

# $D_1(2420)^\pm$

$I(J^P) = \frac{1}{2}(??)$   
 $I$  needs confirmation.

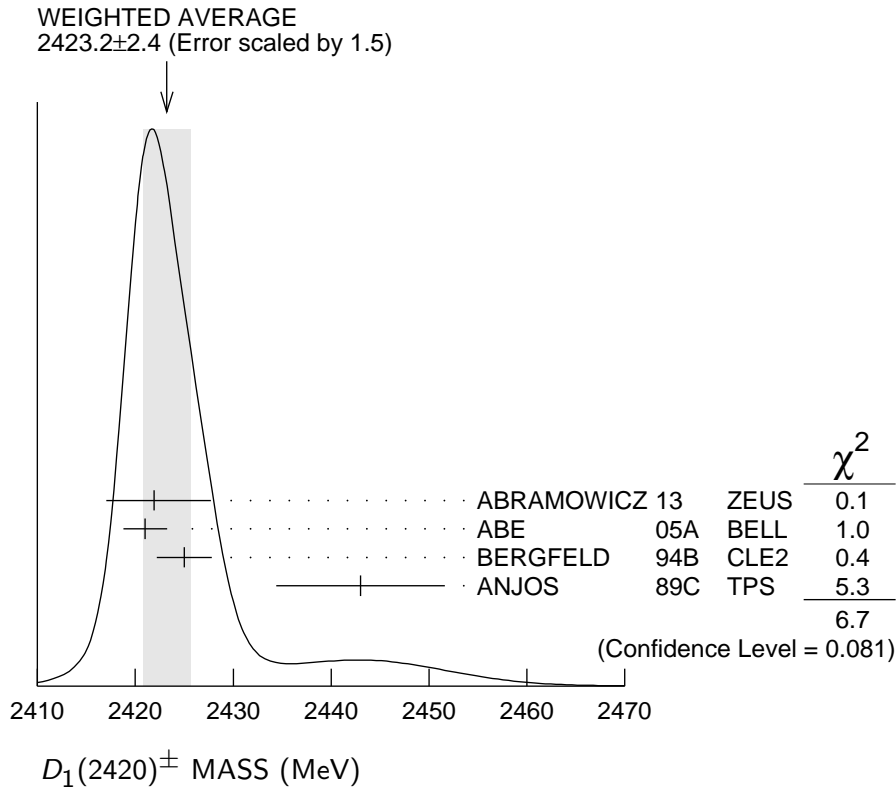
OMITTED FROM SUMMARY TABLE

Seen in  $D^*(2007)^0 \pi^+$ .  $J^P = 0^+$  ruled out.

## $D_1(2420)^\pm$ MASS

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>2423.2±2.4 OUR AVERAGE</b> Error includes scale factor of 1.5. See the ideogram below.				
2421.9±4.7 <sup>+3.4</sup> <sub>-1.2</sub>	759	<sup>1</sup> ABRAMOWICZ13	ZEUS	$e^\pm p \rightarrow D^{(*)0} \pi^+ X$
2421 ±2 ±1	124	ABE	05A	BELL $\bar{B}^0 \rightarrow D^+ \pi^+ \pi^- \pi^-$
2425 ±2 ±2	146	BERGFELD	94B	CLE2 $e^+ e^- \rightarrow D^{*0} \pi^+ X$
2443 ±7 ±5	190	ANJOS	89C	TPS $\gamma N \rightarrow D^0 \pi^+ X^0$

<sup>1</sup>From the fit of the  $M(D^0 \pi^+)$  distribution. The widths of the  $D_1^+$  and  $D_2^{*+}$  are fixed to 25 MeV and 37 MeV, and  $A_{D_1}$  and  $A_{D_2}$  are fixed to the theoretical predictions of 3 and -1, respectively.



