$\omega(1420)$

$I^G(J^{PC}) = 0^-(1^{--})$

See also the $\omega(1650)$ particle listing.

ω(1420) MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
1410± 60 OUR ESTIMATE					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1418± 30± 10	824	[1] AKHMETSHIN	17A	CMD3	1.4–2.0 $e^+e^- \to \omega\eta$
1470± 50	13.1k	[2] AULCHENKO	15A	SND	1.05–1.80 $e^+e^- \to \pi^+\pi^-\pi^0$
1382± 23± 70		AUBERT	07AU	BABR	10.6 $e^+e^- \to \omega\pi^+\pi^-\gamma$
1350± 20± 20		AUBERT,B	04N	BABR	10.6 $e^+e^- \to \pi^+\pi^-\pi^0\gamma$
1400± 50±130	1.2M	[3] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
1450± 10		[4] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi, \omega\pi\pi$
1373± 70	177	[5] AKHMETSHIN	00D	CMD2	1.2–1.38 $e^+e^- \to \omega\pi^+\pi^-$
1370± 25	5095	ANISOVICH	00H	SPEC	0.0 $p\overline{p} \to \omega\pi^0\pi^0\pi^0$
1400^{+100}_{-200}		[6] ACHASOV	98H	RVUE	$e^+e^- \to \pi^+\pi^-\pi^0$
∼ 1400		[7] ACHASOV	98H	RVUE	$e^+e^- \to \omega\pi^+\pi^-$
∼ 1460		[8] ACHASOV	98H	RVUE	$e^+e^- \to K^+K^-$
1440± 70		[9] CLEGG	94	RVUE	
1419± 31	315	[10] ANTONELLI	92	DM2	1.34–2.4$e^+e^- \to \rho\pi$

[1] From a fit of the interfering $\omega(1420)$ and $\omega(1650)$ with a relative phase of π and other parameters floating.

[2] From a fit with contributions from $\omega(782)$, $\phi(1020)$, $\omega(1420)$, and $\omega(1650)$. See ACHASOV 20A for a further analysis of the $\pi^+\pi^-\pi^0$ data.

[3] From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+\pi^-\pi^0$ and ANTONELLI 92 on the $\omega\pi^+\pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.

[4] Using results of CORDIER 81 and preliminary data of DOLINSKY 91 and ANTONELLI 92.

[5] Using the data of AKHMETSHIN 00D and ANTONELLI 92. The $\rho\pi$ dominance for the energy dependence of the $\omega(1420)$ and $\omega(1650)$ width assumed.

[6] Using data from BARKOV 87, DOLINSKY 91, and ANTONELLI 92.

[7] Using the data from ANTONELLI 92.

[8] Using the data from IVANOV 81 and BISELLO 88B.

[9] From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.

[10] From a fit to two Breit-Wigner functions interfering between them and with the ω,ϕ tails with fixed (+,−,+) phases.

ω(1420) WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
290±190 OUR ESTIMATE					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
440±125	267	[1] ACHASOV	20B	SND	$e^+e^- \to \omega\eta \to \eta\pi^0\gamma$

$104\pm\ 35\pm\ 10$	824	[2] AKHMETSHIN	17A	CMD3	1.4–2.0 $e^+e^- \to \omega\eta$
880 ± 170	13.1k	[3] AULCHENKO	15A	SND	1.05–1.80 $e^+e^- \to \pi^+\pi^-\pi^0$
480 ± 180		[4] ACHASOV	10D	SND	1.075–2.0 $e^+e^- \to \pi^0\gamma$
$130\pm\ 50\pm100$		AUBERT	07AU	BABR	10.6 $e^+e^- \to \omega\pi^+\pi^-\gamma$
$450\pm\ 70\pm\ 70$		AUBERT,B	04N	BABR	10.6 $e^+e^- \to \pi^+\pi^-\pi^0\gamma$
$870^{+500}_{-300}\pm450$	1.2M	[5] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
$199\pm\ 15$		[6] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi, \omega\pi\pi$
$188\pm\ 45$	177	[7] AKHMETSHIN	00D	CMD2	1.2–1.38 $e^+e^- \to \omega\pi^+\pi^-$
$360^{+100}_{-\ 60}$	5095	ANISOVICH	00H	SPEC	0.0 $p\overline{p} \to \omega\pi^0\pi^0\pi^0$
$240\pm\ 70$		[8] CLEGG	94	RVUE	
$174\pm\ 59$	315	[9] ANTONELLI	92	DM2	1.34–2.4$e^+e^- \to \rho\pi$

[1] From a fit with contributions from $\omega(1420)$, $\omega(1650)$, and $\phi(1680)$. The mass of $\omega(1420)$ is fixed to the PDG 18 value of 1420 MeV.

[2] From a fit of the interfering $\omega(1420)$ and $\omega(1650)$ with a relative phase of π and other parameters floating.

