

$D^*(2010)^\pm$

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

 $J^P = 1^-$ 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	$e^+e^- \rightarrow \text{hadrons}$
140.64 ±0.08 ±0.06	620	BORTOLETTO92B	CLE2	$e^+e^- \rightarrow \text{hadrons}$

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

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	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K\pi, K3\pi)\pi^\pm$
145.412 ±0.002 ±0.012		ANASTASSOV 02	CLE2	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K\pi)\pi^\pm$
145.54 ±0.08	611	¹ ADINOLFI 99	BEAT	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.45 ±0.02		¹ BREITWEG 99	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K\pi)\pi^\pm$
145.42 ±0.05		¹ BREITWEG 99	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K^-3\pi)\pi^\pm$
145.5 ±0.15	103	² ADLOFF 97B	H1	$D^{*\pm} \rightarrow D^0 \pi^\pm$

145.44	±0.08	152	² BREITWEG	97	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm,$ $D^0 \rightarrow K^- 3\pi$
145.42	±0.11	199	² BREITWEG	97	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm,$ $D^0 \rightarrow K^- \pi^\pm$
145.4	±0.2	48	² DERRICK	95	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.39	±0.06 ±0.03		BARLAG	92B	ACCM	π^- 230 GeV
145.5	±0.2	115	² ALEXANDER	91B	OPAL	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.30	±0.06		² DECAMP	91J	ALEP	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.40	±0.05 ±0.10		ABACHI	88B	HRS	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.46	±0.07 ±0.03		ALBRECHT	85F	ARG	$D^{*\pm} \rightarrow D^0 \pi^+$
145.5	±0.3	28	BAILEY	83	SPEC	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.5	±0.3	60	FITCH	81	SPEC	π^- A
145.3	±0.5	30	FELDMAN	77B	MRK1	$D^{*+} \rightarrow D^0 \pi^+$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●						
145.4256±0.0006±0.0017	138.5k		LEES	13X	BABR	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow$ $(K^- \pi^+) \pi^\pm$
145.4266±0.0005±0.0019	174.3k		LEES	13X	BABR	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow$ $(K^- 2\pi^+ \pi^-) \pi^\pm$
145.44	±0.09	122	² BREITWEG	97B	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm,$ $D^0 \rightarrow K^- \pi^+$
145.8	±1.5	16	AHLEN	83	HRS	$D^{*+} \rightarrow D^0 \pi^+$
145.1	±1.8	12	BAILEY	83	SPEC	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.1	±0.5	14	BAILEY	83	SPEC	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.5	±0.5	14	YELTON	82	MRK2	$29 e^+ e^- \rightarrow$ $K^- \pi^+$
~ 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 $D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow$ $(K \pi, K 3\pi) \pi^\pm$
96 ±4 ±22			¹ ANASTASSOV	02	CLE2 $D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow$ $(K \pi) \pi^\pm$

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

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

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

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

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

Mode		Fraction (Γ_i/Γ)	Confidence level
Γ_1	$D^0 \pi^+$	$(67.7 \pm 0.5) \%$	
Γ_2	$D^+ \pi^0$	$(30.7 \pm 0.5) \%$	
Γ_3	$D^+ \gamma$	$(1.6 \pm 0.4) \%$	
Γ_4	$e^+ \nu_e$	$< 1.1 \times 10^{-5}$	90%
Γ_5	$\mu^+ \nu_\mu$	$< 4.3 \times 10^{-6}$	90%

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 $\langle \delta x_i \delta x_j \rangle / (\delta x_i \delta x_j)$, in percent, from the fit to the branching fractions, $x_i \equiv \Gamma_i/\Gamma_{\text{total}}$. 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

$\Gamma(D^0 \pi^+)/\Gamma_{\text{total}}$						Γ_1/Γ
VALUE		DOCUMENT ID	TECN	COMMENT		
0.677 $\pm$ 0.005	OUR FIT					
0.677 $\pm$ 0.006	OUR AVERAGE					
0.6759 $\pm$ 0.0029 $\pm$ 0.0064	^{1,2,3}	BARTELT	98	CLE2	$e^+ e^-$	
0.688 $\pm$ 0.024 $\pm$ 0.013		ALBRECHT	95F	ARG	$e^+ e^- \rightarrow$ hadrons	
0.681 $\pm$ 0.010 $\pm$ 0.013	¹	BUTLER	92	CLE2	$e^+ e^- \rightarrow$ hadrons	
• • • We do not use the following data for averages, fits, limits, etc. • • •						
0.57 $\pm$ 0.04 $\pm$ 0.04		ADLER	88D	MRK3	$e^+ e^-$	
0.44 $\pm$ 0.10		COLES	82	MRK2	$e^+ e^-$	
0.6 $\pm$ 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.

