

$D_1(2420)^0$ $I(J^P) = \frac{1}{2}(1^+)$
 I needs confirmation. **$D_1(2420)^0$ MASS**The fit includes D^\pm , D^0 , D_s^\pm , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^*(2460)^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2421.3±0.6 OUR FIT	Error includes scale factor of 1.2.			
2420.9±0.8 OUR AVERAGE	Error includes scale factor of 1.2.			
2420.1±0.1±0.8	103k	DEL-AMO-SA..10P	BABR	$e^+e^- \rightarrow D^{*+}\pi^-X$
2426 ±3 ±1	151	ABE	05A	BELL $B^- \rightarrow D^0\pi^+\pi^-\pi^-$
2421.4±1.5±0.9		¹ ABE	04D	BELL $B^- \rightarrow D^{*+}\pi^-\pi^-$
2421 $\begin{smallmatrix} +1 \\ -2 \end{smallmatrix}$ ±2	286	AVERY	94C	CLE2 $e^+e^- \rightarrow D^{*+}\pi^-X$
2422 ±2 ±2	51	FRABETTI	94B	E687 $\gamma Be \rightarrow D^{*+}\pi^-X$
2428 ±3 ±2	279	AVERY	90	CLEO $e^+e^- \rightarrow D^{*+}\pi^-X$
2414 ±2 ±5	171	ALBRECHT	89H	ARG $e^+e^- \rightarrow D^{*+}\pi^-X$
2428 ±8 ±5	171	ANJOS	89C	TPS $\gamma N \rightarrow D^{*+}\pi^-X$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
2420.5±2.1±0.9	3110 ± 340	² CHEKANOV	09	ZEUS $e^\pm p \rightarrow D^{*+}\pi^-X$
2421.7±0.7±0.6	7.5k	ABULENCIA	06A	CDF 1900 $p\bar{p} \rightarrow D^{*+}\pi^-X$
2425 ±3	235	³ ABREU	98M	DLPH e^+e^-

¹ Fit includes the contribution from $D_1^*(2430)^0$.² Calculated using the mass difference $m(D_1^0) - m(D^{*+})_{PDG}$ reported below and $m(D^{*+})_{PDG} = 2010.27 \pm 0.17$ MeV. The 0.17 MeV uncertainty of the PDG mass value should be added to the experimental uncertainty of 0.9 MeV.³ No systematic error given. **$m_{D_1^0} - m_{D^{*+}}$** The fit includes D^\pm , D^0 , D_s^\pm , $D^{*\pm}$, D^{*0} , $D_s^{*\pm}$, $D_1(2420)^0$, $D_2^*(2460)^0$, and $D_{s1}(2536)^\pm$ mass and mass difference measurements.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
411.0±0.6 OUR FIT	Error includes scale factor of 1.2.			
411.5±0.8 OUR AVERAGE				
410.2±2.1±0.9	3110 ± 340	CHEKANOV	09	ZEUS $e^\pm p \rightarrow D^{*+}\pi^-X$
411.7±0.7±0.4	7.5k	ABULENCIA	06A	CDF 1900 $p\bar{p} \rightarrow D^{*+}\pi^-X$

 $D_1(2420)^0$ WIDTH

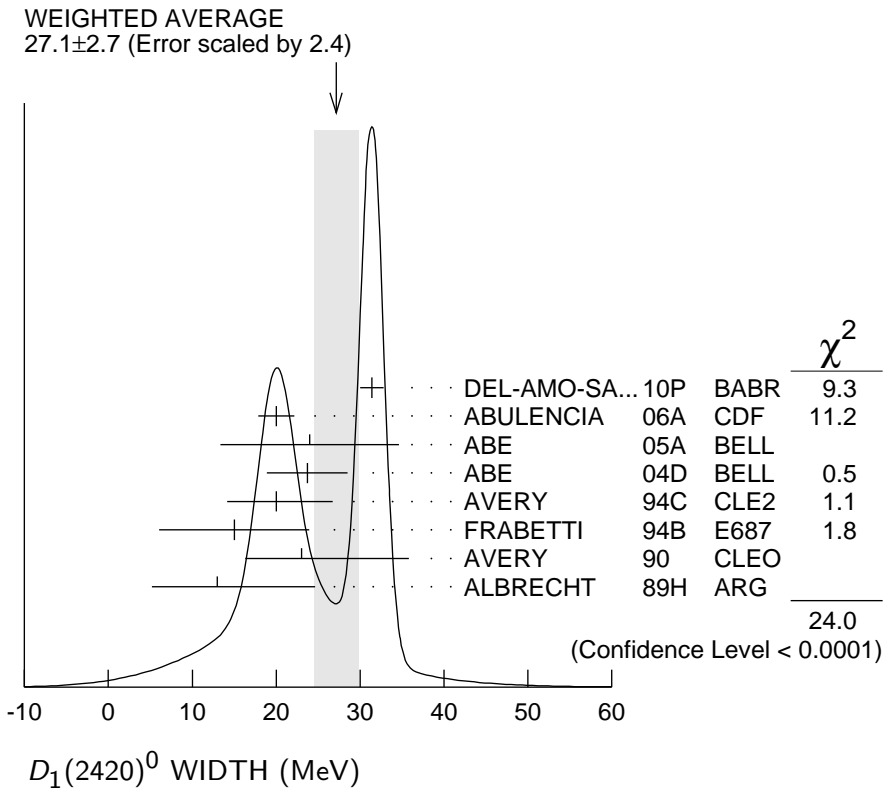
VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
27.1± 2.7 OUR AVERAGE	Error includes scale factor of 2.4. See the ideogram below.			
31.4± 0.5± 1.3	103k	DEL-AMO-SA..10P	BABR	$e^+e^- \rightarrow D^{*+}\pi^-X$
20.0± 1.7± 1.3	7.5k	ABULENCIA	06A	CDF 1900 $p\bar{p} \rightarrow D^{*+}\pi^-X$
24 ± 7 ± 8	151	ABE	05A	BELL $B^- \rightarrow D^0\pi^+\pi^-\pi^-$