[3] From a fit with contributions from $\omega(782)$, $\phi(1020)$, $\omega(1420)$, and $\omega(1650)$. See ACHASOV 20A for a further analysis of the $\pi^+\pi^-\pi^0$ data.

[4] 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 $\rho(1700)$. Systematic errors not evaluated.

[5] From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+\pi^-\pi^0$ and ANTONELLI 92 on the $\omega\pi^+\pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.

[6] Using results of CORDIER 81 and preliminary data of DOLINSKY 91 and ANTONELLI 92.

[7] Using the data of AKHMETSHIN 00D and ANTONELLI 92. The $\rho\pi$ dominance for the energy dependence of the $\omega(1420)$ and $\omega(1650)$ width assumed.

[8] From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.

[9] From a fit to two Breit-Wigner functions interfering between them and with the ω,ϕ tails with fixed (+,−,+) phases.

ω(1420) DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\rho\pi$	seen
Γ_2	$\omega\pi\pi$	seen
Γ_3	$\omega\eta$	
Γ_4	$b_1(1235)\pi$	seen
Γ_5	e^+e^-	seen
Γ_6	$\pi^0\gamma$	

$\omega(1420)$ $\Gamma(i)\Gamma(e^+e^-)/\Gamma^2(\text{total})$

$\Gamma(\rho\pi)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_1/\Gamma \times \Gamma_5/\Gamma$

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

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
0.73 ± 0.08	13.1k	[1] AULCHENKO 15A	SND	1.05–1.80 $e^+e^- \to \pi^+\pi^-\pi^0$
$0.82 \pm 0.05 \pm 0.06$		AUBERT,B 04N	BABR	10.6 $e^+e^- \to \pi^+\pi^-\pi^0\gamma$
$0.65 \pm 0.13 \pm 0.21$	1.2M	[2,3] ACHASOV 03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
0.625 ± 0.160		[4,5] CLEGG 94	RVUE	
0.466 ± 0.178		[6,7] ANTONELLI 92	DM2	1.34–2.4 $e^+e^- \to \rho\pi$

[1] From a fit with contributions from $\omega(782)$, $\phi(1020)$, $\omega(1420)$, and $\omega(1650)$. See ACHASOV 20A for a further analysis of the $\pi^+\pi^-\pi^0$ data.
[2] Calculated by us from the cross section at the peak.
[3] From the combined fit of ANTONELLI 92, ACHASOV 01E, ACHASOV 02E, and ACHASOV 03D data on the $\pi^+\pi^-\pi^0$ and ANTONELLI 92 on the $\omega\pi^+\pi^-$ final states. Supersedes ACHASOV 99E and ACHASOV 02E.
[4] From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.
[5] From the partial and leptonic width given by the authors.
[6] From a fit to two Breit-Wigner functions interfering between them and with the ω,ϕ tails with fixed $(+,-,+)$ phases.
[7] From the product of the leptonic width and partial branching ratio given by the authors.

$\Gamma(\omega\pi\pi)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_2/\Gamma \times \Gamma_5/\Gamma$

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

VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
19.7 ± 5.7	AUBERT 07AU	BABR	10.6 $e^+e^- \to \omega\pi^+\pi^-\gamma$
1.9 ± 1.9	[1] AKHMETSHIN 00D	CMD2	1.2–2.4 $e^+e^- \to \omega\pi^+\pi^-$

[1] Using the data of AKHMETSHIN 00D and ANTONELLI 92. The $\rho\pi$ dominance for the energy dependence of the $\omega(1420)$ and $\omega(1650)$ width assumed.

$\Gamma(\omega\eta)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_3/\Gamma \times \Gamma_5/\Gamma$

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

VALUE (units 10^{-8})	EVTS	DOCUMENT ID	TECN	COMMENT
2.5 ± 0.6	267	[1] ACHASOV 20B	SND	$e^+e^- \to \omega\eta \to \eta\pi^0\gamma$
$2.1^{+1.0}_{-0.8}$		ACHASOV 19	SND	$e^+e^- \to \pi^+\pi^-\pi^0\eta$
$5.0 \pm 2.6 \pm 0.3$	824	[2] AKHMETSHIN 17A	CMD3	1.4–2.0 $e^+e^- \to \omega\eta$
$1.6^{+0.9}_{-0.7}$	898	[3] ACHASOV 16B	SND	1.34–2.00 $e^+e^- \to \omega\eta$

[1] From a fit with contributions from $\omega(1420)$, $\omega(1650)$, and $\phi(1680)$. The mass of $\omega(1420)$ is fixed to the PDG 18 value of 1420 MeV. Fixing also the width of $\omega(1420)$ to the PDG 18 value of 220 MeV results in $(3.0 \pm 1.6) \times 10^{-8}$ measurement.
[2] From a fit of the interfering $\omega(1420)$ and $\omega(1650)$ with a relative phase of π and other parameters floating. From an alternative fit $\Gamma(\omega(1420) \to \omega\eta)/\Gamma_{total} \times \Gamma(\omega(1420) \to e^+e^-) = 5.3 \pm 1.6$ eV.
[3] From a fit with contributions from $\omega(1420)$, $\omega(1650)$, and $\phi(1680)$. The mass and the width of $\omega(1420)$ are fixed to the 2014 edition (PDG 14) of this review.

