

Further States

OMITTED FROM SUMMARY TABLE

This section contains states observed by a single group or states poorly established that thus need confirmation.

QUANTUM NUMBERS, MASSES, WIDTHS, AND BRANCHING RATIOS

X(360) $I^G(J^{PC}) = ?^?(?^?+)$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$360 \pm 7 \pm 9$	64 ± 18	2.3k	¹ ABRAAMYAN 09	CNTR	2.75 $dC \rightarrow \gamma\gamma X$

¹ Not seen in $pC \rightarrow \gamma\gamma X$ at 5.5 GeV/c.

X(1070) $I^G(J^{PC}) = ?^?(0^{++})$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>COMMENT</u>		
1072 ± 1	3.5 ± 0.5	¹ VLADIMIRSK...08	40	$\pi^- p \rightarrow K_S^0 K_S^0 n + m\pi^0$	

¹ Supersedes GRIGOR'EV 05.

X(1110) $I^G(J^{PC}) = 0^+(\text{even}^{++})$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1107 ± 4	$111 \pm 8 \pm 15$	DAFTARI	87	DBC	0. $\bar{p}n \rightarrow \rho^- \pi^+ \pi^-$

f₀(1200–1600) $I^G(J^{PC}) = 0^+(0^{++})$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1323 ± 8	237 ± 20	VLADIMIRSK...06	SPEC	40	$\pi^- p \rightarrow K_S^0 K_S^0 n$
1480^{+100}_{-150}	1030^{+80}_{-170}	¹ ANISOVICH	03	SPEC	
1530^{+90}_{-250}	560 ± 40	² ANISOVICH	03	SPEC	

¹ K-matrix pole from combined analysis of $\pi^- p \rightarrow \pi^0 \pi^0 n$, $\pi^- p \rightarrow K \bar{K} n$, $\pi^+ \pi^- \rightarrow \pi^+ \pi^-$, $\bar{p} p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$, $\pi^+ \pi^- \pi^0$, $K^+ K^- \pi^0$, $K_S^0 K_S^0 \pi^0$, $K^+ K_S^0 \pi^-$ at rest, $\bar{p} n \rightarrow \pi^- \pi^- \pi^+$, $K_S^0 K^- \pi^0$, $K_S^0 K_S^0 \pi^-$ at rest.

² K-matrix pole from combined analysis of $\pi^- p \rightarrow \pi^0 \pi^0 n$, $\pi^- p \rightarrow K \bar{K} n$, $\bar{p} p \rightarrow \pi^0 \pi^0 \pi^0$, $\pi^0 \eta \eta$, $\pi^0 \pi^0 \eta$ at rest.

X(1420) $I^G(J^{PC}) = 2^+(0^{++})$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1420 ± 20	160 ± 10	FILIPPI	00	OBLX	0 $\bar{n} p \rightarrow \pi^+ \pi^+ \pi^-$

X(1545) $I^G(J^{PC}) = ?^?(?^{++})$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>COMMENT</u>		
1545 ± 3	6.0 ± 2.5	¹ VLADIMIRSK...08	40	$\pi^- p \rightarrow K_S^0 K_S^0 n + m\pi^0$	

¹Supersedes VLADIMIRSKII 00.

X(1575) $I^G(J^{PC}) = ?^?(1^{--})$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1576 ⁺⁴⁹⁺⁹⁸ ₋₅₅₋₉₁	818 ⁺²²⁺⁶⁴ ₋₂₃₋₁₃₃	¹ ABLIKIM	06S BES	$J/\psi \rightarrow K^+ K^- \pi^0$	

¹A broad peak observed at $K^+ K^-$ invariant mass. Mass and width above are its pole position. The observed branching ratio is $B(J/\psi \rightarrow X \pi^0) B(X \rightarrow K^+ K^-) = (8.5 \pm 0.6^{+2.7}_{-3.6}) \times 10^{-4}$.

X(1600) $I^G(J^{PC}) = 2^+(2^{++})$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1600 \pm 100	400 \pm 200	¹ ALBRECHT	91F ARG	10.2 $e^+ e^- \rightarrow e^+ e^- 2(\pi^+ \pi^-)$	

¹Our estimate.

X(1650) $I^G(J^{PC}) = 0^-(?^{?^-})$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1652 \pm 7	<50	100	PROKOSHKIN 96	GAM2	32,38 $\pi p \rightarrow \omega \eta n$

X(1730) $I^G(J^{PC}) = ?^?(?^{?+})$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1731.0 \pm 1.2 \pm 2.0	3.2 \pm 0.8 \pm 1.3	58	VLADIMIRSK..07	SPEC	40 $\pi^- p \rightarrow K_S^0 K_S^0 X$

f₂(1750) $I^G(J^{PC}) = 0^+(2^{++})$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1755 \pm 10	67 \pm 12	870	¹ SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(K\bar{K})$

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
17 \pm 5	870	² SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(\gamma\gamma)$

<u>VALUE (keV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.13 \pm 0.04	870	² SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(\pi\pi)$

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1.3 \pm 1.0	870	² SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(\eta\eta)$

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2.0 \pm 0.5	870	² SCHEGELSKY 06A	RVUE	$\gamma\gamma \rightarrow K_S^0 K_S^0$

¹ From analysis of L3 data at 91 and 183–209 GeV.

² From analysis of L3 data at 91 and 183–209 GeV and using SU(3) relations.

X(1775) $I^G(J^{PC}) = 1^-(?^-+)$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
1763±20	192 ± 60	CONDO	91 SHF	$\gamma p \rightarrow (p\pi^+)(\pi^+\pi^-\pi^-)$
1787±18	118 ± 60	CONDO	91 SHF	$\gamma p \rightarrow n\pi^+\pi^+\pi^-$

X(1850 - 3100) $I^G(J^{PC}) = ?^?(1^{--})$

$\Gamma(e^+e^-) \cdot B(X \rightarrow \text{hadrons})$ (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<120	90	¹ ANASHIN	11 KEDR	$e^+e^- \rightarrow \text{hadrons}$

¹ This limit is center-of-mass energy dependent. We quote the most stringent one.

