Further States

OMITTED FROM SUMMARY TABLE

This section contains states observed by a single group or states poorly established that thus need confirmation. Publications that exclude earlier claims in this section are listed under 'Other Related Papers.'

QUANTUM NUMBERS, MASSES, WIDTHS, AND BRANCHING RATIOS

$X(1070)$ $I^G(J^{PC}) = ?^?(0^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		COMMENT
1072.4±0.8	$\mathbf{3.5^{+1.5}_{-1.0}}$	GRIGOR'EV	05	40 $\pi^- p \rightarrow K^0_S K^0_S n$

$X(1110)$ $I^G(J^{PC}) = 0^+(\text{even}^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
1107±4	111 ± 8 ± 15	DAFTARI	87	DBC	0. $\overline{p}n \rightarrow \rho^- \pi^+ \pi^-$

$f_0(1200–1600)$ $I^G(J^{PC}) = 0^+(0^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN
1480^{+100}_{-150}	1030^{+80}_{-170}	[5] ANISOVICH	03	SPEC
1530^{+90}_{-250}	560 ± 40	[6] ANISOVICH	03	SPEC

$X(1420)$ $I^G(J^{PC}) = 2^+(0^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
1420±20	160 ± 10	FILIPPI	00	OBLX	0 $\overline{n}p \rightarrow \pi^+ \pi^+ \pi^-$

$X(1600)$ $I^G(J^{PC}) = 2^+(2^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
1600±100	400 ± 200	[7] ALBRECHT	91F	ARG	10.2 $e^+ e^- \rightarrow e^+ e^- 2(\pi^+ \pi^-)$

$X(1650)$ $I^G(J^{PC}) = 0^-(?^{?-})$

MASS (MeV)	WIDTH (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
1652±7	<50	100	PROKOSHKIN 96	GAM2	32,38 $\pi p \rightarrow \omega \eta n$

$X(1750)$ $I^G(J^{PC}) = ?^?(1^{--})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
1753.5±1.5±2.3	122.2 ± 6.2 ± 8.0	LINK	02K	FOCS	20–160 $\gamma p \rightarrow K^+ K^- p$

B($X(1750) \to \overline{K}^*(892)^0 K^0 \to K^\pm \pi^\mp K^0_S$)/B($X(1750) \to K^+ K^-$)

VALUE	CL%	DOCUMENT ID		TECN
<0.065	90	LINK	02K	FOCS

B($X(1750) \to \overline{K}^*(892)^\pm K^\mp \to K^\pm \pi^\mp K^0_S$)/B($X(1750) \to K^+ K^-$)

VALUE	CL%	DOCUMENT ID		TECN
<0.183	90	LINK	02K	FOCS

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

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

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

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

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

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

$a_3(1875)$ $I^G(J^{PC}) = 1^-(3^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
$1874 \pm 43 \pm 96$	$385 \pm 121 \pm 114$	CHUNG	02	E852	18.3 $\pi^- p \to \pi^+\pi^-\pi^- p$

B($a_3(1875) \to f_2(1270)\pi$)/B($a_3(1875) \to \rho\pi$)

VALUE	DOCUMENT ID		TECN	COMMENT
0.8 ± 0.2	[8] CHUNG	02	E852	18.3 $\pi^- p \to \pi^+\pi^-\pi^- p$

B($a_3(1875) \to \rho_3(1690)\pi$)/B($a_3(1875) \to \rho\pi$)

VALUE	DOCUMENT ID		TECN	COMMENT
0.9 ± 0.3	[8] CHUNG	02	E852	18.3 $\pi^- p \to \pi^+\pi^-\pi^- p$

$\pi_2(1880)$ $I^G(J^{PC}) = 1^-(2^{-+})$

MASS (MeV)	WIDTH (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
$1876 \pm 11 \pm 67$	$146 \pm 17 \pm 62$	145k	LU	05	E852	18 $\pi^- p \to \omega\pi^-\pi^0 p$
$2003 \pm 88 \pm 148$	$306 \pm 132 \pm 121$	69k	KUHN	04	E852	18 $\pi^- p \to \eta\pi^+\pi^-\pi^- p$
1880 ± 20	255 ± 45		ANISOVICH	01B		$\overline{p}p \to (a_2(1320)\eta)\pi^0$

