$a_1(1260)$

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

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$a_1(1260)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
1230±40 OUR ESTIMATE						
• • • We do not use the following data for averages, fits, limits, etc. • • •						
1203± 3		[1] GOMEZ-DUMM	04	RVUE		$\tau^+ \to \pi^+\pi^+\pi^-\nu_\tau$
1331±10± 3	37k	[2] ASNER	00	CLE2		10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$
1255± 7± 6	5904	[3] ABREU	98G	DLPH		e^+e^-
1207± 5± 8	5904	[4] ABREU	98G	DLPH		e^+e^-
1196± 4± 5	5904	[5,6] ABREU	98G	DLPH		e^+e^-
1240±10		BARBERIS	98B			450 $pp \to p_f\pi^+\pi^-\pi^0 p_s$
1262± 9± 7		[3,7] ACKERSTAFF	97R	OPAL		E^{ee}_{cm}= 88–94, $\tau \to 3\pi\nu$
1210± 7± 2		[4,7] ACKERSTAFF	97R	OPAL		E^{ee}_{cm}= 88–94, $\tau \to 3\pi\nu$
1211± 7^{+50}_{-0}		[4] ALBRECHT	93C	ARG		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
1121± 8		[8] ANDO	92	SPEC		8 $\pi^- p \to \pi^+\pi^-\pi^0 n$
1242±37		[9] IVANOV	91	RVUE		$\tau \to \pi^+\pi^+\pi^-\nu$
1260±14		[10] IVANOV	91	RVUE		$\tau \to \pi^+\pi^+\pi^-\nu$
1250± 9		[11] IVANOV	91	RVUE		$\tau \to \pi^+\pi^+\pi^-\nu$
1208±15		ARMSTRONG	90	OMEG	0	300.0$pp \to pp\pi^+\pi^-\pi^0$
1220±15		[12] ISGUR	89	RVUE		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
1260±25		[13] BOWLER	88	RVUE		
1166±18±11		BAND	87	MAC		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
1164±41±23		BAND	87	MAC		$\tau^+ \to \pi^+\pi^0\pi^0\nu$
1250±40		[12] TORNQVIST	87	RVUE		
1046±11		ALBRECHT	86B	ARG		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
1056±20±15		RUCKSTUHL	86	DLCO		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
1194±14±10		SCHMIDKE	86	MRK2		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
1255±23		BELLINI	85	SPEC		40 $\pi^- A \to \pi^-\pi^+\pi^- A$
1240±80		[14] DANKOWY...	81	SPEC	0	8.45 $\pi^- p \to n3\pi$
1280±30		[14] DAUM	81B	CNTR		63,94 $\pi^- p \to p3\pi$
1041±13		[15] GAVILLET	77	HBC	+	4.2 $K^- p \to \Sigma 3\pi$

[1] Using the data of BARATE 98R.
[2] From a fit to the 3π mass spectrum including the $K\overline{K}^*(892)$ threshold.
[3] Uses the model of KUHN 90.
[4] Uses the model of ISGUR 89.
[5] Includes the effect of a possible a_1' state.
[6] Uses the model of FEINDT 90.

[7] Supersedes AKERS 95P.
[8] Average and spread of values using 2 variants of the model of BOWLER 75.
[9] Reanalysis of RUCKSTUHL 86.
[10] Reanalysis of SCHMIDKE 86.
[11] Reanalysis of ALBRECHT 86B.
[12] From a combined reanalysis of ALBRECHT 86B, SCHMIDKE 86, and RUCKSTUHL 86.
[13] From a combined reanalysis of ALBRECHT 86B and DAUM 81B.
[14] Uses the model of BOWLER 75.
[15] Produced in K^- backward scattering.

