$D_1(2420)^0$

$I(J^P) = \frac{1}{2}(1^+)$

$D_1(2420)^0$ 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.

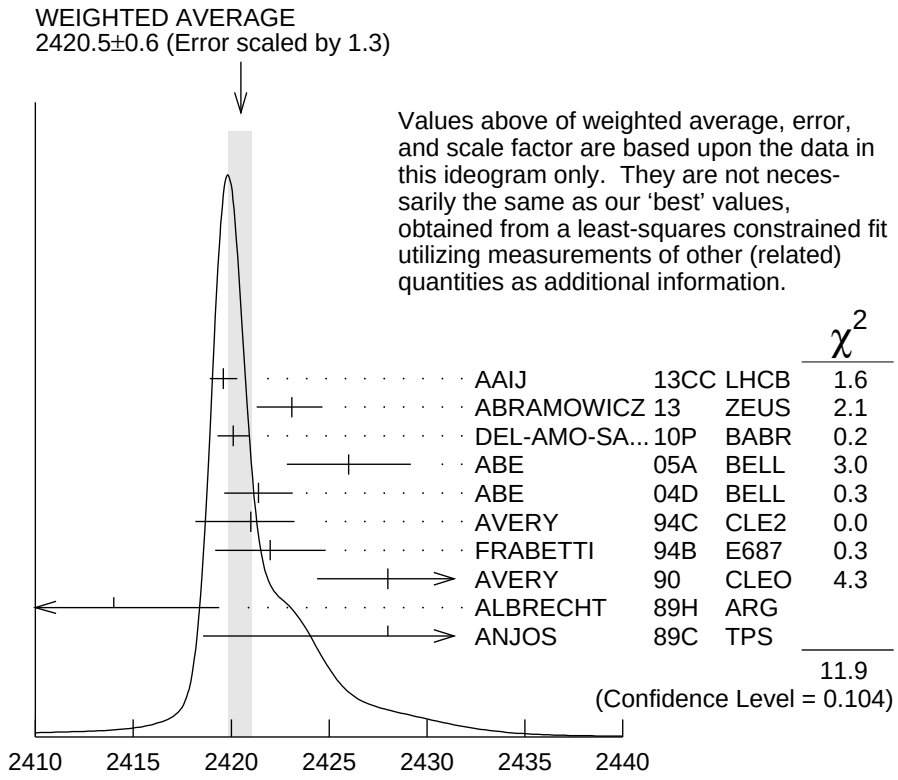
VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
2420.8±0.5 OUR FIT Error includes scale factor of 1.3.					
2420.5±0.6 OUR AVERAGE Error includes scale factor of 1.3. See the ideogram below.					
2419.6±0.1±0.7	210k	AAIJ	13CC	LHCB	$pp \to D^{*+}\pi^- X$
$2423.1\pm1.5^{+0.4}_{-1.0}$	2.7k	[1] ABRAMOWICZ	13	ZEUS	$e^\pm p \to D^{(*)+}\pi^- X$
2420.1±0.1±0.8	103k	DEL-AMO-SA..	10P	BABR	$e^+e^- \to D^{*+}\pi^- X$
2426 ±3 ±1	151	ABE	05A	BELL	$B^- \to D^0\pi^+\pi^-\pi^-$
2421.4±1.5±0.9		[2] ABE	04D	BELL	$B^- \to D^{*+}\pi^-\pi^-$
$2421\ ^{+1}_{-2}$ ±2	286	AVERY	94C	CLE2	$e^+e^- \to D^{*+}\pi^- X$
2422 ±2 ±2	51	FRABETTI	94B	E687	γBe $\to D^{*+}\pi^- X$
2428 ±3 ±2	279	AVERY	90	CLEO	$e^+e^- \to D^{*+}\pi^- X$
2414 ±2 ±5	171	ALBRECHT	89H	ARG	$e^+e^- \to D^{*+}\pi^- X$
2428 ±8 ±5	171	ANJOS	89C	TPS	$\gamma N \to D^{*+}\pi^- X$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2420.5±2.1±0.9	3110±340	[3] CHEKANOV	09	ZEUS	$e^\pm p \to D^{*+}\pi^- X$
2421.7±0.7±0.6	7.5k	ABULENCIA	06A	CDF	1900 $p\overline{p} \to D^{*+}\pi^- X$
2425 ±3	235	[4] ABREU	98M	DLPH	e^+e^-

[1] From the combined fit of the $M(D^+\pi^-)$ and $M(D^{*+}\pi^-)$ distributions. and A_{D_2} fixed to the theoretical prediction of -1.

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

[3] 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.

