$\rho(1700)$

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

See the review on "Spectroscopy of Light Meson Resonances."

$\rho(1700)$ MASS

$\eta\rho^0$ AND $\pi^+\pi^-$ MODES

VALUE (MeV)	DOCUMENT ID
1720±20 OUR ESTIMATE	

$\eta\rho^0$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT

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

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

1834±12	13.4k	[1] GRIBANOV	20	CMD3	1.1–2.0 $e^+e^- \rightarrow \eta\pi^+\pi^-$
1840±10	7.4k	[2] ACHASOV	18	SND	1.22–2.00 $e^+e^- \rightarrow \eta\pi^+\pi^-$
1740±20		ANTONELLI	88	DM2	$e^+e^- \rightarrow \eta\pi^+\pi^-$
1701±15		[3] FUKUI	88	SPEC	8.95 $\pi^- p \rightarrow \eta\pi^+\pi^- n$

[1] Mass and width of the $\rho(770)$ fixed at 775 and 149 MeV, respectively; solution 2 of model 2, $\eta \rightarrow \gamma\gamma$ decays used.

[2] From the combined fit of AULCHENKO 15 and ACHASOV 18 in the model with the interfering $\rho(1450)$, $\rho(1700)$ and $\rho(2150)$ with the parameters of the $\rho(1450)$ and $\rho(1700)$ floating and the mass and width of the $\rho(2150)$ fixed at 2155 MeV and 320 MeV, respectively. The phases of the resonances are π, 0 and π, respectively.

[3] Assuming $\rho^+ f_0(1370)$ decay mode interferes with $a_1(1260)^+\pi$ background. From a two Breit-Wigner fit.

$\pi\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT

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

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

1604.66±30.8	34M	[1] IGNATOV	24	CMD3	$e^+e^- \rightarrow \pi^+\pi^-$
1770.54± 5.49		[2] BARTOS	17	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
1718.50±65.44		[3] BARTOS	17A	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
1766.80±52.36		[4] BARTOS	17A	RVUE	$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$
1644 ±36	20k	[5] LEES	17C	BABR	$J/\psi \rightarrow \pi^+\pi^-\pi^0$
1780 ±20 $^{+15}_{-20}$	63.5k	[6] ABRAMOWICZ	12	ZEUS	$ep \rightarrow e\pi^+\pi^- p$
1861 ±17		[7] LEES	12G	BABR	$e^+e^- \rightarrow \pi^+\pi^-\gamma$
1728 ±17 ±89	5.4M	[8,9] FUJIKAWA	08	BELL	$\tau^- \rightarrow \pi^-\pi^0\nu_\tau$
1780 $^{+37}_{-29}$		[10] ABELE	97	CBAR	$\overline{p}n \rightarrow \pi^-\pi^0\pi^0$
1719 ±15		[10] BERTIN	97C	OBLX	0.0 $\overline{p}p \rightarrow \pi^+\pi^-\pi^0$
1730 ±30		CLEGG	94	RVUE	$e^+e^- \rightarrow \pi^+\pi^-$
1768 ±21		BISELLO	89	DM2	$e^+e^- \rightarrow \pi^+\pi^-$

1745.7	±91.9		DUBNICKA 89	RVUE	$e^+e^- \to \pi^+\pi^-$
1546	±26		GESHKEN... 89	RVUE	
1650		11	ERKAL 85	RVUE	20–70 $\gamma p \to \gamma\pi$
1550	±70		ABE 84B	HYBR	20 $\gamma p \to \pi^+\pi^- p$
1590	±20	12	ASTON 80	OMEG	20–70 $\gamma p \to p 2\pi$
1600	±10	13	ATIYA 79B	SPEC	50 γC $\to$ C2π
1598	$^{+24}_{-22}$		BECKER 79	ASPK	17 $\pi^- p$ polarized
1659	±25	11	LANG 79	RVUE	
1575		11	MARTIN 78C	RVUE	17 $\pi^- p \to \pi^+\pi^- n$
1610	±30	11	FROGGATT 77	RVUE	17 $\pi^- p \to \pi^+\pi^- n$
1590	±20	14	HYAMS 73	ASPK	17 $\pi^- p \to \pi^+\pi^- n$

[1] From a fit of the pion form factor using the GOUNARIS 68 parametrization with the complex phase of the $\rho - \omega$ interference leaving $\rho(1450)$, $\rho(1700)$ resonances as free parameters of the fit. The fit uses also data from CMD-2 and DM2 experiments. Systematic errors not estimated.
[2] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of LEES 12G and ABLIKIM 16C.
[3] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of ACHASOV 06, AKHMETSHIN 07, AUBERT 09AS, and AMBROSINO 11A.
[4] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of FUJIKAWA 08.
[5] From a Dalitz plot analysis in an isobar model with $\rho(1450)$ and $\rho(1700)$ masses and widths floating.
[6] Using the KUHN 90 parametrization of the pion form factor, neglecting ρ–ω interference.
[7] Using the GOUNARIS 68 parametrization of the pion form factor leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.
[8] $|F_\pi(0)|^2$ fixed to 1.
[9] From the GOUNARIS 68 parametrization of the pion form factor.
[10] T-matrix pole.
[11] From phase shift analysis of HYAMS 73 data.
[12] Simple relativistic Breit-Wigner fit with constant width.
[13] An additional 40 MeV uncertainty in both the mass and width is present due to the choice of the background shape.
[14] Included in BECKER 79 analysis.