X(1855) $I^G(J^{PC}) = ?^?(?^{??})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
1856.6±5	20 ± 5	BRIDGES	86D SPEC	0. $\bar{p}d \rightarrow \pi\pi N$

X(1870) $I^G(J^{PC}) = ?^?(2^{??})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
1870±40	250 ± 30	ALDE	86D GAM4	100 $\pi^- p \rightarrow 2\eta X$

a₃(1875) $I^G(J^{PC}) = 1^-(3^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
1874±43±96	385 ± 121 ± 114	CHUNG	02 B852	18.3 $\pi^- p \rightarrow \pi^+\pi^-\pi^- p$

B(a₃(1875) → f₂(1270)π)/B(a₃(1875) → ρπ)

VALUE	DOCUMENT ID	TECN	COMMENT
0.8±0.2	¹ CHUNG	02 B852	18.3 $\pi^- p \rightarrow \pi^+\pi^-\pi^- p$

¹ Using the observable fractions of 50.0% ρπ, 56.5% f₂π, and 11.8% ρ₃π.

B(a₃(1875) → ρ₃(1690)π)/B(a₃(1875) → ρπ)

VALUE	DOCUMENT ID	TECN	COMMENT
0.9±0.3	¹ CHUNG	02 B852	18.3 $\pi^- p \rightarrow \pi^+\pi^-\pi^- p$

¹ Using the observable fractions of 50.0% ρπ, 56.5% f₂π, and 11.8% ρ₃π.

h₁(1900) $I^G(J^{PC}) = 0^-(1^{+-})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
1908±6 ⁺⁸ ₋₄	175 ± 13 ⁺⁷ ₋₁₆	ABLIKIM	24CB BES3	$J/\psi \rightarrow \phi\eta\pi^0$

$a_1(1930)$ $I^G(J^{PC}) = 1^-(1^{++})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1930^{+30}_{-70}	155 ± 45	ANISOVICH	01F SPEC	$2.0 \bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$

$X(1935)$ $I^G(J^{PC}) = 1^+(1^{-?})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1935 ± 20	215 ± 30	EVANGELIS...	79 OMEG	$10,16 \pi^- p \rightarrow \bar{p}pn$

$\rho_2(1940)$ $I^G(J^{PC}) = 1^+(2^{--})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1940 ± 40	155 ± 40	¹ ANISOVICH	02 SPEC	$0.6-1.9 p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$

¹From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$\omega_3(1945)$ $I^G(J^{PC}) = 0^-(3^{--})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1945 ± 20	115 ± 22	¹ ANISOVICH	02B SPEC	$0.6-1.9 p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

¹From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

$a_2(1950)$ $I^G(J^{PC}) = 1^-(2^{++})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1950^{+30}_{-70}	180^{+30}_{-70}	¹ ANISOVICH	01F SPEC	$1.96-2.41 \bar{p}p$

¹From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.

$\omega(1960)$ $I^G(J^{PC}) = 0^-(1^{--})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1960 ± 25	195 ± 60	¹ ANISOVICH	02B SPEC	$0.6-1.9 p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

¹From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

$b_1(1960)$ $I^G(J^{PC}) = 1^+(1^{+-})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1960 ± 35	230 ± 50	¹ ANISOVICH	02 SPEC	$0.6-1.9 p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$

¹From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$h_1(1965)$ $I^G(J^{PC}) = 0^-(1^{+-})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1965 ± 45	345 ± 75	¹ ANISOVICH	02B SPEC	$0.6-1.9 p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

¹ From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

$f_1(1970)$		$I^G(J^{PC}) = 0^+(1^{++})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>		
1971 ± 15	240 ± 45	ANISOVICH 00J	SPEC		

$X(1970)$		$I^G(J^{PC}) = ?^?(?^{??})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1970 ± 10	40 ± 20	CHLIAPNIK... 80	HBC	32 $K^+ p \rightarrow 2K_S^0 2\pi X$	

$X(1975)$		$I^G(J^{PC}) = ?^?(?^{??})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
1973 ± 15	80	30	CASO	70	HBC 11.2 $\pi^- p \rightarrow \rho 2\pi$

$\omega_2(1975)$		$I^G(J^{PC}) = 0^-(2^{--})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
1975 ± 20	175 ± 25	¹ ANISOVICH 02B	SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$	

¹ From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

$a_2(1990)$		$I^G(J^{PC}) = 1^-(2^{++})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2050 ± 10 ± 40	190 ± 22 ± 100	18k	¹ SCHEGELSKY 06	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-\pi^0$
2003 ± 10 ± 19	249 ± 23 ± 32		LU	05	B852 18 $\pi^- p \rightarrow \omega\pi^-\pi^0 p$

¹ From analysis of L3 data at 183–209 GeV.

$\Gamma(\gamma\gamma) \Gamma(\pi^+\pi^-\pi^0) / \Gamma(\text{total})$				
<u>VALUE (keV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.11 ± 0.04 ± 0.05	18k	¹ SCHEGELSKY 06	RVUE	$\gamma\gamma \rightarrow \pi^+\pi^-\pi^0$

¹ From analysis of L3 data at 183–209 GeV.

