

# LIGHT QUARKS ( $u, d, s$ )

OMITTED FROM SUMMARY TABLE

## $u$ -QUARK MASS

The  $u$ -,  $d$ -, and  $s$ -quark masses are estimates of so-called “current-quark masses,” in a mass-independent subtraction scheme such as  $\overline{\text{MS}}$ . The ratios  $m_u/m_d$  and  $m_s/m_d$  are extracted from pion and kaon masses using chiral symmetry. The estimates of  $d$  and  $u$  masses are not without controversy and remain under active investigation. Within the literature there are even suggestions that the  $u$  quark could be essentially massless. The  $s$ -quark mass is estimated from SU(3) splittings in hadron masses.

We have normalized the  $\overline{\text{MS}}$  masses at a renormalization scale of  $\mu = 2$  GeV. Results quoted in the literature at  $\mu = 1$  GeV have been rescaled by dividing by 1.35. The values of “Our Evaluation” were determined in part via Figures 1 and 2.

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>1.5 to 4.5 OUR EVALUATION</b>			
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
$2.9 \pm 0.6$	<sup>1</sup> JAMIN	02	THEO $\overline{\text{MS}}$ scheme
$2.3 \pm 0.4$	<sup>2</sup> NARISON	99	THEO $\overline{\text{MS}}$ scheme
$3.9 \pm 1.1$	<sup>3</sup> JAMIN	95	THEO $\overline{\text{MS}}$ scheme
$3.0 \pm 0.7$	<sup>4</sup> NARISON	95C	THEO $\overline{\text{MS}}$ scheme
<sup>1</sup> JAMIN 02 first calculates the strange quark mass from QCD sum rules using the scalar channel, and then combines with the quark mass ratios obtained from chiral perturbation theory to obtain $m_u$ .			
<sup>2</sup> NARISON 99 uses sum rules to order $\alpha_s^3$ for $\phi$ meson decays to get $m_s$ , and finds $m_u$ by combining with sum rule estimates of $m_u + m_d$ and Dashen's formula.			
<sup>3</sup> JAMIN 95 uses QCD sum rules at next-to-leading order. We have rescaled $m_u(1 \text{ GeV}) = 5.3 \pm 1.5$ to $\mu = 2$ GeV.			
<sup>4</sup> For NARISON 95C, we have rescaled $m_u(1 \text{ GeV}) = 4 \pm 1$ to $\mu = 2$ GeV.			

## $d$ -QUARK MASS

See the comment for the  $u$  quark above.

We have normalized the  $\overline{\text{MS}}$  masses at a renormalization scale of  $\mu = 2$  GeV. Results quoted in the literature at  $\mu = 1$  GeV have been rescaled by dividing by 1.35. The values of “Our Evaluation” were determined in part via Figures 1 and 2.

<u>VALUE (MeV)</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>5 to 8.5 OUR EVALUATION</b>			
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
$5.2 \pm 0.9$	<sup>5</sup> JAMIN	02	THEO $\overline{\text{MS}}$ scheme
$6.4 \pm 1.1$	<sup>6</sup> NARISON	99	THEO $\overline{\text{MS}}$ scheme
$7.0 \pm 1.1$	<sup>7</sup> JAMIN	95	THEO $\overline{\text{MS}}$ scheme
$7.4 \pm 0.7$	<sup>8</sup> NARISON	95C	THEO $\overline{\text{MS}}$ scheme

<sup>5</sup> JAMIN 02 first calculates the strange quark mass from QCD sum rules using the scalar channel, and then combines with the quark mass ratios obtained from chiral perturbation theory to obtain  $m_d$ .

<sup>6</sup> NARISON 99 uses sum rules to order  $\alpha_s^3$  for  $\phi$  meson decays to get  $m_s$ , and finds  $m_d$  by combining with sum rule estimates of  $m_u+m_d$  and Dashen's formula.

<sup>7</sup> JAMIN 95 uses QCD sum rules at next-to-leading order. We have rescaled  $m_d(1 \text{ GeV}) = 9.4 \pm 1.5$  to  $\mu = 2 \text{ GeV}$ .