$\pi\omega$ MODE

VALUE (MeV)	*EVTS*	*DOCUMENT ID*	*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1723± 2		[1] ACHASOV 23A	SND	$e^+e^- \to \omega\pi^0$
1708±41	7815	[2] ACHASOV 13	SND	1.05–2.00 $e^+e^- \to \pi^0\pi^0\gamma$
1550 to 1620		[3] ACHASOV 00I	SND	$e^+e^- \to \pi^0\pi^0\gamma$
1580 to 1710		[4] ACHASOV 00I	SND	$e^+e^- \to \pi^0\pi^0\gamma$
1710±90		ACHASOV 97	RVUE	$e^+e^- \to \omega\pi^0$

[1] From a vector dominance fit to the Born cross section between 1.05 and 2.0 GeV with $\rho(770)$, $\rho(1570)$, $\rho(1700)$, $\rho(2150)$. The fit also uses SND data from the VEPP-2M collider below 1.02 GeV and from LEES 17H and ABLIKIM 21A above 1.5GeV.
[2] From a phenomenological model based on vector meson dominance with the interfering $\rho(1450)$ and $\rho(1700)$ and their widths fixed at 400 and 250 MeV, respectively. Systematic uncertainty not estimated.

[3] Taking into account both $\rho(1450)$ and $\rho(1700)$ contributions. Using the data of ACHASOV 00I on $e^+ e^- \rightarrow \omega \pi^0$ and of EDWARDS 00A on $\tau^- \rightarrow \omega \pi^- \nu_\tau$. $\rho(1450)$ mass and width fixed at 1400 MeV and 500 MeV respectively.

[4] Taking into account the $\rho(1700)$ contribution only. Using the data of ACHASOV 00I on $e^+ e^- \rightarrow \omega \pi^0$ and of EDWARDS 00A on $\tau^- \rightarrow \omega \pi^- \nu_\tau$.

$K\overline{K}$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$1688.7 \pm 3.1 {}^{+141.1}_{-\ \ 1.3}$		[1] ALBRECHT	20	RVUE		0.9 $\overline{p} p \rightarrow K^+ K^- \pi^0$
$1541 \pm 12 \pm 33$	190k	[2] AAIJ	16N	LHCB		$D^0 \rightarrow K^0_S K^\pm \pi^\mp$
1740.8 ± 22.2	27k	[3] ABELE	99D	CBAR	$\pm$	0.0 $\overline{p} p \rightarrow K^+ K^- \pi^0$
1582 ± 36	1600	CLELAND	82B	SPEC	$\pm$	50 $\pi p \rightarrow K^0_S K^\pm p$

[1] T-matrix pole, 2 poles, 3 channels, including $\pi\pi$ scattering data from HYAMS 75.

[2] Using the GOUNARIS 68 parameterization with a fixed width. Value is average using different $K\pi$ S-wave parametrizations in fit.

[3] K-matrix pole. Isospin not determined, could be $\omega(1650)$ or $\phi(1680)$.

$2(\pi^+\pi^-)$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1851 {}^{+27}_{-24}$		ACHASOV	97	RVUE	$e^+ e^- \rightarrow 2(\pi^+\pi^-)$
1570 ± 20		[1] CORDIER	82	DM1	$e^+ e^- \rightarrow 2(\pi^+\pi^-)$
1520 ± 30		[2] ASTON	81E	OMEG	20–70 $\gamma p \rightarrow p 4\pi$
1654 ± 25		[3] DIBIANCA	81	DBC	$\pi^+ d \rightarrow p p 2(\pi^+\pi^-)$
1666 ± 39		[1] BACCI	80	FRAG	$e^+ e^- \rightarrow 2(\pi^+\pi^-)$
1780	34	KILLIAN	80	SPEC	11 $e^- p \rightarrow 2(\pi^+\pi^-)$
1500		[4] ATIYA	79B	SPEC	50 $\gamma C \rightarrow C 4\pi^\pm$
1570 ± 60	65	[5] ALEXANDER	75	HBC	7.5 $\gamma p \rightarrow p 4\pi$
1550 ± 60		[2] CONVERSI	74	OSPK	$e^+ e^- \rightarrow 2(\pi^+\pi^-)$
1550 ± 50	160	SCHACHT	74	STRC	5.5–9 $\gamma p \rightarrow p 4\pi$
1450 ± 100	340	SCHACHT	74	STRC	9–18 $\gamma p \rightarrow p 4\pi$
1430 ± 50	400	BINGHAM	72B	HBC	9.3 $\gamma p \rightarrow p 4\pi$

[1] Simple relativistic Breit-Wigner fit with model dependent width.

