

$\omega(1420)$

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

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 $e^+e^- \rightarrow \omega\eta$
1470± 50	13.1k	² AULCHENKO 15A	SND	1.05–1.80 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
1382± 23± 70		AUBERT 07AU	BABR	10.6 $e^+e^- \rightarrow \omega\pi^+\pi^-\gamma$
1350± 20± 20		AUBERT,B 04N	BABR	10.6 $e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma$
1400± 50± 130	1.2M	³ ACHASOV 03D	RVUE	0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
1450± 10		⁴ HENNER 02	RVUE	1.2–2.0 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
1373± 70	177	⁵ AKHMETSHIN 00D	CMD2	1.2–1.38 $e^+e^- \rightarrow \omega\pi^+\pi^-$
1370± 25	5095	ANISOVICH 00H	SPEC	0.0 $p\bar{p} \rightarrow \omega\pi^0\pi^0\pi^0$
1400 ⁺¹⁰⁰ _{–200}		⁶ ACHASOV 98H	RVUE	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
~ 1400		⁷ ACHASOV 98H	RVUE	$e^+e^- \rightarrow \omega\pi^+\pi^-$
~ 1460		⁸ ACHASOV 98H	RVUE	$e^+e^- \rightarrow K^+K^-$
1440± 70		⁹ CLEGG 94	RVUE	
1419± 31	315	¹⁰ ANTONELLI 92	DM2	1.34–2.4 $e^+e^- \rightarrow \rho\pi$

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	$e^+e^- \rightarrow \omega\eta \rightarrow \eta\pi^0\gamma$

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

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 ± 0.08	13.1k	¹ AULCHENKO	15A SND	$1.05\text{--}1.80 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
$0.82 \pm 0.05 \pm 0.06$		AUBERT,B	04N BABR	$10.6 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \gamma$
$0.65 \pm 0.13 \pm 0.21$	1.2M	^{2,3} ACHASOV	03D RVUE	$0.44\text{--}2.00 e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$
0.625 ± 0.160		^{4,5} CLEGG	94 RVUE	
0.466 ± 0.178		^{6,7} ANTONELLI	92 DM2	$1.34\text{--}2.4 e^+ e^- \rightarrow \rho\pi$

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.

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

VALUE (units 10^{-8})	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
19.7 ± 5.7	AUBERT	07AU BABR	$10.6 e^+ e^- \rightarrow \omega \pi^+ \pi^- \gamma$
1.9 ± 1.9	¹ AKHMETSHIN 00D	CMD2	$1.2\text{--}2.4 e^+ e^- \rightarrow \omega \pi^+ \pi^-$

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.

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

VALUE (units 10^{-8})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.5 ± 0.6	267	¹ ACHASOV	20B SND	$e^+ e^- \rightarrow \omega \eta \rightarrow \eta \pi^0 \gamma$
$2.1^{+1.0}_{-0.8}$		ACHASOV	19 SND	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0 \eta$
$5.0 \pm 2.6 \pm 0.3$	824	² AKHMETSHIN 17A	CMD3	$1.4\text{--}2.0 e^+ e^- \rightarrow \omega \eta$
$1.6^{+0.9}_{-0.7}$	898	³ ACHASOV	16B SND	$1.34\text{--}2.00 e^+ e^- \rightarrow \omega \eta$

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 $\Gamma(\omega(1420) \rightarrow \omega \eta) / \Gamma_{\text{total}} \times \Gamma(\omega(1420) \rightarrow e^+ e^-) = 5.3 \pm 1.6$ 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.

