$D^*(2010)^{\pm}$

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

$J^P = 1^-$ established by ABLIKIM 23AZ.

$D^*(2010)^{\pm}$ 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)	*DOCUMENT ID*		*TECN*	*CHG*	*COMMENT*
2010.26±0.05 OUR FIT					
• • • We do not use the following data for averages, fits, limits, etc. • • •					
2008 ±3	[1] GOLDHABER	77	MRK1	±	$e^+ e^-$
2008.6 ±1.0	[2] PERUZZI	77	LGW	±	$e^+ e^-$

[1] From simultaneous fit to $D^*(2010)^+$, $D^*(2007)^0$, D^+, and D^0; not independent of FELDMAN 77B mass difference below.

[2] PERUZZI 77 mass not independent of FELDMAN 77B mass difference below and PERUZZI 77 D^0 mass value.

$m_{D^*(2010)^+} - m_{D^+}$

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*
140.603 ±0.015 OUR FIT					
140.602 ±0.014 OUR AVERAGE					
140.6010±0.0068±0.0129	151k	LEES	17F	BABR	$e^+ e^- \to$ hadrons
140.64 ±0.08 ±0.06	620	BORTOLETTO	92B	CLE2	$e^+ e^- \to$ hadrons

$m_{D^*(2010)^+} - m_{D^0}$

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*
145.4258±0.0017 OUR FIT					
145.4258±0.0020 OUR AVERAGE		Error includes scale factor of 1.2.			
145.4259±0.0004±0.0017	312.8k	LEES	13X	BABR	$D^{*\pm} \to D^0 \pi^{\pm} \to (K\pi, K3\pi)\pi^{\pm}$
145.412 ±0.002 ±0.012		ANASTASSOV	02	CLE2	$D^{*\pm} \to D^0 \pi^{\pm} \to (K\pi)\,\pi^{\pm}$
145.54 ±0.08	611	[1] ADINOLFI	99	BEAT	$D^{*\pm} \to D^0 \pi^{\pm}$
145.45 ±0.02		[1] BREITWEG	99	ZEUS	$D^{*\pm} \to D^0 \pi^{\pm} \to (K\pi)\pi^{\pm}$
145.42 ±0.05		[1] BREITWEG	99	ZEUS	$D^{*\pm} \to D^0 \pi^{\pm} \to (K^- 3\pi)\pi^{\pm}$
145.5 ±0.15	103	[2] ADLOFF	97B	H1	$D^{*\pm} \to D^0 \pi^{\pm}$

145.44 ±0.08	152	[2] BREITWEG	97	ZEUS	$D^{*\pm} \to D^0\pi^\pm$, $D^0 \to K^- 3\pi$
145.42 ±0.11	199	[2] BREITWEG	97	ZEUS	$D^{*\pm} \to D^0\pi^\pm$, $D^0 \to K^-\pi^+$
145.4 ±0.2	48	[2] DERRICK	95	ZEUS	$D^{*\pm} \to D^0\pi^\pm$
145.39 ±0.06 ±0.03		BARLAG	92B	ACCM	π^- 230 GeV
145.5 ±0.2	115	[2] ALEXANDER	91B	OPAL	$D^{*\pm} \to D^0\pi^\pm$
145.30 ±0.06		[2] DECAMP	91J	ALEP	$D^{*\pm} \to D^0\pi^\pm$
145.40 ±0.05 ±0.10		ABACHI	88B	HRS	$D^{*\pm} \to D^0\pi^\pm$
145.46 ±0.07 ±0.03		ALBRECHT	85F	ARG	$D^{*\pm} \to D^0\pi^+$
145.5 ±0.3	28	BAILEY	83	SPEC	$D^{*\pm} \to D^0\pi^\pm$
145.5 ±0.3	60	FITCH	81	SPEC	π^- A
145.3 ±0.5	30	FELDMAN	77B	MRK1	$D^{*+} \to D^0\pi^+$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
145.4256±0.0006±0.0017	138.5k	LEES	13X	BABR	$D^{*\pm} \to D^0\pi^\pm \to (K^-\pi^+)\pi^\pm$
145.4266±0.0005±0.0019	174.3k	LEES	13X	BABR	$D^{*\pm} \to D^0\pi^\pm \to (K^- 2\pi^+\pi^-)\pi^\pm$
145.44 ±0.09	122	[2] BREITWEG	97B	ZEUS	$D^{*\pm} \to D^0\pi^\pm$, $D^0 \to K^-\pi^+$
145.8 ±1.5	16	AHLEN	83	HRS	$D^{*+} \to D^0\pi^+$
145.1 ±1.8	12	BAILEY	83	SPEC	$D^{*\pm} \to D^0\pi^\pm$
145.1 ±0.5	14	BAILEY	83	SPEC	$D^{*\pm} \to D^0\pi^\pm$
145.5 ±0.5	14	YELTON	82	MRK2	29 $e^+e^- \to K^-\pi^+$
∼ 145.5		AVERY	80	SPEC	γ A
145.2 ±0.6	2	BLIETSCHAU	79	BEBC	νp