[2] Simple relativistic Breit-Wigner fit with constant width.

[3] One peak fit result.

[4] Parameters roughly estimated, not from a fit.

[5] Skew mass distribution compensated by Ross-Stodolsky factor.

$\pi^+\pi^-\pi^0\pi^0$ MODE

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1660 ± 30	ATKINSON	85B	OMEG	20–70 γp

$3(\pi^+\pi^-)$ AND $2(\pi^+\pi^-\pi^0)$ MODES

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
1730±34	[1] FRABETTI	04	E687	$\gamma p \to 3\pi^+ 3\pi^- p$
1783±15	CLEGG	90	RVUE	$e^+e^- \to 3(\pi^+\pi^-) 2(\pi^+\pi^-\pi^0)$

[1] From a fit with two resonances with the JACOB 72 continuum.

$m_{\rho(1700)^0} - m_{\rho(1700)^\pm}$

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
−48.30±83.81	[1] BARTOS	17A	RVUE	$e^+e^- \to \pi^+\pi^-$, $\tau^- \to \pi^-\pi^0\nu_\tau$

[1] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of ACHASOV 06, AKHMETSHIN 07, AUBERT 09AS, AMBROSINO 11A, and FUJIKAWA 08.

$\rho(1700)$ WIDTH

$\eta\rho^0$ AND $\pi^+\pi^-$ MODES

VALUE (MeV)	DOCUMENT ID
250±100 OUR ESTIMATE	

$\eta\rho^0$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
47±19	13.4k	[1] GRIBANOV	20	CMD3	1.1–2.0 $e^+e^- \to \eta\pi^+\pi^-$
132±40	7.4k	[2] ACHASOV	18	SND	1.22–2.00 $e^+e^- \to \eta\pi^+\pi^-$
150±30		ANTONELLI	88	DM2	$e^+e^- \to \eta\pi^+\pi^-$
282±44		[3] FUKUI	88	SPEC	8.95 $\pi^- p \to \eta\pi^+\pi^- n$

[1] Mass and width of the $\rho(770)$ fixed at 775 and 149 MeV, respectively; solution 2 of model 2, $\eta \to \gamma\gamma$ decays used.

[2] From the combined fit of AULCHENKO 15 and ACHASOV 18 in the model with the interfering $\rho(1450)$, $\rho(1700)$ and $\rho(2150)$ with the parameters of the $\rho(1450)$ and $\rho(1700)$ floating and the mass and width of the $\rho(2150)$ fixed at 2155 MeV and 320 MeV, respectively. The phases of the resonances are π, 0 and π, respectively.

[3] Assuming $\rho^+ f_0(1370)$ decay mode interferes with $a_1(1260)^+\pi$ background. From a two Breit-Wigner fit.

$\pi\pi$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
The data in this block is included in the average printed for a previous datablock.				
• • • We do not use the following data for averages, fits, limits, etc. • • •				

249.39 ± 52.24		34M	[1] IGNATOV	24	CMD3	$e^+e^- \to \pi^+\pi^-$
268.98 ± 11.40			[2] BARTOS	17	RVUE	$e^+e^- \to \pi^+\pi^-$
489.58 ± 16.95			[3] BARTOS	17A	RVUE	$e^+e^- \to \pi^+\pi^-$
414.71 ± 119.48			[4] BARTOS	17A	RVUE	$\tau^- \to \pi^-\pi^0\nu_\tau$
109 ± 19		20k	[5] LEES	17C	BABR	$J/\psi \to \pi^+\pi^-\pi^0$
310 ± 30	$^{+25}_{-35}$	63.5k	[6] ABRAMOWICZ	12	ZEUS	$ep \to e\pi^+\pi^- p$
316 ± 26			[7] LEES	12G	BABR	$e^+e^- \to \pi^+\pi^-\gamma$
164 ± 21	$^{+89}_{-26}$	5.4M	[8,9] FUJIKAWA	08	BELL	$\tau^- \to \pi^-\pi^0\nu_\tau$
275 ± 45			[10] ABELE	97	CBAR	$\overline{p}n \to \pi^-\pi^0\pi^0$
310 ± 40			[10] BERTIN	97C	OBLX	$0.0\ \overline{p}p \to \pi^+\pi^-\pi^0$
400 ± 100			CLEGG	94	RVUE	$e^+e^- \to \pi^+\pi^-$
224 ± 22			BISELLO	89	DM2	$e^+e^- \to \pi^+\pi^-$
242.5 ± 163.0			DUBNICKA	89	RVUE	$e^+e^- \to \pi^+\pi^-$
620 ± 60			GESHKEN...	89	RVUE	
<315			[11] ERKAL	85	RVUE	20–70 $\gamma p \to \gamma\pi$
280 $^{+30}_{-80}$			ABE	84B	HYBR	20 $\gamma p \to \pi^+\pi^- p$
230 ± 80			[12] ASTON	80	OMEG	20–70 $\gamma p \to p2\pi$
283 ± 14			[13] ATIYA	79B	SPEC	50 $\gamma C \to C2\pi$
175 $^{+98}_{-53}$			BECKER	79	ASPK	17 $\pi^- p$ polarized
232 ± 34			[11] LANG	79	RVUE	
340			[11] MARTIN	78C	RVUE	17 $\pi^- p \to \pi^+\pi^- n$
300 ± 100			[11] FROGGATT	77	RVUE	17 $\pi^- p \to \pi^+\pi^- n$
180 ± 50			[14] HYAMS	73	ASPK	17 $\pi^- p \to \pi^+\pi^- n$

