$\rho(1450)$

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

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. • • •				
1348±33	BERTIN	98	OBLX	50–405 $\overline{n} p \rightarrow \pi^+\pi^+\pi^-$
1411±14	[3] 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	[4] BARATE	97M	ALEP	$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$
1359±40	[5] 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	$e^+e^- \rightarrow \pi^+\pi^-$

[3] T-matrix pole.
[4] Fixing $\rho(1450)$ width to 310 MeV and $\rho(1700)$ mass and width to 1700 MeV and 235 MeV respectively.
[5] $\rho(1700)$ mass and width fixed at 1700 MeV and 235 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	$e^+e^- \rightarrow 2(\pi^+\pi^-)$
1449± 4	[6] ARMSTRONG	89E	OMEG	300 $pp \rightarrow pp2(\pi^+\pi^-)$

[6] 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	[7,8] BITYUKOV	87	SPEC	0	32.5 $\pi^- p \rightarrow \phi\pi^0 n$

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

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*
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	$e^+e^- \rightarrow \eta\pi^+\pi^-$
60±15	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.				
311± 62	[9] CLEGG	94	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
300	[10] ASTON	80C	OMEG	20–70 $\gamma p \rightarrow \omega\pi^0 p$
320±100	[10] BARBER	80C	SPEC	3–5 $\gamma p \rightarrow \omega\pi^0 p$

[9] Using data from BISELLO 91B, DOLINSKY 86 and ALBRECHT 87L.
[10] 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. • • •				
275±10	BERTIN	98	OBLX	50–405 $\overline{n}p \to \pi^+\pi^+\pi^-$
343±20	[11] ABELE	97	CBAR	$\overline{p}n \to \pi^-\pi^0\pi^0$
310±40	[12] BERTIN	97C	OBLX	0.0 $\overline{p}p \to \pi^+\pi^-\pi^0$
236±36	BERTIN	97D	OBLX	0.05 $\overline{p}p \to 2\pi^+2\pi^-$
269±31	BISELLO	89	DM2	$e^+e^- \to \pi^+\pi^-$

[11] T-matrix pole.
[12] $\rho(1700)$ mass and width fixed at 1700 MeV and 235 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	[13,14] BITYUKOV	87	SPEC	0	32.5 $\pi^-p \to \phi\pi^0 n$

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

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	$e^+e^- \to \pi^+\pi^-$

ρ(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	$\phi\pi$	<1 %	
Γ_7	$K\overline{K}$	$<1.6 \times 10^{-3}$	95%

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

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

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.12	[15] DIEKMAN	88	RVUE	$e^+e^- \to \pi^+\pi^-$

[15] Using total width = 235 MeV.

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

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

$\Gamma(\phi\pi) \times \Gamma(e^+e^-)/\Gamma_{total}$ $\Gamma_6\Gamma_4/\Gamma$

VALUE (eV)	*CL%*	*DOCUMENT ID*		*TECN*	*COMMENT*
<70	90	[16] AULCHENKO	87B	ND	$e^+e^- \rightarrow K^0_S K^0_L \pi^0$

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

$\rho(1450)$ BRANCHING RATIOS

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

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

$\Gamma(\phi\pi)/\Gamma(\omega\pi)$ Γ_6/Γ_3

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

$\Gamma(\omega\pi)/\Gamma(4\pi)$ 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*
~ 0.24	[17] DONNACHIE	91	RVUE	
• • • We do not use the following data for averages, fits, limits, etc. • • •				
>2	FUKUI	91	SPEC	8.95 $\pi^- p \rightarrow \omega\pi^0 n$

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

$\Gamma(\phi\pi)/\Gamma_{total}$ Γ_6/Γ

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
<0.01	[17] 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_7/Γ_3