$B(\pi_2(1880) \to a_2(1320)\eta)$ / $B(\pi_2(1880) \to f_1(1285)\pi)$

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
22.7±7.3	69k	KUHN	04	E852	18 $\pi^- p \to \eta\pi^+\pi^-\pi^- p$

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

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

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

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
1935±20	215 ± 30	EVANGELISTA	79	OMEG	10,16 $\pi^- p \to \overline{p}pn$

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

MASS (MeV)	WIDTH (MeV)		DOCUMENT ID		TECN	COMMENT
1940±40	155 ± 40	[9]	ANISOVICH	02	SPEC	0.6–1.9 $p\overline{p} \to \omega\pi^0$, $\omega\eta\pi^0$, $\pi^+\pi^-$

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

MASS (MeV)	WIDTH (MeV)		DOCUMENT ID		TECN	COMMENT
1945±20	115 ± 22	[10]	ANISOVICH	02B	SPEC	0.6–1.9 $p\overline{p} \to \omega\eta$, $\omega\pi^0\pi^0$

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

MASS (MeV)	WIDTH (MeV)		DOCUMENT ID		TECN	COMMENT
1960±25	195 ± 60	[10]	ANISOVICH	02B	SPEC	0.6–1.9 $p\overline{p} \to \omega\eta$, $\omega\pi^0\pi^0$

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

MASS (MeV)	WIDTH (MeV)		DOCUMENT ID		TECN	COMMENT
1960±35	230 ± 50	[9]	ANISOVICH	02	SPEC	0.6–1.9 $p\overline{p} \to \omega\pi^0$, $\omega\eta\pi^0$, $\pi^+\pi^-$

$\rho(1965)$ $I^G(J^{PC}) = 1^+(1^{--})$

MASS (MeV)	WIDTH (MeV)		DOCUMENT ID		TECN	COMMENT
1970±30	260 ± 45	[9]	ANISOVICH	02	SPEC	0.6–1.9 $p\overline{p} \to \omega\pi^0$, $\omega\eta\pi^0$, $\pi^+\pi^-$
2000±30	295 ± 85		ANISOVICH	00J	SPEC	

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1965 ± 45	345 ± 75	[10] ANISOVICH	02B	SPEC	0.6–1.9 $p\overline{p} \to \omega\eta$, $\omega\pi^0\pi^0$

$f_1(1970)$ $I^G(J^{PC}) = 0^+(1^{++})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
1971 ± 15	240 ± 45	ANISOVICH	00J	SPEC

$X(1970)$ $I^G(J^{PC}) = ?^?(?^{??})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1970 ± 10	40 ± 20	CHLIAPNIK...	80	HBC	32 $K^+ p \to 2K^0_S 2\pi X$

$X(1975)$ $I^G(J^{PC}) = ?^?(?^{??})$

MASS (MeV)	*WIDTH* (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1973 ± 15	80	30	CASO	70	HBC	11.2 $\pi^- p \to \rho 2\pi$

$\omega_2(1975)$ $I^G(J^{PC}) = 0^-(2^{--})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1975 ± 20	175 ± 25	[10] ANISOVICH	02B	SPEC	0.6–1.9 $p\overline{p} \to \omega\eta$, $\omega\pi^0\pi^0$

$a_2(1990)$ $I^G(J^{PC}) = 1^-(2^{++})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
$2003 \pm 10 \pm 19$	$249 \pm 23 \pm 32$	LU	05	E852	18 $\pi^- p \to \omega\pi^-\pi^0 p$
1990^{+15}_{-30}	190 ± 50	ANISOVICH	99C	SPEC	

$\rho(2000)$ $I^G(J^{PC}) = 1^+(1^{--})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
2000 ± 30	295 ± 85	ANISOVICH	00J	SPEC

$f_2(2000)$ $I^G(J^{PC}) = 0^+(2^{++})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
2001 ± 10	312 ± 32	ANISOVICH	00J	SPEC