<sup>8</sup> For NARISON 95C, we have rescaled  $m_d(1 \text{ GeV}) = 10 \pm 1$  to  $\mu = 2 \text{ GeV}$ .

$$\bar{m} = (m_u+m_d)/2$$

See the comments for the  $u$  quark above.

We have normalized the  $\overline{\text{MS}}$  masses at a renormalization scale of  $\mu = 2 \text{ GeV}$ . Results quoted in the literature at  $\mu = 1 \text{ GeV}$  have been rescaled by dividing by 1.35. The values of "Our Evaluation" were determined in part via Figures 1 and 2.

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>2.5 to 5.5 OUR EVALUATION</b>			
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
$3.45^{+0.14}_{-0.20}$	<sup>9</sup> ALIKHAN	02	LATT $\overline{\text{MS}}$ scheme
$5.3 \pm 0.3$	<sup>10</sup> CHIU	02	LATT $\overline{\text{MS}}$ scheme
$3.9 \pm 0.6$	<sup>11</sup> MALTMAN	02	THEO $\overline{\text{MS}}$ scheme
$3.9 \pm 0.6$	<sup>12</sup> MALTMAN	01	THEO $\overline{\text{MS}}$ scheme
$4.57 \pm 0.18$	<sup>13</sup> AOKI	00	LATT $\overline{\text{MS}}$ scheme
$4.4 \pm 2$	<sup>14</sup> GOECKELER	00	LATT $\overline{\text{MS}}$ scheme
$4.23 \pm 0.29$	<sup>15</sup> AOKI	99	LATT $\overline{\text{MS}}$ scheme
$\geq 2.1$	<sup>16</sup> STEELE	99	THEO $\overline{\text{MS}}$ scheme
$4.5 \pm 0.4$	<sup>17</sup> BECIREVIC	98	LATT $\overline{\text{MS}}$ scheme
$4.6 \pm 1.2$	<sup>18</sup> DOSCH	98	THEO $\overline{\text{MS}}$ scheme
$4.7 \pm 0.9$	<sup>19</sup> PRADES	98	THEO $\overline{\text{MS}}$ scheme
$2.7 \pm 0.2$	<sup>20</sup> EICKER	97	LATT $\overline{\text{MS}}$ scheme
$3.6 \pm 0.6$	<sup>21</sup> GOUGH	97	LATT $\overline{\text{MS}}$ scheme
$3.4 \pm 0.4 \pm 0.3$	<sup>22</sup> GUPTA	97	LATT $\overline{\text{MS}}$ scheme
$> 3.8$	<sup>23</sup> LELLOUCH	97	THEO $\overline{\text{MS}}$ scheme
$4.5 \pm 1.0$	<sup>24</sup> BIJNENS	95	THEO $\overline{\text{MS}}$ scheme

<sup>9</sup> ALIKHAN 02 uses lattice simulation of the meson and baryon masses with two dynamical flavors and degenerate light quarks.

<sup>10</sup> CHIU 02 extracts the average light quark mass from quenched lattice simulations using quenched chiral perturbation theory.

<sup>11</sup> MALTMAN 02 uses finite energy sum rules in the  $ud$  and  $us$  pseudoscalar channels. Other mass values are also obtained by similar methods.

<sup>12</sup> MALTMAN 01 uses Borel transformed and finite energy sum rules.

<sup>13</sup> AOKI 00 obtain the light quark masses from a quenched lattice simulation of the meson and baryon spectrum with the Wilson quark action.

<sup>14</sup> GOECKELER 00 obtained from a quenched lattice computation of the pseudoscalar meson masses using  $\mathcal{O}(a)$  improved Wilson fermions and nonperturbative renormalization.

<sup>15</sup> AOKI 99 obtain the light quark masses from a quenched lattice simulation of the meson spectrum with the staggered quark action employing the regularization independent scheme.

