

$\omega(1650)$

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

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. • • •				
1660.0 ± 8.4		¹ LICHARD 23	RVUE	$e^+e^- \rightarrow \omega\eta$
1698 ± 10	267	² ACHASOV 20B	SND	$e^+e^- \rightarrow \omega\eta \rightarrow \eta\pi^0\gamma$
1651 ± 3 $^{+16}_{-6}$	183k	³ ABLIKIM 19AQ	BES	$J/\psi \rightarrow K^+K^-\pi^0$
1673 $^{+6}_{-7}$		ACHASOV 19	SND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0\eta$
1671 ± 6 ± 10	824	⁴ AKHMETSHIN 17A	CMD3	1.4–2.0 $e^+e^- \rightarrow \omega\eta$
1660 ± 10	898	⁵ ACHASOV 16B	SND	1.34–2.00 $e^+e^- \rightarrow \omega\eta$
1680 ± 10	13.1k	⁶ AULCHENKO 15A	SND	1.05–1.80 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
1667 ± 13 ± 6		AUBERT 07AU	BABR	10.6 $e^+e^- \rightarrow \omega\pi^+\pi^-\gamma$
1645 ± 8	13	AUBERT 06D	BABR	10.6 $e^+e^- \rightarrow \omega\eta\gamma$
1660 ± 10 ± 2		AUBERT,B 04N	BABR	10.6 $e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma$
1770 ± 50 ± 60	1.2M	⁷ ACHASOV 03D	RVUE	0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
1619 ± 5		⁸ HENNER 02	RVUE	1.2–2.0 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
1700 ± 20		EUGENIO 01	SPEC	18 $\pi^-p \rightarrow \omega\eta n$
1705 ± 26	612	⁹ AKHMETSHIN 00D	CMD2	$e^+e^- \rightarrow \omega\pi^+\pi^-$
1820 $^{+190}_{-150}$		¹⁰ ACHASOV 98H	RVUE	$e^+e^- \rightarrow \pi^+\pi^-\pi^0$
1840 $^{+100}_{-70}$		¹¹ ACHASOV 98H	RVUE	$e^+e^- \rightarrow \omega\pi^+\pi^-$
1780 $^{+170}_{-300}$		¹² ACHASOV 98H	RVUE	$e^+e^- \rightarrow K^+K^-$
~ 2100		¹³ ACHASOV 98H	RVUE	$e^+e^- \rightarrow K_S^0 K^\pm \pi^\mp$
1606 ± 9		¹⁴ CLEGG 94	RVUE	
1662 ± 13	750	¹⁵ ANTONELLI 92	DM2	1.34–2.4 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
1670 ± 20		ATKINSON 83B	OMEG	20–70 $\gamma p \rightarrow 3\pi X$
1657 ± 13		CORDIER 81	DM1	$e^+e^- \rightarrow \omega 2\pi$
1679 ± 34	21	ESPOSITO 80	FRAM	$e^+e^- \rightarrow 3\pi$
1652 ± 17		COSME 79	OSPK	$e^+e^- \rightarrow 3\pi$

¹ From a VDM fit to AKHMETSHIN 17A $\omega\eta$ data with two additional resonances of low statistical evidences.² 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 ± 9 MeV measurement.³ Could also be $\rho(1700)$. Branching ratio $J/\psi \rightarrow X\pi^0 \rightarrow K^+K^-\pi^0 = (5.3 \pm 0.3^{+0.6}_{-0.5}) \times 10^{-5}$.

- ⁴ From a fit of the interfering $\omega(1420)$ and $\omega(1650)$ with a relative phase of π and other parameters floating.
- ⁵ From a fit with contributions from $\omega(1420)$, $\omega(1650)$, and $\phi(1680)$.
- ⁶ 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.
- ⁷ 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.
- ⁸ Using results of CORDIER 81 and preliminary data of DOLINSKY 91 and ANTONELLI 92.
- ⁹ 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.
- ¹⁰ Using data from BARKOV 87, DOLINSKY 91, and ANTONELLI 92.
- ¹¹ Using the data from ANTONELLI 92.
- ¹² Using the data from IVANOV 81 and BISELLO 88B.
- ¹³ Using the data from BISELLO 91C.
- ¹⁴ From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.
- ¹⁵ From the combined fit of the $\rho\pi$ and $\omega\pi\pi$ final states.