$\rho(2000)$		$I^G(J^{PC}) = 1^+(1^{--})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2000 ± 30	260 ± 45	¹ BUGG	04C	RVUE	Compilation
~ 1988	~ 244	HASAN	94	RVUE	$\bar{p}p \rightarrow \pi\pi$

¹ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$f_2(2000)$		$I^G(J^{PC}) = 0^+(2^{++})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2001 ± 10	312 ± 32	ANISOVICH 00J	SPEC		
~ 1996	~ 134	HASAN	94	RVUE	$\bar{p}p \rightarrow \pi\pi$

X(2000) $I^G(J^{PC}) = 1^-(??^+)$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
1964 ± 35	225 ± 50	¹ ARMSTRONG 93D	E760		$\bar{p}p \rightarrow 3\pi^0 \rightarrow 6\gamma$
~ 2100	~ 500	¹ ANTIPOV 77	CIBS	-	25 $\pi^- p \rightarrow p\pi^- \rho_3$
2214 ± 15	355 ± 21	² BALTAY 77	HBC	0	15 $\pi^- p \rightarrow \Delta^{++} 3\pi$
2080 ± 40	340 ± 80	KALELKAR 75	HBC	+	15 $\pi^+ p \rightarrow p\pi^+ \rho_3$

¹ Cannot determine spin to be 3.
² BALTAY 77 favors $J^P = ,3^+$.

X(2000) $I^G(J^{PC}) = ??(4^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
1998 ± 3 ± 5	< 15	VLADIMIRSK...03	SPEC	$\pi^- p \rightarrow K_S^0 K_S^0 M M$

X(2000) $I^G(J^{PC}) = 0^-(1^{--})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
1992 ± 12 ⁺¹⁵ ₋₆	132 ± 22 ⁺¹⁷ ₋₄	ABLIKIM	24CB BES3	$J/\psi \rightarrow \phi\eta\pi^0$

$\eta(2010)$ $I^G(J^{PC}) = 0^+(0^{-+})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN
2010 ⁺³⁵ ₋₆₀	270 ± 60	ANISOVICH	00J SPEC

$\pi_1(2015)$ $I^G(J^{PC}) = 1^-(1^{-+})$

MASS (MeV)	WIDTH (MeV)	EVTs	DOCUMENT ID	TECN	COMMENT
2014 ± 20 ± 16	230 ± 32 ± 73	145k	LU	05	B852 18 $\pi^- p \rightarrow \omega\pi^- \pi^0 p$
2001 ± 30 ± 92	333 ± 52 ± 49	69k	KUHN	04	B852 18 $\pi^- p \rightarrow \eta\pi^+ \pi^- \pi^- p$

$a_0(2020)$ $I^G(J^{PC}) = 1^-(0^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN
2025 ± 30	330 ± 75	ANISOVICH	99C SPEC

X(2020) $I^G(J^{PC}) = ??(???)$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2015 ± 3	10 ± 4	FERRER	99	RVUE $\pi p \rightarrow p p \bar{p} \pi(\pi)$

$h_3(2025)$ $I^G(J^{PC}) = 0^-(3^{+-})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
2025 ± 20	145 ± 30	¹ ANISOVICH 02B	SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

¹ From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

$$b_3(2030) \quad I^G(J^{PC}) = 1^+(3^{+-})$$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2032±12	117 ± 11	¹ ANISOVICH	02	SPEC 0.6–1.9 $p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$

¹From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$$a_2(2030) \quad I^G(J^{PC}) = 1^-(2^{++})$$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2030±20	205 ± 30	¹ ANISOVICH	01F	SPEC 1.96–2.41 $\bar{p}p$

¹From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.

$$a_3(2030) \quad I^G(J^{PC}) = 1^-(3^{++})$$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2031±12	150 ± 18	¹ ANISOVICH	01F	SPEC 1.96–2.41 $\bar{p}p$

¹From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.

$$\eta_2(2030) \quad I^G(J^{PC}) = 0^+(2^{-+})$$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2030±5±15	205 ± 10 ± 15	ANISOVICH	00E	SPEC

$$B(a_2\pi)_{L=0}/B(a_2\pi)_{L=2}$$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.05±0.03	¹ ANISOVICH	11	SPEC 0.9–1.94 $p\bar{p}$

¹Reanalysis of ADOMEIT 96 and ANISOVICH 00E.

$$B(a_0\pi)/B(a_2\pi)_{L=2}$$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.10±0.08	¹ ANISOVICH	11	SPEC 0.9–1.94 $p\bar{p}$

¹Reanalysis of ADOMEIT 96 and ANISOVICH 00E.

$$B(f_2\eta)/B(a_2\pi)_{L=2}$$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
0.13±0.06	¹ ANISOVICH	11	SPEC 0.9–1.94 $p\bar{p}$

¹Reanalysis of ADOMEIT 96 and ANISOVICH 00E.

$$f_3(2050) \quad I^G(J^{PC}) = 0^+(3^{++})$$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2048±8	213 ± 34	ANISOVICH	00J	SPEC 2.0 $p\bar{p} \rightarrow \eta\pi^0\pi^0$

$$f_0(2060) \quad I^G(J^{PC}) = 0^+(0^{++})$$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
~ 2050	~ 120	¹ OAKDEN	94	RVUE 0.36–1.55 $\bar{p}p \rightarrow \pi\pi$
~ 2060	~ 50	¹ OAKDEN	94	RVUE 0.36–1.55 $\bar{p}p \rightarrow \pi\pi$

¹ See SEMENOV 99 and KLOET 96.

