

$\Sigma(1910) 3/2^-$  $I(J^P) = 1(\frac{3}{2}^-)$  Status: \*\*\*was  $\Sigma(1940)$ For results published before 1974 (they are now obsolete), see our 1982 edition Physics Letters **111B** 1 (1982).Not all analyses require this state. It is not required by the GOYAL 77 analysis of  $K^- n \rightarrow (\Sigma\pi)^-$  nor by the GOPAL 80 analysis of  $K^- n \rightarrow K^- n$ . See also HEMINGWAY 75. **$\Sigma(1910)$  POLE RESIDUES**The normalized residue is the residue divided by  $\Gamma_{pole}/2$ .**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow N\bar{K}$** 

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.03±0.02</b>	<b>-95 ± 60</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Sigma\pi$** 

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.16±0.04</b>	<b>=160 ± 15</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Lambda\pi$** 

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.04±0.03</b>	<b>25 ± 25</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Xi\pi$** 

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.01±0.01</b>		SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Lambda(1520)\pi, P\text{-wave}$** 

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.01±0.01</b>		SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Lambda(1520)\pi, F\text{-wave}$** 

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$\sim 0$		SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Delta\bar{K}, S\text{-wave}$** 

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.03±0.01</b>	<b>120 ± 20</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow N\bar{K}^*(892), S=3/2, S\text{-wave}$** 

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.03±0.02</b>	<b>20 ± 35</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow N\bar{K}^*(892), S=1/2, D\text{-wave}$** 

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.02±0.01</b>		SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow N\bar{K}^*(892)$ ,  $S=3/2$ ,  $D$ -wave**

<u>MODULUS</u>	<u>PHASE (°)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.01±0.01</b>		SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**$\Sigma(1910)$  MASS**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1870 to 1950 (≈ 1910) OUR ESTIMATE</b>			
1878±12	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
1920±50	GOPAL 77	DPWA	$\bar{K}N$ multichannel
1950±30	BAILLON 75	IPWA	$\bar{K}N \rightarrow \Lambda\pi$
1949 <sup>+40</sup> <sub>-60</sub>	VANHORN 75	DPWA	$K^-p \rightarrow \Lambda\pi^0$
1935±80	KANE 74	DPWA	$K^-p \rightarrow \Sigma\pi$
1940±20	LITCHFIELD 74B	DPWA	$K^-p \rightarrow \Lambda(1520)\pi^0$
1950±20	LITCHFIELD 74C	DPWA	$K^-p \rightarrow \Delta(1232)\bar{K}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1886 or 1893	<sup>1</sup> MARTIN 77	DPWA	$\bar{K}N$ multichannel
1940	DEBELLEFON 76	IPWA	$K^-p \rightarrow \Lambda\pi^0, F_{17}$ wave

**$\Sigma(1910)$  WIDTH**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>150 to 300 (≈ 220) OUR ESTIMATE</b>			
224±25	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
170±25	CAMERON 78B	DPWA	$K^-p \rightarrow N\bar{K}^*$
300±80	GOPAL 77	DPWA	$\bar{K}N$ multichannel
150±75	BAILLON 75	IPWA	$\bar{K}N \rightarrow \Lambda\pi$
160 <sup>+70</sup> <sub>-40</sub>	VANHORN 75	DPWA	$K^-p \rightarrow \Lambda\pi^0$
330±80	KANE 74	DPWA	$K^-p \rightarrow \Sigma\pi$
60±20	LITCHFIELD 74B	DPWA	$K^-p \rightarrow \Lambda(1520)\pi^0$
70 <sup>+30</sup> <sub>-20</sub>	LITCHFIELD 74C	DPWA	$K^-p \rightarrow \Delta(1232)\bar{K}$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
157 or 159	<sup>1</sup> MARTIN 77	DPWA	$\bar{K}N$ multichannel

**$\Sigma(1910)$  DECAY MODES**

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $N\bar{K}$	0.01 to 0.05 (≈ 0.02)
$\Gamma_2$ $\Lambda\pi$	( 6 ± 4 ) %
$\Gamma_3$ $\Sigma\pi$	(86 ± 21 ) %
$\Gamma_4$ $\Xi K$	
$\Gamma_5$ $\Sigma(1385)\pi$	seen
$\Gamma_6$ $\Sigma(1385)\pi, S$ -wave	
$\Gamma_7$ $\Lambda(1520)\pi$	seen