$a_1(1260)$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID		TECN	CHG	COMMENT
250 to 600 OUR ESTIMATE						
• • • We do not use the following data for averages, fits, limits, etc. • • •						
480 ± 20		[16] GOMEZ-DUMM	04	RVUE		$\tau^+ \to \pi^+\pi^+\pi^-\nu_\tau$
460 ± 85	205	[17] DRUTSKOY	02	BELL		$B \to D^{(*)} K^- K^{*0}$
814 ± 36 ± 13	37k	[18] ASNER	00	CLE2		10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$
450 ± 50	22k	[19] AKHMETSHIN	99E	CMD2		1.05–1.38 $e^+e^- \to \pi^+\pi^-\pi^0\pi^0$
570 ± 10		[20] BONDAR	99	RVUE		$e^+e^- \to 4\pi$, $\tau \to 3\pi\nu_\tau$
587 ± 27 ± 21	5904	[21] ABREU	98G	DLPH		e^+e^-
478 ± 3 ± 15	5904	[22] ABREU	98G	DLPH		e^+e^-
425 ± 14 ± 8	5904	[23,24] ABREU	98G	DLPH		e^+e^-
400 ± 35		BARBERIS	98B			450 $pp \to p_f\pi^+\pi^-\pi^0 p_s$
621 ± 32 ± 58		[21,25] ACKERSTAFF	97R	OPAL		E^{ee}_{cm}= 88–94, $\tau \to 3\pi\nu$
457 ± 15 ± 17		[22,25] ACKERSTAFF	97R	OPAL		E^{ee}_{cm}= 88–94, $\tau \to 3\pi\nu$
446 ± 21 $^{+140}_{-0}$		[22] ALBRECHT	93C	ARG		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
239 ± 11		ANDO	92	SPEC		8 $\pi^- p \to \pi^+\pi^-\pi^0 n$
266 ± 13 ± 4		[26] ANDO	92	SPEC		8 $\pi^- p \to \pi^+\pi^-\pi^0 n$
465 $^{+228}_{-143}$		[27] IVANOV	91	RVUE		$\tau \to \pi^+\pi^+\pi^-\nu$
298 $^{+40}_{-34}$		[28] IVANOV	91	RVUE		$\tau \to \pi^+\pi^+\pi^-\nu$
488 ± 32		[29] IVANOV	91	RVUE		$\tau \to \pi^+\pi^+\pi^-\nu$
430 ± 50		ARMSTRONG	90	OMEG	0	300.0 $pp \to pp\pi^+\pi^-\pi^0$
420 ± 40		[30] ISGUR	89	RVUE		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
396 ± 43		[31] BOWLER	88	RVUE		
405 ± 75 ± 25		BAND	87	MAC		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
419 ± 108 ± 57		BAND	87	MAC		$\tau^+ \to \pi^+\pi^0\pi^0\nu$
521 ± 27		ALBRECHT	86B	ARG		$\tau^+ \to \pi^+\pi^+\pi^-\nu$

$476^{+132}_{-120} \pm 54$	RUCKSTUHL	86	DLCO		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
$462 \pm 56 \pm 30$	SCHMIDKE	86	MRK2		$\tau^+ \to \pi^+\pi^+\pi^-\nu$
292 ± 40	BELLINI	85	SPEC		40 $\pi^- A \to \pi^-\pi^+\pi^- A$
380 ± 100	[32] DANKOWY...	81	SPEC	0	8.45 $\pi^- p \to n3\pi$
300 ± 50	[32] DAUM	81B	CNTR		63,94 $\pi^- p \to p3\pi$
230 ± 50	[33] GAVILLET	77	HBC	+	4.2 $K^- p \to \Sigma 3\pi$

[16] Using the data of BARATE 98R.
[17] From a fit of the $K^- K^{*0}$ distribution assuming $m_{a_1} = 1230$ MeV and purely resonant production of the $K^- K^{*0}$ system.
[18] From a fit to the 3π mass spectrum including the $K\overline{K}^*(892)$ threshold.
[19] Using the $a_1(1260)$ mass of 1230 MeV.
[20] From AKHMETSHIN 99E and ASNER 00 data using the $a_1(1260)$ mass of 1230 MeV.
[21] Uses the model of KUHN 90.
[22] Uses the model of ISGUR 89.
[23] Includes the effect of a possible a_1' state.
[24] Uses the model of FEINDT 90.
[25] Supersedes AKERS 95P.
[26] Average and spread of values using 2 variants of the model of BOWLER 75.
[27] Reanalysis of RUCKSTUHL 86.
[28] Reanalysis of SCHMIDKE 86.
[29] Reanalysis of ALBRECHT 86B.
[30] From a combined reanalysis of ALBRECHT 86B, SCHMIDKE 86, and RUCKSTUHL 86.
[31] From a combined reanalysis of ALBRECHT 86B and DAUM 81B.
[32] Uses the model of BOWLER 75.
[33] Produced in K^- backward scattering.

