

$D^*(2010)^\pm$ 

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

$I, J, P$  need confirmation.

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

The fit includes  $D^\pm, D^0, D_s^\pm, D^{*\pm}, D^{*0}$ , and  $D_s^{*\pm}$  mass and mass difference measurements.

VALUE (MeV)	DOCUMENT ID	TECN	CHG	COMMENT
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**2010.0±0.5 OUR FIT** Error includes scale factor of 1.1.

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

2008 ±3	<sup>1</sup> GOLDHABER 77	MRK1	±	$e^+ e^-$
2008.6±1.0	<sup>2</sup> PERUZZI 77	MRK1	±	$e^+ e^-$

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

<sup>2</sup>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  $D^\pm, D^0, D_s^\pm, D^{*\pm}, D^{*0}$ , and  $D_s^{*\pm}$  mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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**140.64±0.10 OUR FIT** Error includes scale factor of 1.1.

<b>140.64±0.08±0.06</b>	620	BORTOLETTO92B	CLE2	$e^+ e^- \rightarrow$ hadrons
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 **$m_{D^*(2010)^+} - m_{D^0}$** 

The fit includes  $D^\pm, D^0, D_s^\pm, D^{*\pm}, D^{*0}$ , and  $D_s^{*\pm}$  mass and mass difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
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**145.397±0.030 OUR FIT**

**145.397±0.030 OUR AVERAGE**

145.5 ±0.15	103	<sup>3</sup> ADLOFF 97B	H1	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.44 ±0.08	152	<sup>3</sup> BREITWEG 97	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm,$ $D^0 \rightarrow K^- 3\pi$
145.42 ±0.11	199	<sup>3</sup> BREITWEG 97	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm,$ $D^0 \rightarrow K^- \pi^+$
145.4 ±0.2	48	<sup>3</sup> DERRICK 95	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.39 ±0.06 ±0.03		BARLAG 92B	ACCM	$\pi^- 230$ GeV
145.5 ±0.2	115	<sup>3</sup> ALEXANDER 91B	OPAL	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.30 ±0.06		<sup>3</sup> 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	$\pi^- A$
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. • • •

145.44 ± 0.09	122	<sup>3</sup> 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	$\gamma A$
145.2 ± 0.6	2	BLIETSCHAU	79 BEBC	$\nu p$

<sup>3</sup>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	<sup>4</sup> PERUZZI	77 MRK1	$e^+ e^-$
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<sup>4</sup>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 (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<0.131	90	110	BARLAG	92B ACCM	$\pi^-$ 230 GeV

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

<1.1	90		ABACHI	88B HRS	$D^{*\pm} \rightarrow D^0 \pi^\pm$
<2.2			YELTON	82 MRK2	$e^+ e^- \rightarrow K^- \pi^+ \pi^-$
<2.0	90	30	FELDMAN	77B MRK1	$D^{*+} \rightarrow D^0 \pi^+$

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

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

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $D^0 \pi^+$	(68.3 ± 1.4) %
$\Gamma_2$ $D^+ \pi^0$	(30.6 ± 2.5) %
$\Gamma_3$ $D^+ \gamma$	( 1.1 $^{+2.1}_{-0.7}$ ) %

**CONSTRAINED FIT INFORMATION**

An overall fit to 2 branching ratios uses 3 measurements and one constraint to determine 3 parameters. The overall fit has a  $\chi^2 = 0.0$  for 1 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.

$x_2$	-55	
$x_3$	0	-83
	$x_1$	$x_2$

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

$\Gamma(D^0 \pi^+) / \Gamma_{\text{total}}$   $\Gamma_1 / \Gamma$

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.683 ± 0.014 OUR FIT</b>			
<b>0.683 ± 0.014 OUR AVERAGE</b>			
0.688 ± 0.024 ± 0.013	ALBRECHT	95F ARG	$e^+ e^- \rightarrow$ hadrons
0.681 ± 0.010 ± 0.013	<sup>5</sup> 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	<sup>6</sup> GOLDHABER	77 MRK1	$e^+ e^-$

