

$\Sigma(1620) 1/2^-$  $I(J^P) = 1(\frac{1}{2}^-)$  Status: \*

## OMITTED FROM SUMMARY TABLE

The  $S_{11}$  state at 1697 MeV reported by VANHORN 75 is tentatively listed under the  $\Sigma(1750)$ . CARROLL 76 sees two bumps in the isospin-1 total cross section near this mass. GAO 12 sees no evidence for this resonance.

Production experiments are listed separately in the next entry.

 $\Sigma(1620)$  POLE POSITION

## REAL PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>1680±8</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
••• We do not use the following data for averages, fits, limits, etc. •••			
1501	ZHANG 13A	DPWA	$\bar{K}N$ multichannel

## −2×IMAGINARY PART

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>39±11</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
••• We do not use the following data for averages, fits, limits, etc. •••			
171	ZHANG 13A	DPWA	$\bar{K}N$ multichannel

 $\Sigma(1620)$  POLE RESIDUE

The “normalized residue” is the residue divided by  $\Gamma_{pole}/2$ .

Normalized residue in  $N\bar{K} \rightarrow \Sigma(1620) \rightarrow \Sigma\pi$ 

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
<b>0.14±0.03</b>	<b>−90 ± 25</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

Normalized residue in  $N\bar{K} \rightarrow \Sigma(1620) \rightarrow \Lambda\pi$ 

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
<b>0.10±0.03</b>	<b>75 ± 20</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

Normalized residue in  $N\bar{K} \rightarrow \Sigma(1620) \rightarrow \Xi K$ 

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
<b>0.02±0.01</b>	<b>120 ± 20</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

Normalized residue in  $N\bar{K} \rightarrow \Sigma(1620) \rightarrow \Lambda(1520)\pi$ 

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
<b>0.12±0.05</b>	<b>140 ± 40</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

Normalized residue in  $N\bar{K} \rightarrow \Sigma(1620) \rightarrow \Sigma(1385)\pi$ 

MODULUS	PHASE (°)	DOCUMENT ID	TECN	COMMENT
<b>0.015±0.010</b>	<b>155 ± 40</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1620) \rightarrow N\bar{K}^*(892)$ , S-wave**

<u>MODULUS</u>	<u>PHASE (<math>^\circ</math>)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.05±0.04</b>		SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

**Normalized residue in  $N\bar{K} \rightarrow \Sigma(1620) \rightarrow N\bar{K}^*(892)$ , D-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  $N\bar{K} \rightarrow \Sigma(1620) \rightarrow N\bar{K}$** 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.11+0.03-0.43+20</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel

 **$\Sigma(1620)$  MASS**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1600 to 1650 (<math>\approx 1620</math>) OUR ESTIMATE</b>			
1681± 6	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
1600±15	ZHANG 13A	DPWA	$\bar{K}N$ multichannel
1600± 6	<sup>1</sup> MORRIS 78	DPWA	$K^- n \rightarrow \Lambda\pi^-$
1608± 5	<sup>2</sup> CARROLL 76	DPWA	Isospin-1 total $\sigma$
1630±10	LANGBEIN 72	IPWA	$\bar{K}N$ multichannel
1620	KIM 71	DPWA	K-matrix analysis
• • • We do not use the following data for averages, fits, limits, etc. • • •			
1633±10	<sup>3</sup> CARROLL 76	DPWA	Isospin-1 total $\sigma$

 **$\Sigma(1620)$  WIDTH**

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>40 to 100 (<math>\approx 70</math>) OUR ESTIMATE</b>			
40± 12	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel
400±152	ZHANG 13A	DPWA	$\bar{K}N$ multichannel
87± 19	<sup>1</sup> MORRIS 78	DPWA	$K^- n \rightarrow \Lambda\pi^-$
15	<sup>2</sup> CARROLL 76	DPWA	Isospin-1 total $\sigma$
65± 20	LANGBEIN 72	IPWA	$\bar{K}N$ multichannel
40	KIM 71	DPWA	K-matrix analysis
• • • We do not use the following data for averages, fits, limits, etc. • • •			
10	<sup>3</sup> CARROLL 76	DPWA	Isospin-1 total $\sigma$