## $m_{D_1^*(2420)^\pm} - m_{D_1^*(2420)^0}$

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b><math>4^{+2}_{-3} \pm 3</math></b>	BERGFELD	94B	CLE2 $e^+ e^- \rightarrow \text{hadrons}$

## $D_1(2420)^\pm$ WIDTH

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>25 ± 6 OUR AVERAGE</b>				
21 ± 5 ± 8	124	ABE	05A BELL	$\bar{B}^0 \rightarrow D^+ \pi^+ \pi^- \pi^-$
26 <sup>+</sup> <sub>7</sub> ± 8 <sub>4</sub>	146	BERGFELD	94B CLE2	$e^+ e^- \rightarrow D^{*0} \pi^+ X$
41 ± 19 ± 8	190	ANJOS	89C TPS	$\gamma N \rightarrow D^0 \pi^+ X^0$

## $D_1(2420)^\pm$ DECAY MODES

$D_1^*(2420)^-$  modes are charge conjugates of modes below.

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $D^*(2007)^0 \pi^+$	seen
$\Gamma_2$ $D^+ \pi^+ \pi^-$	seen
$\Gamma_3$ $D^+ \rho^0$	
$\Gamma_4$ $D^+ f_0(500)$	
$\Gamma_5$ $D_0^*(2400)^0 \pi^+$	
$\Gamma_6$ $D^0 \pi^+$	not seen
$\Gamma_7$ $D^{*+} \pi^+ \pi^-$	not seen

## $D_1(2420)^\pm$ BRANCHING RATIOS

$\Gamma(D^*(2007)^0 \pi^+)/\Gamma_{\text{total}}$	$\Gamma_1/\Gamma$		
VALUE	DOCUMENT ID	TECN	COMMENT
<b>seen</b>	ANJOS	89C TPS	$\gamma N \rightarrow D^0 \pi^+ X^0$

$\Gamma(D^0 \pi^+)/\Gamma(D^*(2007)^0 \pi^+)$	$\Gamma_6/\Gamma_1$			
VALUE	CL%	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
<0.18	90	BERGFELD	94B CLE2	$e^+ e^- \rightarrow \text{hadrons}$

## $D_1(2420)^\pm$ POLARIZATION AMPLITUDE $A_{D_1}$

A polarization amplitude  $A_{D_1}$  is a parameter that depends on the initial polarization of the  $D_1$  and is sensitive to a possible  $S$ -wave contribution to its decay. For  $D_1$  decays the helicity angle,  $\theta_h$ , distribution varies like  $1 + A_{D_1} \cos^2 \theta_h$ , where  $\theta_h$  is the angle in the  $D^*$  rest frame between the two pions emitted by the  $D_1 \rightarrow D^* \pi$  and the  $D^* \rightarrow D \pi$ .

Unpolarized  $D_1$  decaying purely via  $D$ -wave is predicted to give  $A_{D_1} = 3$ .

VALUE	DOCUMENT ID	TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •			
3.8 ± 0.6 ± 0.8	<sup>2</sup> AUBERT	09Y BABR	$B^0 \rightarrow D_1^- \ell^+ \nu_\ell$

<sup>2</sup> Assuming  $\Gamma(\Upsilon(4S) \rightarrow B^+ B^-) / \Gamma(\Upsilon(4S) \rightarrow B^0 \bar{B}^0) = 1.065 \pm 0.026$  and equal partial widths and helicity angle distributions for charged and neutral  $D_1$  mesons.

---

### $D_1(2420)^\pm$ REFERENCES

ABRAMOWICZ	13	NP B866 229	H. Abramowicz <i>et al.</i>	(ZEUS Collab.)
AUBERT	09Y	PRL 103 051803	B. Aubert <i>et al.</i>	(BABAR Collab.)
ABE	05A	PRL 94 221805	K. Abe <i>et al.</i>	(BELLE Collab.)
BERGFELD	94B	PL B340 194	T. Bergfeld <i>et al.</i>	(CLEO Collab.)
ANJOS	89C	PRL 62 1717	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)

---