- <sup>16</sup> STEELE 99 obtain a bound on the light quark masses by applying the Holder inequality to a sum rule. We have converted their bound of  $(m_u+m_d)/2 \geq 3$  MeV at  $\mu=1$  GeV to  $\mu=2$  GeV.
- <sup>17</sup> BECIREVIC 98 compute the quark mass using the Alpha action in the quenched approximation. The conversion from the regularization independent scheme to the  $\overline{MS}$  scheme is at NNLO.
- <sup>18</sup> DOSCH 98 use sum rule determinations of the quark condensate and chiral perturbation theory to obtain  $9.4 \leq (m_u+m_d)(1 \text{ GeV}) \leq 15.7$  MeV. We have converted to result to  $\mu=2$  GeV.
- <sup>19</sup> PRADES 98 uses finite energy sum rules for the axial current correlator.
- <sup>20</sup> EICKER 97 use lattice gauge computations with two dynamical light flavors.
- <sup>21</sup> GOUGH 97 use lattice gauge computations in the quenched approximation. Correcting for quenching gives  $2.1 < \overline{m} < 3.5$  MeV at  $\mu=2$  GeV.
- <sup>22</sup> GUPTA 97 use Lattice Monte Carlo computations in the quenched approximation. The value for two light dynamic flavors at  $\mu = 2$  GeV is  $2.7 \pm 0.3 \pm 0.3$  MeV.
- <sup>23</sup> LELLOUCH 97 obtain lower bounds on quark masses using hadronic spectral functions.
- <sup>24</sup> BIJNENS 95 determines  $m_u+m_d (1 \text{ GeV}) = 12 \pm 2.5$  MeV using finite energy sum rules. We have rescaled this to 2 GeV.

### s-QUARK MASS

See the comment for the  $u$  quark above.

We have normalized the  $\overline{MS}$  masses at a renormalization scale of  $\mu = 2$  GeV. Results quoted in the literature at  $\mu = 1$  GeV have been rescaled by dividing by 1.35.

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b>80 to 155 OUR EVALUATION</b>			
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
117 ± 17	<sup>25</sup> GAMIZ	03	THEO $\overline{MS}$ scheme
103 ± 17	<sup>26</sup> GAMIZ	03	THEO $\overline{MS}$ scheme
88 + 3 - 6	<sup>27</sup> ALIKHAN	02	LATT $\overline{MS}$ scheme
115 ± 8	<sup>28</sup> CHIU	02	LATT $\overline{MS}$ scheme
99 ± 16	<sup>29</sup> JAMIN	02	THEO $\overline{MS}$ scheme
100 ± 12	<sup>30</sup> MALTMAN	02	THEO $\overline{MS}$ scheme
116 + 20 - 25	<sup>31</sup> CHEN	01B	THEO $\overline{MS}$ scheme
125 ± 27	<sup>32</sup> KOERNER	01	THEO $\overline{MS}$ scheme
130 ± 15	<sup>33</sup> AOKI	00	LATT $\overline{MS}$ scheme
105 ± 4	<sup>34</sup> GOECKELER	00	LATT $\overline{MS}$ scheme
118 ± 14	<sup>35</sup> AOKI	99	LATT $\overline{MS}$ scheme
170 + 44 - 55	<sup>36</sup> BARATE	99R	ALEP $\overline{MS}$ scheme
115 ± 8	<sup>37</sup> MALTMAN	99	THEO $\overline{MS}$ scheme
129 ± 24	<sup>38</sup> NARISON	99	THEO $\overline{MS}$ scheme
114 ± 23	<sup>39</sup> PICH	99	THEO $\overline{MS}$ scheme
111 ± 12	<sup>40</sup> BECIREVIC	98	LATT $\overline{MS}$ scheme
148 ± 48	<sup>41</sup> CHETYRKIN	98	THEO $\overline{MS}$ scheme
103 ± 10	<sup>42</sup> CUCCHIERI	98	LATT $\overline{MS}$ scheme
115 ± 19	<sup>43</sup> DOMINGUEZ	98	THEO $\overline{MS}$ scheme

$152.4 \pm 14.1$	44	CHETYRKIN	97	THEO	$\overline{MS}$ scheme
$\geq 89$	45	COLANGELO	97	THEO	$\overline{MS}$ scheme
$140 \pm 20$	46	EICKER	97	LATT	$\overline{MS}$ scheme
$95 \pm 16$	47	GOUGH	97	LATT	$\overline{MS}$ scheme
$100 \pm 21 \pm 10$	48	GUPTA	97	LATT	$\overline{MS}$ scheme
$>100$	49	LELLOUCH	97	THEO	$\overline{MS}$ scheme
$140 \pm 24$	50	JAMIN	95	THEO	$\overline{MS}$ scheme

25 GAMIZ 03 determines  $m_s$  from SU(3) breaking in the  $\tau$  hadronic width. The value of  $V_{us}$  is chosen to satisfy CKM unitarity.