$23.7 \pm 2.7 \pm 4.0$		⁴ ABE	04D BELL	$B^- \rightarrow D^{*+} \pi^- \pi^-$
$20 \pm \frac{6}{5} \pm 3$	286	AVERY	94C CLE2	$e^+ e^- \rightarrow D^{*+} \pi^- X$
$15 \pm 8 \pm 4$	51	FRABETTI	94B E687	$\gamma Be \rightarrow D^{*+} \pi^- X$
$23 \pm \frac{8}{6} \pm \frac{10}{3}$	279	AVERY	90 CLEO	$e^+ e^- \rightarrow D^{*+} \pi^- X$
$13 \pm 6 \pm \frac{10}{5}$	171	ALBRECHT	89H ARG	$e^+ e^- \rightarrow D^{*+} \pi^- X$

• • • We do not use the following data for averages, fits, limits, etc. • • •

$53.2 \pm 7.2 \pm \frac{3.3}{4.9}$	3110 ± 340	CHEKANOV	09 ZEUS	$e^\pm p \rightarrow D^{*+} \pi^- X$
$58 \pm 14 \pm 10$	171	ANJOS	89C TPS	$\gamma N \rightarrow D^{*+} \pi^- X$

⁴ Fit includes the contribution from $D_1^*(2430)^0$.



$D_1(2420)^0$ DECAY MODES

$\bar{D}_1(2420)^0$ modes are charge conjugates of modes below.

Mode	Fraction (Γ_i/Γ)
Γ_1 $D^*(2010)^+ \pi^-$	seen
Γ_2 $D^0 \pi^+ \pi^-$	seen
Γ_3 $D^0 \rho^0$	

Γ_4	$D^0 f_0(500)$	
Γ_5	$D_0^*(2400)^+ \pi^-$	
Γ_6	$D^+ \pi^-$	not seen
Γ_7	$D^{*0} \pi^+ \pi^-$	not seen

$D_1(2420)^0$ BRANCHING RATIOS

$\Gamma(D^{*}(2010)^+ \pi^-) / \Gamma_{\text{total}}$					Γ_1 / Γ
<u>VALUE</u>		<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
seen		ACKERSTAFF	97W	OPAL	$e^+ e^- \rightarrow D^{*+} \pi^- X$
seen		AVERY	90	CLEO	$e^+ e^- \rightarrow D^{*+} \pi^- X$
seen		ALBRECHT	89H	ARG	$e^+ e^- \rightarrow D^* \pi^- X$
seen		ANJOS	89C	TPS	$\gamma N \rightarrow D^{*+} \pi^- X$

$\Gamma(D^+ \pi^-) / \Gamma(D^{*}(2010)^+ \pi^-)$					Γ_6 / Γ_1
<u>VALUE</u>	<u>CL%</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>	
<0.24	90	AVERY	90	CLEO	$e^+ e^- \rightarrow D^+ \pi^- X$

$D_1(2420)^0$ 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, θ_h , distribution varies like $1 + A_{D_1} \cos^2 \theta_h$, where θ_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 $A_{D_1} = 3$.

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
5.72 ± 0.25 OUR AVERAGE				
5.72 ± 0.25	103k	DEL-AMO-SA..10P	BABR	$e^+ e^- \rightarrow D^{*+} \pi^- X$
$5.9^{+3.0}_{-1.7} \quad ^{+2.4}_{-1.0}$		CHEKANOV	09	ZEUS $e^\pm p \rightarrow D^{*+} \pi^- X$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
$3.8 \pm 0.6 \pm 0.8$		⁵ AUBERT	09Y	BABR $B^+ \rightarrow D_1^0 \ell^+ \nu_\ell$
$2.74^{+1.40}_{-0.93}$		⁶ AVERY	94C	CLE2 $e^+ e^- \rightarrow D^{*+} \pi^- X$

⁵ 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.

⁶ Systematic uncertainties not estimated.

$D_1(2420)^0$ REFERENCES

DEL-AMO-SA...	10P	PR D82 111101	P. del Amo Sanchez <i>et al.</i>	(BABAR Collab.)
AUBERT	09Y	PRL 103 051803	B. Aubert <i>et al.</i>	(BABAR Collab.)
CHEKANOV	09	EPJ C60 25	S. Chekanov <i>et al.</i>	(ZEUS Collab.)
ABULENCIA	06A	PR D73 051104	A. Abulencia <i>et al.</i>	(CDF Collab.)
ABE	05A	PRL 94 221805	K. Abe <i>et al.</i>	(BELLE Collab.)
ABE	04D	PR D69 112002	K. Abe <i>et al.</i>	(BELLE Collab.)
ABREU	98M	PL B426 231	P. Abreu <i>et al.</i>	(DELPHI Collab.)
ACKERSTAFF	97W	ZPHY C76 425	K. Ackerstaff <i>et al.</i>	(OPAL Collab.)
AVERY	94C	PL B331 236	P. Avery <i>et al.</i>	(CLEO Collab.)
FRABETTI	94B	PRL 72 324	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
AVERY	90	PR D41 774	P. Avery, D. Besson	(CLEO Collab.)
ALBRECHT	89H	PL B232 398	H. Albrecht <i>et al.</i>	(ARGUS Collab.) JP
ANJOS	89C	PRL 62 1717	J.C. Anjos <i>et al.</i>	(FNAL E691 Collab.)