$\pi(2070)$ $I^G(J^{PC}) = 1^-(0^-+)$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2070 ± 35	310 ⁺¹⁰⁰ ₋₅₀	ANISOVICH	01F SPEC	2.0 $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$	

$X(2080)$ $I^G(J^{PC}) = ??(???)$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2080 ± 10	110 ± 20	KREYMER	80 STRC	13 $\pi^- d \rightarrow p\bar{p}n(n_S)$	

$X(2080)$ $I^G(J^{PC}) = ??(3^-?)$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2080 ± 10	190 ± 15	ROZANSKA	80 SPRK	18 $\pi^- p \rightarrow p\bar{p}n$	

$K_1(2085)$ $I^G(J^{PC}) = ??(1^+?)$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2084 ⁺⁴ ₋₂ ± 9	58 ⁺⁴ ₋₃ ± 25	^{1,2} ABLIKIM	23BG BES3	$e^+e^- \rightarrow pK^-\bar{\Lambda}$	
2075 ± 12 ± 5	90 ± 35 ± 9	³ ABLIKIM	04J BES2	$J/\psi \rightarrow K^-\rho\bar{\Lambda}$	

¹ The reported mass and width are the pole positions in the complex (M, Γ) plane.

² Signal observed with a statistical significance $>20\sigma$ comes from 3883 candidate events. Spin parity determined to be $J^P = 1^+$ with a statistical significance $>5\sigma$ over $0^-, 1^-, 2^+$ hypotheses, and in the range within 3.1–7.5 σ with respect to 2^- .

³ From a fit in the region $M_{p\bar{\Lambda}} - M_{p\bar{\Lambda}} - M_{\Lambda} < 150$ MeV. S-wave in the $p\bar{\Lambda}$ system preferred.

A similar near-threshold enhancement in the $p\bar{\Lambda}$ system is observed in $B^+ \rightarrow p\bar{\Lambda}\bar{D}^0$ by CHEN 11F.

$a_1(2095)$ $I^G(J^{PC}) = 1^-(1^++)$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2096 ± 17 ± 121	451 ± 41 ± 81	69k	KUHN	04 B852	18 $\pi^- p \rightarrow \eta\pi^+\pi^-\pi^-p$

$B(a_1(2095) \rightarrow f_1(1285)\pi) / B(a_1(2095) \rightarrow a_1(1260))$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3.18 ± 0.64	69k	KUHN	04 B852	18 $\pi^- p \rightarrow \eta\pi^+\pi^-\pi^-p$

$\eta(2100)$ $I^G(J^{PC}) = 0^+(0^-+)$					
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2050 ⁺³⁰⁺⁷⁵ ₋₂₄₋₂₆	250 ⁺³⁶⁺¹⁸¹ ₋₃₀₋₁₆₄		¹ ABLIKIM	16N BES3	$J/\psi \rightarrow \gamma K^+ K^- K^+ K^-$
2103 ± 50	187 ± 75	586	² BISELLO	89B DM2	$J/\psi \rightarrow 4\pi\gamma$

¹ From a partial wave analysis of $J/\psi \rightarrow \gamma\phi\phi$, for which the primary signal is $\eta(2225) \rightarrow \phi\phi$, and that also finds significant signals for for 0^-+ phase space, $f_0(2100), f_2(2010)$,

$f_2(2300)$, $f_2(2340)$, and a previously unseen 0^{-+} state $X(2500)$ ($M = 2470_{-19}^{+15} + 101_{-23}^{+101}$ MeV, $\Gamma = 230_{-35}^{+64} + 56_{-33}$ MeV).

²ASTON 81B sees no peak, has 850 events in Ajinenko+Barth bins. ARESTOV 80 sees no peak.

X(2100) $I^G(J^{PC}) = ??(0^{??})$		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>			
2100±40	250 ± 40	ALDE	86D GAM4	100 $\pi^- p \rightarrow 2\eta X$

X(2110) $I^G(J^{PC}) = 1^+(3^{-?})$		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>			
2110±10	330 ± 20	EVANGELIS... 79	OMEG	10,16 $\pi^- p \rightarrow \bar{p} p n$

X(2120) $I^G(J^{PC}) = ??(0^{??})$		<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>				
2122.4±6.7 ^{+4.7} _{-2.7}	83 ± 16 ⁺³¹ ₋₁₁	647	ABLIKIM	11C BES3	$J/\psi \rightarrow \gamma \pi^+ \pi^- \eta'$

$\omega(2120)$ or $\phi(2120)$ $I^G(J^{PC}) = 0^-(?^{- -})$		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>			
2119±11±15	69 ± 30 ± 5	¹ ABLIKIM	24AA BES3	$e^+ e^- \rightarrow \pi^+ \pi^- \pi^0$

¹ From a fit with more than 5σ to the Born cross section line shapes of $e^+ e^- \rightarrow \rho \pi$ and $e^+ e^- \rightarrow \rho(1450) \pi$.

$f_2(2140)$ $I^G(J^{PC}) = 0^+(2^{++})$		<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>				
2141±12	49 ± 28	389	GREEN	86 MPSF	400 $p A \rightarrow 4K X$

X(2150) $I^G(J^{PC}) = ??(2^{+?})$		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>			
2150±10	260 ± 10	ROZANSKA	80 SPRK	18 $\pi^- p \rightarrow p \bar{p} n$

$a_2(2175)$ $I^G(J^{PC}) = 1^-(2^{++})$		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>			
2175±40	310 ⁺⁹⁰ ₋₄₅	ANISOVICH	01F SPEC	2.0 $\bar{p} p \rightarrow 3\pi^0, \pi^0 \eta, \pi^0 \eta'$

$\eta(2190)$ $I^G(J^{PC}) = 0^+(0^{-+})$		<u>DOCUMENT ID</u>	<u>TECN</u>
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>		
2190±50	850 ± 100	BUGG	99 BES

$\omega_2(2195)$ $I^G(J^{PC}) = 0^-(2^{--})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2195 ± 30	225 ± 40	¹ ANISOVICH	02B SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

¹ From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

$X(2210)$ $I^G(J^{PC}) = ?^?(?^{??})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2210 ⁺⁷⁹ ₋₂₁	203 ⁺⁴³⁷ ₋₈₇	EVANGELIS...	79B OMEG	10 $\pi^- p \rightarrow K^+ K^- n$
2207 ± 22	130	CASO	70 HBC	11.2 $\pi^- p$

$X_2(2210)$ $I^G(J^{PC}) = 0^+(2^{++})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2210 ± 60	360 ± 120	¹ KLEMP	22 RVUE	$J/\psi \rightarrow \gamma\pi^0\pi^0,$ $\gamma K_S^0 K_S^0$

¹ Fit of the tensor partial waves from BES3 in the multipole basis. Might be a cluster of $J^{PC} = 2^{++}$ resonances. The ratio of decay widths $K K^- / \pi\pi$ is 0.23 ± 0.05 .