26 GAMIZ 03 determines  $m_s$  from SU(3) breaking in the  $\tau$  hadronic width. The value of  $V_{us}$  is taken from the PDG.

27 ALIKHAN 02 uses lattice simulation of the meson and baryon masses with two dynamical flavors and degenerate light quarks. The above value uses the  $K$ -meson mass to determine  $m_s$ . If the  $\phi$  meson is used, the number changes to  $90^{+5}_{-10}$ .

28 CHIU 02 extracts the strange quark mass from quenched lattice simulations using quenched chiral perturbation theory.

29 JAMIN 02 calculates the strange quark mass from QCD sum rules using the scalar channel.

30 MALTMAN 02 uses finite energy sum rules in the  $ud$  and  $us$  pseudoscalar channels. Other mass values are also obtained by similar methods.

31 CHEN 01B uses an analysis of the hadronic spectral function in  $\tau$  decay.

32 KOERNER 01 obtain the  $s$  quark mass of  $m_s(m_\tau) = 130 \pm 27(\text{exp}) \pm 9(\text{thy})$  MeV from an analysis of Cabibbo suppressed  $\tau$  decays. We have converted this to  $\mu = 2$  GeV.

33 AOKI 00 obtain the light quark masses from a quenched lattice simulation of the meson and baryon spectrum with the Wilson quark action. We have averaged their results of  $m_s = 115.6 \pm 2.3$  and  $m_s = 143.7 \pm 5.8$  obtained using  $m_K$  and  $m_\phi$ , respectively, to normalize the spectrum.

34 GOECKELER 00 obtained from a quenched lattice computation of the pseudoscalar meson masses using  $\mathcal{O}(a)$  improved Wilson fermions and nonperturbative renormalization.

35 AOKI 99 obtain the light quark masses from a quenched lattice simulation of the meson spectrum with the Staggered quark action employing the regularization independent scheme. We have averaged their results of  $m_s = 106.0 \pm 7.1$  and  $m_s = 129 \pm 12$  obtained using  $m_K$  and  $m_\phi$ , respectively, to normalize the spectrum.

36 BARATE 99R obtain the strange quark mass from an analysis of the observed mass spectra in  $\tau$  decay. We have converted their value of  $m_s(m_\tau) = 176^{+46}_{-57}$  MeV to  $\mu = 2$  GeV.

37 MALTMAN 99 determines the strange quark mass using finite energy sum rules.

38 NARISON 99 uses sum rules to order  $\alpha_s^3$  for  $\phi$  meson decays.

39 PICH 99 obtain the  $s$ -quark mass from an analysis of the moments of the invariant mass distribution in  $\tau$  decays.

40 BECIREVIC 98 compute the quark mass using the Alpha action in the quenched approximation. The conversion from the regularization independent scheme to the  $\overline{MS}$  scheme is at NNLO.

41 CHETYRKIN 98 uses spectral moments of hadronic  $\tau$  decays to determine  $m_s(1 \text{ GeV}) = 200 \pm 70$  MeV. We have rescaled the result to  $\mu = 2$  GeV.

42 CUCCHIERI 98 obtains the quark mass using a quenched lattice computation of the hadronic spectrum.

43 DOMINGUEZ 98 uses hadronic spectral function sum rules (to four loops, and including dimension six operators) to determine  $m_s(1 \text{ GeV}) < 155 \pm 25$  MeV. We have rescaled the result to  $\mu = 2$  GeV.

44 CHETYRKIN 97 obtains  $205.5 \pm 19.1$  MeV at  $\mu = 1$  GeV from QCD sum rules including fourth-order QCD corrections. We have rescaled the result to  $2$  GeV.