[1] From a fit of the pion form factor using the GOUNARIS 68 parametrization with the complex phase of the $\rho-\omega$ interference leaving $\rho(1450)$, $\rho(1700)$ resonances as free parameters of the fit. The fit uses also data from CMD-2 and DM2 experiments. Systematic errors not estimated.

[2] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of LEES 12G and ABLIKIM 16C.

[3] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of ACHASOV 06, AKHMETSHIN 07, AUBERT 09AS, and AMBROSINO 11A.

[4] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of FUJIKAWA 08.

[5] From a Dalitz plot analysis in an isobar model with $\rho(1450)$ and $\rho(1700)$ masses and widths floating.

[6] Using the KUHN 90 parametrization of the pion form factor, neglecting $\rho-\omega$ interference.

[7] Using the GOUNARIS 68 parametrization of the pion form factor leaving the masses and widths of the $\rho(1450)$, $\rho(1700)$, and $\rho(2150)$ resonances as free parameters of the fit.

[8] $|F_\pi(0)|^2$ fixed to 1.

[9] From the GOUNARIS 68 parametrization of the pion form factor.

[10] T-matrix pole.

[11] From phase shift analysis of HYAMS 73 data.

[12] Simple relativistic Breit-Wigner fit with constant width.

[13] An additional 40 MeV uncertainty in both the mass and width is present due to the choice of the background shape.

[14] Included in BECKER 79 analysis.

$K\overline{K}$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$150.9 \pm 2.5^{+60}_{-10.6}$		[1] ALBRECHT	20	RVUE		$0.9\ \overline{p}p \to K^+K^-\pi^0$
187.2 ± 26.7	27k	[2] ABELE	99D	CBAR	$\pm$	$0.0\ \overline{p}p \to K^+K^-\pi^0$
265 ± 120	1600	CLELAND	82B	SPEC	$\pm$	$50\ \pi p \to K^0_S K^\pm p$

[1] T-matrix pole, 2 poles, 3 channels, including $\pi\pi$ scattering data from HYAMS 75.
[2] K-matrix pole. Isospin not determined, could be $\omega(1650)$ or $\phi(1680)$.

$2(\pi^+\pi^-)$ MODE

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
510 ± 40		[1] CORDIER	82	DM1	$e^+e^- \to 2(\pi^+\pi^-)$
400 ± 50		[2] ASTON	81E	OMEG	20–70 $\gamma p \to p4\pi$
400 ± 146		[3] DIBIANCA	81	DBC	$\pi^+ d \to pp2(\pi^+\pi^-)$
700 ± 160		[1] BACCI	80	FRAG	$e^+e^- \to 2(\pi^+\pi^-)$
100	34	KILLIAN	80	SPEC	11 $e^- p \to 2(\pi^+\pi^-)$
600		[4] ATIYA	79B	SPEC	50 γC $\to$ C$4\pi^\pm$
340 ± 160	65	[5] ALEXANDER	75	HBC	7.5 $\gamma p \to p4\pi$
360 ± 100		[2] CONVERSI	74	OSPK	$e^+e^- \to 2(\pi^+\pi^-)$
400 ± 120	160	[6] SCHACHT	74	STRC	5.5–9 $\gamma p \to p4\pi$
850 ± 200	340	[6] SCHACHT	74	STRC	9–18 $\gamma p \to p4\pi$
650 ± 100	400	BINGHAM	72B	HBC	9.3 $\gamma p \to p4\pi$

[1] Simple relativistic Breit-Wigner fit with model-dependent width.
[2] Simple relativistic Breit-Wigner fit with constant width.
[3] One peak fit result.
[4] Parameters roughly estimated, not from a fit.
[5] Skew mass distribution compensated by Ross-Stodolsky factor.
[6] Width errors enlarged by us to $4\Gamma/\sqrt{N}$; see the note with the $K^*(892)$ mass.

