$$\Sigma(1580) \ 3/2^{-1}$$

$$I(J^P) = 1(rac{3}{2}^-)$$
 Status: \*

#### OMITTED FROM SUMMARY TABLE

Seen in the isospin-1  $\overline{K}N$  cross section at BNL (LI 73, CARROLL 76) and in a partial-wave analysis of  $K^- p \rightarrow \Lambda \pi^0$  for c.m. energies 1560–1600 MeV by LITCHFIELD 74. LITCHFIELD 74 finds  $J^P = 3/2^-$ . Not seen by ENGLER 78 or by CAMERON 78C (with larger statistics in  $K_I^0 p \rightarrow \Lambda \pi^+$  and  $\Sigma^0 \pi^+$ ).

Neither OLMSTED 04 (in  $K^- p \rightarrow \Lambda \pi^0$ ) nor PRAKHOV 04 (in  $K^- p \rightarrow \Lambda \pi^0 \pi^0$ ) see any evidence for this state.

#### $\Sigma(1580)$ POLE POSITION

REAL PART VALUE (MeV)	DOCUMENT ID		TECN	COMMENT	
• • • We do not use the f	ollowing data for average	s, fits,	limits, e	etc. ● ● ●	_
$1607^{+13}_{-11}$	<sup>1</sup> KAMANO	15	DPWA	Multichannel	
$^1$ From the preferred solu	ition A in KAMANO 15.	Solut	ion B rep	ports $M=1492^{+4}_{-7}$ MeV	′.
-2×IMAGINARY PAR	2T				
VALUE (MeV)	DOCUMENT ID		TECN	COMMENT	
$\bullet \bullet \bullet$ We do not use the f	ollowing data for average	s, fits,	, limits, e	etc. • • •	
$253^{+30}_{-18}$	<sup>2</sup> KAMANO	15	DPWA	Multichannel	
<sup>2</sup> From the preferred solu	ution A in KAMANO 15.	Solut	ion B rep	ports M = $138^{+}\frac{8}{14}$ MeV	<i>'</i> .

### Σ(1580) POLE RESIDUES

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

#### Normalized residue in $N\overline{K} \rightarrow \Sigma(1580) \rightarrow N\overline{K}$ MODULUS PHASE ( $^{\circ}$ ) DOCUMENT ID TECN COMMENT • • • We do not use the following data for averages, fits, limits, etc. • • • 51 <sup>3</sup> KAMANO 0.00778 15 DPWA Multichannel <sup>3</sup>From the preferred solution A in KAMANO 15. Normalized residue in $N\overline{K} \rightarrow \Sigma(1580) \rightarrow \Sigma \pi$ MODULUS PHASE ( $^{\circ}$ ) DOCUMENT ID TECN COMMENT • • • We do not use the following data for averages, fits, limits, etc. • • •

0.0625 -6 <sup>4</sup> KAMANO 15 DPWA Multichannel

<sup>4</sup> From the preferred solution A in KAMANO 15.

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

Normalize	ed residue in $N\overline{K}$	$\rightarrow \Sigma(1580) \rightarrow L$	Λπ		
MODULUS	PHASE (° )	DOCUMENT ID		TECN	COMMENT
• • • We d	to not use the follow	ing data for averages	, fits,	limits, et	C. ● ● ●
0.059	156	<sup>5</sup> kamano	15	DPWA	Multichannel
<sup>5</sup> From th	ne preferred solution	A in KAMANO 15.			
Normalize	ed residue in $N\overline{K}$	$\rightarrow \Sigma(1580) \rightarrow L$	Σ(13	85)π, S	Swave

MODULUS PHASE (° ) DOCUMENT ID TECN COMMENT • • • We do not use the following data for averages, fits, limits, etc. • • • <sup>6</sup> KAMANO -1815 DPWA Multichannel 0.0368 <sup>6</sup> From the preferred solution A in KAMANO 15.

# Normalized residue in $N\overline{K} \rightarrow \Sigma(1580) \rightarrow \Sigma(1385)\pi$ , *D*-wave

MODULUS	PHASE (°)	DOCUMENT ID	7	ECN	COMMENT
• • • We d	o not use the fo	llowing data for averages, f	its, lim	its, etc	2. ● ● ●
0.0103	123	<sup>7</sup> KAMANO	15 C	PWA	Multichannel
<sup>7</sup> From th	e preferred solu	tion A in KAMANO 15.			

