

# a<sub>4</sub>(2040)

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

## a<sub>4</sub>(2040) MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
<b>1996<sup>+10</sup><sub>-9</sub> OUR AVERAGE</b> Error includes scale factor of 1.1.					
1885 ± 13 <sup>+50</sup> <sub>-2</sub>	420k	ALEKSEEV	10	COMP	190 π <sup>-</sup> Pb → π <sup>-</sup> π <sup>-</sup> π <sup>+</sup> Pb'
1985 ± 10 ± 13	145k	LU	05	B852	18 π <sup>-</sup> p → ω π <sup>-</sup> π <sup>0</sup> p
1996 ± 25 ± 43		CHUNG	02	B852	18.3 π <sup>-</sup> p → 3π p
2005 <sup>+25</sup> <sub>-45</sub>		<sup>1</sup> ANISOVICH	01F	SPEC	2.0 $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$
2000 ± 40 <sup>+60</sup> <sub>-20</sub>		IVANOV	01	B852	18 π <sup>-</sup> p → η' π <sup>-</sup> p
1944 ± 8 ± 50		<sup>2</sup> AMELIN	99	VES	37 π <sup>-</sup> A → ω π <sup>-</sup> π <sup>0</sup> A*
2010 ± 20		<sup>3</sup> DONSKOV	96	GAM2 0	38 π <sup>-</sup> p → η π <sup>0</sup> n
2040 ± 30		<sup>4</sup> CLELAND	82B	SPEC ±	50 π p → K <sub>S</sub> <sup>0</sup> K <sup>±</sup> p
2030 ± 50		<sup>5</sup> CORDEN	78C	OMEG 0	15 π <sup>-</sup> p → 3π n
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
2004 ± 6	80k	<sup>6</sup> UMAN	06	E835	5.2 $\bar{p}p \rightarrow \eta\eta\pi^0$
1903 ± 10		<sup>7</sup> BALDI	78	SPEC -	10 π <sup>-</sup> p → p K <sub>S</sub> <sup>0</sup> K <sup>-</sup>

<sup>1</sup> From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.

<sup>2</sup> May be a different state.

<sup>3</sup> From a simultaneous fit to the G<sub>+</sub> and G<sub>0</sub> wave intensities.

<sup>4</sup> From an amplitude analysis.

<sup>5</sup> J<sup>P</sup> = 4<sup>+</sup> is favored, though J<sup>P</sup> = 2<sup>+</sup> cannot be excluded.

<sup>6</sup> Statistical error only.

<sup>7</sup> From a fit to the Y<sub>8</sub><sup>0</sup> moment. Limited by phase space.

## a<sub>4</sub>(2040) WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	CHG	COMMENT
<b>255<sup>+28</sup><sub>-24</sub> OUR AVERAGE</b> Error includes scale factor of 1.3. See the ideogram below.					
294 ± 25 <sup>+46</sup> <sub>-19</sub>	420k	ALEKSEEV	10	COMP	190 π <sup>-</sup> Pb → π <sup>-</sup> π <sup>-</sup> π <sup>+</sup> Pb'
231 ± 30 ± 46	145k	LU	05	B852	18 π <sup>-</sup> p → ω π <sup>-</sup> π <sup>0</sup> p
298 ± 81 ± 85		CHUNG	02	B852	18.3 π <sup>-</sup> p → 3π p
180 ± 30		<sup>8</sup> ANISOVICH	01F	SPEC	2.0 $\bar{p}p \rightarrow 3\pi^0, \pi^0\eta, \pi^0\eta'$
350 ± 100 <sup>+70</sup> <sub>-50</sub>		IVANOV	01	B852	18 π <sup>-</sup> p → η' π <sup>-</sup> p

$324 \pm 26 \pm 75$		<sup>9</sup> AMELIN	99	VES	$37 \pi^- A \rightarrow \omega \pi^- \pi^0 A^*$
$370 \pm 80$		<sup>10</sup> DONSKOV	96	GAM2 0	$38 \pi^- p \rightarrow \eta \pi^0 n$
$380 \pm 150$		<sup>11</sup> CLELAND	82B	SPEC $\pm$	$50 \pi p \rightarrow K_S^0 K^\pm p$
$510 \pm 200$		<sup>12</sup> CORDEN	78C	OMEG 0	$15 \pi^- p \rightarrow 3 \pi n$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$401 \pm 16$	80k	<sup>13</sup> UMAN	06	E835	$5.2 \bar{p} p \rightarrow \eta \eta \pi^0$
$166 \pm 43$		<sup>14</sup> BALDI	78	SPEC -	$10 \pi^- p \rightarrow p K_S^0 K^-$

<sup>8</sup> From the combined analysis of ANISOVICH 99C, ANISOVICH 99E, and ANISOVICH 01F.

<sup>9</sup> May be a different state.