[4] 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 (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
410.6±0.5 OUR FIT Error includes scale factor of 1.3.					
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 $p\overline{p} \rightarrow D^{*+}\pi^- X$

$D_1(2420)^0$ WIDTH

VALUE (MeV)	*EVTS*	*DOCUMENT ID*		*TECN*	*COMMENT*
31.7± 2.5 OUR AVERAGE Error includes scale factor of 3.5. See the ideogram below.					
35.2± 0.4± 0.9	210k	AAIJ	13CC	LHCB	$pp \rightarrow D^{*+}\pi^- X$
$38.8\pm 5.0^{+1.9}_{-5.4}$	2.7k	[1] ABRAMOWICZ	13	ZEUS	$e^{\pm}p \rightarrow D^{(*)+}\pi^- X$
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 $p\overline{p} \rightarrow D^{*+}\pi^- X$
24 ± 7 ± 8	151	ABE	05A	BELL	$B^- \rightarrow D^0\pi^+\pi^-\pi^-$

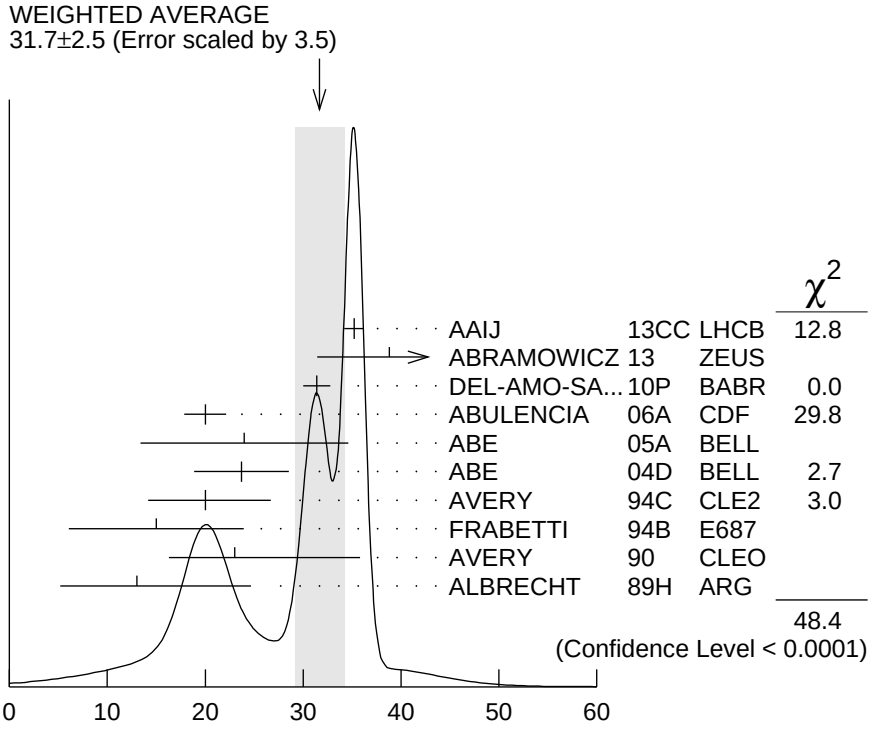
$23.7 \pm 2.7 \pm 4.0$		[2] ABE	04D	BELL	$B^- \to D^{*+}\pi^-\pi^-$
$20 \,^{+6}_{-5} \pm 3$	286	AVERY	94C	CLE2	$e^+e^- \to D^{*+}\pi^- X$
$15 \pm 8 \pm 4$	51	FRABETTI	94B	E687	$\gamma\,\mathrm{Be} \to D^{*+}\pi^- X$
$23 \,^{+8}_{-6} \,^{+10}_{-3}$	279	AVERY	90	CLEO	$e^+e^- \to D^{*+}\pi^- X$
$13 \pm 6 \,^{+10}_{-5}$	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	$\gamma N \to D^{*+}\pi^- X$

[1] From the combined fit of the $M(D^+\pi^-)$ and $M(D^{*+}\pi^-)$ distributions. and A_{D_2} fixed to the theoretical prediction of -1.

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



$D_1(2420)^0$ 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	$D^0 f_0(500)$	
Γ_5	$D_0^*(2300)^+ \pi^-$	
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
5.73±0.25 OUR AVERAGE					
$7.8\ ^{+6.7}_{-2.7}\ ^{+4.6}_{-1.8}$	2.7k	[1] ABRAMOWICZ13		ZEUS	$e^\pm p \rightarrow D^{(*)+} \pi^- X$
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. • • •					
3.30±0.48	210k	[2] AAIJ	13CC	LHCB	$pp \rightarrow D^{*+} \pi^- X$
3.8 ±0.6 ±0.8		[3] AUBERT	09Y	BABR	$B^+ \rightarrow D_1^0 \ell^+ \nu_\ell$
$2.74^{+1.40}_{-0.93}$		[4] AVERY	94C	CLE2	$e^+ e^- \rightarrow D^{*+} \pi^- X$

[1] From the combined fit of the $M(D^+ \pi^-)$ and $M(D^{*+} \pi^-)$ distributions. and A_{D_2} fixed to the theoretical prediction of -1. A pure D-wave not excluded although some S-wave mixing possible.

[2] Systematic uncertainty not estimated. Resonance parameters fixed.

[3] 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.

[4] Systematic uncertainties not estimated.

$D_1(2420)^0$ REFERENCES

AAIJ	13CC	JHEP 1309 145	R. Aaij *et al.*	(LHCb Collab.)
ABRAMOWICZ	13	NP B866 229	H. Abramowicz *et al.*	(ZEUS Collab.)
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.)