$\Gamma_8$	$\Lambda(1520)\pi$ , <i>P</i> -wave	
$\Gamma_9$	$\Lambda(1520)\pi$ , <i>F</i> -wave	
$\Gamma_{10}$	$\Delta(1232)\bar{K}$	( 3.0 $\pm$ 1.0) %
$\Gamma_{11}$	$\Delta(1232)\bar{K}$ , <i>S</i> -wave	
$\Gamma_{12}$	$\Delta(1232)\bar{K}$ , <i>D</i> -wave	
$\Gamma_{13}$	$N\bar{K}^*(892)$	seen
$\Gamma_{14}$	$N\bar{K}^*(892)$ , <i>S</i> =3/2, <i>S</i> -wave	
$\Gamma_{15}$	$N\bar{K}^*(892)$ , <i>S</i> =1/2, <i>D</i> -wave	( 1.0 $\pm$ 1.0) %
$\Gamma_{16}$	$N\bar{K}^*(892)$ , <i>S</i> =3/2, <i>D</i> -wave	

### $\Sigma(1910)$ BRANCHING RATIOS

See "Sign conventions for resonance couplings" in the Note on  $\Lambda$  and  $\Sigma$  Resonances.

$\Gamma(N\bar{K})/\Gamma_{\text{total}}$				$\Gamma_1/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.01 to 0.05 (<math>\approx</math> 0.02) OUR ESTIMATE</b>				
0.03 $\pm$ 0.02	SARANTSEV	19	DPWA $\bar{K}N$ multichannel	
<0.04	GOPAL	77	DPWA $\bar{K}N$ multichannel	
0.14 or 0.13	<sup>1</sup> MARTIN	77	DPWA $\bar{K}N$ multichannel	
$\Gamma(\Lambda\pi)/\Gamma_{\text{total}}$				$\Gamma_2/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.06<math>\pm</math>0.04</b>	SARANTSEV	19	DPWA $\bar{K}N$ multichannel	
$\Gamma(\Sigma\pi)/\Gamma_{\text{total}}$				$\Gamma_3/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.86<math>\pm</math>0.21</b>	SARANTSEV	19	DPWA $\bar{K}N$ multichannel	
$\Gamma(\Xi K)/\Gamma_{\text{total}}$				$\Gamma_4/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$\sim 0$	SARANTSEV	19	DPWA $\bar{K}N$ multichannel	
$\Gamma(\Lambda(1520)\pi, P\text{-wave})/\Gamma_{\text{total}}$				$\Gamma_8/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$\sim 0$	SARANTSEV	19	DPWA $\bar{K}N$ multichannel	
$\Gamma(\Lambda(1520)\pi, F\text{-wave})/\Gamma_{\text{total}}$				$\Gamma_9/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$\sim 0$	SARANTSEV	19	DPWA $\bar{K}N$ multichannel	
$\Gamma(\Delta(1232)\bar{K})/\Gamma_{\text{total}}$				$\Gamma_{10}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.03<math>\pm</math>0.01</b>	SARANTSEV	19	DPWA $\bar{K}N$ multichannel	
$\Gamma(N\bar{K}^*(892))/\Gamma_{\text{total}}$				$\Gamma_{13}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.03<math>\pm</math>0.02</b>	SARANTSEV	19	DPWA $\bar{K}N$ multichannel	

$\Gamma(N\bar{K}^*(892), S=1/2, D\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_{15}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.01±0.01</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

$\Gamma(N\bar{K}^*(892), S=3/2, D\text{-wave})/\Gamma_{\text{total}}$   $\Gamma_{16}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
~ 0	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Lambda\pi$   $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
-0.06 ± 0.03	GOPAL 77	DPWA	$\bar{K}N$ multichannel
-0.04 ± 0.02	BAILLON 75	IPWA	$\bar{K}N \rightarrow \Lambda\pi$
-0.05 <sup>+0.03</sup> / <sub>-0.02</sub>	VANHORN 75	DPWA	$K^-p \rightarrow \Lambda\pi^0$
-0.153±0.070	DEVENISH 74B		Fixed- <i>t</i> dispersion rel.
• • • We do not use the following data for averages, fits, limits, etc. • • •			
-0.15 or -0.14	<sup>1</sup> MARTIN 77	DPWA	$\bar{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Sigma\pi$   $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
-0.08±0.04	GOPAL 77	DPWA	$\bar{K}N$ multichannel
-0.14±0.04	KANE 74	DPWA	$K^-p \rightarrow \Sigma\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
+0.16 or +0.16	<sup>1</sup> MARTIN 77	DPWA	$\bar{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Sigma(1385)\pi$   $(\Gamma_1\Gamma_5)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
+0.066±0.025	<sup>2</sup> CAMERON 78	DPWA	$K^-p \rightarrow \Sigma(1385)\pi$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Lambda(1520)\pi, P\text{-wave}$   $(\Gamma_1\Gamma_8)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
< 0.03	CAMERON 77	DPWA	$K^-p \rightarrow \Lambda(1520)\pi^0$
-0.11±0.04	LITCHFIELD 74B	DPWA	$K^-p \rightarrow \Lambda(1520)\pi^0$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Lambda(1520)\pi, F\text{-wave}$   $(\Gamma_1\Gamma_9)^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
0.062±0.021	CAMERON 77	DPWA	$K^-p \rightarrow \Lambda(1520)\pi^0$
-0.08 ± 0.04	LITCHFIELD 74B	DPWA	$K^-p \rightarrow \Lambda(1520)\pi^0$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Delta(1232)\bar{K}, S\text{-wave}$   $(\Gamma_1\Gamma_{11})^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
-0.16±0.05	LITCHFIELD 74C	DPWA	$K^-p \rightarrow \Delta(1232)\bar{K}$