#### **Σ(1580) MASS**

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
≈ 1580 OUR ESTIMATE	_			
$1583 \pm 4$	<sup>8</sup> CARROLL	76	DPWA	lsospin-1 total $\sigma$
$1582 \pm 4$	<sup>9</sup> LITCHFIELD	74	DPWA	$K^- p \rightarrow \Lambda \pi^0$
<sup>8</sup> CARROLL 76 sees a total-	cross-section bump w	ith (J	/+1/2) Γ	$_{\rm el}$ / $\Gamma_{\rm total}$ = 0.06.

<sup>9</sup> The main effect observed by LITCHFIELD 74 is in the  $\Lambda\pi$  final state; the  $\overline{K}N$  and  $\Sigma\pi$  couplings are estimated from a multichannel fit including total-cross-section data of LI 73.

## **Σ(1580) WIDTH**

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
15	<sup>10</sup> CARROLL	76	DPWA	Isospin-1 total $\sigma$
11±4	<sup>11</sup> LITCHFIELD	74	DPWA	$\mathcal{K}^- p \rightarrow \Lambda \pi^0$

 $^{10}$  CARROLL 76 sees a total-cross-section bump with (J+1/2)  $\Gamma_{el}$  /  $\Gamma_{total}$  = 0.06.

<sup>11</sup>The main effect observed by LITCHFIELD 74 is in the  $\Lambda\pi$  final state; the  $\overline{K}N$  and  $\Sigma \pi$  couplings are estimated from a multichannel fit including total-cross-section data of LI 73.

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#### $\Sigma(1580)$ DECAY MODES

	Mode
Γ <sub>1</sub>	NK
Γ2	$\Lambda\pi$
Γ <sub>3</sub>	$\Sigma \pi$
Γ <sub>4</sub>	$\Sigma(1385)\pi$ , $S$ -wave
Γ <sub>5</sub>	$\Sigma(1385)\pi$ , $D$ -wave
Г <sub>6</sub>	$N\overline{K}^{*}(892), S=1/2, D$ -wave
Г <sub>7</sub>	$N\overline{K}^{*}(892), S=3/2, S$ -wave
Г <sub>8</sub>	$N\overline{K}^{*}(892), S=3/2, D$ -wave

# $\Sigma(1580)$ BRANCHING RATIOS

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

$\Gamma(N\overline{K})/\Gamma_{\text{total}}$					$\Gamma_1/\Gamma$
VALUE	DOCUMENT ID		TECN	COMMENT	
$+0.03 \pm 0.01$	<sup>12</sup> LITCHFIELD	74	DPWA	<b>K</b> N multichan	inel
$\bullet$ $\bullet$ We do not use the follow	ing data for average	s, fits	, limits, e	etc. • • •	
0.003	<sup>13</sup> KAMANO	15	DPWA	Multichannel	
<sup>12</sup> The main effect observed b $\Sigma \pi$ couplings are estimated LI 73. <sup>13</sup> From the preferred solution	y LITCHFIELD 74 from a multichanne A in KAMANO 15.	is in I fit in	the $\Lambda\pi$ cluding t	final state; the total-cross-section	<i>KN</i> and on data of
$\Gamma(\Lambda\pi)/\Gamma_{total}$					Г <sub>2</sub> /Г
VALUE	DOCUMENT ID		TECN	COMMENT	
$\bullet \bullet \bullet$ We do not use the follow	ing data for average	s, fits	, limits, e	etc. • • •	
0.490	<sup>14</sup> KAMANO	15	DPWA	Multichannel	
$^{ m 14}$ From the preferred solution	A in KAMANO 15.				
$\Gamma(\Sigma \pi)/\Gamma_{\text{total}}$	DOCUMENT ID		TECN	COMMENT	Г <sub>3</sub> /Г
VALUE	DUCUMENT ID	f:te	<u>IECN</u>	COMMENT	
• • • We do not use the rollow	Ing data for average	S, TITS,	, limits, e		
0.387	<sup>13</sup> KAMANO	15	DPWA	Multichannel	
<sup>15</sup> From the preferred solution	A in KAMANO 15.				
$\Gamma(\Sigma(1385)\pi, S-wave)/\Gamma_{tot}$	al				Г4/Г
VALUE	DOCUMENT ID		TECN	COMMENT	
$\bullet \bullet \bullet$ We do not use the follow	ing data for average	s, fits	, limits, e	etc. • • •	
0.12	<sup>16</sup> KAMANO	15	DPWA	Multichannel	
$^{16}$ From the preferred solution	A in KAMANO 15.				