[1] Statistical errors only.
[2] Systematic error not evaluated.

$m_{D^*(2010)^+} - m_{D^*(2007)^0}$

VALUE (MeV)	DOCUMENT ID		TECN	COMMENT
• • • We do not use the following data for averages, fits, limits, etc. • • •				
2.6±1.8	[1] PERUZZI	77	LGW	e^+e^-

[1] Not independent of FELDMAN 77B mass difference above, PERUZZI 77 D^0 mass, and GOLDHABER 77 $D^*(2007)^0$ mass.

$D^*(2010)^\pm$ WIDTH

VALUE (keV)	CL%	EVTS	DOCUMENT ID		TECN	COMMENT
83.4±1.8 OUR AVERAGE						
83.3±1.2± 1.4		312.8k	[1] LEES	13X	BABR	$D^{*\pm} \to D^0\pi^\pm \to (K\pi, K3\pi)\pi^\pm$
96 ±4 ±22			[1] ANASTASSOV	02	CLE2	$D^{*\pm} \to D^0\pi^\pm \to (K\pi)\,\pi^\pm$

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

83.4±1.7± 1.5		138.5k	[1] LEES	13X	BABR	$D^{*\pm} \to D^0\pi^\pm \to (K^-\pi^+)\pi^\pm$
83.2±1.5± 2.6		174.3k	[1] LEES	13X	BABR	$D^{*\pm} \to D^0\pi^\pm \to (K^-2\pi^+\pi^-)\pi^\pm$
<131	90	110	BARLAG	92B	ACCM	π^- 230 GeV

[1] Ignoring the electromagnetic contribution from $D^{*\pm} \to D^\pm\gamma$.

$D^*(2010)^\pm$ DECAY MODES

$D^*(2010)^-$ modes are charge conjugates of the modes below.

	Mode	Fraction (Γ_i/Γ)
Γ_1	$D^0\pi^+$	(67.7±0.5) %
Γ_2	$D^+\pi^0$	(30.7±0.5) %
Γ_3	$D^+\gamma$	(1.6±0.4) %

CONSTRAINED FIT INFORMATION

An overall fit to 3 branching ratios uses 6 measurements and one constraint to determine 3 parameters. The overall fit has a $\chi^2 =$ 0.3 for 4 degrees of freedom.

The following *off-diagonal* array elements are the correlation coefficients $\langle\delta x_i\delta x_j\rangle/(\delta x_i\cdot\delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i/\Gamma_{total}$. The fit constrains the x_i whose labels appear in this array to sum to one.

x_2	−62	
x_3	−43	−44
	x_1	x_2

$D^*(2010)^+$ BRANCHING RATIOS

$\Gamma(D^0\pi^+)/\Gamma_{total}$ **Γ_1/Γ**

VALUE	*DOCUMENT ID*		*TECN*	*COMMENT*
0.677 ±0.005 OUR FIT				
0.677 ±0.006 OUR AVERAGE				
0.6759±0.0029±0.0064	[1,2,3] BARTELT	98	CLE2	e^+e^-
0.688 ±0.024 ±0.013	ALBRECHT	95F	ARG	$e^+e^- \to$ hadrons
0.681 ±0.010 ±0.013	[1] BUTLER	92	CLE2	$e^+e^- \to$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.57 ±0.04 ±0.04	ADLER	88D	MRK3	e^+e^-
0.44 ±0.10	COLES	82	MRK2	e^+e^-
0.6 ±0.15	[3] GOLDHABER	77	MRK1	e^+e^-

[1] The branching ratios are not independent, they have been constrained by the authors to sum to 100%.
[2] Systematic error includes theoretical error on the prediction of the ratio of hadronic modes.
[3] Assuming that isospin is conserved in the decay.

