$\omega(1650)$

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

$\omega(1650)$ MASS

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
1670± 30 OUR ESTIMATE						
1660± 10± 2		AUBERT,B	04N	BABR		10.6 $e^+e^- \to \pi^+\pi^-\pi^0\gamma$
1700± 20		EUGENIO	01	SPEC		18 $\pi^- p \to \omega\eta n$
1705± 26	612	[1] AKHMETSHIN	00D	CMD2		$e^+e^- \to \omega\pi^+\pi^-$
1662± 13	750	[2] ANTONELLI	92	DM2		1.34–2.4 $e^+e^- \to \rho\pi, \omega\pi\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1770± 50±60	1.2M	[3] ACHASOV	03D	RVUE		0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
1619± 5		[4] HENNER	02	RVUE		1.2–2.0 $e^+e^- \to \rho\pi, \omega\pi\pi$
1820^{+190}_{-150}		[5] ACHASOV	98H	RVUE		$e^+e^- \to \pi^+\pi^-\pi^0$
$1840^{+100}_{-\ 70}$		[6] ACHASOV	98H	RVUE		$e^+e^- \to \omega\pi^+\pi^-$
1780^{+170}_{-300}		[7] ACHASOV	98H	RVUE		$e^+e^- \to K^+K^-$
~ 2100		[8] ACHASOV	98H	RVUE		$e^+e^- \to K^0_S K^\pm\pi^\mp$
1606± 9		[9] CLEGG	94	RVUE		
1670± 20		ATKINSON	83B	OMEG		20–70 $\gamma p \to 3\pi X$
1657± 13		CORDIER	81	DM1		$e^+e^- \to \omega 2\pi$
1679± 34	21	ESPOSITO	80	FRAM		$e^+e^- \to 3\pi$
1652± 17		COSME	79	OSPK	0	$e^+e^- \to 3\pi$

[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.

[2] From the combined fit of the $\rho\pi$ and $\omega\pi\pi$ final states.

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

[6] Using the data from ANTONELLI 92.

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

[8] Using the data from BISELLO 91C.

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

$\omega(1650)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
315 ± 35 OUR ESTIMATE						
230 ± 30 ± 20		AUBERT,B	04N	BABR		10.6 $e^+e^- \to \pi^+\pi^-\pi^0\gamma$
250 ± 50		EUGENIO	01	SPEC		18 $\pi^- p \to \omega\eta n$
370 ± 25	612	[10] AKHMETSHIN	00D	CMD2		$e^+e^- \to \omega\pi^+\pi^-$
280 ± 24	750	[11] ANTONELLI	92	DM2		1.34–2.4 $e^+e^- \to \rho\pi, \omega\pi\pi$
• • • We do not use the following data for averages, fits, limits, etc. • • •						
$490^{+200}_{-150} \pm 130$	1.2M	[12] ACHASOV	03D	RVUE		0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
250 ± 14		[13] HENNER	02	RVUE		1.2–2.0 $e^+e^- \to \rho\pi, \omega\pi\pi$
113 ± 20		[14] CLEGG	94	RVUE		
160 ± 20		ATKINSON	83B	OMEG		20–70 $\gamma p \to 3\pi X$
136 ± 46		CORDIER	81	DM1		$e^+e^- \to \omega 2\pi$
99 ± 49	21	ESPOSITO	80	FRAM		$e^+e^- \to 3\pi$
42 ± 17		COSME	79	OSPK	0	$e^+e^- \to 3\pi$

[10] 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.
[11] From the combined fit of the $\rho\pi$ and $\omega\pi\pi$ final states.
[12] 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.
[13] Using results of CORDIER 81 and preliminary data of DOLINSKY 91 and ANTONELLI 92.
[14] From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.

$\omega(1650)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\rho\pi$	seen
Γ_2	$\omega\pi\pi$	seen
Γ_3	$\omega\eta$	seen
Γ_4	e^+e^-	seen

$\omega(1650)$ $\Gamma(i)\Gamma(e^+e^-)/\Gamma^2(\text{total})$

$\Gamma(\rho\pi) \times \Gamma(e^+e^-)/\Gamma^2_{\text{total}}$ $\Gamma_1\Gamma_4/\Gamma^2$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.3 ±0.1 ±0.1		AUBERT,B	04N	BABR	10.6 $e^+e^- \to \pi^+\pi^-\pi^0\gamma$
$1.2\ ^{+0.4}_{-0.1}$ ±0.8	1.2M	[15,16] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
0.921 ± 0.230		[17,18] CLEGG	94	RVUE	
0.479 ± 0.050	750	[19,20] ANTONELLI	92	DM2	1.34–2.4 $e^+e^- \to \rho\pi, \omega\pi\pi$

