

# $\pi_1(1400)$

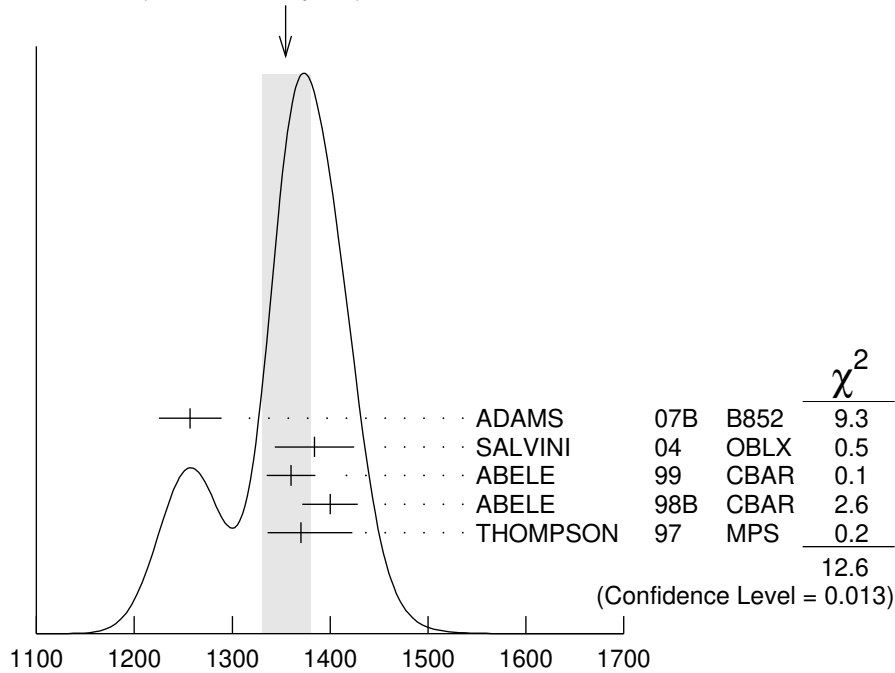
$$I^G(J^{PC}) = 1^-(1^-+)$$

Coupled channel analyses favor the existence of only one broad  $1^-+$  isovector state consistent with  $\pi_1(1600)$  in the 1400–1600 MeV region. See the review on "Spectroscopy of Light Meson Resonances." See also  $\pi_1(1600)$ .

## $\pi_1(1400)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
<b>1354 ± 25</b>	<b>OUR AVERAGE</b>	Error includes scale factor of 1.8. See the ideogram below.			
1257 ± 20 ± 25	23.5k	ADAMS	07B	B852	18 $\pi^- p \rightarrow \eta \pi^0 n$
1384 ± 20 ± 35	90k	SALVINI	04	OBLX	$\bar{p} p \rightarrow 2\pi^+ 2\pi^-$
1360 ± 25		ABELE	99	CBAR	0.0 $\bar{p} p \rightarrow \pi^0 \pi^0 \eta$
1400 ± 20 ± 20		ABELE	98B	CBAR	0.0 $\bar{p} n \rightarrow \pi^- \pi^0 \eta$
1370 ± 16 <sup>+50</sup> / <sub>-30</sub>		<sup>1</sup> THOMPSON	97	MPS	18 $\pi^- p \rightarrow \eta \pi^- p$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1404.7 ± 3.5 <sup>+15.1</sup> / <sub>-17.7</sub>		<sup>2</sup> ALBRECHT	20	RVUE	0.9 $\bar{p} p \rightarrow \pi^0 \pi^0 \eta$
1323.1 ± 4.6		<sup>3</sup> AOYAGI	93	BKEI	$\pi^- p \rightarrow \eta \pi^- p$
1406 ± 20		<sup>4</sup> ALDE	88B	GAM4 0	100 $\pi^- p \rightarrow \eta \pi^0 n$

WEIGHTED AVERAGE  
1354±25 (Error scaled by 1.8)



<sup>1</sup> Natural parity exchange, questioned by DZIERBA 03.  
<sup>2</sup> T-matrix pole, 1 pole, 2 channels ( $\pi \eta$ ,  $\pi \eta'$  for unitarity).  
<sup>3</sup> Unnatural parity exchange.  
<sup>4</sup> Seen in the  $P_0$ -wave intensity of the  $\eta \pi^0$  system, unnatural parity exchange.

