$\Sigma(1620)$ $1/2^-$

$I(J^P) = 1(\frac{1}{2}^-)$ 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
1680±8	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1501	ZHANG	13A	DPWA	$\overline{K}N$ multichannel

−2×IMAGINARY PART

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

$\Sigma(1620)$ POLE RESIDUE

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

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

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.14±0.03	**−90 ± 25**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

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

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.10±0.03	**75 ± 20**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

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

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.02±0.01	**120 ± 20**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

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

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.12±0.05	**140 ± 40**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

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

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.015±0.010	**155 ± 40**	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

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

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.05±0.04		SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Sigma(1620) \to N\overline{K}^*(892)$, D-wave

MODULUS	PHASE (°)	DOCUMENT ID		TECN	COMMENT
0.01±0.01		SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

Normalized residue in $N\overline{K} \to \Sigma(1620) \to N\overline{K}$

VALUE	DOCUMENT ID		TECN	COMMENT
0.11+-0.03043+-20	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

$\Sigma(1620)$ MASS

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

$\Sigma(1620)$ WIDTH

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

$\Sigma(1620)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$N\overline{K}$	0.10 to 0.60
Γ_2	$\Lambda\pi$	(9.0 ±3.0) %
Γ_3	$\Sigma\pi$	(17 ±5) %
Γ_4	ΞK	
Γ_5	$\Lambda(1520)\pi$	(10 ±5) %
Γ_6	$\Sigma(1385)\pi$	

$\Sigma(1620)$ BRANCHING RATIOS

$\Gamma(N\overline{K})/\Gamma_{total}$ — Γ_1/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.10 to 0.60 OUR ESTIMATE				
0.11±0.03	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel
0.59±0.10	ZHANG	13A	DPWA	$\overline{K}N$ multichannel
0.22±0.02	LANGBEIN	72	IPWA	$\overline{K}N$ multichannel
0.05	KIM	71	DPWA	K-matrix analysis

$\Gamma(\Sigma\pi)/\Gamma_{total}$ — Γ_3/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.17±0.05	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

$\Gamma(\Lambda\pi)/\Gamma_{total}$ — Γ_2/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.09±0.03	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

$\Gamma(\Xi K)/\Gamma_{total}$ — Γ_4/Γ

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

$\Gamma(\Lambda(1520)\pi)/\Gamma_{total}$ — Γ_5/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
0.10±0.05	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

$\Gamma(\Sigma(1385)\pi)/\Gamma_{total}$ — Γ_6/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
<0.01	SARANTSEV	19	DPWA	$\overline{K}N$ multichannel

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Sigma(1620) \rightarrow \Lambda\pi$ — $(\Gamma_1\Gamma_2)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
0.12±0.02	[1] MORRIS	78	DPWA	$K^- n \rightarrow \Lambda\pi^-$
not seen	BAILLON	75	IPWA	$\overline{K}N \rightarrow \Lambda\pi$
0.15	KIM	71	DPWA	K-matrix analysis

$(\Gamma_i\Gamma_f)^{1/2}/\Gamma_{total}$ in $N\overline{K} \rightarrow \Sigma(1620) \rightarrow \Sigma\pi$ — $(\Gamma_1\Gamma_3)^{1/2}/\Gamma$

VALUE	DOCUMENT ID		TECN	COMMENT
+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	$\overline{K}N$ multichannel
+0.08	KIM	71	DPWA	K-matrix analysis

$\Sigma(1620)$ FOOTNOTES

[1] MORRIS 78 obtains an equally good fit without including this resonance.

[2] Total cross-section bump with $(J+1/2)\ \Gamma_{el}\ /\ \Gamma_{total}$ is 0.06 seen by CARROLL 76.

[3] Total cross-section bump with $(J+1/2)\ \Gamma_{el}\ /\ \Gamma_{total}$ is 0.04 seen by CARROLL 76.

Σ(1620) REFERENCES

SARANTSEV	19	EPJ A55 180	A.V. Sarantsev *et al.*	(BONN, PNPI)
ZHANG	13A	PR C88 035205	H. Zhang *et al.*	(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 *et al.*	(FSU) IJP
CARROLL	76	PRL 37 806	A.S. Carroll *et al.*	(BNL) I
HEPP	76B	PL 65B 487	V. Hepp *et al.*	(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

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