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$\Gamma(oldsymbol{\Sigma}(1385)\pi, D$ -wav	re)/Γ <sub>total</sub>				Γ <sub>5</sub> /Γ
VALUE	DOCUMENT ID		TECN	COMMENT	
• • We do not use th	e following data for average	es, fits,	limits, e	etc. • • •	
0.001	<sup>17</sup> KAMANO	15	DPWA	Multichannel	
<sup>17</sup> From the preferred s	solution A in KAMANO 15.				
Г( <i>NK</i> *(892), <i>S</i> =1/2	2, <i>D</i> -wave)/Γ <sub>total</sub>				Г <sub>6</sub> /Г
VALUE	DOCUMENT ID		TECN	COMMENT	
• • • We do not use th	e following data for average	es, fits,	limits, e	etc. ● ● ●	
not seen	<sup>18</sup> KAMANO	15	DPWA	Multichannel	
$^{18}\mathrm{From}$ the preferred s	solution A in KAMANO 15.				
-( <i>N</i> <del>K</del> *(892), <i>S</i> =3/2	2, <i>S</i> -wave)/F <sub>total</sub>				۲ <sub>7</sub> /۱
/ALUE	DOCUMENT ID		TECN	COMMENT	
• • We do not use th	e following data for average	es, fits,	limits, e	etc. • • •	
10t seen	<sup>19</sup> KAMANO	15	DPWA	Multichannel	
$^{19}$ From the preferred s	solution A in KAMANO 15.				
Γ( <i>ΝҠ</i> *(892), <i>S</i> =3/2	2, <i>D</i> -wave)/Γ <sub>total</sub>				Г <sub>8</sub> /I
/ALUE	DOCUMENT ID		TECN	COMMENT	
• • We do not use th	e following data for average	es, fits,	limits, e	etc. • • •	
not seen	<sup>20</sup> KAMANO	15	DPWA	Multichannel	
$^{20}$ From the preferred s	solution A in KAMANO 15.				
1/					1/
$(\Gamma_i \Gamma_f)^{\frac{1}{2}} / \Gamma_{\text{total}} \text{ in } N$	$\overline{K}  ightarrow \Sigma(1580)  ightarrow \Lambda \pi$			<b>(Γ</b> 1	⁻₂) <sup>≯2</sup> /I
VALUE	DOCUMENT ID		TECN	COMMENT	
not seen	CAMERON	<b>78</b> C	HBC	$K_L^0 p \rightarrow \Lambda \pi^+$	
not seen	ENGLER	78	HBC	$K_L^0 p \rightarrow \Lambda \pi^+$	
$+0.10\pm0.02$	<sup>21</sup> LITCHFIELD	74	DPWA	$K^{-}p \rightarrow \Lambda \pi^{0}$	
<sup>21</sup> The main effect ob $\Sigma \pi$ couplings are es LI 73.	served by LITCHFIELD 74 timated from a multichanne	is in el fit in	the $\Lambda\pi$ cluding t	final state; the otal-cross-sectio	<del>Κ</del> Ν and n data c
$(\Gamma_i \Gamma_f)^{\frac{1}{2}} / \Gamma_{\text{total}} \text{ in } N^{\frac{1}{2}}$	$\overline{K} \to \Sigma(1580) \to \Sigma \pi$ <u>DOCUMENT ID</u>		<u>TECN</u>	(Г <u>1</u> 	3) <sup>1/2</sup> /I
not seen	CAMERON	78C	НВС	$K^0_I p \rightarrow \Sigma^0 \pi^-$	+
not seen	ENGLER	78	HBC	$K_{I}^{0}p \rightarrow \Sigma^{0}\pi^{-1}$	F
$+0.03\pm0.04$	<sup>22</sup> LITCHFIELD	74	DPWA	$\frac{L}{K}$ M multichann	iel
22 The main offerst all	annual by LITCUEIELD 74			с. I I	<del></del>

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