

**$a_4(2040)$** 

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

 **$a_4(2040)$  MASS**

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

<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  $G_+$  and  $G_0$  wave intensities.<sup>4</sup> From an amplitude analysis.<sup>5</sup>  $J^P = 4^+$  is favored, though  $J^P = 2^+$  cannot be excluded.<sup>6</sup> Statistical error only.<sup>7</sup> From a fit to the  $Y_8^0$  moment. Limited by phase space. **$a_4(2040)$  WIDTH**

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

$324 \pm 26 \pm 75$	<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.

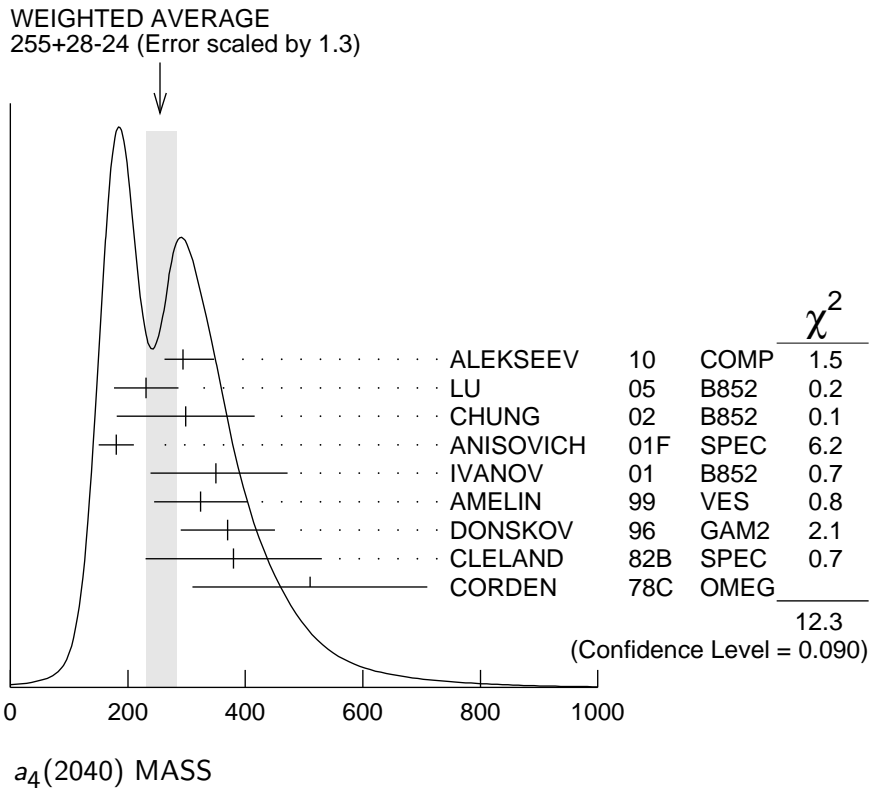
<sup>10</sup> From a simultaneous fit to the  $G_+$  and  $G_0$  wave intensities.

<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>	
<b>seen</b>	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>	
<b>seen</b>	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>	
<b><math>1.1 \pm 0.2 \pm 0.2</math></b>	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>	
<b>seen</b>	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>	$\Gamma_6/\Gamma$
<u>VALUE</u>						
<b>seen</b>	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