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

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

0.23 ± 0.14	¹ ACHASOV	10D	SND $1.075\text{--}2.0 e^+e^- \rightarrow \pi^0\gamma$
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$2.03^{+0.70}_{-0.75}$	² AKHMETSHIN 05	CMD2	$0.60\text{--}1.38 e^+e^- \rightarrow \pi^0\gamma$
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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

$$\Gamma(\omega\pi\pi)/\Gamma_{\text{total}} \qquad \Gamma_2/\Gamma$$

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

0.301 ± 0.029	¹ HENNER	02	RVUE $1.2\text{--}2.0 e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
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possibly seen	AKHMETSHIN 00D	CMD2	$e^+e^- \rightarrow \omega\pi^+\pi^-$
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$$\Gamma(\omega\pi\pi)/\Gamma(b_1(1235)\pi) \qquad \Gamma_2/\Gamma_4$$

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

0.60 ± 0.16	5095	ANISOVICH	00H	SPEC $0.0 p\bar{p} \rightarrow \omega\pi^0\pi^0\pi^0$
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$$\Gamma(\rho\pi)/\Gamma_{\text{total}} \qquad \Gamma_1/\Gamma$$

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

seen	ACHASOV	20A	SND $1.15\text{--}2.00 e^+e^- \rightarrow \pi^+\pi^-\pi^0$
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0.699 ± 0.029	¹ HENNER	02	RVUE $1.2\text{--}2.0 e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
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$$\Gamma(e^+e^-)/\Gamma_{\text{total}} \qquad \Gamma_5/\Gamma$$

VALUE (units 10^{-7})	EVTS	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

~ 6.6	1.2M	^{2,3} ACHASOV	03D	RVUE $0.44\text{--}2.00 e^+e^- \rightarrow \pi^+\pi^-\pi^0$
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23 ± 1	¹ HENNER	02	RVUE $1.2\text{--}2.0 e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
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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 <i>et al.</i>	(SND Collab.)
ACHASOV	20B	EPJ C80 1008	M.N. Achasov <i>et al.</i>	(SND Collab.)
ACHASOV	19	PR D99 112004	M.N. Achasov <i>et al.</i>	(SND Collab.)
PDG	18	PR D98 030001	M. Tanabashi <i>et al.</i>	(PDG Collab.)
AKHMETSHIN	17A	PL B773 150	R.R. Akhmetshin <i>et al.</i>	(CMD-3 Collab.)
ACHASOV	16B	PR D94 092002	M.N. Achasov <i>et al.</i>	(SND Collab.)
AULCHENKO	15A	JETP 121 27	V.M. Aulchenko <i>et al.</i>	(SND Collab.)
Translated from ZETF 148 34.				

PDG	14	CP C38 070001	K. Olive <i>et al.</i>	(PDG Collab.)
ACHASOV	10D	PR D98 112001	M.N. Achasov <i>et al.</i>	(SND Collab.)
AUBERT	07AU	PR D76 092005	B. Aubert <i>et al.</i>	(BABAR Collab.)
AKHMETSHIN	05	PL B605 26	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
AUBERT,B	04N	PR D70 072004	B. Aubert <i>et al.</i>	(BABAR Collab.)
ACHASOV	03D	PR D68 052006	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
ACHASOV	02E	PR D66 032001	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
HENNER	02	EPJ C26 3	V.K. Henner <i>et al.</i>	
ACHASOV	01E	PR D63 072002	M.N. Achasov <i>et al.</i>	(Novosibirsk SND Collab.)
AKHMETSHIN	00D	PL B489 125	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
ANISOVICH	00H	PL B485 341	A.V. Anisovich <i>et al.</i>	
ACHASOV	99E	PL B462 365	M.N. Achasov <i>et al.</i>	(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 <i>et al.</i>	(DM2 Collab.)
DOLINSKY	91	PRPL 202 99	S.I. Dolinsky <i>et al.</i>	(NOVO)
BISELLO	88B	ZPHY C39 13	D. Bisello <i>et al.</i>	(PADO, CLER, FRAS+)
BARKOV	87	JETPL 46 164	L.M. Barkov <i>et al.</i>	(NOVO)
		Translated from ZETFP 46 132.		
CORDIER	81	PL 106B 155	A. Cordier <i>et al.</i>	(ORSAY)
IVANOV	81	PL 107B 297	P.M. Ivanov <i>et al.</i>	(NOVO)