$\rho(1450)$

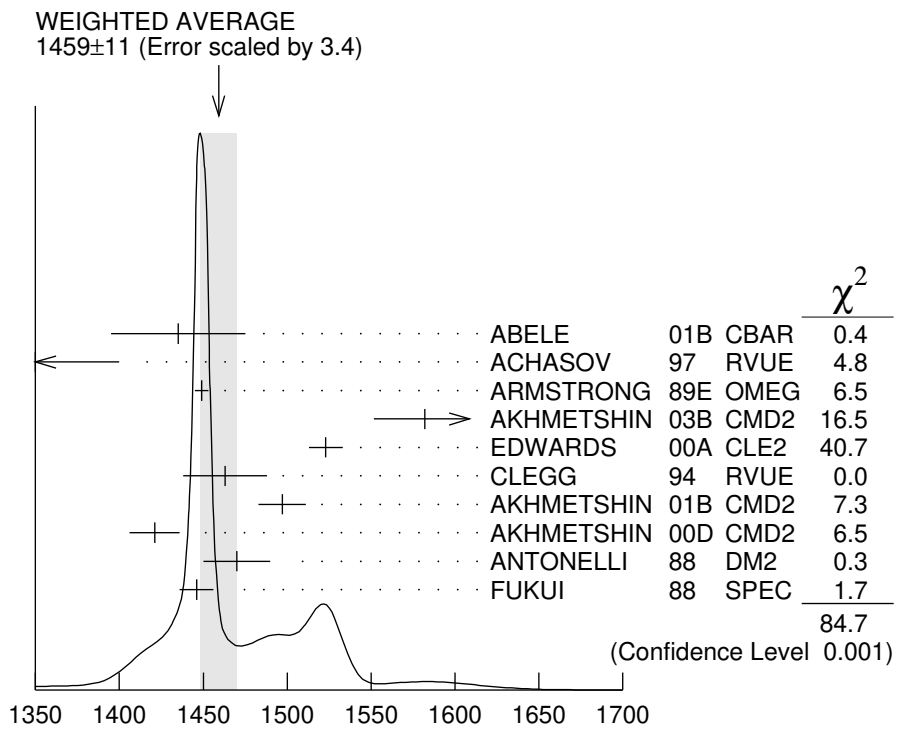
$I^G(J^{PC}) = 1^+(1^{--})$

See our mini-review under the $\rho(1700)$.

$\rho(1450)$ MASS

VALUE (MeV) *DOCUMENT ID*

1459±11 OUR AVERAGE Includes data from the 3 datablocks that follow this one. Error includes scale factor of 3.4. See the ideogram below.



$\eta\rho^0$ MODE

VALUE (MeV) *DOCUMENT ID* *TECN* *COMMENT*

The data in this block is included in the average printed for a previous datablock.

1497±14	[1] AKHMETSHIN	01B	CMD2	$e^+e^- \to \eta\gamma$
1421±15	[2] AKHMETSHIN	00D	CMD2	$e^+e^- \to \eta\pi^+\pi^-$
1470±20	ANTONELLI	88	DM2	$e^+e^- \to \eta\pi^+\pi^-$
1446±10	FUKUI	88	SPEC	8.95 $\pi^- p \to \eta\pi^+\pi^- n$

[1] Using the data of AKHMETSHIN 01B on $e^+e^- \to \eta\gamma$, AKHMETSHIN 00D and ANTONELLI 88 on $e^+e^- \to \eta\pi^+\pi^-$.

[2] Using the data of ANTONELLI 88, DOLINSKY 91, and AKHMETSHIN 00D. The energy-independent width of the $\rho(1450)$ and $\rho(1700)$ mesons assumed.

$\omega\pi$ MODE

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.					
$1582\pm17\pm25$	2382	[3] AKHMETSHIN	03B	CMD2	$e^+e \to \pi^0\pi^0\gamma$
1523 ± 10		[4] EDWARDS	00A	CLE2	$\tau^- \to \omega\pi^-\nu_\tau$
1463 ± 25		[5] CLEGG	94	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1349\pm25^{+10}_{-5}$	341	[6] ALEXANDER	01B	CLE2	$B \to D^{(*)}\omega\pi^-$
1250		[7] ASTON	80C	OMEG	20–70 $\gamma p \to \omega\pi^0 p$
1290 ± 40		[7] BARBER	80C	SPEC	3–5 $\gamma p \to \omega\pi^0 p$

[3] Using the data of AKHMETSHIN 03B and BISELLO 91B assuming the $\omega\pi^0$ and $\pi^+\pi^-$ mass dependence of the total width. $\rho(1700)$ mass and width fixed at 1700 MeV and 240 MeV, respectively.