 **$\Sigma(1620)$  DECAY MODES**

	<u>Mode</u>	<u>Fraction (<math>\Gamma_i/\Gamma</math>)</u>
$\Gamma_1$	$N\bar{K}$	0.10 to 0.60
$\Gamma_2$	$\Lambda\pi$	( 9.0 ±3.0 ) %
$\Gamma_3$	$\Sigma\pi$	(17 ±5 ) %
$\Gamma_4$	$\Xi K$	
$\Gamma_5$	$\Lambda(1520)\pi$	(10 ±5 ) %
$\Gamma_6$	$\Sigma(1385)\pi$	

**$\Sigma(1620)$  BRANCHING RATIOS**

$\Gamma(N\bar{K})/\Gamma_{\text{total}}$				$\Gamma_1/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.10 to 0.60 OUR ESTIMATE</b>				
0.11±0.03	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel	
0.59±0.10	ZHANG 13A	DPWA	$\bar{K}N$ multichannel	
0.22±0.02	LANGBEIN 72	IPWA	$\bar{K}N$ multichannel	
0.05	KIM 71	DPWA	K-matrix analysis	
$\Gamma(\Sigma\pi)/\Gamma_{\text{total}}$				$\Gamma_3/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.17±0.05</b>	SARANTSEV 19	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>0.09±0.03</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>	
~ 0	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel	
$\Gamma(\Lambda(1520)\pi)/\Gamma_{\text{total}}$				$\Gamma_5/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<b>0.10±0.05</b>	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel	
$\Gamma(\Sigma(1385)\pi)/\Gamma_{\text{total}}$				$\Gamma_6/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.01	SARANTSEV 19	DPWA	$\bar{K}N$ multichannel	
$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(1620) \rightarrow \Lambda\pi$				$(\Gamma_1\Gamma_2)^{1/2}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
0.12±0.02	<sup>1</sup> MORRIS 78	DPWA	$K^-n \rightarrow \Lambda\pi^-$	
not seen	BAILLON 75	IPWA	$\bar{K}N \rightarrow \Lambda\pi$	
0.15	KIM 71	DPWA	K-matrix analysis	
$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{\text{total}}$ in $N\bar{K} \rightarrow \Sigma(1620) \rightarrow \Sigma\pi$				$(\Gamma_1\Gamma_3)^{1/2}/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
+0.32±0.03	ZHANG 13A	DPWA	Multichannel	
not seen	HEPP 76B	DPWA	$K^-N \rightarrow \Sigma\pi$	
+0.40±0.06	LANGBEIN 72	IPWA	$\bar{K}N$ multichannel	
+0.08	KIM 71	DPWA	K-matrix analysis	

 **$\Sigma(1620)$  FOOTNOTES**<sup>1</sup> MORRIS 78 obtains an equally good fit without including this resonance.<sup>2</sup> Total cross-section bump with  $(J+1/2) \Gamma_{\text{el}} / \Gamma_{\text{total}}$  is 0.06 seen by CARROLL 76.<sup>3</sup> Total cross-section bump with  $(J+1/2) \Gamma_{\text{el}} / \Gamma_{\text{total}}$  is 0.04 seen by CARROLL 76.

## $\Sigma(1620)$ REFERENCES

SARANTSEV	19	EPJ A55 180	A.V. Sarantsev <i>et al.</i>	(BONN, PNPI)
ZHANG	13A	PR C88 035205	H. Zhang <i>et al.</i>	(KSU)
GAO	12	PR C86 025201	P. Gao, J. Shi, B.S. Zou	(BHEP, BEIJT)
Also		NP A867 41	P. Gao, B.S. Zou, A. Sibirtsev	(BHEP, BEIJT+)
MORRIS	78	PR D17 55	W.A. Morris <i>et al.</i>	(FSU) IJP
CARROLL	76	PRL 37 806	A.S. Carroll <i>et al.</i>	(BNL) I
HEPP	76B	PL 65B 487	V. Hepp <i>et al.</i>	(CERN, HEIDH, MPIM) IJP
BAILLON	75	NP B94 39	P.H. Baillon, P.J. Litchfield	(CERN, RHEL) IJP
VANHORN	75	NP B87 145	A.J. van Horn	(LBL) IJP
Also		NP B87 157	A.J. van Horn	(LBL) IJP
LANGBEIN	72	NP B47 477	W. Langbein, F. Wagner	(MPIM) IJP
KIM	71	PRL 27 356	J.K. Kim	(HARV) IJP
Also		Duke Conf. 161	J.K. Kim	(HARV) IJP
Hyperon Resonances, 1970				

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