$\omega(1650)$

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

See also the $\omega(1420)$ particle listing.

$\omega(1650)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
1670 ± 30 OUR ESTIMATE					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1643 ± 6		[1] DIMOVA	25	SND	$e^+e^- \to \pi^+\pi^-\pi^0$
1643 ± 6		[2] ACHASOV	24A	SND	$e^+e^- \to \pi^+\pi^-\pi^0$
1660.0 ± 8.4		[3] LICHARD	23	RVUE	$e^+e^- \to \omega\eta$
1698 ± 10	267	[4] ACHASOV	20B	SND	$e^+e^- \to \omega\eta \to \eta\pi^0\gamma$
1651 ± 3 $^{+16}_{-6}$	183k	[5] ABLIKIM	19AQ	BES	$J/\psi \to K^+K^-\pi^0$
1673 $^{+6}_{-7}$		ACHASOV	19	SND	$e^+e^- \to \pi^+\pi^-\pi^0\eta$
1671 ± 6 ± 10	824	[6] AKHMETSHIN	17A	CMD3	1.4–2.0 $e^+e^- \to \omega\eta$
1660 ± 10	898	[7] ACHASOV	16B	SND	1.34–2.00 $e^+e^- \to \omega\eta$
1680 ± 10	13.1k	[8] AULCHENKO	15A	SND	1.05–1.80 $e^+e^- \to \pi^+\pi^-\pi^0$
1667 ± 13 ± 6		AUBERT	07AU	BABR	10.6 $e^+e^- \to \omega\pi^+\pi^-\gamma$
1645 ± 8	13	AUBERT	06D	BABR	10.6 $e^+e^- \to \omega\eta\gamma$
1660 ± 10 ± 2		AUBERT,B	04N	BABR	10.6 $e^+e^- \to \pi^+\pi^-\pi^0\gamma$
1770 ± 50 ± 60	1.2M	[9] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
1619 ± 5		[10] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi$, $\omega\pi\pi$
1700 ± 20		EUGENIO	01	SPEC	18 $\pi^-p \to \omega\eta n$
1705 ± 26	612	[11] AKHMETSHIN	00D	CMD2	$e^+e^- \to \omega\pi^+\pi^-$
1820 $^{+190}_{-150}$		[12] ACHASOV	98H	RVUE	$e^+e^- \to \pi^+\pi^-\pi^0$
1840 $^{+100}_{-70}$		[13] ACHASOV	98H	RVUE	$e^+e^- \to \omega\pi^+\pi^-$
1780 $^{+170}_{-300}$		[14] ACHASOV	98H	RVUE	$e^+e^- \to K^+K^-$
~ 2100		[15] ACHASOV	98H	RVUE	$e^+e^- \to K^0_S K^\pm\pi^\mp$
1606 ± 9		[16] CLEGG	94	RVUE	
1662 ± 13	750	[17] ANTONELLI	92	DM2	1.34–2.4 $e^+e^- \to \rho\pi$, $\omega\pi\pi$
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	$e^+e^- \to 3\pi$

[1] From a fit to the cross section with contributions from $\omega(782)$, $\phi(1020)$, $\omega(1420)$, and $\omega(1650)$. An alternative fit which also includes $\phi(1680)$ gives 1649 ± 9 MeV with a worse χ^2. Supersedes ACHASOV 24A.

[2] From a fit to the cross section including contribution from $\omega(782)$, $\phi(1020)$, $\omega(1420)$, and $\omega(1650)$. Supersedes ACHASOV 20A.

[3] From a VDM fit to AKHMETSHIN 17A $\omega\eta$ data with two additional resonances of low statistical evidences.
[4] 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 1694 $\pm$ 9 MeV measurement.
[5] Could also be $\rho(1700)$. Branching ratio $J/\psi \to X\pi^0 \to K^+K^-\pi^0 = (5.3\pm0.3^{+0.6}_{-0.5})\times 10^{-5}$.
[6] From a fit of the interfering $\omega(1420)$ and $\omega(1650)$ with a relative phase of π and other parameters floating.
[7] From a fit with contributions from $\omega(1420)$, $\omega(1650)$, and $\phi(1680)$.
[8] 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.
[9] 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.
[10] Using results of CORDIER 81 and preliminary data of DOLINSKY 91 and ANTONELLI 92.
[11] 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.
[12] Using data from BARKOV 87, DOLINSKY 91, and ANTONELLI 92.
[13] Using the data from ANTONELLI 92.
[14] Using the data from IVANOV 81 and BISELLO 88B.
[15] Using the data from BISELLO 91C.
[16] From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.
[17] From the combined fit of the $\rho\pi$ and $\omega\pi\pi$ final states.