[4] Mass-independent width parameterization. $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV respectively.

[5] Using data from BISELLO 91B, DOLINSKY 86 and ALBRECHT 87L.

[6] Using Breit-Wigner parameterization of the $\rho(1450)$ and assuming the $\omega\pi^-$ mass dependence for the total width.

[7] Not separated from $b_1(1235)$, not pure $J^P = 1^-$ effect.

4π MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.				
1435 ± 40	ABELE	01B	CBAR	0.0 $\overline{p}n \to 2\pi^-2\pi^0\pi^+$
1350 ± 50	ACHASOV	97	RVUE	$e^+e^- \to 2(\pi^+\pi^-)$
1449 ± 4	[8] ARMSTRONG	89E	OMEG	300 $pp \to pp2(\pi^+\pi^-)$

[8] Not clear whether this observation has I=1 or 0.

$\pi\pi$ MODE

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1328 ± 15		[9] SCHAEL	05C	ALEP	$\tau^- \to \pi^-\pi^0\nu_\tau$
1406 ± 15	87k	[10,11] ANDERSON	00A	CLE2	$\tau^- \to \pi^-\pi^0\nu_\tau$
~ 1368		[12] ABELE	99C	CBAR	0.0 $\overline{p}d \to \pi^+\pi^-\pi^- p$
1348 ± 33		BERTIN	98	OBLX	0.05–0.405 $\overline{n}p \to \pi^+\pi^+\pi^-$
1411 ± 14		[13] ABELE	97	CBAR	$\overline{p}n \to \pi^-\pi^0\pi^0$
1370^{+90}_{-70}		ACHASOV	97	RVUE	$e^+e^- \to \pi^+\pi^-$
1359 ± 40		[11] BERTIN	97C	OBLX	0.0 $\overline{p}p \to \pi^+\pi^-\pi^0$
1282 ± 37		BERTIN	97D	OBLX	0.05 $\overline{p}p \to 2\pi^+2\pi^-$
1424 ± 25		BISELLO	89	DM2	$e^+e^- \to \pi^+\pi^-$
1292 ± 17		[14] KURDADZE	83	OLYA	0.64–1.4 $e^+e^- \to \pi^+\pi^-$

[9] From the combined fit of the τ^- data from ANDERSON 00A and SCHAEL 05C and e^+e^- data from the compilation of BARKOV 85, AKHMETSHIN 04, and ALOISIO 05. $\rho(1700)$ mass and width fixed at 1713 MeV and 235 MeV, respectively. Supersedes BARATE 97M.
[10] From the GOUNARIS 68 parametrization of the pion form factor.
[11] $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV, respectively.
[12] $\rho(1700)$ mass and width fixed at 1780 MeV and 275 MeV respectively.
[13] T-matrix pole.
[14] Using for $\rho(1700)$ mass and width 1600 $\pm$ 20 and 300 $\pm$ 10 MeV respectively.

$\phi\pi$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1480±40	[15,16] BITYUKOV	87	SPEC	0	32.5 $\pi^- p \rightarrow \phi\pi^0 n$

[15] DONNACHIE 91 suggests this is a different particle.
[16] Not seen by ABELE 97H.

$K\overline{K}$ MODE

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1422.8±6.5	27k	[17] ABELE	99D	CBAR	$\pm$	0.0 $\overline{p}p \rightarrow K^+K^-\pi^0$

