

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

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

$I, J, P$  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.

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>CHG</u>	<u>COMMENT</u>
<b>2010.0±0.5 OUR FIT</b>	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.

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>140.64±0.10 OUR FIT</b>	Error includes scale factor of 1.1.			
<b>140.64±0.08±0.06</b>	620	BORTOLETTO92B	CLE2	$e^+e^- \rightarrow$ hadrons

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

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

<u>VALUE (MeV)</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>145.421±0.010 OUR FIT</b>	Error includes scale factor of 1.1.			
<b>145.421±0.010 OUR AVERAGE</b>				
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	<sup>3</sup> ADINOLFI 99	BEAT	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.45 ±0.02		<sup>3</sup> BREITWEG 99	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K\pi) \pi^\pm$
145.42 ±0.05		<sup>3</sup> BREITWEG 99	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm \rightarrow (K^- 3\pi) \pi^\pm$
145.5 ±0.15	103	<sup>4</sup> ADLOFF 97B	H1	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.44 ±0.08	152	<sup>4</sup> BREITWEG 97	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm,$
145.42 ±0.11	199	<sup>4</sup> BREITWEG 97	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm,$ $D^0 \rightarrow K^- 3\pi$
145.4 ±0.2	48	<sup>4</sup> DERRICK 95	ZEUS	$D^{*\pm} \rightarrow D^0 \pi^\pm,$ $D^0 \rightarrow K^- \pi^+$

145.39 ±0.06 ±0.03			BARLAG	92B ACCM	$\pi^-$ 230 GeV
145.5 ±0.2	115	<sup>4</sup>	ALEXANDER	91B OPAL	$D^{*\pm} \rightarrow D^0 \pi^\pm$
145.30 ±0.06		<sup>4</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	$D^{*\pm} \rightarrow D^0 \pi^\pm$
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>4</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> Statistical errors only.					
<sup>4</sup> Systematic error not evaluated.					

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

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
2.6 ± 1.8	<sup>5</sup> PERUZZI	77 MRK1	$e^+ e^-$
<sup>5</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

<u>VALUE (keV)</u>	<u>CL%</u>	<u>EVTS</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>96 ± 4 ± 22</b>			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. ● ● ●					
<131	90	110	BARLAG	92B ACCM	$\pi^-$ 230 GeV

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

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

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $D^0 \pi^+$	(67.7 ± 0.5) %
$\Gamma_2$ $D^+ \pi^0$	(30.7 ± 0.5) %
$\Gamma_3$ $D^+ \gamma$	( 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

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

VALUE	DOCUMENT ID	TECN	COMMENT
<b>0.677 ± 0.005 OUR FIT</b>			
<b>0.677 ± 0.006 OUR AVERAGE</b>			
0.6759 ± 0.0029 ± 0.0064	<sup>6,7,8</sup> BARTELT	98 CLE2	$e^+ e^-$
0.688 ± 0.024 ± 0.013	ALBRECHT	95F ARG	$e^+ e^- \rightarrow$ hadrons
0.681 ± 0.010 ± 0.013	<sup>6</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>8</sup> GOLDHABER	77 MRK1	$e^+ e^-$

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

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.307 ± 0.005 OUR FIT</b>				
<b>0.3073 ± 0.0013 ± 0.0062</b>				
	<sup>6,7,8</sup>	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	<sup>6</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	$e^+ e^-$

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

VALUE	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>0.016 ± 0.004 OUR FIT</b>					
<b>0.016 ± 0.005 OUR AVERAGE</b>					
0.0168 ± 0.0042 ± 0.0029			<sup>6,7</sup> BARTELT	98 CLE2	$e^+ e^-$
0.011 ± 0.014 ± 0.016	12		<sup>6</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>9</sup> COLES	82 MRK2	$e^+e^-$

<sup>6</sup> The branching ratios are not independent, they have been constrained by the authors to sum to 100%.

<sup>7</sup> Systematic error includes theoretical error on the prediction of the ratio of hadronic modes.

<sup>8</sup> Assuming that isospin is conserved in the decay.

<sup>9</sup> Not independent of  $\Gamma(D^0\pi^+)/\Gamma_{\text{total}}$  and  $\Gamma(D^+\pi^0)/\Gamma_{\text{total}}$  measurement.

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

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BAILEY	83	PL 132B 230	R. Bailey <i>et al.</i>	(AMST, BRIS, CERN, CRAC+)
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