$\pi^+\pi^-\pi^0\pi^0$ MODE

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
300 ± 50	ATKINSON	85B	OMEG	20–70 γp

$\omega\pi^0$ MODE

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
371 ± 3	[1] ACHASOV	23A	SND	$e^+e^- \to \omega\pi^0$
350 to 580	[2] ACHASOV	00I	SND	$e^+e^- \to \pi^0\pi^0\gamma$
490 to 1040	[3] ACHASOV	00I	SND	$e^+e^- \to \pi^0\pi^0\gamma$

[1] From a vector dominance fit to the Born cross section between 1.05 and 2.0 GeV with $\rho(770)$, $\rho(1570)$, $\rho(1700)$, $\rho(2150)$. The fit also uses SND data from the VEPP-2M collider below 1.02 GeV and from LEES 17H and ABLIKIM 21A above 1.5 GeV.
[2] Taking into account both $\rho(1450)$ and $\rho(1700)$ contributions. Using the data of ACHASOV 00I on $e^+e^- \to \omega\pi^0$ and of EDWARDS 00A on $\tau^- \to \omega\pi^-\nu_\tau$. $\rho(1450)$ mass and width fixed at 1400 MeV and 500 MeV respectively.
[3] Taking into account the $\rho(1700)$ contribution only. Using the data of ACHASOV 00I on $e^+e^- \to \omega\pi^0$ and of EDWARDS 00A on $\tau^- \to \omega\pi^-\nu_\tau$.

$3(\pi^+\pi^-)$ AND $2(\pi^+\pi^-\pi^0)$ MODES

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
315 ± 100	[1] FRABETTI	04	E687	$\gamma p \rightarrow 3\pi^+ 3\pi^- p$
285 ± 20	CLEGG	90	RVUE	$e^+e^- \rightarrow 3(\pi^+\pi^-)2(\pi^+\pi^-\pi^0)$

[1] From a fit with two resonances with the JACOB 72 continuum.

$\Gamma_{\rho(1700)^0} - \Gamma_{\rho(1700)^\pm}$

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
74.87 ± 120.67	[1] BARTOS	17A	RVUE	$e^+e^- \rightarrow \pi^+\pi^-, \tau^- \rightarrow \pi^-\pi^0\nu_\tau$

[1] Applies the Unitary & Analytic Model of the pion electromagnetic form factor of DUBNICKA 10 to analyze the data of ACHASOV 06, AKHMETSHIN 07, AUBERT 09AS, AMBROSINO 11A, and FUJIKAWA 08.

$\rho(1700)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	4π	
Γ_2	$2(\pi^+\pi^-)$	seen
Γ_3	$\rho\pi\pi$	seen
Γ_4	$\rho^0\pi^+\pi^-$	seen
Γ_5	$\rho^0\pi^0\pi^0$	
Γ_6	$\rho^\pm\pi^\mp\pi^0$	seen
Γ_7	$a_1(1260)\pi$	seen
Γ_8	$h_1(1170)\pi$	seen
Γ_9	$\pi(1300)\pi$	seen
Γ_{10}	$\rho\rho$	seen
Γ_{11}	$\pi^+\pi^-$	seen
Γ_{12}	$\pi\pi$	seen
Γ_{13}	$K\overline{K}^*(892)+$ c.c.	seen
Γ_{14}	$\eta\rho$	seen
Γ_{15}	$a_2(1320)\pi$	not seen
Γ_{16}	$K\overline{K}$	seen
Γ_{17}	e^+e^-	seen
Γ_{18}	$\pi^0\omega$	seen
Γ_{19}	$\pi^0\gamma$	not seen
Γ_{20}	$f_0(1500)\gamma$	not seen

$\rho(1700)$ $\Gamma(i)\Gamma(e^+e^-)/\Gamma(\text{total})$

This combination of a partial width with the partial width into e^+e^- and with the total width is obtained from the cross-section into channel$_I$ in e^+e^- annihilation.

$\Gamma\big(2(\pi^+\pi^-)\big) \times \Gamma\big(e^+e^-\big)/\Gamma_{\text{total}}$ — $\Gamma_2\Gamma_{17}/\Gamma$

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.6 ± 0.2	DELCOURT	81B	DM1	$e^+e^- \to 2(\pi^+\pi^-)$
2.83 ± 0.42	BACCI	80	FRAG	$e^+e^- \to 2(\pi^+\pi^-)$

$\Gamma\big(\pi^+\pi^-\big) \times \Gamma\big(e^+e^-\big)/\Gamma_{\text{total}}$ — $\Gamma_{11}\Gamma_{17}/\Gamma$

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.13	[1] DIEKMAN	88	RVUE	$e^+e^- \to \pi^+\pi^-$
$0.029^{+0.016}_{-0.012}$	KURDADZE	83	OLYA	0.64–1.4 $e^+e^- \to \pi^+\pi^-$

[1] Using total width = 220 MeV.

