

$D^*(2010)^\pm$

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

I, J, P need confirmation.

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

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
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.

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
140.68 ± 0.08 OUR FIT				
140.64 ± 0.08 ± 0.06	620	BORTOLETTO92B	CLE2	$e^+ e^- \rightarrow$ 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.

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
145.4257 ± 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	³ ADINOLFI 99	BEAT	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.45 ± 0.02		³ BREITWEG 99	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K\pi)\pi^\pm$
145.42 ± 0.05		³ BREITWEG 99	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K^- 3\pi)\pi^\pm$
145.5 ± 0.15	103	⁴ ADLOFF 97B	H1	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.44 ± 0.08	152	⁴ BREITWEG 97	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm,$
145.42 ± 0.11	199	⁴ BREITWEG 97	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm,$ $D^0 \rightarrow K^- 3\pi$ $D^0 \rightarrow K^- \pi^+$

145.4	± 0.2	48	⁴ DERRICK	95	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.39	$\pm 0.06 \pm 0.03$		BARLAG	92B	ACCM	$\pi^- 230 \text{ GeV}$
145.5	± 0.2	115	⁴ ALEXANDER	91B	OPAL	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.30	± 0.06		⁴ DECAMP	91J	ALEP	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.40	$\pm 0.05 \pm 0.10$		ABACHI	88B	HRS	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.46	$\pm 0.07 \pm 0.03$		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	$\pi^- A$
145.3	± 0.5	30	FELDMAN	77B	MRK1	$D^{*+} \rightarrow D^0 \pi^+$

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145.4256	$\pm 0.0006 \pm 0.0017$	138.5k	LEES	13X	BABR	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K^- \pi^+) \pi^\pm$
145.4266	$\pm 0.0005 \pm 0.0019$	174.3k	LEES	13X	BABR	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K^- 2\pi^+ \pi^-) \pi^\pm$
145.44	± 0.09	122	⁴ 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	γA
145.2	± 0.6	2	BLIETSCHAU	79	BEBC	νp

³ Statistical errors only.

⁴ Systematic error not evaluated.

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

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

2.6	± 1.8	⁵ PERUZZI	77 LGW	$e^+ e^-$
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⁵ 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
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83.4 \pm 1.8 OUR AVERAGE

83.3	$\pm 1.2 \pm 1.4$	312.8k	⁶ LEES	13X	BABR	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K\pi, K3\pi) \pi^\pm$
96	$\pm 4 \pm 22$		⁶ ANASTASSOV 02	CLE2		$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K\pi) \pi^\pm$

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83.4	$\pm 1.7 \pm 1.5$	138.5k	⁶ 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	⁶ LEES	13X	BABR	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K^- 2\pi^+ \pi^-) \pi^\pm$

<131	90	110	BARLAG	92B	ACCM	$\pi^- 230 \text{ GeV}$
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⁶ Ignoring 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)
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 $\langle \delta x_i \delta x_j \rangle / (\delta x_i \delta x_j)$, 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 ±0.005	OUR FIT					
0.677 ±0.006	OUR AVERAGE					
0.6759±0.0029±0.0064		^{7,8,9} BARTELT	98	CLE2	e^+e^-	
0.688 ±0.024 ±0.013		ALBRECHT	95F	ARG	$e^+e^- \rightarrow$ hadrons	
0.681 ±0.010 ±0.013		⁷ BUTLER	92	CLE2	$e^+e^- \rightarrow$ 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		⁹ GOLDHABER	77	MRK1	e^+e^-	

$\Gamma(D^+\pi^0)/\Gamma_{\text{total}}$						Γ_2/Γ
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT		
0.307 ±0.005						
0.3073±0.0013±0.0062						
		^{7,8,9} 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	$e^+e^- \rightarrow$ hadrons	
0.308 ±0.004 ±0.008	410	⁷ BUTLER	92	CLE2	$e^+e^- \rightarrow$ hadrons	
0.26 ±0.02 ±0.02		ADLER	88D	MRK3	e^+e^-	
0.34 ±0.07		COLES	82	MRK2	e^+e^-	

$\Gamma(D^+\gamma)/\Gamma_{\text{total}}$	CL%	EVTS	DOCUMENT ID	TECN	COMMENT	Γ_3/Γ
0.016 ± 0.004						
OUR FIT						
0.016 ± 0.005						
OUR AVERAGE						
0.0168 ± 0.0042 ± 0.0029			^{7,8} BARTELT	98	CLE2	e^+e^-
0.011 ± 0.014 ± 0.016		12	⁷ BUTLER	92	CLE2	$e^+e^- \rightarrow$ hadrons

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

<0.052		90	ALBRECHT	95F	ARG	$e^+e^- \rightarrow$ hadrons
0.17 ± 0.05 ± 0.05			ADLER	88D	MRK3	e^+e^-
0.22 ± 0.12			¹⁰ COLES	82	MRK2	e^+e^-

⁷ The branching ratios are not independent, they have been constrained by the authors to sum to 100%.

⁸ Systematic error includes theoretical error on the prediction of the ratio of hadronic modes.

⁹ Assuming that isospin is conserved in the decay.

¹⁰ Not independent of $\Gamma(D^0\pi^+)/\Gamma_{\text{total}}$ and $\Gamma(D^+\pi^0)/\Gamma_{\text{total}}$ measurement.

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

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 (errata.)	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.)