ω(1650) WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
150$\pm$ 50 OUR ESTIMATE					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
148$\pm$ 13		[1] DIMOVA	25	SND	$e^+e^- \to \pi^+\pi^-\pi^0$
148$\pm$ 13		[2] ACHASOV	24A	SND	$e^+e^- \to \pi^+\pi^-\pi^0$
106$\pm$ 15		[3] LICHARD	23	RVUE	$e^+e^- \to \omega\eta$
110$\pm$ 16	267	[4] ACHASOV	20B	SND	$e^+e^- \to \omega\eta \to \eta\pi^0\gamma$
194$\pm$ 8^{+15}_{-7}	183k	[5] ABLIKIM	19AQ	BES	$J/\psi \to K^+K^-\pi^0$
95$\pm$ 11		ACHASOV	19	SND	$e^+e^- \to \pi^+\pi^-\pi^0\eta$
113$\pm$ 9$\pm$ 10	824	[6] AKHMETSHIN	17A	CMD3	1.4–2.0 $e^+e^- \to \omega\eta$
110$\pm$ 20	898	[7] ACHASOV	16B	SND	1.34–2.00 $e^+e^- \to \omega\eta$
310$\pm$ 30	13.1k	[8] AULCHENKO	15A	SND	1.05–1.80 $e^+e^- \to \pi^+\pi^-\pi^0$
222$\pm$ 25$\pm$ 20		AUBERT	07AU	BABR	10.6 $e^+e^- \to \omega\pi^+\pi^-\gamma$
114$\pm$ 14	13	AUBERT	06D	BABR	10.6 $e^+e^- \to \omega\eta\gamma$
230$\pm$ 30$\pm$ 20		AUBERT,B	04N	BABR	10.6 $e^+e^- \to \pi^+\pi^-\pi^0\gamma$
$490^{+200}_{-150}\pm130$	1.2M	[9] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
250$\pm$ 14		[10] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi, \omega\pi\pi$
250$\pm$ 50		EUGENIO	01	SPEC	18 $\pi^-p \to \omega\eta n$
370$\pm$ 25	612	[11] AKHMETSHIN	00D	CMD2	$e^+e^- \to \omega\pi^+\pi^-$
113$\pm$ 20		[12] CLEGG	94	RVUE	

280± 24	750	[13] ANTONELLI	92	DM2	1.34–2.4 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
160± 20		ATKINSON	83B	OMEG	20–70 $\gamma p \rightarrow 3\pi X$
136± 46		CORDIER	81	DM1	$e^+e^- \rightarrow \omega 2\pi$
99± 49	21	ESPOSITO	80	FRAM	$e^+e^- \rightarrow 3\pi$
42± 17		COSME	79	OSPK	$e^+e^- \rightarrow 3\pi$

[1] From a fit to the cross section with contributions from $\omega(782)$, $\phi(1020)$, $\omega(1420)$, and $\omega(1650)$. An alternative fit which also includes $\phi(1680)$ gives 165 ± 14 MeV with a worse χ^2. Supersedes ACHASOV 24A.

[2] From a fit to the cross section including contribution from $\omega(782)$, $\phi(1020)$, $\omega(1420)$, and $\omega(1650)$. Supersedes ACHASOV 20A.

[3] From a VDM fit to AKHMETSHIN 17A $\omega\eta$ data with two additional resonances of low statistical evidences.

[4] 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 94 ± 13 MeV measurement.

[5] Could also be $\rho(1700)$. Branching ratio $J/\psi \rightarrow X\pi^0 \rightarrow K^+K^-\pi^0 = (5.3 \pm 0.3^{+0.6}_{-0.5}) \times 10^{-5}$.

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

[7] From a fit with contributions from $\omega(1420)$, $\omega(1650)$, and $\phi(1680)$.

[8] 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.

[9] 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.

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

[11] 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.

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

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

$\omega(1650)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\rho\pi$	seen
Γ_2	$\rho(1450)\pi$	seen
Γ_3	$\omega\pi\pi$	seen
Γ_4	$\omega\eta$	seen
Γ_5	e^+e^-	seen
Γ_6	$\pi^0\gamma$	not seen

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

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

VALUE (units 10^{-6})	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.56 ±0.23	13.1k	[1] AULCHENKO	15A	SND	1.05–1.80 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$

1.3	± 0.1	± 0.1		AUBERT,B	04N	BABR	10.6 $e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma$
1.2	$^{+0.4}_{-0.1}$	± 0.8	1.2M	[2,3] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.921 ± 0.230				[4,5] CLEGG	94	RVUE	
0.479 ± 0.050			750	[6,7] ANTONELLI	92	DM2	1.34–2.4 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$

[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 the combined fit of the $\rho\pi$ and $\omega\pi\pi$ final states.
[7] From the product of the leptonic width and partial branching ratio given by the authors.

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

VALUE (units 10^{-7})			EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •							
7.0	± 0.5			AUBERT	07AU	BABR	10.6 $e^+e^- \rightarrow \omega\pi^+\pi^-\gamma$
4.1	± 0.9	± 1.3	1.2M	[1,2] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
5.40 ± 0.95				[3] AKHMETSHIN	00D	CMD2	1.2–1.38 $e^+e^- \rightarrow \omega\pi^+\pi^-$
3.18 ± 0.80				[4,5] CLEGG	94	RVUE	
6.07 ± 0.61			750	[6,7] ANTONELLI	92	DM2	1.34–2.4 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$

[1] Calculated by us from the cross section at the peak.
[2] 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.
[3] 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.
[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 the combined fit of the $\rho\pi$ and $\omega\pi\pi$ final states.
[7] From the product of the leptonic width and partial branching ratio given by the authors.