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

MASS (MeV)	*WIDTH* (MeV)		*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
1964±35	225 ± 50	[11]	ARMSTRONG	93D	E760		$\overline{p}p \to 3\pi^0 \to 6\gamma$
~ 2100	~ 500	[11]	ANTIPOV	77	CIBS	−	25 $\pi^- p \to p\pi^- \rho_3$
2214±15	355 ± 21	[12]	BALTAY	77	HBC	0	15 $\pi^- p \to \Delta^{++} 3\pi$
2080±40	340 ± 80		KALELKAR	75	HBC	+	15 $\pi^+ p \to p\pi^+ \rho_3$

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
1998±3±5	<15	VLADIMIRSKY	03	SPEC	$\pi^- p \to K^0_S K^0_S M M$

$\pi_2(2005)$ $I^G(J^{PC}) = 1^-(2^{-+})$

MASS (MeV)	*WIDTH* (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
1974±14±83	341 ± 61 ± 139	145k	LU	05	E852	18 $\pi^- p \to \omega\pi^-\pi^0 p$
2005±15	200 ± 40		ANISOVICH	01F	SPEC	2.0 $\overline{p}p \to 3\pi^0$, $\pi^0\eta$, $\pi^0\eta'$

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

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*
2013±25 OUR AVERAGE						
2014±20±16	230 ± 32 ± 73	145k	LU	05	E852	18 $\pi^- p \to \omega\pi^-\pi^0 p$
2001±30±92	333 ± 52 ± 49	69k	KUHN	04	E852	18 $\pi^- p \to \eta\pi^+\pi^-\pi^- p$

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

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	$\pi p \to p p \overline{p} \pi(\pi)$

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2025 ± 20	145 ± 30	[10] ANISOVICH	02B	SPEC	0.6–1.9 $p\overline{p} \to \omega\eta$, $\omega\pi^0\pi^0$

$b_3(2025)$ $I^G(J^{PC}) = 1^+(3^{+-})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2032 ± 12	117 ± 11	[9] ANISOVICH	02	SPEC	0.6–1.9 $p\overline{p} \to$ $\omega\pi^0$, $\omega\eta\pi^0$, $\pi^+\pi^-$

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
$2030 \pm 5 \pm 15$	$205 \pm 10 \pm 15$	ANISOVICH	00E	SPEC

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

VALUE	*DOCUMENT ID*		*TECN*
0.74 ± 0.17	[13] ANISOVICH	00E	SPEC

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

VALUE	*DOCUMENT ID*		*TECN*
0.072 ± 0.016	[13] ANISOVICH	00E	SPEC

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

VALUE	*DOCUMENT ID*		*TECN*
0.074 ± 0.026	[13] ANISOVICH	00E	SPEC

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
2048 ± 8	213 ± 34	ANISOVICH	00J	SPEC

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
~ 2050	~ 120	[14] OAKDEN	94	RVUE	0.36–1.55 $\overline{p}p \to \pi\pi$
~ 2060	~ 50	[14] OAKDEN	94	RVUE	0.36–1.55 $\overline{p}p \to \pi\pi$

$\pi(2070)$ $I^G(J^{PC}) = 1^-(0^{-+})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2070 ± 35	310^{+100}_{-50}	ANISOVICH	01F	SPEC	2.0 $\overline{p}p \to 3\pi^0$, $\pi^0\eta$, $\pi^0\eta'$

$a_3(2070)$ $I^G(J^{PC}) = 1^-(3^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN
2070 ± 20	170 ± 40	ANISOVICH	99C	SPEC

$X(2075)$ $I^G(J^{PC}) = ?^?(?^{??})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
$2075 \pm 12 \pm 5$	**$90 \pm 35 \pm 9$**	[1] ABLIKIM	04J	BES2	$J/\psi \to K^- p \overline{\Lambda}$

[1] From a fit in the region $M_{p\overline{\Lambda}} - M_p - M_\Lambda < 150$ MeV. S-wave in the $p\overline{\Lambda}$ system preferred.

