$\omega(1420)$

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

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

$\omega(1420)$ 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.

$\omega(1420)$ 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± 35± 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 ± 15		[6] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi$, $\omega\pi\pi$
188 ± 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 ± 70		[8] CLEGG	94	RVUE	
174 ± 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.

$\omega(1420)$ 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	$\pi^0\gamma$	

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

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

VALUE (units 10^{-6})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$0.73\ \pm0.08$	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$\pm$0.160		[4,5] CLEGG	94	RVUE	
0.466$\pm$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.

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

VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
19.7$\pm$5.7	AUBERT 07AU	BABR	10.6 $e^+e^- \to \omega\pi^+\pi^-\gamma$
1.9$\pm$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.

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

VALUE (units 10^{-8})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.5$\pm$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.

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

VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.23$\pm$0.14	[1] ACHASOV 10D	SND	1.075–2.0 $e^+e^- \to \pi^0\gamma$

$2.03^{+0.70}_{-0.75}$	[2] AKHMETSHIN 05	CMD2	0.60–1.38	$e^+e^- \to \pi^0\gamma$

[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 $\rho(1700)$. 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 $e^+e^- \to \rho\pi, \omega\pi\pi$
possibly seen	AKHMETSHIN	00D	CMD2	$e^+e^- \to \omega\pi^+\pi^-$

$\Gamma(\omega\pi\pi)/\Gamma(b_1(1235)\pi)$ 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 $p\overline{p} \to \omega\pi^0\pi^0\pi^0$

$\Gamma(\rho\pi)/\Gamma_{total}$ 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 $e^+e^- \to \pi^+\pi^-\pi^0$
0.699 ± 0.029	[1] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi, \omega\pi\pi$

$\Gamma(e^+e^-)/\Gamma_{total}$ 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 $e^+e^- \to \pi^+\pi^-\pi^0$
23 ± 1		[1] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi, \omega\pi\pi$

[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)