$h_1(2215)$ $I^G(J^{PC}) = 0^-(1^{+-})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2215 ± 40	325 ± 55	¹ ANISOVICH	02B SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

¹ From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

$\rho_2(2225)$ $I^G(J^{PC}) = 1^+(2^{--})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2225 ± 35	335 ⁺¹⁰⁰ ₋₅₀	¹ ANISOVICH	02 SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\pi^0,$ $\omega\eta\pi^0, \pi^+\pi^-$

¹ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$\rho_4(2230)$ $I^G(J^{PC}) = 1^+(4^{--})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2230 ± 25	210 ± 30	¹ ANISOVICH	02 SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\pi^0,$ $\omega\eta\pi^0, \pi^+\pi^-$

¹ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$b_1(2240)$ $I^G(J^{PC}) = 1^+(1^{+-})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2240 ± 35	320 ± 85	¹ ANISOVICH	02 SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\pi^0,$ $\omega\eta\pi^0, \pi^+\pi^-$

¹ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$f_2(2240)$ $I^G(J^{PC}) = 0^+(2^{++})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2240 ± 15	241 ± 30	¹ ANISOVICH	00J SPEC	1.92–2.41 $p\bar{p}$
~ 2226	~ 226	HASAN	94 RVUE	$p\bar{p} \rightarrow \pi\pi$

• • • We do not use the following data for averages, fits, limits, etc. • • •

¹ From the combined analysis of ANISOVICH 99C, ANISOVICH 99F, ANISOVICH 99J, ANISOVICH 99K, and ANISOVICH 00B. See also ANISOVICH 12.

 $b_3(2245)$ $I^G(J^{PC}) = 1^+(3^{+-})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
2245 ± 50	320 ± 70	¹ BUGG	04C RVUE

¹ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

 $\eta_2(2250)$ $I^G(J^{PC}) = 0^+(2^{-+})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
2248 ± 20	280 ± 20	ANISOVICH	00I SPEC
2267 ± 14	290 ± 50	ANISOVICH	00J SPEC

 $\pi_4(2250)$ $I^G(J^{PC}) = 1^-(4^{-+})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2250 ± 15	215 ± 25	ANISOVICH	01F SPEC	$2.0 \bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$

 $\omega_4(2250)$ $I^G(J^{PC}) = 0^-(4^{--})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2250 ± 30	150 ± 50	¹ ANISOVICH	02B SPEC	$0.6\text{--}1.9 p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

¹ From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

 $\omega_5(2250)$ $I^G(J^{PC}) = 0^-(5^{--})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
2250 ± 70	320 ± 95	¹ BUGG	04 RVUE

¹ From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

 $\omega_3(2255)$ $I^G(J^{PC}) = 0^-(3^{--})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2255 ± 15	175 ± 30	¹ ANISOVICH	02B SPEC	$0.6\text{--}1.9 p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

¹ From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

 $a_4(2255)$ $I^G(J^{PC}) = 1^-(4^{++})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2237 ± 5	291 ± 12	UMAN	06 E835	$5.2 \bar{p}p \rightarrow \eta\eta\pi^0$
2255 ± 40	330^{+110}_{-50}	¹ ANISOVICH	01F SPEC	$1.96\text{--}2.41 \bar{p}p$

¹ From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.

$a_2(2255)$		$I^G(J^{PC}) = 1^-(2^{++})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2255 ± 20	230 ± 15	¹ ANISOVICH	01G	SPEC	1.96–2.41 $\bar{p}p$

¹ From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, ANISOVICH 01F, and ANISOVICH 01G.

$X(2260)$		$I^G(J^{PC}) = 0^+(4^{+?})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2260 ± 20	400 ± 100	EVANGELIS...	79	OMEG	10,16 $\pi^- p \rightarrow \bar{p}pn$

$\rho(2270)$		$I^G(J^{PC}) = 1^+(1^{--})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2265 ± 40	325 ± 80	¹ ANISOVICH	02	SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\pi^0, \omega\eta\pi^0, \pi^+\pi^-$
2280 ± 50	440 ± 110	ATKINSON	85	OMEG	20–70 $\gamma p \rightarrow p\omega\pi^+\pi^-\pi^0$

¹ From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

$a_1(2270)$		$I^G(J^{PC}) = 1^-(1^{++})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2270 $^{+55}_{-40}$	305 $^{+70}_{-40}$	ANISOVICH	01F	SPEC	2.0 $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$

$h_3(2275)$		$I^G(J^{PC}) = 0^-(3^{+-})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2275 ± 25	190 ± 45	¹ ANISOVICH	02B	SPEC	0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

¹ From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

$a_3(2275)$		$I^G(J^{PC}) = 1^-(3^{++})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2275 ± 35	350 $^{+100}_{-50}$	¹ ANISOVICH	01G	SPEC	1.96–2.41 $\bar{p}p$

¹ From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, ANISOVICH 01F, and ANISOVICH 01G.

$\pi_2(2285)$		$I^G(J^{PC}) = 1^-(2^{-+})$			
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
2285 ± 20 ± 25	250 ± 20 ± 25	¹ ANISOVICH	11	SPEC	0.9–1.94 $p\bar{p}$

¹ Reanalysis of ADOMEIT 96 and ANISOVICH 00E.