$a_2(2080)$ $I^G(J^{PC}) = 1^-(2^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN
2060 ± 20	195 ± 30	ANISOVICH	99C	SPEC
2100^{+10}_{-30}	360^{+40}_{-100}	ANISOVICH	99E	SPEC

$X(2080)$ $I^G(J^{PC}) = ?^?(?^{??})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
2080 ± 10	110 ± 20	KREYMER	80	STRC	13 $\pi^- d \to p\overline{p}n(n_s)$

$X(2080)$ $I^G(J^{PC}) = ?^?(3^{-?})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
2080 ± 10	190 ± 15	ROZANSKA	80	SPRK	18 $\pi^- p \to p\overline{p}n$

$a_1(2095)$ $I^G(J^{PC}) = 1^-(1^{++})$

MASS (MeV)	WIDTH (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
$2096 \pm 17 \pm 121$	**$451 \pm 41 \pm 81$**	69k	KUHN	04	E852	18 $\pi^- p \to \eta\pi^+\pi^-\pi^- p$

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

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
3.18 ± 0.64	69k	KUHN	04	E852	18 $\pi^- p \to \eta\pi^+\pi^-\pi^- p$

$\eta(2100)$ $I^G(J^{PC}) = 0^+(0^{-+})$

MASS (MeV)	WIDTH (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
2103 ± 50	187 ± 75	586	[15] BISELLO	89B	DM2	$J/\psi \to 4\pi\gamma$

$X(2100)$ $I^G(J^{PC}) = ?^?(0^{??})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
2100 ± 40	250 ± 40	ALDE	86D	GAM4	100 $\pi^- p \to 2\eta X$

$X(2110)$ $I^G(J^{PC}) = 1^+(3^{-?})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
2110 ± 10	330 ± 20	EVANGELISTA	79	OMEG	10,16 $\pi^- p \to \overline{p} p n$

$f_2(2140)$ $I^G(J^{PC}) = 0^+(2^{++})$

MASS (MeV)	WIDTH (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
2141 ± 12	49 ± 28	389	GREEN	86	MPSF	400 pA $\to$ $4KX$

$\omega(2145)$ $I^G(J^{PC}) = 0^-(1^{--})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
2150 ± 20	235 ± 30	ANISOVICH	01C	SPEC	0.6–1.9 $\overline{p} p \to \omega \eta$
2145 ± 20	200 ± 25	ANISOVICH	00D	SPEC	

$X(2150)$ $I^G(J^{PC}) = ?^?(2^{+?})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
2150 ± 10	260 ± 10	ROZANSKA	80	SPRK	18 $\pi^- p \to p \overline{p} n$

$a_2(2175)$ $I^G(J^{PC}) = 0^-(2^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
2175 ± 40	310^{+90}_{-45}	ANISOVICH	01F	SPEC	2.0 $\overline{p} p \to 3\pi^0$, $\pi^0 \eta$, $\pi^0 \eta'$

$\eta(2190)$ $I^G(J^{PC}) = 0^+(0^{-+})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN
2190 ± 50	850 ± 100	BUGG	99	BES

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

MASS (MeV)	WIDTH (MeV)		DOCUMENT ID		TECN	COMMENT
2195 ± 30	225 ± 40	10	ANISOVICH	02B	SPEC	0.6–1.9 $p\overline{p} \to \omega \eta$, $\omega \pi^0 \pi^0$

$\omega(2205)$ $I^G(J^{PC}) = 0^-(1^{--})$

MASS (MeV)	WIDTH (MeV)		DOCUMENT ID		TECN	COMMENT
2205 ± 30	350 ± 90	10	ANISOVICH	02B	SPEC	0.6–1.9 $p\overline{p} \to \omega \eta$, $\omega \pi^0 \pi^0$

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

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
2210^{+79}_{-21}	203^{+437}_{-87}	EVANGELISTA	79B	OMEG	10 $\pi^- p \to K^+ K^- n$

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2207 ± 22	130	CASO	70	HBC	11.2 $\pi^- p$

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2215 ± 40	325 ± 55	[10] ANISOVICH	02B	SPEC	0.6–1.9 $p\overline{p} \rightarrow \omega\eta$, $\omega\pi^0\pi^0$

