\( \Lambda(2020) 7/2^+ \)

\[ I(J^P) = 0(7^+) \]

Status: * 

OMITTED FROM SUMMARY TABLE

In LITCHFIELD 71, need for the state rests solely on a possibly inconsistent polarization measurement at 1.784 GeV/c. HEMINGWAY 75 does not require this state. GOPAL 77 does not need it in either \( N\bar{K} \) or \( \Sigma\pi \). With new \( K^- n \) angular distributions included, DECLAIS 77 sees it. However, this and other new data are included in GOPAL 80 and the state is not required. BACCARI 77 weakly supports it.

### \( \Lambda(2020) \) POLE POSITION

<table>
<thead>
<tr>
<th>REAL PART</th>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>We do not use the following data for averages, fits, limits, etc.</td>
<td>1757</td>
<td>1 KAMANO 15 DPW Multichannel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 From the preferred solution A in KAMANO 15. Solution B reports \( M = 2041^{+80}_{-82} \) MeV.

<table>
<thead>
<tr>
<th>IMAGINARY PART</th>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
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</thead>
<tbody>
<tr>
<td>We do not use the following data for averages, fits, limits, etc.</td>
<td>146</td>
<td>1 KAMANO 15 DPW Multichannel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 From the preferred solution A in KAMANO 15. Solution B reports \( M = 238^{+114}_{-34} \) MeV.

### \( \Lambda(2020) \) POLE RESIDUES

The normalized residue is the residue divided by \( \Gamma_{pole}/2 \).

**Normalized residue in \( N\bar{K} \rightarrow \Lambda(2020) \rightarrow N\bar{K} \)**

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>PHASE (°)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>We do not use the following data for averages, fits, limits, etc.</td>
<td>0.000145</td>
<td>1 KAMANO 15 DPW Multichannel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 From the preferred solution A in KAMANO 15.

**Normalized residue in \( N\bar{K} \rightarrow \Lambda(2020) \rightarrow \Sigma\pi \)**

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>PHASE (°)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>We do not use the following data for averages, fits, limits, etc.</td>
<td>0.0112</td>
<td>1 KAMANO 15 DPW Multichannel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 From the preferred solution A in KAMANO 15.

**Normalized residue in \( N\bar{K} \rightarrow \Lambda(2020) \rightarrow \Lambda\eta \)**

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>PHASE (°)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>We do not use the following data for averages, fits, limits, etc.</td>
<td>0.000786</td>
<td>1 KAMANO 15 DPW Multichannel</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 From the preferred solution A in KAMANO 15.
**Normalized residue in \( N \bar{K} \to \Lambda(2020) \to \Sigma(1385)\pi, F\)-wave**

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>PHASE (°)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00451</td>
<td>-82</td>
<td>(^1) KAMANO 15</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) From the preferred solution A in KAMANO 15.

**Normalized residue in \( N \bar{K} \to \Lambda(2020) \to \Sigma(1385)\pi, H\)-wave**

<table>
<thead>
<tr>
<th>MODULUS</th>
<th>PHASE (°)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0000298</td>
<td>-128</td>
<td>(^1) KAMANO 15</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) From the preferred solution A in KAMANO 15.

---

### \( \Lambda(2020) \) MASS

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \approx 2020 ) OUR ESTIMATE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2043±22</td>
<td>ZHANG 13A</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
<tr>
<td>2140</td>
<td>BACCARI 77</td>
<td>DPWA ( K^- p \to \Lambda \omega )</td>
<td></td>
</tr>
<tr>
<td>2117</td>
<td>DECLAI 77</td>
<td>DPWA ( \bar{K}N \to \bar{K}N )</td>
<td></td>
</tr>
<tr>
<td>2100±30</td>
<td>LITCHFIELD 71</td>
<td>DPWA ( K^- p \to \bar{K}N )</td>
<td></td>
</tr>
<tr>
<td>2020±20</td>
<td>BARBARO-... 70</td>
<td>DPWA ( K^- p \to \Sigma \pi )</td>
<td></td>
</tr>
</tbody>
</table>