$\Gamma(\pi^0\gamma)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ — $\Gamma_6/\Gamma \times \Gamma_5/\Gamma$

VALUE (units 10^{-8})	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.23 ± 0.14	[1] ACHASOV	10D	SND	1.075–2.0 $e^+e^- \rightarrow \pi^0\gamma$
$2.03^{+0.70}_{-0.75}$	[2] AKHMETSHIN	05	CMD2	0.60–1.38 $e^+e^- \rightarrow \pi^0\gamma$

[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 $\rho(1700)$. Systematic errors not evaluated.
[2] Using 1420 MeV and 220 MeV for the $\omega(1420)$ mass and width.

$\omega(1420)$ BRANCHING RATIOS

$\Gamma(\omega\pi\pi)/\Gamma_{total}$ — Γ_2/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.301 ± 0.029	[1] HENNER	02	RVUE	1.2–2.0 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
possibly seen	AKHMETSHIN	00D	CMD2	$e^+e^- \rightarrow \omega\pi^+\pi^-$

$\Gamma(\omega\pi\pi)/\Gamma(b_1(1235)\pi)$ — Γ_2/Γ_4

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.60 ± 0.16	5095	ANISOVICH	00H	SPEC	0.0 $p\overline{p} \rightarrow \omega\pi^0\pi^0\pi^0$

$\Gamma(\rho\pi)/\Gamma_{total}$ — Γ_1/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	ACHASOV	20A	SND	1.15–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.699 ± 0.029	[1] HENNER	02	RVUE	1.2–2.0 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$

$\Gamma(e^+e^-)/\Gamma_{total}$ — Γ_5/Γ

VALUE (units 10^{-7})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$\sim$ 6.6	1.2M	[2,3] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
$23\ \pm1$		[1] HENNER	02	RVUE	1.2–2.0 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$

[1] Assuming that the $\omega(1420)$ decays into $\rho\pi$ and $\omega\pi\pi$ only.
[2] Calculated by us from the cross section at the peak.
[3] Assuming that the $\omega(1420)$ decays into $\rho\pi$ only.

$\omega(1420)$ REFERENCES

ACHASOV	20A	EPJ C80 993	M.N. Achasov *et al.*	(SND Collab.)
ACHASOV	20B	EPJ C80 1008	M.N. Achasov *et al.*	(SND Collab.)
ACHASOV	19	PR D99 112004	M.N. Achasov *et al.*	(SND Collab.)
PDG	18	PR D98 030001	M. Tanabashi *et al.*	(PDG Collab.)
AKHMETSHIN	17A	PL B773 150	R.R. Akhmetshin *et al.*	(CMD-3 Collab.)
ACHASOV	16B	PR D94 092002	M.N. Achasov *et al.*	(SND Collab.)
AULCHENKO	15A	JETP 121 27	V.M. Aulchenko *et al.*	(SND Collab.)
		Translated from ZETF 148 34.		
PDG	14	CP C38 070001	K. Olive *et al.*	(PDG Collab.)
ACHASOV	10D	PR D98 112001	M.N. Achasov *et al.*	(SND Collab.)
AUBERT	07AU	PR D76 092005	B. Aubert *et al.*	(BABAR Collab.)
AKHMETSHIN	05	PL B605 26	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
AUBERT,B	04N	PR D70 072004	B. Aubert *et al.*	(BABAR Collab.)
ACHASOV	03D	PR D68 052006	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
ACHASOV	02E	PR D66 032001	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
HENNER	02	EPJ C26 3	V.K. Henner *et al.*	
ACHASOV	01E	PR D63 072002	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
AKHMETSHIN	00D	PL B489 125	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
ANISOVICH	00H	PL B485 341	A.V. Anisovich *et al.*	
ACHASOV	99E	PL B462 365	M.N. Achasov *et al.*	(Novosibirsk SND Collab.)
ACHASOV	98H	PR D57 4334	N.N. Achasov, A.A. Kozhevnikov	
CLEGG	94	ZPHY C62 455	A.B. Clegg, A. Donnachie	(LANC, MCHS)
ANTONELLI	92	ZPHY C56 15	A. Antonelli *et al.*	(DM2 Collab.)
DOLINSKY	91	PRPL 202 99	S.I. Dolinsky *et al.*	(NOVO)
BISELLO	88B	ZPHY C39 13	D. Bisello *et al.*	(PADO, CLER, FRAS+)
BARKOV	87	JETPL 46 164	L.M. Barkov *et al.*	(NOVO)
		Translated from ZETFP 46 132.		
CORDIER	81	PL 106B 155	A. Cordier *et al.*	(ORSAY)
IVANOV	81	PL 107B 297	P.M. Ivanov *et al.*	(NOVO)