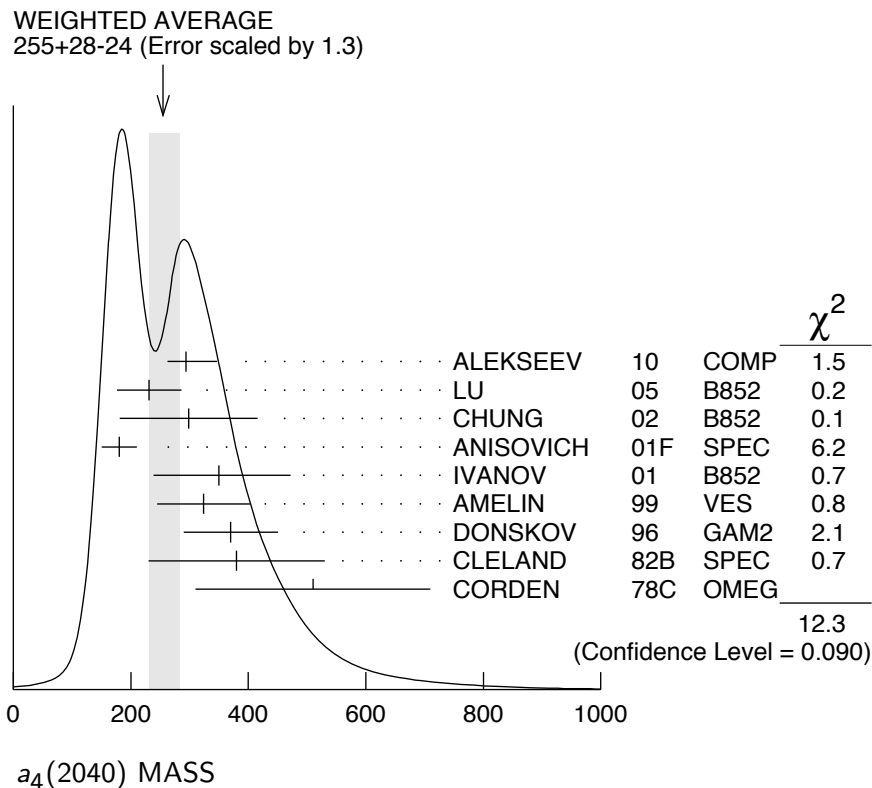
<sup>10</sup> From a simultaneous fit to the  $G_+$  and  $G_0$  wave intensities.

<sup>11</sup> From an amplitude analysis.

<sup>12</sup>  $J^P = 4^+$  is favored, though  $J^P = 2^+$  cannot be excluded.

<sup>13</sup> Statistical error only.

<sup>14</sup> From a fit to the  $Y_8^0$  moment. Limited by phase space.



### **$a_4(2040)$ DECAY MODES**

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $K \bar{K}$	seen
$\Gamma_2$ $\pi^+ \pi^- \pi^0$	seen
$\Gamma_3$ $\rho \pi$	seen
$\Gamma_4$ $f_2(1270) \pi$	seen

$\Gamma_5$	$\omega\pi^-\pi^0$	seen
$\Gamma_6$	$\omega\rho$	seen
$\Gamma_7$	$\eta\pi^0$	seen
$\Gamma_8$	$\eta'(958)\pi$	seen

### $a_4(2040)$ BRANCHING RATIOS

$\Gamma(K\bar{K})/\Gamma_{\text{total}}$					$\Gamma_1/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
seen	BALDI	78	SPEC	$\pm$	$10\pi^-p \rightarrow K_S^0 K^- p$

$\Gamma(\pi^+\pi^-\pi^0)/\Gamma_{\text{total}}$					$\Gamma_2/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
seen	CORDEN	78C	OMEG	0	$15\pi^-p \rightarrow 3\pi n$

$\Gamma(\rho\pi)/\Gamma(f_2(1270)\pi)$					$\Gamma_3/\Gamma_4$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
$1.1 \pm 0.2 \pm 0.2$	CHUNG	02	B852		$18.3\pi^-p \rightarrow 3\pi p$

$\Gamma(\eta\pi^0)/\Gamma_{\text{total}}$					$\Gamma_7/\Gamma$
<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	
seen	DONSKOV	96	GAM2	0	$38\pi^-p \rightarrow \eta\pi^0 n$

$\Gamma(\omega\rho)/\Gamma_{\text{total}}$	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>	$\Gamma_6/\Gamma$
seen	145k	LU	05	B852	$18\pi^-p \rightarrow \omega\pi^-\pi^0 p$	

### $a_4(2040)$ REFERENCES

ALEKSEEV	10	PRL 104 241803	M.G. Alekseev <i>et al.</i>	(COMPASS Collab.)
UMAN	06	PR D73 052009	I. Uman <i>et al.</i>	(FNAL E835)
LU	05	PRL 94 032002	M. Lu <i>et al.</i>	(BNL E852 Collab.)
CHUNG	02	PR D65 072001	S.U. Chung <i>et al.</i>	(BNL E852 Collab.)
ANISOVICH	01F	PL B517 261	A.V. Anisovich <i>et al.</i>	
IVANOV	01	PRL 86 3977	E.I. Ivanov <i>et al.</i>	(BNL E852 Collab.)
AMELIN	99	PAN 62 445	D.V. Amelin <i>et al.</i>	(VES Collab.)
		Translated from YAF 62 487.		
ANISOVICH	99C	PL B452 173	A.V. Anisovich <i>et al.</i>	
ANISOVICH	99E	PL B452 187	A.V. Anisovich <i>et al.</i>	
DONSKOV	96	PAN 59 982	S.V. Donskov <i>et al.</i>	(GAMS Collab.) IGJPC
		Translated from YAF 59 1027.		
CLELAND	82B	NP B208 228	W.E. Cleland <i>et al.</i>	(DURH, GEVA, LAUS+)
BALDI	78	PL 74B 413	R. Baldi <i>et al.</i>	(GEVA) JP
CORDEN	78C	NP B136 77	M.J. Corden <i>et al.</i>	(BIRM, RHEL, TELA+) JP