VALUE	*DOCUMENT ID*		*TECN*
<0.08	[17] DONNACHIE	91	RVUE

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

$\rho(1450)$ REFERENCES

BERTIN	98	PR D57 55	A. Bertin, Bruschi, Capponi+	(OBELIX Collab.)
ABELE	97	PL B391 191	A. Abele, Adomeit, Amsler+	(Crystal Barrel Collab.)
ABELE	97H	PL B415 280	A. Abele+	(Crystal Barrel Collab.)
ACHASOV	97	PR D55 2663	+Kozhevnikov+	(NOVM)
BARATE	97M	ZPHY C76 15	R. Barate+	(ALEPH Collab.)
BERTIN	97C	PL B408 476	A. Bertin, Bruschi+	(OBELIX Collab.)
BERTIN	97D	PL B414 220	A. Bertin+	(OBELIX Collab.)
CLEGG	94	ZPHY C62 455	+Donnachie	(LANC, MCHS)
BISELLO	91B	NP B21 111 (suppl)		(DM2 Collab.)
DONNACHIE	91	ZPHY C51 689	+Clegg	(MCHS, LANC)
FUKUI	91	PL B257 241	+Horikawa+	(SUGI, NAGO, KEK, KYOT, MIYA)
ARMSTRONG	89E	PL B228 536	+Benayoun	(ATHU, BARI, BIRM, CERN, CDEF, CURIN+)
BISELLO	89	PL B220 321	+Busetto+	(DM2 Collab.)
DUBNICKA	89	JPG 15 1349	+Martinovic+	(JINR, SLOV)
ANTONELLI	88	PL B212 133	+Baldini+	(DM2 Collab.)
CLEGG	88	ZPHY C40 313	+Donnachie	(MCHS, LANC)
DIEKMAN	88	PRPL 159 101		(BONN)
FUKUI	88	PL B202 441	+Horikawa+	(SUGI, NAGO, KEK, KYOT, MIYA)
ALBRECHT	87L	PL B185 223	+Binder, Boeckmann, Glaser+	(ARGUS Collab.)
AULCHENKO	87B	JETPL 45 145	+Dolinsky, Druzhinin, Dubrovin+	(NOVO)
		Translated from ZETFP 45 118.		
BITYUKOV	87	PL B188 383	+Dzhelyadin, Dorofeev, Golovkin+	(SERP)
DONNACHIE	87B	ZPHY C34 257	+Clegg	(MCHS, LANC)
DOLINSKY	86	PL B174 453	+Druzhinin, Dubrovin, Eidelman+	(NOVO)
ASTON	80C	PL 92B 211		(BONN, CERN, EPOL, GLAS, LANC, MCHS+)
BARBER	80C	ZPHY C4 169	+Dainton, Brodbeck, Brookes+	(DARE, LANC, SHEF)

OTHER RELATED PAPERS

ABELE	97H	PL B415 280	A. Abele+	(Crystal Barrel Collab.)
BARNES	97	PR D55 4157	T. Barnes+	(ORNL, RAL, MCHS)
CLOSE	97C	PR D56 1584	F.E. Close+	(RAL, MCHS)
URHEIM	97	NPBPS 55C 359	J. Urheim	(CLEO Collab.)
ACHASOV	96B	PAN 59 1262	+Shestakov	(NOVM)
		Translated from YAF 59 1319.		
MURADOV	94	PAN 57 864		(BAKU)
LANDSBERG	92	SJNP 55 1051		(SERP)
		Translated from YAF 55 1896.		
BRAU	88	PR D37 2379	+Franek+	(SLAC Hybrid Facility Photon Collab.)
ASTON	87	NP B292 693	+Awaji, D'Amore+	(SLAC, NAGO, CINC, INUS)
KURDADZE	86	JETPL 43 643	+Lelchuk, Pakhtusova, Sidorov, Skrinskii+	(NOVO)
		Translated from ZETFP 43 497.		
BARKOV	85	NP B256 365	+Chilingarov, Eidelman, Khazin, Lelchuk+	(NOVO)
BISELLO	85	LAL 85-15	+Augustin, Ajaltouni+	(PADO, LALO, CLER, FRAS)
ABE	84B	PRL 53 751	+Bacon, Ballam+	(SLAC Hybrid Facility Photon Collab.)
ATKINSON	84C	NP B243 1	+	(BONN, CERN, GLAS, LANC, MCHS, CURIN+)
CORDIER	82	PL 109B 129	+Bisello, Bizot, Buon, Delcourt	(LALO)
KILLIAN	80	PR D21 3005	+Treadwell, Ahrens, Berkelman, Cassel+	(CORN)
COSME	76	PL 63B 352	+Courau, Dudelzak, Grelaud, Jean-Marie+	(ORSAY)
BINGHAM	72B	PL 41B 635	+Rabin, Rosenfeld, Smadja+	(LBL, UCB, SLAC)
FRENKIEL	72	NP B47 61	+Ghesquiere, Lillestol, Chung+	(CDEF, CERN)
LAYSSAC	71	NC 6A 134	+Renard	(MONP)