

**$D^*(2007)^0$** 

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

 $J^P = 1^-$  established by ABLIKIM 23AZ. **$D^*(2007)^0$  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>COMMENT</u>                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------|-------------------------------|
| <b>2006.85±0.05 OUR FIT</b>                                                                                                                           | Error includes scale factor of 1.1. |             |                               |
| • • • We do not use the following data for averages, fits, limits, etc. • • •                                                                         |                                     |             |                               |
| 2006 ±1.5                                                                                                                                             | <sup>1</sup> GOLDHABER 77           | MRK1        | e <sup>+</sup> e <sup>-</sup> |
| <sup>1</sup> From simultaneous fit to D <sup>*</sup> (2010) <sup>+</sup> , D <sup>*</sup> (2007) <sup>0</sup> , D <sup>+</sup> , and D <sup>0</sup> . |                                     |             |                               |

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

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                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|---------------------------|------|-------------------------------------|
| <b>142.014±0.030 OUR FIT</b>                                                                                                                                                                                                               | Error includes scale factor of 1.5. |                           |      |                                     |
| <b>142.016±0.030 OUR AVERAGE</b>                                                                                                                                                                                                           | Error includes scale factor of 1.5. |                           |      |                                     |
| 142.007±0.015±0.014                                                                                                                                                                                                                        | 10k                                 | <sup>1</sup> TOMARADZE 15 | CLEO | $e^+e^- \rightarrow \text{hadrons}$ |
| 142.2 ±0.3 ±0.2                                                                                                                                                                                                                            | 145                                 | ALBRECHT 95F              | ARG  | $e^+e^- \rightarrow \text{hadrons}$ |
| 142.12 ±0.05 ±0.05                                                                                                                                                                                                                         | 1176                                | BORTOLETTO92B             | CLE2 | $e^+e^- \rightarrow \text{hadrons}$ |
| • • • We do not use the following data for averages, fits, limits, etc. • • •                                                                                                                                                              |                                     |                           |      |                                     |
| 142.2 ±2.0                                                                                                                                                                                                                                 |                                     | SADROZINSKI 80            | CBAL | $D^{*0} \rightarrow D^0 \pi^0$      |
| 142.7 ±1.7                                                                                                                                                                                                                                 |                                     | <sup>2</sup> GOLDHABER 77 | MRK1 | $e^+e^-$                            |
| <sup>1</sup> Obtained by analyzing CLEO-c data but not authored by the CLEO Collaboration. This value comes from the average of the results for two decay modes, $D^0 \rightarrow K^- \pi^+$ and $D^0 \rightarrow K^- \pi^+ \pi^- \pi^+$ . |                                     |                           |      |                                     |
| <sup>2</sup> From simultaneous fit to $D^*(2010)^+$ , $D^*(2007)^0$ , $D^+$ , and $D^0$ .                                                                                                                                                  |                                     |                           |      |                                     |

 **$D^*(2007)^0$  WIDTH**

| VALUE (MeV)                                                           | CL% | DOCUMENT ID             | TECN | COMMENT                        |
|-----------------------------------------------------------------------|-----|-------------------------|------|--------------------------------|
| <b>&lt;2.1</b>                                                        | 90  | <sup>1</sup> ABACHI 88B | HRS  | $D^{*0} \rightarrow D^+ \pi^-$ |
| <sup>1</sup> Assuming $m_{D^{*0}} = 2007.2 \pm 2.1 \text{ MeV}/c^2$ . |     |                         |      |                                |

**$D^*(2007)^0$  DECAY MODES**

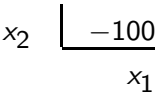
$\overline{D}^*(2007)^0$  modes are charge conjugates of modes below.

|            | Mode         | Fraction ( $\Gamma_i/\Gamma$ )      | Confidence level |
|------------|--------------|-------------------------------------|------------------|
| $\Gamma_1$ | $D^0\pi^0$   | (64.7 $\pm$ 0.9 ) %                 |                  |
| $\Gamma_2$ | $D^0\gamma$  | (35.3 $\pm$ 0.9 ) %                 |                  |
| $\Gamma_3$ | $D^0e^+e^-$  | ( 3.91 $\pm$ 0.33) $\times 10^{-3}$ |                  |
| $\Gamma_4$ | $\mu^+\mu^-$ | < 2.5 $\times 10^{-8}$              | 90%              |
| $\Gamma_5$ | $e^+e^-$     | < 1.7 $\times 10^{-6}$              | 90%              |

**CONSTRAINED FIT INFORMATION**

An overall fit to 2 branching ratios uses 5 measurements and one constraint to determine 2 parameters. The overall fit has a  $\chi^2 = 2.5$  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.