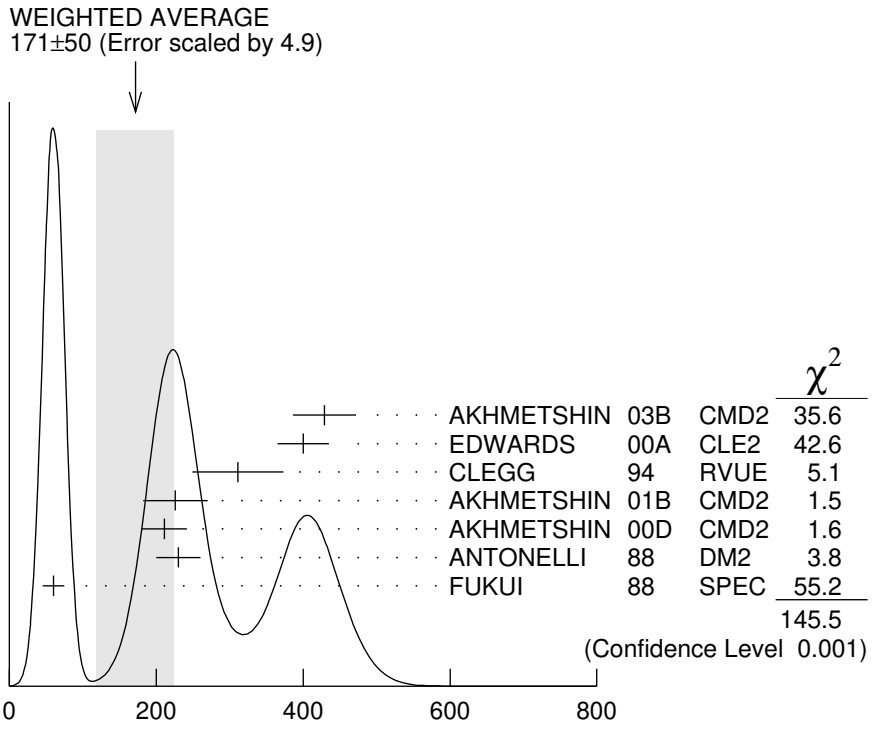
[17] K-matrix pole. Isospin not determined, could be $\omega(1420)$.

MIXED MODES

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1265.5±75.3	DUBNICKA	89	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$

$\rho(1450)$ WIDTH

VALUE (MeV)	*DOCUMENT ID*
171±50 OUR AVERAGE Includes data from the 3 datablocks that follow this one. Error includes scale factor of 4.9. See the ideogram below.	



$\rho(1450)$ WIDTH (MeV)

$\eta\rho^0$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.				
226 ± 44	[18] AKHMETSHIN	01B	CMD2	$e^+e^- \to \eta\gamma$
211 ± 31	[19] AKHMETSHIN	00D	CMD2	$e^+e^- \to \eta\pi^+\pi^-$
230 ± 30	ANTONELLI	88	DM2	$e^+e^- \to \eta\pi^+\pi^-$
60 ± 15	FUKUI	88	SPEC	8.95 $\pi^- p \to \eta\pi^+\pi^- n$

[18] Using the data of AKHMETSHIN 01B on $e^+e^- \to \eta\gamma$, AKHMETSHIN 00D and ANTONELLI 88 on $e^+e^- \to \eta\pi^+\pi^-$.

[19] Using the data of ANTONELLI 88, DOLINSKY 91, and AKHMETSHIN 00D. The energy-independent width of the $\rho(1450)$ and $\rho(1700)$ mesons assumed.

$\omega\pi$ MODE

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.					
$429\pm 42\pm10$	2382	[20] AKHMETSHIN	03B	CMD2	$e^+e \to \pi^0\pi^0\gamma$
400 ± 35		[21] EDWARDS	00A	CLE2	$\tau^- \to \omega\pi^-\nu_\tau$
311 ± 62		[22] CLEGG	94	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$547\pm 86^{+46}_{-45}$	341	[23] ALEXANDER	01B	CLE2	$B \to D^{(*)}\omega\pi^-$
300		[24] ASTON	80C	OMEG	20–70 $\gamma p \to \omega\pi^0 p$
320 ± 100		[24] BARBER	80C	SPEC	3–5 $\gamma p \to \omega\pi^0 p$

[20] Using the data of AKHMETSHIN 03B and BISELLO 91B assuming the $\omega\pi^0$ and $\pi^+\pi^-$ mass dependence of the total width. $\rho(1700)$ mass and width fixed at 1700 MeV and 240 MeV, respectively.
[21] Mass-independent width parameterization. $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV respectively.
[22] Using data from BISELLO 91B, DOLINSKY 86 and ALBRECHT 87L.
[23] Using Breit-Wigner parameterization of the $\rho(1450)$ and assuming the $\omega\pi^-$ mass dependence for the total width.
[24] Not separated from $b_1(1235)$, not pure $J^P = 1^-$ effect.