$\Gamma\big(K\overline{K}^*(892)+\text{c.c.}\big) \times \Gamma\big(e^+e^-\big)/\Gamma_{\text{total}}$ — $\Gamma_{13}\Gamma_{17}/\Gamma$

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.305 ± 0.071	[1] BIZOT	80	DM1	e^+e^-

[1] Model dependent.

$\Gamma\big(\eta\rho\big) \times \Gamma\big(e^+e^-\big)/\Gamma_{\text{total}}$ — $\Gamma_{14}\Gamma_{17}/\Gamma$

VALUE (eV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.35 \pm 0.53 \pm 0.08$	13.4k	[1] GRIBANOV	20	CMD3	1.1–2.0 $e^+e^- \to \eta\pi^+\pi^-$
$84 \pm 26 \pm 4$		[2] LEES	18	BABR	$e^+e^- \to \eta\pi^+\pi^-$
7 ± 3		ANTONELLI	88	DM2	$e^+e^- \to \eta\pi^+\pi^-$

[1] Mass and width of the $\rho(770)$ fixed at 775 and 149 MeV, respectively; solution 2 of model 2, $\eta \to \gamma\gamma$ decays used.

[2] Includes non-resonant contribution. The selected fit model includes three ρ excited states. Model uncertainty is 80%.

$\Gamma\big(K\overline{K}\big) \times \Gamma\big(e^+e^-\big)/\Gamma_{\text{total}}$ — $\Gamma_{16}\Gamma_{17}/\Gamma$

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.035 ± 0.029	[1] BIZOT	80	DM1	e^+e^-

[1] Model dependent.

$\Gamma\big(\rho\pi\pi\big) \times \Gamma\big(e^+e^-\big)/\Gamma_{\text{total}}$ — $\Gamma_3\Gamma_{17}/\Gamma$

VALUE (keV)	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3.510 ± 0.090	[1] BIZOT	80	DM1	e^+e^-

[1] Model dependent.

$\rho(1700)$ $\Gamma(i)/\Gamma(\text{total}) \times \Gamma(e^+e^-)/\Gamma(\text{total})$

$\Gamma(\pi^0\omega)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ — $\Gamma_{18}/\Gamma \times \Gamma_{17}/\Gamma$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.09 ± 0.05	10.2k	[1] ACHASOV	16D	SND	1.05–2.00 $e^+e^- \to \pi^0\pi^0\gamma$
1.7 ± 0.4	7815	[2] ACHASOV	13	SND	1.05–2.00 $e^+e^- \to \pi^0\pi^0\gamma$

[1] From a phenomenological model based on vector meson dominance with interfering $\rho(700)$, $\rho(1450)$, and $\rho(1700)$. The $\rho(1700)$ mass and width are fixed at 1720 MeV and 250 MeV, respectively. Systematic uncertainty not estimated. Supersedes ACHASOV 13.

[2] From a phenomenological model based on vector meson dominance with the interfering $\rho(1450)$ and $\rho(1700)$ and their widths fixed at 400 and 250 MeV, respectively. Systematic uncertainty not estimated.

$\Gamma(\eta\rho)/\Gamma_{\text{total}} \times \Gamma(e^+e^-)/\Gamma_{\text{total}}$ — $\Gamma_{14}/\Gamma \times \Gamma_{17}/\Gamma$

VALUE (units 10^{-8})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$8.3^{+3.8}_{-3.1}$	7.4k	[1] ACHASOV	18	SND	1.22–2.00 $e^+e^- \to \eta\pi^+\pi^-$

[1] From the combined fit of AULCHENKO 15 and ACHASOV 18 in the model with the interfering $\rho(1450)$, $\rho(1700)$ and $\rho(2150)$ with the parameters of the $\rho(1450)$ and $\rho(1700)$ floating and the mass and width of the $\rho(2150)$ fixed at 2155 MeV and 320 MeV, respectively. The phases of the resonances are π, 0 and π, respectively.

$\rho(1700)$ BRANCHING RATIOS

$\Gamma(\rho\pi\pi)/\Gamma(4\pi)$ — Γ_3/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.28 ± 0.06	[1] ABELE	01B	CBAR	0.0 $\overline{p}n \to 5\pi$

[1] $\omega\pi$ not included.

$\Gamma(\rho^0\pi^+\pi^-)/\Gamma(2(\pi^+\pi^-))$ — Γ_4/Γ_2

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 1.0		DELCOURT	81B	DM1	$e^+e^- \to 2(\pi^+\pi^-)$
0.7 ± 0.1	500	SCHACHT	74	STRC	5.5–18 $\gamma p \to p4\pi$
0.80		[1] BINGHAM	72B	HBC	9.3 $\gamma p \to p4\pi$

[1] The $\pi\pi$ system is in S-wave.