$\Gamma(D^+\pi^0)/\Gamma_{\text{total}}$ 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	$e^+e^- \rightarrow \text{hadrons}$
0.308 ± 0.004 ± 0.008	410	¹ BUTLER	92 CLE2	$e^+e^- \rightarrow \text{hadrons}$
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.

$\Gamma(D^+\gamma)/\Gamma_{\text{total}}$ 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	$e^+e^- \rightarrow \text{hadrons}$
• • • We do not use the following data for averages, fits, limits, etc. • • •					
<0.052	90		ALBRECHT	95F ARG	$e^+e^- \rightarrow \text{hadrons}$
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 $\Gamma(D^0\pi^+)/\Gamma_{\text{total}}$ and $\Gamma(D^+\pi^0)/\Gamma_{\text{total}}$ measurement.

$\Gamma(e^+\nu_e)/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<1.1 × 10⁻⁵	90	ABLIKIM	24AO BES3	e^+e^- at 4.178–4.226 GeV

$\Gamma(\mu^+\nu_\mu)/\Gamma_{\text{total}}$ Γ_5/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<4.3 × 10⁻⁶	90	ABLIKIM	24AO BES3	e^+e^- at 4.178–4.226 GeV

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

ABLIKIM	24AO	PR D110 012003	M. Ablikim <i>et al.</i>	(BESIII Collab.)
ABLIKIM	23AZ	PL B846 138245	M. Ablikim <i>et al.</i>	(BESIII Collab.) JP
LEES	17F	PRL 119 202003	J.P. Lees <i>et al.</i>	(BABAR Collab.)
LEES	13X	PRL 111 111801	J.P. Lees <i>et al.</i>	(BABAR Collab.)
Also		PR D88 052003	J.P. Lees <i>et al.</i>	(BABAR Collab.)
Also		PR D88 079902 (errat.)	J.P. Lees <i>et al.</i>	(BABAR Collab.)
ANASTASSOV	02	PR D65 032003	A. Anastassov <i>et al.</i>	(CLEO Collab.)
ADINOLFI	99	NP B547 3	M. Adinolfi <i>et al.</i>	(Beatrice Collab.)
BREITWEG	99	EPJ C6 67	J. Breitweg <i>et al.</i>	(ZEUS Collab.)
BARTELT	98	PRL 80 3919	J. Bartelt <i>et al.</i>	(CLEO Collab.)
ADLOFF	97B	ZPHY C72 593	C. Adloff <i>et al.</i>	(H1 Collab.)
BREITWEG	97	PL B401 192	J. Breitweg <i>et al.</i>	(ZEUS Collab.)
BREITWEG	97B	PL B407 402	J. Breitweg <i>et al.</i>	(ZEUS Collab.)
ALBRECHT	95F	ZPHY C66 63	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
DERRICK	95	PL B349 225	M. Derrick <i>et al.</i>	(ZEUS Collab.)
BARLAG	92B	PL B278 480	S. Barlag <i>et al.</i>	(ACCMOR Collab.)
BORTOLETTO	92B	PRL 69 2046	D. Bortoletto <i>et al.</i>	(CLEO Collab.)
BUTLER	92	PRL 69 2041	F. Butler <i>et al.</i>	(CLEO Collab.)
ALEXANDER	91B	PL B262 341	G. Alexander <i>et al.</i>	(OPAL Collab.)
DECAMP	91J	PL B266 218	D. Decamp <i>et al.</i>	(ALEPH Collab.)
ABACHI	88B	PL B212 533	S. Abachi <i>et al.</i>	(ANL, IND, MICH, PURD+)
ADLER	88D	PL B208 152	J. Adler <i>et al.</i>	(Mark III Collab.)
ALBRECHT	85F	PL 150B 235	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
AHLEN	83	PRL 51 1147	S.P. Ahlen <i>et al.</i>	(ANL, IND, LBL+)
BAILEY	83	PL 132B 230	R. Bailey <i>et al.</i>	(AMST, BRIS, CERN, CRAC+)
COLES	82	PR D26 2190	M.W. Coles <i>et al.</i>	(LBL, SLAC)
YELTON	82	PRL 49 430	J.M. Yelton <i>et al.</i>	(SLAC, LBL, UCB+)
FITCH	81	PRL 46 761	V.L. Fitch <i>et al.</i>	(PRIN, SACL, TORI+)
AVERY	80	PRL 44 1309	P. Avery <i>et al.</i>	(ILL, FNAL, COLU)
BLIETSCHAU	79	PL 86B 108	J. Blietschau <i>et al.</i>	(AACH3, BONN, CERN+)
FELDMAN	77B	PRL 38 1313	G.J. Feldman <i>et al.</i>	(Mark I Collab.)
GOLDHABER	77	PL 69B 503	G. Goldhaber <i>et al.</i>	(Mark I Collab.)
PERUZZI	77	PRL 39 1301	I. Peruzzi <i>et al.</i>	(LGW Collab.)