$\omega(1650)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
315 ± 35 OUR ESTIMATE				
• • • We do not use the following data for averages, fits, limits, etc. • • •				
106 ± 15		¹ LICHARD 23	RVUE	$e^+e^- \rightarrow \omega\eta$
110 ± 16	267	² ACHASOV 20B	SND	$e^+e^- \rightarrow \omega\eta \rightarrow \eta\pi^0\gamma$
194 ± 8 ⁺ _− 15 ₇	183k	³ ABLIKIM 19AQ	BES	$J/\psi \rightarrow K^+K^-\pi^0$
95 ± 11		ACHASOV 19	SND	$e^+e^- \rightarrow \pi^+\pi^-\pi^0\eta$
113 ± 9 ± 10	824	⁴ AKHMETSHIN 17A	CMD3	1.4–2.0 $e^+e^- \rightarrow \omega\eta$
110 ± 20	898	⁵ ACHASOV 16B	SND	1.34–2.00 $e^+e^- \rightarrow \omega\eta$
310 ± 30	13.1k	⁶ AULCHENKO 15A	SND	1.05–1.80 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
222 ± 25 ± 20		AUBERT 07AU	BABR	10.6 $e^+e^- \rightarrow \omega\pi^+\pi^-\gamma$
114 ± 14	13	AUBERT 06D	BABR	10.6 $e^+e^- \rightarrow \omega\eta\gamma$
230 ± 30 ± 20		AUBERT,B 04N	BABR	10.6 $e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma$
490 ⁺ _− 200 ₁₅₀ ± 130	1.2M	⁷ ACHASOV 03D	RVUE	0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
250 ± 14		⁸ HENNER 02	RVUE	1.2–2.0 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
250 ± 50		EUGENIO 01	SPEC	18 $\pi^-p \rightarrow \omega\eta n$
370 ± 25	612	⁹ AKHMETSHIN 00D	CMD2	$e^+e^- \rightarrow \omega\pi^+\pi^-$
113 ± 20		¹⁰ CLEGG 94	RVUE	
280 ± 24	750	¹¹ 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 VDM fit to AKHMETSHIN 17A $\omega\eta$ data with two additional resonances of low statistical evidences.

² 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.

³ Could also be $\rho(1700)$. Branching ratio $J/\psi \rightarrow X \pi^0 \rightarrow K^+ K^- \pi^0 = (5.3 \pm 0.3^{+0.6}_{-0.5}) \times 10^{-5}$.

⁴ From a fit of the interfering $\omega(1420)$ and $\omega(1650)$ with a relative phase of π and other parameters floating.

⁵ From a fit with contributions from $\omega(1420)$, $\omega(1650)$, and $\phi(1680)$.

⁶ 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.

⁷ 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.

⁸ Using results of CORDIER 81 and preliminary data of DOLINSKY 91 and ANTONELLI 92.

⁹ 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.

¹⁰ From a fit to two Breit-Wigner functions and using the data of DOLINSKY 91 and ANTONELLI 92.

¹¹ 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	SNB	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.

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

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

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

VALUE (units 10^{-7})	EVTS	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
6.4 $\pm$ 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 $\pm$ 0.3 $\pm$ 0.3	824	² AKHMETSHIN	17A CMD3	1.4–2.0 $e^+e^- \rightarrow \omega\eta$
4.4 $\pm$ 0.5	898	³ ACHASOV	16B SND	1.34–2.00 $e^+e^- \rightarrow \omega\eta$
5.7 $\pm$ 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 $\Gamma(\omega(1650) \rightarrow \omega\eta)/\Gamma_{\text{total}} \times \Gamma(\omega(1650) \rightarrow e^+e^-) = 51 \pm 3$ 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 **$\Gamma(\rho\pi)/\Gamma_{\text{total}}$ 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	¹ ACHASOV	03D	RVUE 0.44–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.380 ± 0.014		² HENNER	02	RVUE 1.2–2.0 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
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.				

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

VALUE	DOCUMENT ID	TECN	COMMENT
seen	ACHASOV	20A	SND 1.15–2.00 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$

 $\Gamma(\omega\pi\pi)/\Gamma_{\text{total}}$ 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 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
0.620 ± 0.014		² HENNER	02	RVUE 1.2–2.0 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
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.				

 $\Gamma(e^+e^-)/\Gamma_{\text{total}}$ 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 $e^+e^- \rightarrow \pi^+\pi^-\pi^0$
32 ± 1		² HENNER	02	RVUE 1.2–2.0 $e^+e^- \rightarrow \rho\pi, \omega\pi\pi$
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.				

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

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	¹ ACHASOV	10D	SND 1.075–2.0 $e^+e^- \rightarrow \pi^0\gamma$
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 $\rho(1700)$. The width of the highest mass effective resonance is fixed at 315 MeV.			

 $\omega(1650)$ REFERENCES

LICHARD	23	PR D108 092005	P. Lichard	(OPAV, CTUP)
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.)
ABLIKIM	19AQ	PR D100 032004	M. Ablikim <i>et al.</i>	(BESIII 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.)
ACHASOV	10D	Translated from ZETF 148 34. 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.)
AUBERT	06D	PR D73 052003	B. Aubert <i>et al.</i>	(BABAR 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.)
AKHMETSHIN	03B	PL B562 173	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 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.)
EUGENIO	01	PL B497 190	P. Eugenio <i>et al.</i>	
AKHMETSHIN	00D	PL B489 125	R.R. Akhmetshin <i>et al.</i>	(Novosibirsk CMD-2 Collab.)
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.)
BISELLO	91C	ZPHY C52 227	D. Bisello <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)
ATKINSON	83B	Translated from ZETFP 46 132. PL 127B 132	M. Atkinson <i>et al.</i>	(BONN, CERN, GLAS+)
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)
ESPOSITO	80	LNC 28 195	B. Esposito <i>et al.</i>	(FRAS, NAPL, PADO+)
COSME	79	NP B152 215	G. Cosme <i>et al.</i>	(IPN)