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

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

| *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 | [3] ADINOLFI | 99 | BEAT | $D^{*\pm} \to D^0\pi^\pm$ |
| 145.45 ±0.02 | | [3] BREITWEG | 99 | ZEUS | $D^{*\pm} \to D^0\pi^\pm \to (K\pi)\pi^\pm$ |
| 145.42 ±0.05 | | [3] BREITWEG | 99 | ZEUS | $D^{*\pm} \to D^0\pi^\pm \to (K^-3\pi)\pi^\pm$ |
| 145.5 ±0.15 | 103 | [4] ADLOFF | 97B | H1 | $D^{*\pm} \to D^0\pi^\pm$ |
| 145.44 ±0.08 | 152 | [4] BREITWEG | 97 | ZEUS | $D^{*\pm} \to D^0\pi^\pm$, $D^0 \to K^-3\pi$ |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 145.42 | ±0.11 | | 199 | [4] BREITWEG | 97 | ZEUS | $D^{*\pm} \to D^0\pi^\pm$, $D^0 \to K^-\pi^+$ |
| 145.4 | ±0.2 | | 48 | [4] DERRICK | 95 | ZEUS | $D^{*\pm} \to D^0\pi^\pm$ |
| 145.39 | ±0.06 | ±0.03 | | BARLAG | 92B | ACCM | $\pi^-$ 230 GeV |
| 145.5 | ±0.2 | | 115 | [4] ALEXANDER | 91B | OPAL | $D^{*\pm} \to D^0\pi^\pm$ |
| 145.30 | ±0.06 | | | [4] 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 | $\pi^-$ 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 | [4] 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 | $\gamma$ A |
| 145.2 | ±0.6 | | 2 | BLIETSCHAU | 79 | BEBC | $\nu p$ |

[3] Statistical errors only.
[4] 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 | [5] PERUZZI | 77 | LGW | $e^+e^-$ |

[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* |
|---|---|---|---|---|---|---|
| **83.4±1.8 OUR AVERAGE** | | | | | | |
| 83.3±1.2± 1.4 | | 312.8k | [6] LEES | 13X | BABR | $D^{*\pm} \to D^0\pi^\pm \to (K\pi, K3\pi)\pi^\pm$ |
| 96 ±4 ±22 | | | [6] 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 | [6] LEES | 13X | BABR | $D^{*\pm} \to D^0\pi^\pm \to (K^-\pi^+)\pi^\pm$ |
| 83.2±1.5± 2.6 | | 174.3k | [6] LEES | 13X | BABR | $D^{*\pm} \to D^0\pi^\pm \to (K^-2\pi^+\pi^-)\pi^\pm$ |
| <131 | 90 | 110 | BARLAG | 92B | ACCM | $\pi^-$ 230 GeV |

[6] 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 ($\Gamma_i/\Gamma$) |
|---|---|---|
| $\Gamma_1$ | $D^0\pi^+$ | (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 $\left\langle \delta x_i \delta x_j \right\rangle / (\delta x_i \cdot \delta x_j)$, 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 |
|---|---|---|---|---|
| **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 | $e^+e^- \to$ hadrons |
| 0.681 ±0.010 ±0.013 | [7] 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 | [9] GOLDHABER | 77 | MRK1 | $e^+e^-$ |

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

| VALUE | EVTS | DOCUMENT ID | | TECN | COMMENT |
|---|---|---|---|---|---|
| **0.307 ±0.005 OUR FIT** | | | | | |
| **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 | $e^+e^- \to$ hadrons |
| 0.308 ±0.004 ±0.008 | 410 | [7] 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 | $e^+e^-$ |

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

| 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 | | | [7,8] BARTELT | 98 | CLE2 | $e^+e^-$ |
| 0.011 ±0.014 ±0.016 | | 12 | [7] 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 | | | [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


| | | | | |
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