$a_1(1260)$ DECAY MODES

	Mode	Fraction (Γ_i/Γ)
Γ_1	$\pi^+\pi^-\pi^0$	
Γ_2	$\pi^0\pi^0\pi^0$	
Γ_3	$(\rho\pi)_{S-\text{wave}}$	seen
Γ_4	$(\rho\pi)_{D-\text{wave}}$	seen
Γ_5	$(\rho(1450)\pi)_{S-\text{wave}}$	seen
Γ_6	$(\rho(1450)\pi)_{D-\text{wave}}$	seen
Γ_7	$\sigma\pi$	seen
Γ_8	$f_0(980)\pi$	not seen
Γ_9	$f_0(1370)\pi$	seen
Γ_{10}	$f_2(1270)\pi$	seen
Γ_{11}	$K\overline{K}^*(892)+$ c.c.	seen
Γ_{12}	$\pi\gamma$	seen

$a_1(1260)$ PARTIAL WIDTHS

$\Gamma(\pi\gamma)$ — Γ_{12}

VALUE (keV)	DOCUMENT ID		TECN	COMMENT
640±246	ZIELINSKI	84C	SPEC	200 $\pi^+ Z \rightarrow Z3\pi$

D-wave/S-wave AMPLITUDE RATIO IN DECAY OF $a_1(1260) \rightarrow \rho\pi$

VALUE	DOCUMENT ID		TECN	COMMENT
−0.108±0.016 OUR AVERAGE				
−0.14 ±0.04 ±0.07	[36] CHUNG	02	B852	18.3 $\pi^- p \rightarrow \pi^+\pi^-\pi^- p$
−0.10 ±0.02 ±0.02	[34,35] ACKERSTAFF	97R	OPAL	E^{ee}_{cm}= 88–94, $\tau \rightarrow 3\pi\nu$
−0.11 ±0.02	[34] ALBRECHT	93C	ARG	$\tau^+ \rightarrow \pi^+\pi^+\pi^-\nu$

[34] Uses the model of ISGUR 89.
[35] Supersedes AKERS 95P.
[36] Deck-type background not subtracted.

$a_1(1260)$ BRANCHING RATIOS

$\Gamma((\rho\pi)_{S-\text{wave}})/\Gamma_{\text{total}}$ — Γ_3/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
60.19	37k	[37] ASNER	00	CLE2	10.6 $e^+e^- \rightarrow \tau^+\tau^-$, $\tau^- \rightarrow \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma((\rho\pi)_{D-\text{wave}})/\Gamma_{\text{total}}$ — Γ_4/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
1.30±0.60±0.22	37k	[37] ASNER	00	CLE2	10.6 $e^+e^- \rightarrow \tau^+\tau^-$, $\tau^- \rightarrow \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma((\rho(1450)\pi)_{S-\text{wave}})/\Gamma_{\text{total}}$ — Γ_5/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
0.56±0.84±0.32	37k	[37,38] ASNER	00	CLE2	10.6 $e^+e^- \rightarrow \tau^+\tau^-$, $\tau^- \rightarrow \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma((\rho(1450)\pi)_{D-\text{wave}})/\Gamma_{\text{total}}$ — Γ_6/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.04±1.20±0.28	37k	[37,38] ASNER	00	CLE2	10.6 $e^+e^- \rightarrow \tau^+\tau^-$, $\tau^- \rightarrow \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma(\sigma\pi)/\Gamma_{total}$ — Γ_7/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
seen		CHUNG	02	B852	18.3 $\pi^- p \to \pi^+\pi^-\pi^- p$
$18.76 \pm 4.29 \pm 1.48$	37k	[37,39] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma(f_0(980)\pi)/\Gamma_{total}$ — Γ_8/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
not seen	37k	ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma(f_0(1370)\pi)/\Gamma_{total}$ — Γ_9/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$7.40 \pm 2.71 \pm 1.26$	37k	[37,40] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma(f_2(1270)\pi)/\Gamma_{total}$ — Γ_{10}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$1.19 \pm 0.49 \pm 0.17$	37k	[37,41] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$