$\Gamma(D^+ \pi^0) / \Gamma_{\text{total}}$   $\Gamma_2 / \Gamma$

<u>VALUE</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.306 ± 0.025 OUR FIT</b>				
● ● ● 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	<sup>5</sup> 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	$e^+ e^-$

$\Gamma(D^+ \gamma) / \Gamma_{\text{total}}$   $\Gamma_3 / \Gamma$

<u>VALUE</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.011<sup>+0.021</sup><sub>-0.007</sub> OUR FIT</b>					
<b>0.011 ± 0.014 ± 0.016</b>					
	12		<sup>5</sup> 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			<sup>7</sup> COLES	82 MRK2	$e^+ e^-$

<sup>5</sup> The BUTLER 92 branching ratios are not independent, they have been constrained by the authors to sum to 100%.

<sup>6</sup> Assuming that isospin is conserved in the decay.

<sup>7</sup> Not independent of  $\Gamma(D^0 \pi^+)/\Gamma_{\text{total}}$  and  $\Gamma(D^+ \pi^0)/\Gamma_{\text{total}}$  measurement.

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

ADLOFF	97B	ZPHY C72 593	+Aid, Anderson+	(H1 Collab.)
BREITWEG	97	PL B401 192	+Derrick, Krakauer+	(ZEUS Collab.)
BREITWEG	97B	PL B407 402	J. Breitweg+	(ZEUS Collab.)
ALBRECHT	95F	ZPHY C66 63	+Ehrlichmann+	(ARGUS Collab.)
DERRICK	95	PL B349 225	+Krakauer+	(ZEUS Collab.)
BARLAG	92B	PL B278 480	+Becker, Bozek+	(ACCMOR Collab.)
BORTOLETTO	92B	PRL 69 2046	+Brown, Dominick+	(CLEO Collab.)
BUTLER	92	PRL 69 2041	+Fu, Kalbfleish+	(CLEO Collab.)
ALEXANDER	91B	PL B262 341	+Allison, Allport, Anderson, Arcelli+	(OPAL Collab.)
DECAMP	91J	PL B266 218	+Deschizeaux, Goy, Lees+	(ALEPH Collab.)
ABACHI	88B	PL B212 533	+Akerlof+	(ANL, IND, MICH, PURD, LBL)
ADLER	88D	PL B208 152	+Becker+	(Mark III Collab.)
ALBRECHT	85F	PL 150B 235	+Binder, Harder, Philipp+	(ARGUS Collab.)
AHLEN	83	PRL 51 1147	+Akerlof+	(ANL, IND, LBL, MICH, PURD, SLAC)
BAILEY	83	PL 132B 230	+Bardsley+	(AMST, BRIS, CERN, CRAC, MPIM+)
COLES	82	PR D26 2190	+Abrams, Blocker, Blondel+	(LBL, SLAC)
YELTON	82	PRL 49 430	+Feldman, Goldhaber+	(SLAC, LBL, UCB, HARV)
FITCH	81	PRL 46 761	+Devaux, Cavaglia, May+	(PRIN, SACL, TORI, BNL)
AVERY	80	PRL 44 1309	+Wiss, Butler, Gladding+	(ILL, FNAL, COLU)
BLIETSCHAU	79	PL 86B 108	+	(AACH3, BONN, CERN, MPIM, OXF)
FELDMAN	77B	PRL 38 1313	+Peruzzi, Piccolo, Abrams, Alam+	(Mark I Collab.)
GOLDHABER	77	PL 69B 503	+Wiss, Abrams, Alam+	(Mark I Collab.)
PERUZZI	77	PRL 39 1301	+Piccolo, Feldman+	(Mark I Collab.)

### OTHER RELATED PAPERS

KAMAL	92	PL B284 421	+Xu	(ALBE)
ALTHOFF	83C	PL 126B 493	+Fischer, Burkhardt+	(TASSO Collab.)
BEBEK	82	PRL 49 610	+	(HARV, OSU, ROCH, RUTG, SYRA, VAND+)
TRILLING	81	PRPL 75 57		(LBL, UCB)
PERUZZI	76	PRL 37 569	+Piccolo, Feldman, Nguyen, Wiss+	(Mark I Collab.)