$D_1(2420)^0$

$I(J^P) = \frac{1}{2}(1^+)$
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.				
$2420.1\pm0.1\pm0.8$	103k	DEL-AMO-SA...10P	BABR	$e^+e^- \to D^{*+}\pi^- X$
$2426\ \pm3\ \pm1$	151	ABE	05A	BELL	$B^- \to D^0\pi^+\pi^-\pi^-$
$2421.4\pm1.5\pm0.9$		[1] ABE	04D	BELL	$B^- \to D^{*+}\pi^-\pi^-$
$2421\ ^{+1}_{-2}\ \pm2$	286	AVERY	94C	CLE2	$e^+e^- \to D^{*+}\pi^- X$
$2422\ \pm2\ \pm2$	51	FRABETTI	94B	E687	$\gamma Be \to D^{*+}\pi^- X$
$2428\ \pm3\ \pm2$	279	AVERY	90	CLEO	$e^+e^- \to D^{*+}\pi^- X$
$2414\ \pm2\ \pm5$	171	ALBRECHT	89H	ARG	$e^+e^- \to D^{*+}\pi^- X$
$2428\ \pm8\ \pm5$	171	ANJOS	89C	TPS	$\gamma N \to D^{*+}\pi^- X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$2420.5\pm2.1\pm0.9$	3110 ± 340	[2] CHEKANOV	09	ZEUS	$e^{\pm}p \to D^{*+}\pi^- X$
$2421.7\pm0.7\pm0.6$	7.5k	ABULENCIA	06A	CDF	1900 $p\overline{p} \to D^{*+}\pi^- X$
$2425\ \pm3$	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					
$410.2\pm2.1\pm0.9$	3110 ± 340	CHEKANOV	09	ZEUS	$e^{\pm}p \to D^{*+}\pi^- X$
$411.7\pm0.7\pm0.4$	7.5k	ABULENCIA	06A	CDF	1900 $p\overline{p} \to D^{*+}\pi^- X$

$D_1(2420)^0$ 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.				
$31.4\pm 0.5\pm 1.3$	103k	DEL-AMO-SA...10P	BABR	$e^+e^- \to D^{*+}\pi^- X$
$20.0\pm 1.7\pm 1.3$	7.5k	ABULENCIA	06A	CDF	1900 $p\overline{p} \to D^{*+}\pi^- X$
$24\ \pm 7\ \pm 8$	151	ABE	05A	BELL	$B^- \to D^0\pi^+\pi^-\pi^-$

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

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

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

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

WEIGHTED AVERAGE
27.1±2.7 (Error scaled by 2.4)

			χ^2
DEL-AMO-SA...	10P	BABR	9.3
ABULENCIA	06A	CDF	11.2
ABE	05A	BELL	
ABE	04D	BELL	0.5
AVERY	94C	CLE2	1.1
FRABETTI	94B	E687	1.8
AVERY	90	CLEO	
ALBRECHT	89H	ARG	
			24.0

(Confidence Level < 0.0001)

$D_1(2420)^0$ WIDTH (MeV)
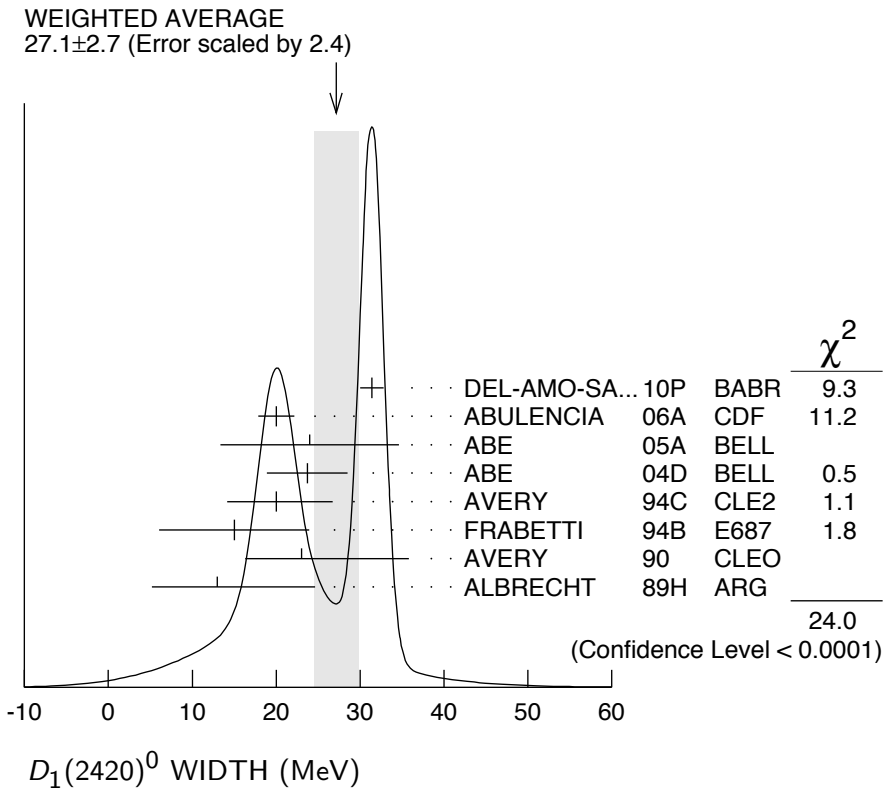
$D_1(2420)^0$ DECAY MODES

$\overline{D}_1(2420)^0$ 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	$D^0 f_0(600)$		
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

$\Gamma(D^*(2010)^+ \pi^-)/\Gamma_{total}$ Γ_1/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
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

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<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 $A_{D_1} = 3$.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
5.72±0.25 OUR AVERAGE				
5.72 ± 0.25	103k	DEL-AMO-SA..10P	BABR	$e^+ e^- \rightarrow D^{*+} \pi^- X$
$5.9 \, {}^{+3.0}_{-1.7} \, {}^{+2.4}_{-1.0}$		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 $\Gamma(\Upsilon(4S) \rightarrow B^+ B^-) / \Gamma(\Upsilon(4S) \rightarrow B^0 \overline{B}^0) = 1.065 \pm 0.026$ 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 *et al.*	(BABAR Collab.)
AUBERT	09Y	PRL 103 051803	B. Aubert *et al.*	(BABAR Collab.)
CHEKANOV	09	EPJ C60 25	S. Chekanov *et al.*	(ZEUS Collab.)
ABULENCIA	06A	PR D73 051104	A. Abulencia *et al.*	(CDF Collab.)
ABE	05A	PRL 94 221805	K. Abe *et al.*	(BELLE Collab.)
ABE	04D	PR D69 112002	K. Abe *et al.*	(BELLE Collab.)
ABREU	98M	PL B426 231	P. Abreu *et al.*	(DELPHI Collab.)
ACKERSTAFF	97W	ZPHY C76 425	K. Ackerstaff *et al.*	(OPAL Collab.)
AVERY	94C	PL B331 236	P. Avery *et al.*	(CLEO Collab.)
FRABETTI	94B	PRL 72 324	P.L. Frabetti *et al.*	(FNAL E687 Collab.)
AVERY	90	PR D41 774	P. Avery, D. Besson	(CLEO Collab.)
ALBRECHT	89H	PL B232 398	H. Albrecht *et al.*	(ARGUS Collab.) JP
ANJOS	89C	PRL 62 1717	J.C. Anjos *et al.*	(FNAL E691 Collab.)