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2240 ± 35	320 ± 85	[9] ANISOVICH	02	SPEC	0.6–1.9 $p\overline{p} \rightarrow$ $\omega\pi^0$, $\omega\eta\pi^0$, $\pi^+\pi^-$

$\rho_2(2240)$ $I^G(J^{PC}) = 1^+(2^{--})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2225 ± 35	$335^{+100}_{-\ 50}$	[9] ANISOVICH	02	SPEC	0.6–1.9 $p\overline{p} \rightarrow$ $\omega\pi^0$, $\omega\eta\pi^0$, $\pi^+\pi^-$

$\rho_4(2240)$ $I^G(J^{PC}) = 1^+(4^{--})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2230 ± 25	210 ± 30	[9] ANISOVICH	02	SPEC	0.6–1.9 $p\overline{p} \rightarrow$ $\omega\pi^0$, $\omega\eta\pi^0$, $\pi^+\pi^-$

$\pi_2(2245)$ $I^G(J^{PC}) = 1^-(2^{-+})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2245 ± 60	$320^{+100}_{-\ 40}$	ANISOVICH	01F	SPEC	2.0 $\overline{p}p \rightarrow 3\pi^0$, $\pi^0\eta$, $\pi^0\eta'$

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

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

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

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

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2250 ± 30	150 ± 50	[10] ANISOVICH	02B	SPEC	0.6–1.9 $p\overline{p} \to \omega\eta$, $\omega\pi^0\pi^0$

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2255 ± 15	175 ± 30	[10] ANISOVICH	02B	SPEC	0.6–1.9 $p\overline{p} \to \omega\eta$, $\omega\pi^0\pi^0$

$X(2260)$ $I^G(J^{PC}) = 0^+(4^{+?})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*	*TECN*	*COMMENT*
2260 ± 20	400 ± 100	EVANGELISTA 79	OMEG	10,16 $\pi^- p \to \overline{p}pn$

$\rho(2265)$ $I^G(J^{PC}) = 1^+(1^{--})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2265 ± 40	325 ± 80	[9] ANISOVICH	02	SPEC	0.6–1.9 $p\overline{p} \to \omega\pi^0$, $\omega\eta\pi^0$, $\pi^+\pi^-$

$a_1(2270)$ $I^G(J^{PC}) = 1^-(1^{++})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2270^{+55}_{-40}	305^{+70}_{-40}	ANISOVICH	01F	SPEC	2.0 $\overline{p}p \to 3\pi^0$, $\pi^0\eta$, $\pi^0\eta'$

$a_2(2270)$ $I^G(J^{PC}) = 1^-(2^{++})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
2265 ± 20	235^{+60}_{-35}	ANISOVICH	99C	SPEC
2280 ± 30	280 ± 50	ANISOVICH	99E	SPEC

$h_3(2275)$ $I^G(J^{PC}) = 0^-(3^{+-})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2275 ± 25	190 ± 45	[10] ANISOVICH	02B	SPEC	0.6–1.9 $p\overline{p} \to \omega\eta$, $\omega\pi^0\pi^0$

$a_4(2280)$ $I^G(J^{PC}) = 1^-(4^{++})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
2300 ± 20	230 ± 40	ANISOVICH	99C	SPEC
2260 ± 15	180 ± 20	ANISOVICH	99E	SPEC

$\eta(2280)$ $I^G(J^{PC}) = 0^+(0^{-+})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
2285 ± 20	325 ± 30	ANISOVICH	00J	SPEC
2320 ± 15	230 ± 35	[16] ANISOVICH	00M	SPEC

$\rho(2280)$ $I^G(J^{PC}) = 1^+(1^{--})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2280 ± 50	440 ± 110	ATKINSON	85	OMEG	20–70 $\gamma p \rightarrow p\omega\pi^+\pi^-\pi^0$

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2285 ± 60	230 ± 40	[10] ANISOVICH	02B	SPEC	0.6–1.9 $p\overline{p} \rightarrow \omega\eta, \omega\pi^0\pi^0$

$X(2290)$ $I^G(J^{PC}) = 0^-(1^{--})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
2290 ± 20	**275 ± 35**	[2] BUGG	04A	RVUE

[2] Partial wave analysis of the data on $p\overline{p} \rightarrow \overline{\Lambda}\Lambda$ from BARNES 00.