45 COLANGELO 97 is QCD sum rule computation. We have rescaled  $m_s(1 \text{ GeV}) > 120$  to  $\mu = 2$  GeV.

- 46 EICKER 97 use lattice gauge computations with two dynamical light flavors.  
 47 GOUGH 97 use lattice gauge computations in the quenched approximation. Correcting for quenching gives  $54 < m_s < 92$  MeV at  $\mu=2$  GeV.  
 48 GUPTA 97 use Lattice Monte Carlo computations in the quenched approximation. The value for two light dynamical flavors at  $\mu = 2$  GeV is  $68 \pm 12 \pm 7$  MeV.  
 49 LELLOUCH 97 obtain lower bounds on quark masses using hadronic spectral functions.  
 50 JAMIN 95 uses QCD sum rules at next-to-leading order. We have rescaled  $m_s(1 \text{ GeV}) = 189 \pm 32$  to  $\mu = 2$  GeV.

## LIGHT QUARK MASS RATIOS

### *u/d* MASS RATIO

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>0.2 to 0.7 OUR EVALUATION</b>			
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
$0.410 \pm 0.036$	51 NELSON	03 LATT	$\overline{MS}$ scheme
0.44	52 GAO	97 THEO	$\overline{MS}$ scheme
$0.553 \pm 0.043$	53 LEUTWYLER	96 THEO	Compilation
$< 0.3$	54 CHOI	92 THEO	
0.26	55 DONOGHUE	92 THEO	
$0.30 \pm 0.07$	56 DONOGHUE	92B THEO	
0.66	57 GERARD	90 THEO	
0.4 to 0.65	58 LEUTWYLER	90B THEO	
0.05 to 0.78	59 MALTMAN	90 THEO	

- 51 NELSON 03 computes coefficients in the order  $p^4$  chiral Lagrangian using a lattice calculation with three dynamical flavors. The ratio  $m_u/m_d$  is obtained by combining this with the chiral perturbation theory computation of the meson masses to order  $p^4$ .  
 52 GAO 97 uses electromagnetic mass splittings of light mesons.  
 53 LEUTWYLER 96 uses a combined fit to  $\eta \rightarrow 3\pi$  and  $\psi' \rightarrow J/\psi(\pi, \eta)$  decay rates, and the electromagnetic mass differences of the  $\pi$  and  $K$ .  
 54 CHOI 92 result obtained from the decays  $\psi(2S) \rightarrow J/\psi(1S)\pi$  and  $\psi(2S) \rightarrow J/\psi(1S)\eta$ , and a dilute instanton gas estimate of some unknown matrix elements.  
 55 DONOGHUE 92 result is from a combined analysis of meson masses,  $\eta \rightarrow 3\pi$  using second-order chiral perturbation theory including nonanalytic terms, and  $(\psi(2S) \rightarrow J/\psi(1S)\pi)/(\psi(2S) \rightarrow J/\psi(1S)\eta)$ .  
 56 DONOGHUE 92B computes quark mass ratios using  $(\psi(2S) \rightarrow J/\psi(1S)\pi)/(\psi(2S) \rightarrow J/\psi(1S)\eta)$ , and an estimate of  $L_{14}$  using Weinberg sum rules.  
 57 GERARD 90 uses large  $N$  and  $\eta$ - $\eta'$  mixing.  
 58 LEUTWYLER 90B determines quark mass ratios using second-order chiral perturbation theory for the meson and baryon masses, including nonanalytic corrections. Also uses Weinberg sum rules to determine  $L_7$ .  
 59 MALTMAN 90 uses second-order chiral perturbation theory including nonanalytic terms for the meson masses. Uses a criterion of "maximum reasonableness" that certain coefficients which are expected to be of order one are  $\leq 3$ .

### *s/d* MASS RATIO

<u>VALUE</u>	<u>DOCUMENT ID</u>	<u>TECN</u>	<u>COMMENT</u>
<b>17 to 22 OUR EVALUATION</b>			
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
20.0	60 GAO	97 THEO	$\overline{MS}$ scheme
$18.9 \pm 0.8$	61 LEUTWYLER	96 THEO	Compilation
21	62 DONOGHUE	92 THEO	
18	63 GERARD	90 THEO	
18 to 23	64 LEUTWYLER	90B THEO	

