$\rho(1450)$

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

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

$\rho(1450)$ MASS

VALUE (MeV)	DOCUMENT ID
1465±25 OUR ESTIMATE	This is only an educated guess; the error given is larger than the error on the average of the published values.
1452± 8 OUR AVERAGE	Includes data from the 2 datablocks that follow this one.

$\eta\rho^0$ MODE

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.				
1470±20	ANTONELLI	88	DM2	$e^+e^- \rightarrow \eta\pi^+\pi^-$
1446±10	FUKUI	88	SPEC	$8.95\ \pi^-p \rightarrow \eta\pi^+\pi^-n$

$\omega\pi$ MODE

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.				
1463±25	[1] CLEGG	94	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1250	[2] ASTON	80C	OMEG	20–70 $\gamma p \rightarrow \omega\pi^0 p$
1290±40	[2] BARBER	80C	SPEC	3–5 $\gamma p \rightarrow \omega\pi^0 p$

[1] Using data from BISELLO 91B, DOLINSKY 86 and ALBRECHT 87L.
[2] Not separated from $b_1(1235)$, not pure $J^P = 1^-$ effect.

$\pi\pi$ MODE

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 1368	[3] ABELE	99C	CBAR	$0.0\ \overline{p}d \rightarrow \pi^+\pi^-\pi^-p$
1348±33	BERTIN	98	OBLX	$0.05–0.405\ \overline{n}p \rightarrow \pi^+\pi^+\pi^-$
1411±14	[4] ABELE	97	CBAR	$\overline{p}n \rightarrow \pi^-\pi^0\pi^0$
1370^{+90}_{-70}	ACHASOV	97	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
1380±24	[5] BARATE	97M	ALEP	$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$
1359±40	[6] BERTIN	97C	OBLX	$0.0\ \overline{p}p \rightarrow \pi^+\pi^-\pi^0$
1282±37	BERTIN	97D	OBLX	$0.05\ \overline{p}p \rightarrow 2\pi^+2\pi^-$
1424±25	BISELLO	89	DM2	$e^+e^- \rightarrow \pi^+\pi^-$
1292±17	[7] KURDADZE	83	OLYA	$0.64–1.4\ e^+e^- \rightarrow \pi^+\pi^-$

[3] $\rho(1700)$ mass and width fixed at 1780 MeV and 275 MeV respectively.
[4] T-matrix pole.
[5] Fixing $\rho(1450)$ width to 310 MeV and $\rho(1700)$ mass and width to 1700 MeV and 235 MeV respectively.
[6] $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV, respectively.
[7] Using for $\rho(1700)$ mass and width 1600 ± 20 and 300 ± 10 MeV respectively.

$\pi^+\pi^-\pi^+\pi^-$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
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.

$\phi\pi$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1480±40	[9,10] BITYUKOV	87	SPEC	0	32.5 $\pi^- p \to \phi\pi^0 n$

[9] DONNACHIE 91 suggests this is a different particle.
[10] 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	[11] ABELE	99D	CBAR	±	0.0 $\overline{p}p \to K^+K^-\pi^0$

[11] 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	$e^+e^- \to \pi^+\pi^-$

$\rho(1450)$ WIDTH

VALUE (MeV)	*DOCUMENT ID*
310±60 OUR ESTIMATE	This is only an educated guess; the error given is larger than the error on the average of the published values.

$\eta\rho^0$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
230±30	ANTONELLI	88	DM2	$e^+e^- \to \eta\pi^+\pi^-$
60±15	FUKUI	88	SPEC	8.95 $\pi^- p \to \eta\pi^+\pi^- n$

$\omega\pi$ MODE

VALUE (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
The data in this block is included in the average printed for a previous datablock.				
311± 62	[12] CLEGG	94	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
300	[13] ASTON	80C	OMEG	20–70 $\gamma p \to \omega\pi^0 p$
320±100	[13] BARBER	80C	SPEC	3–5 $\gamma p \to \omega\pi^0 p$

[12] Using data from BISELLO 91B, DOLINSKY 86 and ALBRECHT 87L.
[13] Not separated from $b_1(1235)$, not pure $J^P = 1^-$ effect.

$\pi\pi$ MODE

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
~ 374	[14] 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	[15] ABELE	97	CBAR	$\overline{p}n \rightarrow \pi^-\pi^0\pi^0$
310 ± 40	[16] 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	[17] KURDADZE	83	OLYA	0.64–1.4 $e^+e^- \rightarrow \pi^+\pi^-$

[14] $\rho(1700)$ mass and width fixed at 1780 MeV and 275 MeV respectively.
[15] T-matrix pole.
[16] $\rho(1700)$ mass and width fixed at 1700 MeV and 235 MeV, respectively.
[17] 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	[18,19] BITYUKOV	87	SPEC	0	32.5 $\pi^- p \rightarrow \phi\pi^0 n$

[18] DONNACHIE 91 suggests this is a different particle.
[19] 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	[20] ABELE	99D	CBAR	$\pm$	0.0 $\overline{p}p \rightarrow K^+K^-\pi^0$