---

### \( \Lambda(2020) \) WIDTH

<table>
<thead>
<tr>
<th>VALUE (MeV)</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>200±75</td>
<td>ZHANG 13A</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
<tr>
<td>128</td>
<td>BACCARI 77</td>
<td>DPWA ( K^- p \to \Lambda \omega )</td>
<td></td>
</tr>
<tr>
<td>167</td>
<td>DECLAI 77</td>
<td>DPWA ( \bar{K}N \to \bar{K}N )</td>
<td></td>
</tr>
<tr>
<td>120±30</td>
<td>LITCHFIELD 71</td>
<td>DPWA ( K^- p \to \bar{K}N )</td>
<td></td>
</tr>
<tr>
<td>160±30</td>
<td>BARBARO-... 70</td>
<td>DPWA ( K^- p \to \Sigma \pi )</td>
<td></td>
</tr>
</tbody>
</table>

---

### \( \Lambda(2020) \) DECAY MODES

<table>
<thead>
<tr>
<th>Mode</th>
<th>Fraction ( (\Gamma_i/\Gamma) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Gamma_1 )</td>
<td>( N \bar{K} )</td>
</tr>
<tr>
<td>( \Gamma_2 )</td>
<td>( \Sigma \pi )</td>
</tr>
<tr>
<td>( \Gamma_3 )</td>
<td>( \Lambda \eta )</td>
</tr>
<tr>
<td>( \Gamma_4 )</td>
<td>( \Sigma(1385)\pi, F)-wave</td>
</tr>
<tr>
<td>( \Gamma_5 )</td>
<td>( \Sigma(1385)\pi, H)-wave</td>
</tr>
<tr>
<td>( \Gamma_6 )</td>
<td>( N \bar{K}^*) (892), ( S=1/2, F)-wave</td>
</tr>
<tr>
<td>( \Gamma_7 )</td>
<td>( N \bar{K}^*) (892), ( S=3/2, F)-wave</td>
</tr>
<tr>
<td>( \Gamma_8 )</td>
<td>( N \bar{K}^*) (892), ( S=3/2, H)-wave</td>
</tr>
<tr>
<td>( \Gamma_9 )</td>
<td>( \Lambda \omega )</td>
</tr>
<tr>
<td>( \Gamma_{10} )</td>
<td>( N \bar{K}^*) (892), ( S=1/2 )</td>
</tr>
</tbody>
</table>
Λ(2020) BRANCHING RATIOS

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

\[ \frac{\Gamma(NK)}{\Gamma_{\text{total}}} \]
\[ \frac{\Gamma_{1}}{\Gamma} \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.028 ± 0.005</td>
<td>ZHANG 13A</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
<tr>
<td>0.05</td>
<td>DECLAIS 77</td>
<td>DPWA KN → KN</td>
<td></td>
</tr>
<tr>
<td>0.05 ± 0.02</td>
<td>LITCHFIELD 71</td>
<td>DPWA K-p → KN</td>
<td></td>
</tr>
</tbody>
</table>

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

1 From the preferred solution A in KAMANO 15.

\[ \frac{\Gamma(\Sigma \pi)}{\Gamma_{\text{total}}} \]
\[ \frac{\Gamma_{2}}{\Gamma} \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.891</td>
<td>KAMANO 15</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
</tbody>
</table>

1 From the preferred solution A in KAMANO 15.

\[ \frac{\Gamma(\Lambda \eta)}{\Gamma_{\text{total}}} \]
\[ \frac{\Gamma_{3}}{\Gamma} \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.002</td>
<td>KAMANO 15</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
</tbody>
</table>

1 From the preferred solution A in KAMANO 15.

\[ \frac{\Gamma(\Sigma(1385) \pi, F-wave)}{\Gamma_{\text{total}}} \]
\[ \frac{\Gamma_{4}}{\Gamma} \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.105</td>
<td>KAMANO 15</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
</tbody>
</table>

1 From the preferred solution A in KAMANO 15.

\[ \frac{\Gamma(\Sigma(1385) \pi, H-wave)}{\Gamma_{\text{total}}} \]
\[ \frac{\Gamma_{5}}{\Gamma} \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>not seen</td>
<td>KAMANO 15</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
</tbody>
</table>