$\Gamma(\rho^0\pi^0\pi^0)/\Gamma(\rho^\pm\pi^\mp\pi^0)$ — Γ_5/Γ_6

VALUE	DOCUMENT ID		TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.10	ATKINSON	85B	OMEG		20–70 γp
<0.15	ATKINSON	82	OMEG	0	20–70 $\gamma p \to p4\pi$

$\Gamma(a_1(1260)\pi)/\Gamma(4\pi)$ — Γ_7/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.16 ± 0.05	[1] ABELE	01B	CBAR	0.0 $\overline{p}n \rightarrow 5\pi$

[1] $\omega\pi$ not included.

$\Gamma(h_1(1170)\pi)/\Gamma(4\pi)$ — Γ_8/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.17 ± 0.06	[1] ABELE	01B	CBAR	0.0 $\overline{p}n \rightarrow 5\pi$

[1] $\omega\pi$ not included.

$\Gamma(\pi(1300)\pi)/\Gamma(4\pi)$ — Γ_9/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.30 ± 0.10	[1] ABELE	01B	CBAR	0.0 $\overline{p}n \rightarrow 5\pi$

[1] $\omega\pi$ not included.

$\Gamma(\rho\rho)/\Gamma(4\pi)$ — Γ_{10}/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.09 ± 0.03	[1] ABELE	01B	CBAR	0.0 $\overline{p}n \rightarrow 5\pi$

[1] $\omega\pi$ not included.

$\Gamma(\pi^+\pi^-)/\Gamma_{total}$ — Γ_{11}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.108 \pm 0.017 {}^{+0.162}_{-0.004}$	[1] ALBRECHT	20	RVUE	0.9 $\overline{p}p \rightarrow K^+K^-\pi^0$
$0.287 {}^{+0.043}_{-0.042}$	BECKER	79	ASPK	17 $\pi^- p$ polarized
0.15 to 0.30	[2] MARTIN	78C	RVUE	17 $\pi^- p \rightarrow \pi^+\pi^- n$
<0.20	[3] COSTA...	77B	RVUE	$e^+e^- \rightarrow 2\pi, 4\pi$
0.30 ± 0.05	[2] FROGGATT	77	RVUE	17 $\pi^- p \rightarrow \pi^+\pi^- n$
<0.15	[4] EISENBERG	73	HBC	5 $\pi^+ p \rightarrow \Delta^{++} 2\pi$
0.25 ± 0.05	[5] HYAMS	73	ASPK	17 $\pi^- p \rightarrow \pi^+\pi^- n$

[1] Residue from T-matrix pole, 2 poles, 3 channels, Chew-Mandelstam functions and simplified analytic continuation for the 4π channel. Includes scattering data from HYAMS 75 and model-independent calculation of GARCIA-MARTIN 11A.

[2] From phase shift analysis of HYAMS 73 data.

[3] Estimate using unitarity, time reversal invariance, Breit-Wigner.

[4] Estimated using one-pion-exchange model.

[5] Included in BECKER 79 analysis.

$\Gamma(K\overline{K})/\Gamma_{total}$ Γ_{16}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.007\pm0.006^{+0.041}_{-0.002}$	[1] ALBRECHT	20	RVUE	0.9 $\overline{p}p \to K^+K^-\pi^0$

[1] Residue from T-matrix pole, 2 poles, 3 channels, Chew-Mandelstam functions and simplified analytic continuation for the 4π channel. Includes scattering data from HYAMS 75 and model-independent calculation of GARCIA-MARTIN 11A.

$\Gamma(\pi^+\pi^-)/\Gamma(2(\pi^+\pi^-))$ Γ_{11}/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.13 ± 0.05	ASTON	80	OMEG	20–70 $\gamma p \to p2\pi$
<0.14	[1] DAVIER	73	STRC	6–18 $\gamma p \to p4\pi$
<0.2	[2] BINGHAM	72B	HBC	9.3 $\gamma p \to p2\pi$

[1] Upper limit is estimate.
[2] 2σ upper limit.

$\Gamma(\pi\pi)/\Gamma(4\pi)$ Γ_{12}/Γ_1

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.16 ± 0.04	[1,2] ABELE	01B	CBAR	0.0 $\overline{p}n \to 5\pi$

[1] Using ABELE 97.
[2] $\omega\pi$ not included.

$\Gamma(K\overline{K}^*(892)+\text{c.c.})/\Gamma_{total}$ Γ_{13}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
possibly seen	COAN	04	CLEO	$\tau^- \to K^-\pi^-K^+\nu_\tau$

$\Gamma(K\overline{K}^*(892)+\text{c.c.})/\Gamma(2(\pi^+\pi^-))$ Γ_{13}/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.15 ± 0.03	[1] DELCOURT	81B	DM1	$e^+e^- \to \overline{K}K\pi$

[1] Assuming $\rho(1700)$ and ω radial excitations to be degenerate in mass.