$\Gamma(D^+\pi^0)/\Gamma_{total}$ Γ_2/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.307 ±0.005 OUR FIT				
0.3073±0.0013±0.0062		[1,2,3] BARTELT 98	CLE2	e^+e^-
• • • We do not use the following data for averages, fits, limits, etc. • • •				
0.312 ±0.011 ±0.008	1404	ALBRECHT 95F	ARG	$e^+e^- \to$ hadrons
0.308 ±0.004 ±0.008	410	[1] BUTLER 92	CLE2	$e^+e^- \to$ hadrons
0.26 ±0.02 ±0.02		ADLER 88D	MRK3	e^+e^-
0.34 ±0.07		COLES 82	MRK2	e^+e^-

[1] The branching ratios are not independent, they have been constrained by the authors to sum to 100%.
[2] Systematic error includes theoretical error on the prediction of the ratio of hadronic modes.
[3] Assuming that isospin is conserved in the decay.

$\Gamma(D^+\gamma)/\Gamma_{total}$ Γ_3/Γ

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
0.016 ±0.004 OUR FIT					
0.016 ±0.005 OUR AVERAGE					
0.0168±0.0042±0.0029			[1,2] BARTELT 98	CLE2	e^+e^-
0.011 ±0.014 ±0.016		12	[1] BUTLER 92	CLE2	$e^+e^- \to$ hadrons
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.052	90		ALBRECHT 95F	ARG	$e^+e^- \to$ hadrons
0.17 ±0.05 ±0.05			ADLER 88D	MRK3	e^+e^-
0.22 ±0.12			[3] COLES 82	MRK2	e^+e^-

[1] The branching ratios are not independent, they have been constrained by the authors to sum to 100%.
[2] Systematic error includes theoretical error on the prediction of the ratio of hadronic modes.
[3] Not independent of $\Gamma(D^0\pi^+)/\Gamma_{total}$ and $\Gamma(D^+\pi^0)/\Gamma_{total}$ measurement.

$D^*(2010)^{\pm}$ REFERENCES

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LEES	13X	PRL 111 111801	J.P. Lees et al.	(BABAR Collab.)
Also		PR D88 052003	J.P. Lees et al.	(BABAR Collab.)
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DERRICK	95	PL B349 225	M. Derrick et al.	(ZEUS Collab.)
BARLAG	92B	PL B278 480	S. Barlag et al.	(ACCMOR Collab.)
BORTOLETTO	92B	PRL 69 2046	D. Bortoletto et al.	(CLEO Collab.)

BUTLER	92	PRL 69 2041	F. Butler *et al.*	(CLEO Collab.)
ALEXANDER	91B	PL B262 341	G. Alexander *et al.*	(OPAL Collab.)
DECAMP	91J	PL B266 218	D. Decamp *et al.*	(ALEPH Collab.)
ABACHI	88B	PL B212 533	S. Abachi *et al.*	(ANL, IND, MICH, PURD+)
ADLER	88D	PL B208 152	J. Adler *et al.*	(Mark III Collab.)
ALBRECHT	85F	PL 150B 235	H. Albrecht *et al.*	(ARGUS Collab.)
AHLEN	83	PRL 51 1147	S.P. Ahlen *et al.*	(ANL, IND, LBL+)
BAILEY	83	PL 132B 230	R. Bailey *et al.*	(AMST, BRIS, CERN, CRAC+)
COLES	82	PR D26 2190	M.W. Coles *et al.*	(LBL, SLAC)
YELTON	82	PRL 49 430	J.M. Yelton *et al.*	(SLAC, LBL, UCB+)
FITCH	81	PRL 46 761	V.L. Fitch *et al.*	(PRIN, SACL, TORI+)
AVERY	80	PRL 44 1309	P. Avery *et al.*	(ILL, FNAL, COLU)
BLIETSCHAU	79	PL 86B 108	J. Blietschau *et al.*	(AACH3, BONN, CERN+)
FELDMAN	77B	PRL 38 1313	G.J. Feldman *et al.*	(Mark I Collab.)
GOLDHABER	77	PL 69B 503	G. Goldhaber *et al.*	(Mark I Collab.)
PERUZZI	77	PRL 39 1301	I. Peruzzi *et al.*	(LGW Collab.)