4π MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
325 ± 100	ABELE	01B	CBAR	0.0 $\overline{p}n \rightarrow 2\pi^-2\pi^0\pi^+$

$\pi\pi$ MODE

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
468 ± 41		[25] SCHAEL	05C	ALEP	$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$
455 ± 41	87k	[26,27] ANDERSON	00A	CLE2	$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$
~ 374		[28] ABELE	99C	CBAR	0.0 $\overline{p}d \rightarrow \pi^+\pi^-\pi^-p$
275 ± 10		BERTIN	98	OBLX	0.05–0.405 $\overline{n}p \rightarrow \pi^+\pi^+\pi^-$
343 ± 20		[29] ABELE	97	CBAR	$\overline{p}n \rightarrow \pi^-\pi^0\pi^0$
310 ± 40		[27] BERTIN	97C	OBLX	0.0 $\overline{p}p \rightarrow \pi^+\pi^-\pi^0$
236 ± 36		BERTIN	97D	OBLX	0.05 $\overline{p}p \rightarrow 2\pi^+2\pi^-$
269 ± 31		BISELLO	89	DM2	$e^+e^- \rightarrow \pi^+\pi^-$
218 ± 46		[30] KURDADZE	83	OLYA	0.64–1.4 $e^+e^- \rightarrow \pi^+\pi^-$

[25] From the combined fit of the τ^- data from ANDERSON 00A and SCHAEL 05C and e^+e^- data from the compilation of BARKOV 85, AKHMETSHIN 04, and ALOISIO 05. $\rho(1700)$ mass and width fixed at 1713 MeV and 235 MeV, respectively. Supersedes BARATE 97M.
[26] From the GOUNARIS 68 parametrization of the pion form factor.
[27] $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV, respectively.
[28] $\rho(1700)$ mass and width fixed at 1780 MeV and 275 MeV respectively.
[29] T-matrix pole.
[30] Using for $\rho(1700)$ mass and width 1600 $\pm$ 20 and 300 $\pm$ 10 MeV respectively.

$\phi\pi$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
130 ± 60	[31,32] BITYUKOV	87	SPEC	0	32.5 $\pi^- p \rightarrow \phi\pi^0 n$

[31] DONNACHIE 91 suggests this is a different particle.
[32] Not seen by ABELE 97H.

$K\overline{K}$ MODE

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •						
146.5 ± 10.5	27k	[33] ABELE	99D	CBAR	$\pm$	0.0 $\overline{p}p \rightarrow K^+K^-\pi^0$

[33] K-matrix pole. Isospin not determined, could be $\omega(1420)$.

MIXED MODES

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
391 ± 70	DUBNICKA	89	RVUE	$e^+ e^- \to \pi^+ \pi^-$

$\rho(1450)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1	$\pi\pi$	seen	
Γ_2	4π	seen	
Γ_3	$\omega\pi$	<2.0 %	95%
Γ_4	$a_1(1260)\pi$		
Γ_5	$h_1(1170)\pi$		
Γ_6	$\pi(1300)\pi$		
Γ_7	$\rho\rho$		
Γ_8	$\rho(\pi\pi)_{S\text{-wave}}$		
Γ_9	$e^+ e^-$	seen	
Γ_{10}	$\eta\rho$	<4 %	
Γ_{11}	$a_2(1320)\pi$	not seen	
Γ_{12}	$\phi\pi$	<1 %	
Γ_{13}	$K\overline{K}$	$<1.6 \times 10^{-3}$	95%
Γ_{14}	$\eta\gamma$	possibly seen	

$\rho(1450)\ \Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

$\Gamma(\pi\pi) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_1\Gamma_9/\Gamma$

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.12	[34] DIEKMAN	88	RVUE	$e^+ e^- \to \pi^+ \pi^-$
$0.027^{+0.015}_{-0.010}$	[35] KURDADZE	83	OLYA	0.64–1.4 $e^+ e^- \to \pi^+ \pi^-$

$\Gamma(\eta\rho) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{10}\Gamma_9/\Gamma$

VALUE (eV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
74 ± 20	[36] AKHMETSHIN	00D	CMD2	$e^+ e^- \to \eta\pi^+\pi^-$
91 ± 19	ANTONELLI	88	DM2	$e^+ e^- \to \eta\pi^+\pi^-$

$\Gamma(\phi\pi) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ $\Gamma_{12}\Gamma_9/\Gamma$

VALUE (eV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<70	90	[37] AULCHENKO	87B	ND	$e^+ e^- \to K^0_S K^0_L \pi^0$

$\Gamma(\eta\gamma) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_{14}\Gamma_9/\Gamma$

VALUE (units 10^{-9})	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<41.1	[38] AKHMETSHIN	05	CMD2	0.60-1.38 $e^+e^- \to \eta\gamma$
10.0±2.2±1.5	[39] AKHMETSHIN	01B	CMD2	$e^+e^- \to \eta\gamma$