$f_3(2300)$ $I^G(J^{PC}) = 0^+(3^{++})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
2303 ± 15	214 ± 29	ANISOVICH	00J	SPEC

$\rho_3(2300)$ $I^G(J^{PC}) = 1^+(3^{--})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
2300^{+50}_{-80}	340 ± 50	ANISOVICH	00J	SPEC

$a_3(2310)$ $I^G(J^{PC}) = 1^-(3^{++})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
2310 ± 40	$180^{+120}_{-\ 60}$	ANISOVICH	99C	SPEC

$f_1(2310)$ $I^G(J^{PC}) = 0^+(1^{++})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
2310 ± 60	255 ± 70	ANISOVICH	00J	SPEC

$\eta_4(2320)$ $I^G(J^{PC}) = 0^+(4^{-+})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*
2328 ± 38	240 ± 90	ANISOVICH	00J	SPEC

$f_0(2330)$ $I^G(J^{PC}) = 0^+(0^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2337 ± 14	217 ± 33	ANISOVICH	00J	SPEC
~ 2321	~ 223	HASAN	94	

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

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
2330 ± 30	435 ± 75	ATKINSON	88	OMEG	25–50 $\gamma p \rightarrow \rho^{\pm} \rho^0 \pi^{\mp}$

$a_1(2340)$ $I^G(J^{PC}) = 1^-(1^{++})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN
2340 ± 40	230 ± 70	ANISOVICH	99E	SPEC

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

MASS (MeV)	WIDTH (MeV)	EVTS	DOCUMENT ID		TECN	COMMENT
2340 ± 20	180 ± 60	126	[17] BALTAY	75	HBC	15 $\pi^+ p \rightarrow p 5\pi$

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

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
2360 ± 25	300^{+100}_{-50}	ANISOVICH	01F	SPEC	2.0 $\overline{p}p \rightarrow 3\pi^0$, $\pi^0\eta$, $\pi^0\eta'$

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

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

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

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

$X(2632)$ $I^G(J^{PC}) = ?^?(?^{??})$

MASS (MeV)	WIDTH (MeV)	DOCUMENT ID		TECN	COMMENT
2632.6 ± 1.8 OUR AVERAGE					
2635.2 ± 3.3		[3] EVDOKIMOV	04	SELX	$X(2632) \rightarrow D_s^+ \eta$
2631.6 ± 2.1	< 17	[4] EVDOKIMOV	04	SELX	$X(2632) \rightarrow D^0 K^+$

[3] From a mass difference to D_s^+ of 666.9 ± 3.3 MeV.

[4] From a mass difference to D^0 of 767.0 ± 2.0 MeV.

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

VALUE	*DOCUMENT ID*	*TECN*
0.14±0.06	EVDOKIMOV 04	SELX

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2676±27	150	CASO	70	HBC	11.2 $\pi^- p \to \rho^- \pi^+ \pi^- p$

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2710±20	170 ± 40	ROZANSKA	80	SPRK	18 $\pi^- p \to p\overline{p}n$

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
2747±32	195 ± 75	DENNEY	83	LASS	10 $\pi^+ p \to K^+ K^- \pi^+ p$

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f_6(3100) $I^G(J^{PC}) = 0^+(6^{++})$

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
3100±100	**700 ± 130**	BINON	05	GAMS	33 $\pi^- p \to \eta\eta n$

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
3250±8±20	45 ± 18	ALEEV	93	BIS2	$X(3250) \to \Lambda\overline{p}K^+$
3265±7±20	40 ± 18	ALEEV	93	BIS2	$X(3250) \to \overline{\Lambda}pK^-$

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

MASS (MeV)	*WIDTH* (MeV)	*DOCUMENT ID*		*TECN*	*COMMENT*
3245±8±20	25 ± 11	ALEEV	93	BIS2	$X(3250) \to \Lambda\overline{p}K^+\pi^\pm$
3250±9±20	50 ± 20	ALEEV	93	BIS2	$X(3250) \to \overline{\Lambda}pK^-\pi^\mp$
3270±8±20	25 ± 11	ALEEV	93	BIS2	$X(3250) \to K^0_S p\overline{p}K^\pm$