**$D^*(2007)^0$  BRANCHING RATIOS**

| $\Gamma(D^0\pi^0)/\Gamma_{\text{total}}$  |      |             |      |         | $\Gamma_1/\Gamma$ |
|-------------------------------------------|------|-------------|------|---------|-------------------|
| VALUE                                     | EVTS | DOCUMENT ID | TECN | COMMENT |                   |
| <b>0.647<math>\pm</math>0.009 OUR FIT</b> |      |             |      |         |                   |

- • • We do not use the following data for averages, fits, limits, etc. • • •
- |                               |      |                        |     |      |                                   |
|-------------------------------|------|------------------------|-----|------|-----------------------------------|
| 0.655 $\pm$ 0.008 $\pm$ 0.005 | 3.2k | <sup>1</sup> ABLIKIM   | 15B | BES3 | $e^+e^- \rightarrow$ hadrons      |
| 0.635 $\pm$ 0.003 $\pm$ 0.017 | 69k  | <sup>1</sup> AUBERT,BE | 05G | BABR | 10.6 $e^+e^- \rightarrow$ hadrons |
| 0.596 $\pm$ 0.035 $\pm$ 0.028 | 858  | <sup>2</sup> ALBRECHT  | 95F | ARG  | $e^+e^- \rightarrow$ hadrons      |
| 0.636 $\pm$ 0.023 $\pm$ 0.033 | 1097 | <sup>2</sup> BUTLER    | 92  | CLE2 | $e^+e^- \rightarrow$ hadrons      |
- <sup>1</sup> Derived from the ratio  $\Gamma(D^0\pi^0) / \Gamma(D^0\gamma)$  assuming that the branching fractions of  $D^{*0} \rightarrow D^0\pi^0$  and  $D^{*0} \rightarrow D^0\gamma$  decays sum to 100%.
- <sup>2</sup> The BUTLER 92 and ALBRECHT 95F branching ratios are not independent, they have been constrained by the authors to sum to 100%.

| $\Gamma(D^0\gamma)/\Gamma_{\text{total}}$     |      |                       |      |         | $\Gamma_2/\Gamma$            |
|-----------------------------------------------|------|-----------------------|------|---------|------------------------------|
| VALUE                                         | EVTS | DOCUMENT ID           | TECN | COMMENT |                              |
| <b>0.353<math>\pm</math>0.009 OUR FIT</b>     |      |                       |      |         |                              |
| <b>0.381<math>\pm</math>0.029 OUR AVERAGE</b> |      |                       |      |         |                              |
| 0.404 $\pm$ 0.035 $\pm$ 0.028                 | 456  | <sup>1</sup> ALBRECHT | 95F  | ARG     | $e^+e^- \rightarrow$ hadrons |
| 0.364 $\pm$ 0.023 $\pm$ 0.033                 | 621  | <sup>1</sup> BUTLER   | 92   | CLE2    | $e^+e^- \rightarrow$ hadrons |
| 0.37 $\pm$ 0.08 $\pm$ 0.08                    |      | ADLER                 | 88D  | MRK3    | $e^+e^-$                     |

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

|                             |      |                        |     |      |                                          |
|-----------------------------|------|------------------------|-----|------|------------------------------------------|
| $0.345 \pm 0.008 \pm 0.005$ | 1.8k | <sup>2</sup> ABLIKIM   | 15B | BES3 | $e^+e^- \rightarrow \text{hadrons}$      |
| $0.365 \pm 0.003 \pm 0.017$ | 68k  | <sup>2</sup> AUBERT,BE | 05G | BABR | $10.6 e^+e^- \rightarrow \text{hadrons}$ |
| $0.47 \pm 0.23$             |      | LOW                    | 87  | HRS  | $29 \text{ GeV } e^+e^-$                 |
| $0.53 \pm 0.13$             |      | BARTEL                 | 85G | JADE | $e^+e^-$ , hadrons                       |
| $0.47 \pm 0.12$             |      | COLES                  | 82  | MRK2 | $e^+e^-$                                 |
| $0.45 \pm 0.15$             |      | GOLDHABER              | 77  | MRK1 | $e^+e^-$                                 |

<sup>1</sup> The BUTLER 92 and ALBRECHT 95F branching ratios are not independent, they have been constrained by the authors to sum to 100%.

<sup>2</sup> Derived from the ratio  $\Gamma(D^0\pi^0) / \Gamma(D^0\gamma)$  assuming that the branching fractions of  $D^{*0} \rightarrow D^0\pi^0$  and  $D^{*0} \rightarrow D^0\gamma$  decays sum to 100%.

## $\Gamma(D^0\pi^0)/\Gamma(D^0\gamma)$

$\Gamma_1/\Gamma_2$

| VALUE                             | EVTS | DOCUMENT ID | TECN | COMMENT            |
|-----------------------------------|------|-------------|------|--------------------|
| <b><math>1.83 \pm 0.07</math></b> |      |             |      | <b>OUR FIT</b>     |
| <b><math>1.85 \pm 0.07</math></b> |      |             |      | <b>OUR AVERAGE</b> |

|                          |      |           |     |      |                                          |
|--------------------------|------|-----------|-----|------|------------------------------------------|
| $1.90 \pm 0.07 \pm 0.05$ | 4.9k | ABLIKIM   | 15B | BES3 | $10.6 e^+e^- \rightarrow \text{hadrons}$ |
| $1.74 \pm 0.02 \pm 0.13$ |      | AUBERT,BE | 05G | BABR | $10.6 e^+e^- \rightarrow \text{hadrons}$ |

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

|                   |                   |     |      |                                                     |
|-------------------|-------------------|-----|------|-----------------------------------------------------|
| $1.789 \pm 0.082$ | <sup>1</sup> AAIJ | 22N | LHCB | $B^0, B_s^0 \rightarrow \bar{D}^{*0}(K\pi, \pi\pi)$ |
|-------------------|-------------------|-----|------|-----------------------------------------------------|

<sup>1</sup> Statistical error only.