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$  in  $N\bar{K} \rightarrow \Sigma(1910) \rightarrow \Delta(1232)\bar{K}, D\text{-wave}$   $(\Gamma_1\Gamma_{12})^{1/2}/\Gamma$

VALUE	DOCUMENT ID	TECN	COMMENT
-0.14±0.05	LITCHFIELD 74C	DPWA	$K^-p \rightarrow \Delta(1232)\bar{K}$

$(\Gamma_i \Gamma_f)^{1/2} / \Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(1910) \rightarrow N\bar{K}^*(892)$	$(\Gamma_1 \Gamma_{13})^{1/2} / \Gamma$		
VALUE	DOCUMENT ID	TECN	COMMENT
$-0.09 \pm 0.02$	<sup>3</sup> CAMERON	78B	DPWA $K^- p \rightarrow N\bar{K}^*$

### $\Sigma(1910)$ FOOTNOTES

- <sup>1</sup> The two MARTIN 77 values are from a T-matrix pole and from a Breit-Wigner fit.
- <sup>2</sup> The published sign has been changed to be in accord with the baryon-first convention.
- <sup>3</sup> Upper limits on the  $D_1$  and  $D_3$  waves are each 0.03.

### $\Sigma(1910)$ REFERENCES

SARANTSEV	19	EPJ A55 180	A.V. Sarantsev <i>et al.</i>	(BONN, PNPI)
PDG	82	PL 111B 1	M. Roos <i>et al.</i>	(HELS, CIT, CERN)
GOPAL	80	Toronto Conf. 159	G.P. Gopal	(RHEL)
CAMERON	78	NP B143 189	W. Cameron <i>et al.</i>	(RHEL, LOIC) IJP
CAMERON	78B	NP B146 327	W. Cameron <i>et al.</i>	(RHEL, LOIC) IJP
CAMERON	77	NP B131 399	W. Cameron <i>et al.</i>	(RHEL, LOIC) IJP
GOPAL	77	NP B119 362	G.P. Gopal <i>et al.</i>	(LOIC, RHEL) IJP
GOYAL	77	PR D16 2746	D.P. Goyal, A.V. Sodhi	(DELH)
MARTIN	77	NP B127 349	B.R. Martin, M.K. Pidcock, R.G. Moorhouse	(LOUC+) IJP
Also		NP B126 266	B.R. Martin, M.K. Pidcock	(LOUC)
Also		NP B126 285	B.R. Martin, M.K. Pidcock	(LOUC) IJP
DEBELLEFON	76	NP B109 129	A. de Bellefon, A. Berthon	(CDEF) IJP
BAILLON	75	NP B94 39	P.H. Baillon, P.J. Litchfield	(CERN, RHEL) IJP
HEMINGWAY	75	NP B91 12	R.J. Hemingway <i>et al.</i>	(CERN, HEIDH, MPIM) IJP
VANHORN	75	NP B87 145	A.J. van Horn	(LBL) IJP
Also		NP B87 157	A.J. van Horn	(LBL) IJP
DEVENISH	74B	NP B81 330	R.C.E. Devenish, C.D. Froggatt, B.R. Martin	(DESY+)
KANE	74	LBL-2452	D.F. Kane	(LBL) IJP
LITCHFIELD	74B	NP B74 19	P.J. Litchfield <i>et al.</i>	(CERN, HEIDH) IJP
LITCHFIELD	74C	NP B74 39	P.J. Litchfield <i>et al.</i>	(CERN, HEIDH) IJP