[34] Using total width = 235 MeV.
[35] Using for $\rho(1700)$ mass and width 1600 ± 20 and 300 ± 10 MeV respectively.
[36] Using the data of ANTONELLI 88, DOLINSKY 91, and AKHMETSHIN 00D. The energy-independent width of the $\rho(1450)$ and $\rho(1700)$ mesons assumed.
[37] Using mass 1480 ± 40 MeV and total width 130 ± 60 MeV of BITYUKOV 87.
[38] From 2γ decay mode of η using 1465 MeV and 310 MeV for the $\rho(1450)$ mass and width.
[39] Using the data of AKHMETSHIN 01B on $e^+e^- \to \eta\gamma$, AKHMETSHIN 00D and ANTONELLI 88 on $e^+e^- \to \eta\pi^+\pi^-$.

$\rho(1450)$ BRANCHING RATIOS

$\Gamma(\eta\rho)/\Gamma_{total}$ Γ_{10}/Γ

VALUE	*DOCUMENT ID*		*TECN*
<0.04	DONNACHIE	87B	RVUE

$\Gamma(a_2(1320)\pi)/\Gamma_{total}$ Γ_{11}/Γ

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	AMELIN	00	VES	37 $\pi^- p \to \eta\pi^+\pi^- n$

$\Gamma(\phi\pi)/\Gamma(\omega\pi)$ Γ_{12}/Γ_3

VALUE	*CL%*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
>0.5	95	BITYUKOV	87	SPEC	0	32.5 $\pi^- p \to \phi\pi^0 n$

$\Gamma(\omega\pi)/\Gamma(4\pi)$ Γ_3/Γ_2

VALUE	*DOCUMENT ID*		*TECN*
<0.14	CLEGG	88	RVUE

$\Gamma(a_1(1260)\pi)/\Gamma(4\pi)$ Γ_4/Γ_2

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.27±0.08	[40] ABELE	01B	CBAR	0.0 $\overline{p}n \to 5\pi$

$\Gamma(h_1(1170)\pi)/\Gamma(4\pi)$ Γ_5/Γ_2

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.08±0.04	[40] ABELE	01B	CBAR	0.0 $\overline{p}n \to 5\pi$

$\Gamma(\pi(1300)\pi)/\Gamma(4\pi)$ Γ_6/Γ_2

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.37±0.13	[40] ABELE	01B	CBAR	0.0 $\overline{p}n \to 5\pi$

$\Gamma(\rho\rho)/\Gamma(4\pi)$ Γ_7/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.11 ± 0.05	[40] ABELE	01B	CBAR	0.0 $\overline{p}n \rightarrow 5\pi$

$\Gamma(\rho(\pi\pi)_{S\text{-wave}})/\Gamma(4\pi)$ Γ_8/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.17 ± 0.09	[40] ABELE	01B	CBAR	0.0 $\overline{p}n \rightarrow 5\pi$

$\Gamma(\pi\pi)/\Gamma(4\pi)$ Γ_1/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.37 ± 0.10	[40,41] ABELE	01B	CBAR	0.0 $\overline{p}n \rightarrow 5\pi$

$\Gamma(\eta\rho)/\Gamma(\omega\pi)$ Γ_{10}/Γ_3

VALUE	DOCUMENT ID		TECN	COMMENT
~ 0.24	[42] DONNACHIE	91	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
>2	FUKUI	91	SPEC	8.95 $\pi^- p \rightarrow \omega\pi^0 n$

$\Gamma(\omega\pi)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE	DOCUMENT ID		TECN
~ 0.21	CLEGG	94	RVUE

$\Gamma(\pi\pi)/\Gamma(\omega\pi)$ Γ_1/Γ_3

VALUE	DOCUMENT ID		TECN
~ 0.32	CLEGG	94	RVUE

$\Gamma(\phi\pi)/\Gamma_{\text{total}}$ Γ_{12}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
<0.01	[42] DONNACHIE	91	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
not seen	ABELE	97H	CBAR	$\overline{p}p \rightarrow K^0_L K^0_S \pi^0 \pi^0$

$\Gamma(K\overline{K})/\Gamma(\omega\pi)$ Γ_{13}/Γ_3

VALUE	DOCUMENT ID		TECN
<0.08	[42] DONNACHIE	91	RVUE

[40] $\omega\pi$ not included.
[41] Using ABELE 97.
[42] Using data from BISELLO 91B, DOLINSKY 86 and ALBRECHT 87L.