## $\Gamma(D^0 e^+ e^-)/\Gamma(D^0\gamma)$

$\Gamma_3/\Gamma_2$

| <u>VALUE (units <math>10^{-3}</math>)</u>   | <u>EVTS</u> | <u>DOCUMENT ID</u> | <u>TECN</u> | <u>COMMENT</u>     |
|---------------------------------------------|-------------|--------------------|-------------|--------------------|
| <b><math>11.08 \pm 0.76 \pm 0.49</math></b> | 421         | ABLIKIM            | 21BD BES3   | 4.178 GeV $e^+e^-$ |

## $\Gamma(\mu^+\mu^-)/\Gamma_{\text{total}}$

$\Gamma_4/\Gamma$

| VALUE                                      | CL% | DOCUMENT ID       | TECN | COMMENT                                  |
|--------------------------------------------|-----|-------------------|------|------------------------------------------|
| <b><math>&lt;2.5 \times 10^{-8}</math></b> | 90  | <sup>1</sup> AAIJ | 23D  | LHCB $B^- \rightarrow \pi^- \mu^+ \mu^-$ |

<sup>1</sup> AAIJ 23D reports  $< 2.6 \times 10^{-8}$  from a measurement of  $[\Gamma(D^{*}(2007)^0 \rightarrow \mu^+\mu^-)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \bar{D}^{*}(2007)^0\pi^+)]$  assuming  $B(B^+ \rightarrow \bar{D}^{*}(2007)^0\pi^+) = (4.90 \pm 0.17) \times 10^{-3}$ , which we rescale to our best value  $B(B^+ \rightarrow \bar{D}^{*}(2007)^0\pi^+) = 5.17 \times 10^{-3}$ . The reported value also assumes  $B(B^- \rightarrow J/\psi(1S)K^-) = (10.20 \pm 0.19) \times 10^{-4}$  and  $B(J/\psi(1S) \rightarrow \mu^+\mu^-) = (59.61 \pm 0.33) \times 10^{-3}$  for the normalization mode  $B^- \rightarrow J/\psi(1S)K^-$ .

## $\Gamma(e^+e^-)/\Gamma_{\text{total}}$

$\Gamma_5/\Gamma$

| VALUE                                      | CL% | DOCUMENT ID  | TECN | COMMENT                                  |
|--------------------------------------------|-----|--------------|------|------------------------------------------|
| <b><math>&lt;1.7 \times 10^{-6}</math></b> | 90  | SHEMYAKIN 20 | CMD3 | $e^+e^- \rightarrow D^0\pi^0, D^0\gamma$ |

## $D^{*}(2007)^0$ REFERENCES

|           |      |                |                            |                     |
|-----------|------|----------------|----------------------------|---------------------|
| AAIJ      | 23D  | EPJ C83 666    | R. Aaij <i>et al.</i>      | (LHCb Collab.)      |
| ABLIKIM   | 23AZ | PL B846 138245 | M. Ablikim <i>et al.</i>   | (BESIII Collab.) JP |
| AAIJ      | 22N  | PR D105 072005 | R. Aaij <i>et al.</i>      | (LHCb Collab.)      |
| ABLIKIM   | 21BD | PR D104 112012 | M. Ablikim <i>et al.</i>   | (BESIII Collab.)    |
| SHEMYAKIN | 20   | PAN 83 954     | D.N. Shemyakin             | (CMD-3 Collab.)     |
| ABLIKIM   | 15B  | PR D91 031101  | M. Ablikim <i>et al.</i>   | (BESIII Collab.)    |
| TOMARADZE | 15   | PR D91 011102  | A. Tomaradze <i>et al.</i> | (NWES)              |
| AUBERT,BE | 05G  | PR D72 091101  | B. Aubert <i>et al.</i>    | (BABAR Collab.)     |

|             |     |                   |                                  |                         |
|-------------|-----|-------------------|----------------------------------|-------------------------|
| ALBRECHT    | 95F | ZPHY C66 63       | H. Albrecht <i>et al.</i>        | (ARGUS 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.)          |
| 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.)      |
| LOW         | 87  | PL B183 232       | E.H. Low <i>et al.</i>           | (HRS Collab.)           |
| BARTEL      | 85G | PL 161B 197       | W. Bartel <i>et al.</i>          | (JADE Collab.)          |
| COLES       | 82  | PR D26 2190       | M.W. Coles <i>et al.</i>         | (LBL, SLAC)             |
| SADROZINSKI | 80  | Madison Conf. 681 | H.F.W. Sadrozinski <i>et al.</i> | (PRIN, CIT+)            |
| GOLDHABER   | 77  | PL 69B 503        | G. Goldhaber <i>et al.</i>       | (Mark I Collab.)        |

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