$\omega_3(2285)$ $I^G(J^{PC}) = 0^-(3^{--})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2278 ± 28	224 ± 50	¹ BUGG	04A	RVUE
2285 ± 60	230 ± 40	² ANISOVICH	02B	SPEC 0.6–1.9 $p\bar{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

¹ Partial wave analysis of the data on $p\bar{p} \rightarrow \bar{\Lambda}\Lambda$ from BARNES 00.² From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B. **$\omega(2290)$** $I^G(J^{PC}) = 0^-(1^{--})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
2290 ± 20	275 ± 35	¹ BUGG	04A RVUE

¹ Partial wave analysis of the data on $p\bar{p} \rightarrow \bar{\Lambda}\Lambda$ from BARNES 00. **$f_2(2295)$** $I^G(J^{PC}) = 0^+(2^{++})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2293 ± 13	216 ± 37	¹ ANISOVICH	00J	SPEC 1.92–2.41 $p\bar{p}$

¹ From the combined analysis of ANISOVICH 99C, ANISOVICH 99F, ANISOVICH 99J, ANISOVICH 99K, and ANISOVICH 00B. See also ANISOVICH 12. **$f_3(2300)$** $I^G(J^{PC}) = 0^+(3^{++})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
2334 ± 25	200 ± 20	¹ BUGG	04A RVUE

¹ Partial wave analysis of the data on $p\bar{p} \rightarrow \bar{\Lambda}\Lambda$ from BARNES 00. **$h_1(2300)$** $I^G(J^{PC}) = 0^-(1^{+-})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
$2316 \pm 9 \pm 30$	$89 \pm 15 \pm 26$	¹ ABLIKIM	25E BES3

¹ From a partial wave analysis of $\psi(2S) \rightarrow \phi\eta\eta'$. Reported in $\psi(2S) \rightarrow h_1(2300)\eta'$ with 9.6σ significance and in $\psi(2S) \rightarrow h_1(2300)\eta$ at 5.6σ . **$f_1(2310)$** $I^G(J^{PC}) = 0^+(1^{++})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
2310 ± 60	255 ± 70	ANISOVICH	00J SPEC

 $\eta(2320)$ $I^G(J^{PC}) = 0^+(0^{-+})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
2320 ± 15	230 ± 35	¹ ANISOVICH	00M SPEC

¹ From the combined analysis of $\bar{p}p \rightarrow \eta\eta\eta$ from ANISOVICH 00M and $\bar{p}p \rightarrow \eta\pi^0\pi^0$ from ANISOVICH 00J.

$\eta_4(2330)$ $I^G(J^{PC}) = 0^+(4^-+)$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2328 ± 38	240 ± 90	ANISOVICH	00J SPEC	2.0 $p\bar{p} \rightarrow \eta\pi^0\pi^0$

$\omega(2330)$ $I^G(J^{PC}) = 0^-(1^{--})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2330 ± 30	435 ± 75	ATKINSON	88 OMEG	25-50 $\gamma p \rightarrow \rho^\pm \rho^0 \pi^\mp$

$T_{c\bar{s}0}^*(2330)$ $I(J^P) = 1(0^+)$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2327 ± 13 ± 13	96 ± 16 ⁺¹⁷⁰ ₋₂₃	¹ AAIJ	24AQ LHCB	$D_{s1}(2460)^+ \rightarrow D_s^+ \pi^+ \pi^-$

¹ From a K-matrix model analysis including $f_0(500)$ and $T_{c\bar{s}0}^*$. The $T_{c\bar{s}0}^*$ resonance is claimed by one experiment only.

$X(2340)$ $I^G(J^{PC}) = ??(???)$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2340 ± 20	180 ± 60	126	¹ BALTAY	75 HBC	15 $\pi^+ p \rightarrow p 5\pi$

¹ Dominant decay into $\rho^0 \rho^0 \pi^+$. BALTAY 78 finds confirmation in $2\pi^+ \pi^- 2\pi^0$ events which contain $\rho^+ \rho^0 \pi^0$ and $2\rho^+ \pi^-$.

$\pi(2360)$ $I^G(J^{PC}) = 1^-(0^-+)$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2360 ± 25	300 ⁺¹⁰⁰ ₋₅₀	ANISOVICH	01F SPEC	2.0 $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$

$X(2360)$ $I^G(J^{PC}) = ??(4^{+?})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2360 ± 10	430 ± 30	ROZANSKA	80 SPRK	18 $\pi^- p \rightarrow p\bar{p}n$

• • • We do not use the following data for averages, fits, limits, etc. • • •

2356 ± 7 ± 15	304 ± 28 ± 54	¹ ABLIKIM	23AY BES3	$e^+ e^- \rightarrow (\Lambda\bar{\Lambda})\eta$
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¹ Assuming $J^{PC} = 1^{--}$.

$X(2440)$ $I^G(J^{PC}) = ??(5^{-?})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2440 ± 10	310 ± 20	ROZANSKA	80 SPRK	18 $\pi^- p \rightarrow p\bar{p}n$

$a_6(2450)$ $I^G(J^{PC}) = 1^-(6^{++})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2450 ± 130	400 ± 250	CLELAND	82B SPEC	50 $\pi p \rightarrow K_S^0 K^\pm p$

X(2540) $I^G(J^{PC}) = 0^+(0^{++})$		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>			
$2539 \pm 14^{+38}_{-14}$	$274^{+77+126}_{-61-163}$	UEHARA	13 BELL	$\gamma\gamma \rightarrow K_S^0 K_S^0$

$\Gamma(\gamma\gamma) \times B(K\bar{K})$

<u>VALUE (eV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
40^{+9+17}_{-7-40}	UEHARA	13 BELL	$\gamma\gamma \rightarrow K_S^0 K_S^0$