$\pi_1(1400)$  MASS (MeV) $\pi_1(1400)$  WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
<b>330 ±35</b>	<b>OUR AVERAGE</b>				
354 ±64 ± 58	23.5k	ADAMS	07B	B852	18 $\pi^- p \rightarrow \eta \pi^0 n$
378 ±50 ± 50	90k	SALVINI	04	OBLX	$\bar{p} p \rightarrow 2\pi^+ 2\pi^-$
220 ±90		ABELE	99	CBAR	0.0 $\bar{p} p \rightarrow \pi^0 \pi^0 \eta$
310 ±50 + 50 - 30		ABELE	98B	CBAR	0.0 $\bar{p} n \rightarrow \pi^- \pi^0 \eta$
385 ±40 + 65 - 105		<sup>1</sup> THOMPSON	97	MPS	18 $\pi^- p \rightarrow \eta \pi^- p$

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

628.3 ± 27.1 + 35.8 - 138.2		<sup>2</sup> ALBRECHT	20	RVUE	0.9 $\bar{p} p \rightarrow \pi^0 \pi^0 \eta$
143.2 ± 12.5		<sup>3</sup> AOYAGI	93	BKEI	$\pi^- p \rightarrow \eta \pi^- p$
180 ± 20		<sup>4</sup> ALDE	88B	GAM4 0	100 $\pi^- p \rightarrow \eta \pi^0 n$

<sup>1</sup> Resolution is not unfolded, natural parity exchange, questioned by DZIERBA 03.

<sup>2</sup> T-matrix pole, 1 pole, 2 channels ( $\pi \eta$ ,  $\pi \eta'$  for unitarity).

<sup>3</sup> Unnatural parity exchange.

<sup>4</sup> Seen in the  $P_0$ -wave intensity of the  $\eta \pi^0$  system, unnatural parity exchange.

 $\pi_1(1400)$  DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $\eta \pi^0$	seen
$\Gamma_2$ $\eta \pi^-$	seen
$\Gamma_3$ $\eta' \pi$	
$\Gamma_4$ $\rho(770) \pi$	not seen

 $\pi_1(1400)$  BRANCHING RATIOS

$\Gamma(\eta \pi^0)/\Gamma_{\text{total}}$	VALUE	DOCUMENT ID	TECN	CHG	COMMENT	$\Gamma_1/\Gamma$
not seen		PROKOSHKIN	95B	GAM4	100 $\pi^- p \rightarrow \eta \pi^0 n$	
not seen		<sup>1</sup> BUGG	94	RVUE	$\bar{p} p \rightarrow \eta 2\pi^0$	
not seen		<sup>2</sup> APEL	81	NICE 0	40 $\pi^- p \rightarrow \eta \pi^0 n$	

<sup>1</sup> Using Crystal Barrel data.

<sup>2</sup> A general fit allowing  $S$ ,  $D$ , and  $P$  waves (including  $m=0$ ) is not done because of limited statistics.

$\Gamma(\eta \pi^-)/\Gamma_{\text{total}}$	VALUE	DOCUMENT ID	TECN	COMMENT	$\Gamma_2/\Gamma$
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• • • We do not use the following data for averages, fits, limits, etc. • • •

possibly seen		BELADIDZE	93	VES	37 $\pi^- N \rightarrow \eta \pi^- N$
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$\Gamma(\eta'\pi)/\Gamma(\eta\pi^0)$  $\Gamma_3/\Gamma_1$ 

<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●

<0.80	95	BOUTEMEUR 90	GAM4	100 $\pi^- p \rightarrow 4\gamma n$
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 $\Gamma(\rho(770)\pi)/\Gamma_{\text{total}}$  $\Gamma_4/\Gamma$ 

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
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<b>not seen</b>	AGHASYAN 18B	COMP	190 $\pi^- p \rightarrow \pi^- \pi^+ \pi^- p$
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 $\pi_1(1400)$  REFERENCES

ALBRECHT	20	EPJ C80 453	M. Albrecht <i>et al.</i>	(Crystal Barrel Collab.)
AGHASYAN	18B	PR D98 092003	M. Aghasyan <i>et al.</i>	(COMPASS Collab.)
ADAMS	07B	PL B657 27	G.S. Adams <i>et al.</i>	(BNL E852 Collab.)
SALVINI	04	EPJ C35 21	P. Salvini <i>et al.</i>	(OBELIX Collab.)
DZIERBA	03	PR D67 094015	A.R. Dzierba <i>et al.</i>	
ABELE	99	PL B446 349	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
ABELE	98B	PL B423 175	A. Abele <i>et al.</i>	(Crystal Barrel Collab.)
THOMPSON	97	PRL 79 1630	D.R. Thompson <i>et al.</i>	(BNL E852 Collab.)
PROKOSHKIN	95B	PAN 58 606	Y.D. Prokoshkin, S.A. Sadovsky	(SERP)
		Translated from YAF 58 662.		
BUGG	94	PR D50 4412	D.V. Bugg <i>et al.</i>	(LOQM)
AOYAGI	93	PL B314 246	H. Aoyagi <i>et al.</i>	(BKEI Collab.)
BELADIDZE	93	PL B313 276	G.M. Beladidze <i>et al.</i>	(VES Collab.)
BOUTEMEUR	90	Hadron 89 Conf. p 119	M. Boutemeur, M. Poulet	(SERP, BELG, LANL+)
ALDE	88B	PL B205 397	D.M. Alde <i>et al.</i>	(SERP, BELG, LANL, LAPP) IGJPC
APEL	81	NP B193 269	W.D. Apel <i>et al.</i>	(SERP, CERN)