1 From the preferred solution A in KAMANO 15.

\[ \frac{\Gamma(NK^*(892), S=1/2, F-wave)}{\Gamma_{\text{total}}} \]
\[ \frac{\Gamma_{6}}{\Gamma} \]

<table>
<thead>
<tr>
<th>VALUE</th>
<th>DOCUMENT ID</th>
<th>TECN</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>not seen</td>
<td>KAMANO 15</td>
<td>DPWA Multichannel</td>
<td></td>
</tr>
</tbody>
</table>

1 From the preferred solution A in KAMANO 15.
\[ \Gamma(N^\ast R(892), S=3/2, F\text{-wave})/\Gamma_{\text{total}} \]  

\[ \frac{\Gamma_7}{\Gamma} \]

**VALUE** | **DOCUMENT ID** | **TECN** | **COMMENT**
--- | --- | --- | ---
\[ 0.001 \] | 1 KAMANO 15 | DPWA Multichannel | 1 From the preferred solution A in KAMANO 15.

\[ \Gamma(N^\ast R^\ast(892), S=3/2, H\text{-wave})/\Gamma_{\text{total}} \]  

\[ \frac{\Gamma_8}{\Gamma} \]

**VALUE** | **DOCUMENT ID** | **TECN** | **COMMENT**
--- | --- | --- | ---
\[ \text{not seen} \] | 1 KAMANO 15 | DPWA Multichannel | 1 From the preferred solution A in KAMANO 15.

\[ \Gamma(N^\ast R^\ast(892), S=1/2)/\Gamma_{\text{total}} \]  

\[ \frac{\Gamma_{10}}{\Gamma} \]

**VALUE** | **DOCUMENT ID** | **TECN** | **COMMENT**
--- | --- | --- | ---
\[ 0.30 \pm 0.09 \] | ZHANG 13A | DPWA Multichannel |

\[ (\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}} \text{ in } N^\ast R \rightarrow \Lambda(2020) \rightarrow \Sigma \pi \]  

\[ (\Gamma_1 \Gamma_2)^{1/2}/\Gamma \]

**VALUE** | **DOCUMENT ID** | **TECN** | **COMMENT**
--- | --- | --- | ---
\[ +0.02 \pm 0.01 \] | ZHANG 13A | DPWA Multichannel |
\[ -0.15 \pm 0.02 \] | BARBARO-... 70 | DPWA K^- p \rightarrow \Sigma \pi |

\[ (\Gamma_i \Gamma_f)^{1/2}/\Gamma_{\text{total}} \text{ in } N^\ast R \rightarrow \Lambda(2020) \rightarrow \Lambda \omega \]  

\[ (\Gamma_1 \Gamma_9)^{1/2}/\Gamma \]

**VALUE** | **DOCUMENT ID** | **TECN** | **COMMENT**
--- | --- | --- | ---
\[ <0.05 \] | BACCARI 77 | DPWA K^- p \rightarrow \Lambda \omega |

\[ \Lambda(2020) \text{ REFERENCES} \]

| KAMANO | 15 | PR C92 025205 | H. Kamano et al. | (ANL, OSAK) |
| ZHANG | 13A | PR C88 035205 | H. Zhang et al. | (KSU) |
| GOPAL | 80 | Toronto Conf. 159 | G.P. Gopal | (RHEL) |
| BACCARI | 77 | NC 41A 96 | B. Baccari et al. | (SACL, CDEF) IJP |
| DECLAI | 77 | CERN 77-16 | Y. Declais et al. | (CAEN, CERN) IJP |
| GOPAL | 77 | NP B119 362 | G.P. Gopal et al. | (LOIC, RHEL) |
| HEMINGWAY | 75 | NP B91 12 | R.J. Hemingway et al. | (CERN, HEIDH, MPIM) IJP |
| LITCHFIELD | 71 | NP B30 125 | P.J. Litchfield et al. | (RHEL, CDEF, SACL) IJP |
| BARBARO-... | 70 | Duke Conf. 173 | A. Barbaro-Galtieri | (LRL) IJP |

Hyperon Resonances, 1970

Citation: C. Patrignani et al. (Particle Data Group), Chin. Phys. C, 40, 100001 (2016) and 2017 update