X(2600) $I^G(J^{PC}) = ??(???)$		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>			
$2618.3 \pm 2.0^{+16.3}_{-1.4}$	$195 \pm 5^{+26}_{-17}$	ABLIKIM	22G BES3	$J/\psi \rightarrow \gamma\pi^+\pi^-\eta'$

$B(J/\psi \rightarrow \gamma X(2600)) \times B(X(2600) \rightarrow f_0(1500)\eta') \times B(f_0(1500) \rightarrow \pi^+\pi^-)$

<u>VALUE (units 10^{-5})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$3.09 \pm 0.21^{+1.14}_{-0.77}$	¹ ABLIKIM	22G BES3	$J/\psi \rightarrow \gamma\pi^+\pi^-\eta'$

¹ The $\pi^+\pi^-$ mass spectrum is described by a coherent sum of two Breit-Wigner resonances, $f_0(1500)$ and a new $X(1540)$ with mass $1540.2 \pm 7.0^{+36.3}_{-6.1}$ MeV and width $157 \pm 19^{+11}_{-77}$ MeV.

$B(J/\psi \rightarrow \gamma X(2600)) \times B(X(2600) \rightarrow X(1540)\eta') \times B(X(1540) \rightarrow \pi^+\pi^-)$

<u>VALUE (units 10^{-5})</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$2.69 \pm 0.19^{+0.38}_{-1.21}$	¹ ABLIKIM	22G BES3	$J/\psi \rightarrow \gamma\pi^+\pi^-\eta'$

¹ The $\pi^+\pi^-$ mass spectrum is described by a coherent sum of two Breit-Wigner resonances, $f_0(1500)$ and a new $X(1540)$ with mass $1540.2 \pm 7.0^{+36.3}_{-6.1}$ MeV and width $157 \pm 19^{+11}_{-77}$ MeV.

$K_S^*(2600)$ $I(J^P) = 1/2(0^+)$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
$2662 \pm 59 \pm 201$	$480 \pm 47 \pm 72$	¹ AAIJ	23AH LHCb	$B^+ \rightarrow K^+(K_S^0 K\pi)$

¹ From Dalitz plot analyses of $\eta_c(1S, 2S) \rightarrow K_S^0 K^+ \pi^- + \text{c.c.}$.

X(2632) $I^G(J^{PC}) = ??(???)$		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>			
2635.2 ± 3.3		¹ EVDOKIMOV	04 SELX	$X(2632) \rightarrow D_S^+ \eta$
2631.6 ± 2.1	< 17	² EVDOKIMOV	04 SELX	$X(2632) \rightarrow D_S^0 K^+$

¹ From a mass difference to D_S^+ of 666.9 ± 3.3 MeV.

² From a mass difference to D_S^0 of 767.0 ± 2.0 MeV.

$B(X(2632) \rightarrow D^0 K^+)/B(X(2632) \rightarrow D_s^+ \eta)$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>
0.14±0.06	¹ EVDOKIMOV 04	SELX

¹ Possible interpretation of this decay pattern is discussed by YASUI 07.

X(2680) $I^G(J^{PC}) = ??(???)$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2676±27	150	CASO	70 HBC	11.2 $\pi^- p \rightarrow \rho^- \pi^+ \pi^- p$

X(2710) $I^G(J^{PC}) = ??(6^{+?})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2710±20	170 ± 40	ROZANSKA	80 SPRK	18 $\pi^- p \rightarrow \rho \bar{p} n$

X(2750) $I^G(J^{PC}) = ??(7^{-?})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
2747±32	195 ± 75	DENNEY	83 LASS	10 $\pi^+ p \rightarrow K^+ K^- \pi^+ p$

f₆(3100) $I^G(J^{PC}) = 0^+(6^{++})$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3100±100	700 ± 130	BINON	05 GAMS	33 $\pi^- p \rightarrow \eta \eta n$

X(3250) $I^G(J^{PC}) = ??(???)$ 3-Body Decays

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3250±8±20	45 ± 18	ALEEV	93 BIS2	$X(3250) \rightarrow \Lambda \bar{p} K^+$
3265±7±20	40 ± 18	ALEEV	93 BIS2	$X(3250) \rightarrow \bar{\Lambda} p K^-$

X(3250) $I^G(J^{PC}) = ??(???)$ 4-Body Decays

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3245±8±20	25 ± 11	ALEEV	93 BIS2	$X(3250) \rightarrow \Lambda \bar{p} K^+ \pi^\pm$
3250±9±20	50 ± 20	ALEEV	93 BIS2	$X(3250) \rightarrow \bar{\Lambda} p K^- \pi^\mp$
3270±8±20	25 ± 11	ALEEV	93 BIS2	$X(3250) \rightarrow K_S^0 p \bar{p} K^\pm$

X(3350) $I^G(J^{PC}) = ??(???)$

<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3350 ⁺¹⁰ ₋₂₀ ± 20	70 ⁺⁴⁰ ₋₃₀ ± 40	50 ± 10	¹ GABYSHEV	06A BELL	$B^- \rightarrow \Lambda_c^+ \bar{p} \pi^-$

¹ A similar enhancement in the $\Lambda_c^+ \bar{p}$ final state is also reported by BABAR collaboration in AUBERT 10H.

ψ(3760) $I^G(J^{PC}) = ??(1^{--})$

<u>MASS (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
3751.9±3.8±2.8	¹ ABLIKIM	24BO BES3	$e^+ e^- \rightarrow \text{hadrons}$
~ 3740	¹ ABLIKIM	24E BES3	$e^+ e^- \rightarrow \text{light hadrons}$

¹ Fit to cross sections for $\sqrt{s} = 3645$ to 3871 MeV.