$\Gamma(\omega\pi\pi) \times \Gamma(e^+e^-)/\Gamma^2_{\rm total}$ $\Gamma_2\Gamma_4/\Gamma^2$

VALUE (units 10^{-6})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.41 ±0.09 ±0.13	1.2M	[15,16] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
0.540±0.095		[21] AKHMETSHIN	00D	CMD2	1.2–1.38 $e^+e^- \to \omega\pi^+\pi^-$
0.318±0.080		[17,18] CLEGG	94	RVUE	
0.607±0.061	750	[19,20] ANTONELLI	92	DM2	1.34–2.4$e^+e^- \to \rho\pi, \omega\pi\pi$

$\Gamma(\omega\eta) \times \Gamma(e^+e^-)/\Gamma^2_{\rm total}$ $\Gamma_3\Gamma_4/\Gamma^2$

VALUE (units 10^{-6})	CL%	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<6	90	[22] AKHMETSHIN	03B	CMD2	$e^+e \to \eta\pi^0\gamma$

[15] Calculated by us from the cross section at the peak.
[16] 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.
[17] From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.
[18] From the partial and leptonic width given by the authors.
[19] From the combined fit of the $\rho\pi$ and $\omega\pi\pi$ final states.
[20] From the product of the leptonic width and partial branching ratio given by the authors.
[21] 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.
[22] $\omega(1650)$ mass and width fixed at 1700 MeV and 250 MeV, respectively.

$\omega(1650)$ BRANCHING RATIOS

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 0.35	1.2M	[24] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
0.620±0.014		[25] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi, \omega\pi\pi$

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 0.65	1.2M	[24] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
0.380±0.014		[25] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi, \omega\pi\pi$

$\Gamma(e^+e^-)/\Gamma_{total}$ Γ_4/Γ

VALUE (units 10^{-7})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 18	1.2M	[23,25] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
32 ± 1		[25] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi$, $\omega\pi\pi$

[23] Calculated by us from the cross section at the peak.

[24] 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.

[25] Assuming that the $\omega(1650)$ decays into $\rho\pi$ and $\omega\pi\pi$ only.

$\omega(1650)$ REFERENCES

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.)
AKHMETSHIN	03B	PL B562 173	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 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.)
EUGENIO	01	PL B497 190	P. Eugenio *et al.*	
AKHMETSHIN	00D	PL B489 125	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
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.)
BISELLO	91C	ZPHY C52 227	D. Bisello *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 Translated from ZETFP 46 132.	L.M. Barkov *et al.*	(NOVO)
ATKINSON	83B	PL 127B 132	M. Atkinson *et al.*	(BONN, CERN, GLAS+)
CORDIER	81	PL 106B 155	A. Cordier *et al.*	(ORSAY)
IVANOV	81	PL 107B 297	P.M. Ivanov *et al.*	(NOVO)
ESPOSITO	80	LNC 28 195	B. Esposito *et al.*	(FRAS, NAPL, PADO+)
COSME	79	NP B152 215	G. Cosme *et al.*	(IPN)

OTHER RELATED PAPERS

AUBERT	06D	PR D73 052003	B. Aubert *et al.*	(BABAR Collab.)
AKHMETSHIN	03	PL B551 27	R.R. Akhmetshin *et al.*	(Novosibirsk CMD-2 Collab.)
Also		PAN 65 1222 Translated from YAF 65 1255.	E.V. Anashkin, V.M. Aulchenko, R.R. Akhmetshin	
ACHASOV	02B	PAN 65 153 Translated from YAF 65 158.	N.N. Achasov, A.A. Kozhevnikov	
CLOSE	02	PR D65 092003	F.E. Close, A. Donnachie, Yu.S. Kalashnikova	
ACHASOV	00J	PR D62 117503	N.N. Achasov, A.A. Kozhevnikov	
ANISOVICH	00H	PL B485 341	A.V. Anisovich *et al.*	
ABELE	99D	PL B468 178	A. Abele *et al.*	(Crystal Barrel Collab.)
BELOZEROVA	98	PPN 29 63 Translated from FECAY 29 148.	T.S. Belozerova, V.K. Henner	
ACHASOV	97F	PAN 60 2029 Translated from YAF 60 2212.	N.N. Achasov, A.A. Kozhevnikov	(NOVM)
DOLINSKY	91	PRPL 202 99	S.I. Dolinsky *et al.*	(NOVO)
ATKINSON	87	ZPHY C34 157	M. Atkinson *et al.*	(BONN, CERN, GLAS+)
ATKINSON	84	NP B231 15	M. Atkinson *et al.*	(BONN, CERN, GLAS+)