$\Gamma(\omega\eta)/\Gamma_{total} \times \Gamma(e^+e^-)/\Gamma_{total}$ $\qquad$ $\Gamma_4/\Gamma \times \Gamma_5/\Gamma$

VALUE (units 10^{-7})			EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •							
6.4	± 0.9		267	[1] ACHASOV	20B	SND	$e^+e^- \rightarrow \omega\eta \rightarrow \eta\pi^0\gamma$
5.62	$^{+0.45}_{-0.42}$			ACHASOV	19	SND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0\eta$
4.5	± 0.3	± 0.3	824	[2] AKHMETSHIN	17A	CMD3	1.4–2.0 $e^+e^- \rightarrow \omega\eta$
4.4	± 0.5		898	[3] ACHASOV	16B	SND	1.34–2.00 $e^+e^- \rightarrow \omega\eta$
5.7	± 0.6		13	AUBERT	06D	BABR	10.6 $e^+e^- \rightarrow \omega\eta\gamma$
< 60 at 90% CL				[4] AKHMETSHIN	03B	CMD2	$e^+e \rightarrow \eta\pi^0\gamma$

[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 $(5.4 \pm 0.6) \times 10^{-7}$ 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 $\Gamma(\omega(1650) \to \omega\eta)/\Gamma_{total} \times \Gamma(\omega(1650) \to e^+e^-) = 51 \pm 3$ eV.
[3] From a fit with contributions from $\omega(1420)$, $\omega(1650)$, and $\phi(1680)$.
[4] $\omega(1650)$ mass and width fixed at 1700 MeV and 250 MeV, respectively.

$\omega(1650)$ BRANCHING RATIOS

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
not seen		[1] DIMOVA	25	SND	$e^+e^- \to \pi^+\pi^-\pi^0$
~ 0.65	1.2M	[2] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
0.380 ± 0.014		[3] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi, \omega\pi\pi$

[1] From a fit to the cross section with contributions from $\omega(782)$, $\phi(1020)$, $\omega(1420)$, and $\omega(1650)$.
[2] 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.
[3] Assuming that the $\omega(1650)$ decays into $\rho\pi$ and $\omega\pi\pi$ only.

$\Gamma(\rho(1450)\pi)/\Gamma_{total}$ — Γ_2/Γ

VALUE	DOCUMENT ID		TECN	COMMENT
seen	ACHASOV	20A	SND	1.15–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
possibly seen	[1] DIMOVA	25	SND	$e^+e^- \to \pi^+\pi^-\pi^0$

[1] From a fit to the cross section with contributions from $\omega(782)$, $\phi(1020)$, $\omega(1420)$, and $\omega(1650)$.

$\Gamma(\omega\pi\pi)/\Gamma_{total}$ — Γ_3/Γ

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 0.35	1.2M	[1] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
0.620 ± 0.014		[2] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi, \omega\pi\pi$

[1] 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.
[2] Assuming that the $\omega(1650)$ decays into $\rho\pi$ and $\omega\pi\pi$ only.

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

VALUE (units 10^{-7})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 18	1.2M	[1,2] ACHASOV	03D	RVUE	0.44–2.00 $e^+e^- \to \pi^+\pi^-\pi^0$
32 ± 1		[2] HENNER	02	RVUE	1.2–2.0 $e^+e^- \to \rho\pi, \omega\pi\pi$

[1] Calculated by us from the cross section at the peak.
[2] Assuming that the $\omega(1650)$ decays into $\rho\pi$ and $\omega\pi\pi$ only.

$\Gamma(\pi^0\gamma)/\Gamma_{total}$ Γ_6/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.

$\omega(1650)$ REFERENCES

DIMOVA	25	PPN 56 820	T.V. Dimova *et al.*	(SND Collab.)
ACHASOV	24A	PAN 87 747	M.N. Achasov *et al.*	(SND Collab.)
LICHARD	23	PR D108 092005	P. Lichard	(OPAV, CTUP)
ACHASOV	20A	EPJ C80 993	M.N. Achasov *et al.*	(SND Collab.)
ACHASOV	20B	EPJ C80 1008	M.N. Achasov *et al.*	(SND Collab.)
ABLIKIM	19AQ	PR D100 032004	M. Ablikim *et al.*	(BESIII 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.		
ACHASOV	10D	PR D98 112001	M.N. Achasov *et al.*	(SND Collab.)
AUBERT	07AU	PR D76 092005	B. Aubert *et al.*	(BABAR Collab.)
AUBERT	06D	PR D73 052003	B. Aubert *et al.*	(BABAR 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.)
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	L.M. Barkov *et al.*	(NOVO)
		Translated from ZETFP 46 132.		
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)