FOOTNOTES for Further States

[5] K-matrix pole from combined analysis of $\pi^- p \to \pi^0\pi^0 n$, $\pi^- p \to K\overline{K} n$, $\pi^+\pi^- \to \pi^+\pi^-$, $\overline{p}p \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$, $\pi^+\pi^-\pi^0$, $K^+K^-\pi^0$, $K^0_S K^0_S \pi^0$, $K^+K^0_S\pi^-$ at rest, $\overline{p}n \to \pi^-\pi^-\pi^+$, $K^0_S K^-\pi^0$, $K^0_S K^0_S \pi^-$ at rest.

[6] K-matrix pole from combined analysis of $\pi^- p \to \pi^0\pi^0 n$, $\pi^- p \to K\overline{K} n$, $\overline{p}p \to \pi^0\pi^0\pi^0$, $\pi^0\eta\eta$, $\pi^0\pi^0\eta$ at rest.

[7] Our estimate.

[8] Using the observable fractions of 50.0% $\rho\pi$, 56.5% $f_2\pi$, and 11.8% $\rho_3\pi$.

[9] From the combined analysis of ANISOVICH 00J, ANISOVICH 01D, ANISOVICH 01E, and ANISOVICH 02.

[10] From the combined analysis of ANISOVICH 00D, ANISOVICH 01C, and ANISOVICH 02B.

[11] Cannot determine spin to be 3.

[12] BALTAY 77 favors $J^P = ,3^+$.

[13] Corrected for all decay modes.

[14] See SEMENOV 99 and KLOET 96.

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

[16] Combined fit along with data of ANISOVICH 00J.

[17] 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 $2\rho^+\pi^-$.

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ABLIKIM	04J	PRL 93 112002	M. Ablikim *et al.*	(BES Collab.)
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VLADIMIRSKY	03	PAN 66 700	V.V. Vladimirsky *et al.*	
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CHUNG	02	PR D65 072001	S.U. Chung *et al.*	(BNL E852 Collab.)
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ALBRECHT	91F	ZPHY C50 1	H. Albrecht *et al.*	(ARGUS Collab.)
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D'ANDLAU	75	PL 58B 223	C. d'Andlau *et al.*	(CDEF, PISA)
KALOGERO...	75	PRL 34 1047	T. Kalogeropoulos, G.S. Tzanakos	(SYRA)
CARROLL	74	PRL 32 247	A.S. Carroll *et al.*	(BNL)
THOMPSON	74	NP B69 220	G. Thompson *et al.*	(PURD)
DONALD	73	NP B61 333	R.A. Donald *et al.*	(LIVP, PARIS)
ALEXANDER	72	NP B45 29	G. Alexander *et al.*	(TELA)
ANTIPOV	72	PL 40 147	Y.M. Antipov *et al.*	(SERP)
TAKAHASHI	72	PR D6 1266	K. Takahashi *et al.*	(TOHOK, PENN, NDAM+)
BENVENUTI	71	PRL 27 283	A.C. Benvenuti *et al.*	(WISC)
SABAU	71	LNC 1 514	M. Sabeu, J.L. Uretsky	(BUCH, ANL)
BAUD	70	PL 31B 549	R. Baud *et al.*	(CERN Boson Spectrometer Collab.)
ANDERSON	69	PRL 22 1390	E.W. Anderson *et al.*	(BNL, CMU)
BOESEBECK	68	NP B4 501	K. Boesebeck *et al.*	(AACH, BERL, CERN)
HUSON	68	PL 28B 208	R. Huson *et al.*	(ORSAY, MILA, UCLA)
ALLES-...	67B	NC 50A 776	V. Alles-Borelli *et al.*	(CERN, BONN)
DANYSZ	67B	NC 51A 801	J.A. Danysz, B.R. French, V. Simak	(CERN)

CHIKOVANI	66	PL 22 233	G.E. Chikovani *et al.*	(SERP)
FOCACCI	66	PRL 17 890	M.N. Focacci *et al.*	(CERN)