ρ(1450) REFERENCES

AKHMETSHIN	05	PL B605 26	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
ALOISIO	05	PL B606 12	A. Aloisio *et al.*	(KLOE Collab.)
SCHAEL	05C	PRPL 421 191	S. Schael *et al.*	(ALEPH Collab.)
AKHMETSHIN	04	PL B578 285	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AKHMETSHIN	03B	PL B562 173	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
ABELE	01B	EPJ C21 261	A. Abele *et al.*	(Crystal Barrel Collab.)
AKHMETSHIN	01B	PL B509 217	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
ALEXANDER	01B	PR D64 092001	J.P. Alexander *et al.*	(CLEO Collab.)
AKHMETSHIN	00D	PL B489 125	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AMELIN	00	NP A668 83	D. Amelin *et al.*	(VES Collab.)
ANDERSON	00A	PR D61 112002	S. Anderson *et al.*	(CLEO Collab.)
EDWARDS	00A	PR D61 072003	K.W. Edwards *et al.*	(CLEO Collab.)
ABELE	99C	PL B450 275	A. Abele *et al.*	(Crystal Barrel Collab.)
ABELE	99D	PL B468 178	A. Abele *et al.*	(Crystal Barrel Collab.)
BERTIN	98	PR D57 55	A. Bertin *et al.*	(OBELIX Collab.)
ABELE	97	PL B391 191	A. Abele *et al.*	(Crystal Barrel Collab.)
ABELE	97H	PL B415 280	A. Abele *et al.*	(Crystal Barrel Collab.)
ACHASOV	97	PR D55 2663	N.N. Achasov *et al.*	(NOVM)
BARATE	97M	ZPHY C76 15	R. Barate *et al.*	(ALEPH Collab.)
BERTIN	97C	PL B408 476	A. Bertin *et al.*	(OBELIX Collab.)
BERTIN	97D	PL B414 220	A. Bertin *et al.*	(OBELIX Collab.)
CLEGG	94	ZPHY C62 455	A.B. Clegg, A. Donnachie	(LANC, MCHS)
BISELLO	91B	NPBPS B21 111	D. Bisello	(DM2 Collab.)
DOLINSKY	91	PRPL 202 99	S.I. Dolinsky *et al.*	(NOVO)
DONNACHIE	91	ZPHY C51 689	A. Donnachie, A.B. Clegg	(MCHS, LANC)
FUKUI	91	PL B257 241	S. Fukui *et al.*	(SUGI, NAGO, KEK, KYOT+)
ARMSTRONG	89E	PL B228 536	T.A. Armstrong, M. Benayoun	(ATHU, BARI, BIRM+)
BISELLO	89	PL B220 321	D. Bisello *et al.*	(DM2 Collab.)
DUBNICKA	89	JPG 15 1349	S. Dubnicka *et al.*	(JINR, SLOV)
ANTONELLI	88	PL B212 133	A. Antonelli *et al.*	(DM2 Collab.)
CLEGG	88	ZPHY C40 313	A.B. Clegg, A. Donnachie	(MCHS, LANC)
DIEKMAN	88	PRPL 159 101	B. Diekmann	(BONN)
FUKUI	88	PL B202 441	S. Fukui *et al.*	(SUGI, NAGO, KEK, KYOT+)
ALBRECHT	87L	PL B185 223	H. Albrecht *et al.*	(ARGUS Collab.)
AULCHENKO	87B	JETPL 45 145 Translated from ZETFP 45 118.	V.M. Aulchenko *et al.*	(NOVO)
BITYUKOV	87	PL B188 383	S.I. Bityukov *et al.*	(SERP)
DONNACHIE	87B	ZPHY C34 257	A. Donnachie, A.B. Clegg	(MCHS, LANC)
DOLINSKY	86	PL B174 453	S.I. Dolinsky *et al.*	(NOVO)
BARKOV	85	NP B256 365	L.M. Barkov *et al.*	(NOVO)
KURDADZE	83	JETPL 37 733 Translated from ZETFP 37 613.	L.M. Kurdadze *et al.*	(NOVO)
ASTON	80C	PL 92B 211	D. Aston	(BONN, CERN, EPOL, GLAS, LANC+)
BARBER	80C	ZPHY C4 169	D.P. Barber *et al.*	(DARE, LANC, SHEF)
GOUNARIS	68	PRL 21 244	G.J. Gounaris, J.J. Sakurai	

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