$\Gamma(K\overline{K}^*(892)+\text{c.c.})/\Gamma_{total}$ — Γ_{11}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2.2 ± 0.5	2255	[42] COAN	04	CLEO	$\tau^- \to K^-\pi^-K^+\nu_\tau$
8 to 15	205	[43] DRUTSKOY	02	BELL	$B \to D^{(*)}K^-K^{*0}$
$3.3 \pm 0.5 \pm 0.1$	37k	[44] ASNER	00	CLE2	10.6 $e^+e^- \to \tau^+\tau^-$, $\tau^- \to \pi^-\pi^0\pi^0\nu_\tau$
2.6 ± 0.3		[45] BARATE	99R	ALEP	$\tau \to K\overline{K}\pi\nu_\tau$

$\Gamma(\sigma\pi)/\Gamma((\rho\pi)_{S-wave})$ — Γ_7/Γ_3

VALUE	EVTS	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •					
~ 0.3	28k	AKHMETSHIN	99E	CMD2	1.05–1.38 $e^+e^- \to \pi^+\pi^-\pi^+\pi^-$
0.003 ± 0.003		[46] LONGACRE	82	RVUE	

$\Gamma(\pi^0\pi^0\pi^0)/\Gamma(\pi^+\pi^-\pi^0)$ — Γ_2/Γ_1

VALUE	CL%	DOCUMENT ID		COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.008	90	[47] BARBERIS	01	450 $pp \to p_f 3\pi^0 p_s$

[37] From a fit to the Dalitz plot.
[38] Assuming for $\rho(1450)$ mass and width of 1370 and 386 MeV respectively.
[39] Assuming for σ mass and width of 860 and 880 MeV respectively.
[40] Assuming for $f_0(1370)$ mass and width of 1186 and 350 MeV respectively.
[41] Assuming for $f_2(1270)$ mass and width of 1275 and 185 MeV respectively.
[42] Using structure functions from KUHN 92 and DECKER 93A and $B(\tau^- \to K^-\pi^-K^+\nu_\tau) = (0.155 \pm 0.006 \pm 0.009)\%$ from BRIERE 03.
[43] From a comparison to ALAM 94 assuming purely resonant production of the K^-K^{*0} system.
[44] From a fit to the 3π mass spectrum including the $K\overline{K}^*(892)$ threshold.
[45] Assuming $a_1(1260)$ dominance and taking $B(\tau \to a_1(1260)\nu_\tau)$ from BUSKULIC 96.
[46] Uses multichannel Aitchison-Bowler model (BOWLER 75). Uses data from GAVILLET 77, DAUM 80, and DANKOWYCH 81.
[47] Inconsistent with observations of $\sigma\pi$, $f_0(1370)\pi$, and $f_2(1270)\pi$ decay modes.

$a_1(1260)$ REFERENCES

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GOMEZ-DUMM	04	PR D69 073002	D. Gomez Dumm, A. Pich, J. Portoles	
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BONDAR	99	PL B466 403	A.E. Bondar et al.	(Novosibirsk CMD-2 Collab.)
ABREU	98G	PL B426 411	P. Abreu et al.	(DELPHI Collab.)
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ALAM	94	PR D50 43	M.S. Alam et al.	(CLEO Collab.)
ALBRECHT	93C	ZPHY C58 61	H. Albrecht et al.	(ARGUS Collab.)
DECKER	93A	ZPHY C58 445	R. Decker et al.	
ANDO	92	PL B291 496	A. Ando et al.	(KEK, KYOT, NIRS, SAGA+)
KUHN	92	ZPHY C56 661	J.H. Kuhn, E. Mirkes	
IVANOV	91	ZPHY C49 563	Y.P. Ivanov, A.A. Osipov, M.K. Volkov	(JINR)
ARMSTRONG	90	ZPHY C48 213	T.A. Armstrong, M. Benayoun, W. Beusch	
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BOWLER	88	PL B209 99	M.G. Bowler	(OXF)
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		Translated from YAF 41 1223.		
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