[20] 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	$e^+e^- \rightarrow \pi^+\pi^-$

$\rho(1450)$ 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	e^+e^-	seen	
Γ_5	$\eta\rho$	<4 %	
Γ_6	$a_2(1320)\pi$	not seen	
Γ_7	$\phi\pi$	<1 %	
Γ_8	$K\overline{K}$	$<1.6\times10^{-3}$	95%

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

$\Gamma(\pi\pi) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ — $\Gamma_1\Gamma_4/\Gamma$

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.12	[21] DIEKMAN	88	RVUE	$e^+e^- \to \pi^+\pi^-$
$0.027^{+0.015}_{-0.010}$	[22] KURDADZE	83	OLYA	0.64–1.4 $e^+e^- \to \pi^+\pi^-$

[21] Using total width = 235 MeV.
[22] Using for $\rho(1700)$ mass and width 1600 ± 20 and 300 ± 10 MeV respectively.

$\Gamma(\eta\rho) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ — $\Gamma_5\Gamma_4/\Gamma$

VALUE (eV)	DOCUMENT ID		TECN	COMMENT
91±19	ANTONELLI	88	DM2	$e^+e^- \to \eta\pi^+\pi^-$

$\Gamma(\phi\pi) \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ — $\Gamma_7\Gamma_4/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID		TECN	COMMENT
<70	90	[23] AULCHENKO	87B	ND	$e^+e^- \to K^0_S K^0_L \pi^0$

[23] Using mass 1480 ± 40 MeV and total width 130 ± 60 MeV of BITYUKOV 87.

$\rho(1450)$ BRANCHING RATIOS

$\Gamma(\eta\rho)/\Gamma_{\text{total}}$ — Γ_5/Γ

VALUE	DOCUMENT ID		TECN
<0.04	DONNACHIE	87B	RVUE

$\Gamma(a_2(1320)\pi)/\Gamma_{\text{total}}$ — Γ_6/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_7/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

$\Gamma(\eta\rho)/\Gamma(\omega\pi)$ — Γ_5/Γ_3

VALUE	DOCUMENT ID		TECN	COMMENT
$\sim$ 0.24	[24] DONNACHIE	91	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
>2	FUKUI	91	SPEC	8.95 $\pi^- p \to \omega\pi^0 n$

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

VALUE	DOCUMENT ID		TECN
$\sim$ 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_7/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
<0.01	[24] 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_8/Γ_3

VALUE	DOCUMENT ID		TECN
<0.08	[24] DONNACHIE	91	RVUE

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

$\rho(1450)$ REFERENCES

AMELIN	00	NP B668 83	D. Amelin et al.	(VES 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	NP B21 111 (suppl)	D. Bisello	(DM2 Collab.)
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	V.M. Aulchenko et al.	(NOVO)
		Translated from ZETFP 45 118.		
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)
KURDADZE	83	JETPL 37 733	L.M. Kurdadze et al.	(NOVO)
		Translated from ZETFP 37 613.		
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)

OTHER RELATED PAPERS

BELOZEROVA	98	PPN 29 63	T.S. Belozerova, V.K. Henner	
		Translated from FECAY 29 148.		
ABELE	97H	PL B415 280	A. Abele et al.	(Crystal Barrel Collab.)
BARNES	97	PR D55 4157	T. Barnes et al.	(ORNL, RAL, MCHS)
CLOSE	97C	PR D56 1584	F.E. Close et al.	(RAL, MCHS)
URHEIM	97	NPBPS 55C 359	J. Urheim	(CLEO Collab.)
ACHASOV	96B	PAN 59 1262	N.N. Achasov, G.N. Shestakov	(NOVM)
		Translated from YAF 59 1319.		
MURADOV	94	PAN 57 864	R.K. Muradov	(BAKU)
LANDSBERG	92	SJNP 55 1051		(SERP)
		Translated from YAF 55 1896.		

BRAU	88	PR D37 2379	J.E. Brau *et al.*	
ASTON	87	NP B292 693	D. Aston *et al.*	(SLAC, NAGO, CINC, INUS)
KURDADZE	86	JETPL 43 643	L.M. Kurdadze *et al.*	(NOVO)
		Translated from ZETFP 43 497.		
BARKOV	85	NP B256 365	L.M. Barkov *et al.*	(NOVO)
BISELLO	85	LAL 85-15	D. Bisello *et al.*	(PADO, LALO, CLER+)
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CORDIER	82	PL 109B 129	A. Cordier *et al.*	(LALO)
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COSME	76	PL 63B 352	G. Cosme *et al.*	(ORSAY)
BINGHAM	72B	PL 41B 635	H.H. Bingham *et al.*	(LBL, UCB, SLAC)
FRENKIEL	72	NP B47 61	P. Frenkiel *et al.*	(CDEF, CERN)
LAYSSAC	71	NC 6A 134	J. Layssac, F.M. Renard	(MONP)