$\psi(3780)$		$I^G(J^{PC}) = ?^?(1^{--})$				
<u>MASS (MeV)</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
$3778.7 \pm 0.5 \pm 0.3$		¹ ABLIKIM	24BO BES3	$e^+e^- \rightarrow$ hadrons		
~ 3780		¹ ABLIKIM	24E BES3	$e^+e^- \rightarrow$ light hadrons		

¹ Fit to cross sections for $\sqrt{s} = 3645$ to 3871 MeV.

$\psi(3810)$		$I^G(J^{PC}) = ?^?(1^{--})$				
<u>MASS (MeV)</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
$3804.5 \pm 0.9 \pm 0.9$		¹ ABLIKIM	24BO BES3	$e^+e^- \rightarrow$ hadrons		
~ 3806		¹ ABLIKIM	24E BES3	$e^+e^- \rightarrow$ light hadrons		

¹ Fit to cross sections for $\sqrt{s} = 3645$ to 3871 MeV.

$h_c(4000)$		$I^G(J^{PC}) = 0^-(1^{+-})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
4000^{+17+29}_{-14-22}	184^{+71+97}_{-45-61}	1.6k	¹ AAIJ	24AB LHCB	$B^+ \rightarrow D^{*\pm} D^{\mp} K^+$	

¹ From a simultaneous amplitude analysis of $B^+ \rightarrow D^{*+} D^- K^+$, $B^+ \rightarrow D^{*-} D^+ K^+$ and their c.c.

$\chi_{c1}(4010)$		$I^G(J^{PC}) = 0^+(1^{++})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$4012.5^{+3.6+4.1}_{-3.9-3.7}$	$62.7^{+7.0+6.4}_{-6.4-6.6}$	1.6k	¹ AAIJ	24AB LHCB	$B^+ \rightarrow D^{*\pm} D^{\mp} K^+$	

¹ From a simultaneous amplitude analysis of $B^+ \rightarrow D^{*+} D^- K^+$, $B^+ \rightarrow D^{*-} D^+ K^+$ and their c.c.

$h_c(4300)$		$I^G(J^{PC}) = 0^-(1^{+-})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
$4307.3^{+6.4+3.3}_{-6.6-4.1}$	58^{+28+28}_{-16-25}	1.6k	¹ AAIJ	24AB LHCB	$B^+ \rightarrow D^{*\pm} D^{\mp} K^+$	

¹ From a simultaneous amplitude analysis of $B^+ \rightarrow D^{*+} D^- K^+$, $B^+ \rightarrow D^{*-} D^+ K^+$ and their c.c.

$\psi(4500)$		$I^G(J^{PC}) = 0^-(1^{--})$				
<u>MASS (MeV)</u>	<u>WIDTH (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>		
$4467.4^{+7.2+3.2}_{-5.4-2.7}$	$62.8^{+19.2+9.9}_{-14.4-7.0}$	¹ ABLIKIM	25B BES3	$e^+e^- \rightarrow$ $\pi^+\pi^-h_c(1P)$		
$4544.2 \pm 18.7 \pm 1.7$	$116.1 \pm 33.5 \pm 1.7$	² ABLIKIM	24D BES3	$e^+e^- \rightarrow \omega\gamma J/\psi$		
$4469.1 \pm 26.2 \pm 3.6$	$246.3 \pm 36.7 \pm 9.4$	³ ABLIKIM	23X BES3	$e^+e^- \rightarrow$ $D^{*0} D^{*-} \pi^+$		
$4484.7 \pm 13.3 \pm 24.1$	$111.1 \pm 30 \pm 15.2$	⁴ ABLIKIM	22AU BES3	$e^+e^- \rightarrow$ $K^+ K^- J/\psi$		

- ¹ Using three coherent Breit-Wigner functions between 4.009 and 4.950 GeV.
- ² Assuming one single Breit-Wigner resonance in $\omega\chi_{c2}(1P)$ ($\chi_{c2} \rightarrow \gamma J/\psi$). Measured $\Gamma_{ee} \cdot B(\omega\chi_{c1}(1P)) = 1.86 \pm 0.32 \pm 0.13$ eV.
- ³ From a cross-section measurement of $e^+e^- \rightarrow D^{*0}D^{*-}\pi^+$ between 4.189 and 4.951 GeV, assuming a coherent sum of 3 Breit-Wigner resonances plus a continuum amplitude. $\Gamma(e^+e^-) \cdot B(D^{*0}D^{*-}\pi^+) = 107\text{--}1744$ eV depending on solutions I – VIII with the same fit qualities. The two other resonances have masses (widths) 4209.6 ± 7.5 (81.6 ± 19.9) MeV and 4675.3 ± 29.7 (218.3 ± 73.5) MeV.
- ⁴ ABLIKIM 22AU cross sections analysis of the process $e^+e^- \rightarrow K^+K^-J/\psi$ at c.m. energies 4.127–4.600 GeV from 15.6 fb^{-1} of data.

$$T_{c\bar{c}s1}(4600)^0 \quad I^G(J^{PC}) = 1/2^?(1+?)$$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
$4578 \pm 10 \pm 18$	$133 \pm 28 \pm 69$	AAIJ 25Q	LHCB	$B^+ \rightarrow \psi(2S)K^+\pi^+\pi^-$

$$T_{c\bar{c}s1}(4900)^0 \quad I^G(J^{PC}) = 1/2^?(1+?)$$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
$4925 \pm 22 \pm 47$	$255 \pm 55 \pm 127$	AAIJ 25Q	LHCB	$B^+ \rightarrow \psi(2S)K^+\pi^+\pi^-$

$$T_{c\bar{c}s1}(5200)^0 \quad I^G(J^{PC}) = 1/2^?(1-?)$$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID	TECN	COMMENT
$5225 \pm 86 \pm 181$	$226 \pm 76 \pm 374$	AAIJ 25Q	LHCB	$B^+ \rightarrow \psi(2S)K^+\pi^+\pi^-$

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