$\Gamma(\eta\rho)/\Gamma_{total}$ Γ_{14}/Γ

VALUE	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
possibly seen		AKHMETSHIN	00D	CMD2	$e^+e^- \to \eta\pi^+\pi^-$
<0.04		DONNACHIE	87B	RVUE	
<0.02	58	ATKINSON	86B	OMEG	20–70 γp

$\Gamma(\eta\rho)/\Gamma(2(\pi^+\pi^-))$ Γ_{14}/Γ_2

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.123 ± 0.027	DELCOURT	82	DM1	$e^+e^- \to \pi^+\pi^-$ MM
~ 0.1	ASTON	80	OMEG	20–70 γp

$\Gamma\big(\pi^+\pi^-\text{neutrals}\big)/\Gamma\big(2(\pi^+\pi^-)\big)$ $(\Gamma_5+\Gamma_6+0.714\Gamma_{14})/\Gamma_2$

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.6 ± 0.4	[1] BALLAM	74	HBC	9.3 γp

[1] Upper limit. Background not subtracted.

$\Gamma\big(a_2(1320)\pi\big)/\Gamma_{\text{total}}$ Γ_{15}/Γ

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

$\Gamma\big(K\overline{K}\big)/\Gamma\big(2(\pi^+\pi^-)\big)$ Γ_{16}/Γ_2

VALUE	CL%	DOCUMENT ID		TECN	CHG	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.015 ± 0.010		[1] DELCOURT	81B	DM1		$e^+e^- \to \overline{K}K$
<0.04	95	BINGHAM	72B	HBC	0	9.3 γp

[1] Assuming $\rho(1700)$ and ω radial excitations to be degenerate in mass.

$\Gamma\big(K\overline{K}\big)/\Gamma\big(K\overline{K}^*(892)+\text{c.c.}\big)$ Γ_{16}/Γ_{13}

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.052 ± 0.026	BUON	82	DM1	$e^+e^- \to$ hadrons

$\Gamma\big(\pi^0\omega\big)/\Gamma_{\text{total}}$ Γ_{18}/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
not seen		MATVIENKO	15	BELL	$\overline{B}^0 \to D^{*+}\omega\pi^-$
seen	1.6k	ACHASOV	12	SND	$e^+e^- \to \pi^0\pi^0\gamma$
not seen	2382	AKHMETSHIN	03B	CMD2	$e^+e \to \pi^0\pi^0\gamma$
seen		ACHASOV	97	RVUE	$e^+e^- \to \omega\pi^0$

$\Gamma\big(\pi^0\gamma\big)/\Gamma_{\text{total}}$ Γ_{19}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	[1] ACHASOV	10D	SND	1.075–2.0 $e^+e^- \to \pi^0\gamma$

[1] From a fit of a VMD model with two effective resonances with masses of 1450 MeV and 1700 MeV to describe the excited vector states $\omega(1420)$, $\rho(1450)$, $\omega(1650)$, and $\rho(1700)$. The width of the highest mass effective resonance is fixed at 315 MeV.

$\Gamma\big(f_0(1500)\gamma\big)/\Gamma_{\text{total}}$ Γ_{20}/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
not seen	[1] ACHASOV	22	SND	1.17–2.00 $e^+e^- \to \eta\eta\gamma$

[1] The 90% CL upper limit on the Born cross sections $\sigma(e^+e^- \to \phi(1680) \to f_2'(1525)\gamma \to \eta\eta\gamma)$ and $\sigma(e^+e^- \to \rho(1700) \to f_0(1500)\gamma \to \eta\eta\gamma)$ is 10.6 pb.

ρ(1700) REFERENCES

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ACHASOV	23A	PR D108 092012	M.N. Achasov *et al.*	(SND Collab.)
ACHASOV	22	EPJ C82 168	M.N. Achasov *et al.*	(SND Collab.)
ABLIKIM	21A	PL B813 136059	M. Ablikim *et al.*	(BESIII Collab.)
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ACHASOV	18	PR D97 012008	M.N. Achasov *et al.*	(SND Collab.)
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BARTOS	17	PR D96 113004	E. Bartos *et al.*	
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LEES	17C	PR D95 072007	J.P. Lees *et al.*	(BABAR Collab.)
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ABLIKIM	16C	PL B753 629	M. Ablikim *et al.*	(BESIII Collab.)
ACHASOV	16D	PR D94 112001	M.N. Achasov *et al.*	(SND Collab.)
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MATVIENKO	15	PR D92 012013	D. Matvienko *et al.*	(BELLE Collab.)
ACHASOV	13	PR D88 054013	M.N. Achasov *et al.*	(SND Collab.)
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CLEGG	94	ZPHY C62 455	A.B. Clegg, A. Donnachie	(LANC, MCHS)
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CLELAND	82B	NP B208 228	W.E. Cleland *et al.*	(DURH, GEVA, LAUS+)
CORDIER	82	PL 109B 129	A. Cordier *et al.*	(LALO)
DELCOURT	82	PL 113B 93	B. Delcourt *et al.*	(LALO)
ASTON	81E	NP B189 15	D. Aston	(BONN, CERN, EPOL, GLAS, LANC+)
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