M. Alston-Garnjost et al. (LBL, MTHO+) IUP
M. Alston-Garnjost et al. (LBL, MTHO+) IUP
G.P. Gopal et al. (LOIC, RHEL) IUP
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<tr>
<th>Authors</th>
<th>Reference</th>
<th>Contributions</th>
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<tr>
<td>MARTIN</td>
<td>NP B127 349</td>
<td>B.R. Martin, M.K. Pidcock, R.G. Moorhouse (LOUC) IJP</td>
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<td>NP B126 266</td>
<td>B.R. Martin, M.K. Pidcock (LOUC)</td>
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<td>Also</td>
<td>NP B126 285</td>
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<td>HEPP</td>
<td>PL 65B 487</td>
<td>V. Hepp et al. (CERN, HEIDH, MPIM) IJP</td>
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<tr>
<td>BAILLON</td>
<td>NP B94 39</td>
<td>P.H. Baillon, P.J. Litchfield (CERN, RHET) IJP</td>
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<tr>
<td>PONTE</td>
<td>PR D12 2597</td>
<td>R.A. Ponte et al. (MASA, TENN, UCR) IJP</td>
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<td>VANHORN</td>
<td>NP B87 145</td>
<td>A.J. van Horn (LBL) IJP</td>
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<td>NP B87 157</td>
<td>A.J. van Horn (LBL) IJP</td>
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<td>KANE</td>
<td>LBL-2452</td>
<td>D.F. Kane (LBL) IJP</td>
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