- <sup>60</sup> GAO 97 uses electromagnetic mass splittings of light mesons.  
<sup>61</sup> LEUTWYLER 96 uses a combined fit to  $\eta \rightarrow 3\pi$  and  $\psi' \rightarrow J/\psi(\pi, \eta)$  decay rates, and the electromagnetic mass differences of the  $\pi$  and  $K$ .  
<sup>62</sup> DONOGHUE 92 result is from a combined analysis of meson masses,  $\eta \rightarrow 3\pi$  using second-order chiral perturbation theory including nonanalytic terms, and  $(\psi(2S) \rightarrow J/\psi(1S)\pi)/(\psi(2S) \rightarrow J/\psi(1S)\eta)$ .  
<sup>63</sup> GERARD 90 uses large  $N$  and  $\eta$ - $\eta'$  mixing.  
<sup>64</sup> LEUTWYLER 90B determines quark mass ratios using second-order chiral perturbation theory for the meson and baryon masses, including nonanalytic corrections. Also uses Weinberg sum rules to determine  $L_7$ .

### $(m_s - m)/(m_d - m_u)$ MASS RATIO

$$\bar{m} \equiv (m_u + m_d)/2$$

VALUE DOCUMENT ID TECN

#### 30 to 50 OUR EVALUATION

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

- |            |                         |    |      |
|------------|-------------------------|----|------|
|            | <sup>65</sup> ANISOVICH | 96 | THEO |
| $36 \pm 5$ | <sup>66</sup> NEFKENS   | 92 | THEO |
| $45 \pm 3$ | <sup>67</sup> NEFKENS   | 92 | THEO |
- <sup>65</sup> ANISOVICH 96 find  $Q=22.7 \pm 0.8$  with  $Q^2 \equiv (m_s^2 - m^2)/(m_d^2 - m_s^2)$  from  $\eta \rightarrow \pi^+ \pi^- \pi^0$  decay using dispersion relations and chiral perturbation theory.  
<sup>66</sup> NEFKENS 92 result is from an analysis of meson masses, mixing, and decay.  
<sup>67</sup> NEFKENS 92 result is from an analysis of baryon masses.

### LIGHT QUARKS ( $u, d, s$ ) REFERENCES

GAMIZ	03	JHEP 0301 060	E. Gamiz <i>et al.</i>
NELSON	03	PRL 90 021601	D. Nelson, G.T. Fleming, G.W. Kilcup
ALIKHAN	02	PR D65 054505	A. Ali Khan <i>et al.</i> (CP-PACS Collab.)
Also	03	PR D67 059901 (erratum)	A. Ali Khan <i>et al.</i> (CP-PACS Collab.)
CHIU	02	PL B538 298	T.-W. Chiu, T.-H. Hsieh
JAMIN	02	EPJ C24 237	M. Jamin, J.A. Oller, A. Pich
MALTMAN	02	PR D65 074013	K. Maltman, J. Kambor
CHEN	01B	EPJ C22 31	S. Chen <i>et al.</i>
KOERNER	01	EPJ C20 259	J.G. Koerner, F. Krajewski, A.A. Pivovarov
MALTMAN	01	PL B517 332	K. Maltman, J. Kambor
AOKI	00	PRL 84 238	S. Aoki <i>et al.</i> (CP-PACS Collab.)
GOECKELER	00	PR D62 054504	M. Goeckeler <i>et al.</i>
AOKI	99	PRL 82 4392	S. Aoki <i>et al.</i> (JLQCD Collab.)
BARATE	99R	EPJ C11 599	R. Barate <i>et al.</i> (ALEPH Collab.)
MALTMAN	99	PL B462 195	K. Maltman
NARISON	99	PL B466 345	S. Narison
PICH	99	JHEP 9910 004	A. Pich, J. Prades
STEELE	99	PL B451 201	T.G. Steele, K. Kostuik, J. Kwan
BECIREVIC	98	PL B444 401	D. Becirevic <i>et al.</i>
CHETYRKIN	98	NP B533 473	K.G. Chetyrkin, J.H. Kuehn, A.A. Pivovarov
CUCCHIERI	98	PL B422 212	A. Chucchieri <i>et al.</i>
DOMINGUEZ	98	PL B425 193	C.A. Dominguez, L. Pirovano, K. Schilcher
DOSCH	98	PL B417 173	H.G. Dosch, S. Narison
PRADES	98	NPBPS 64 253	J. Prades
CHETYRKIN	97	PL B404 337	K.G. Chetyrkin, D. Pirjol, K. Schilcher
COLANGELO	97	PL B408 340	P. Colangelo <i>et al.</i>
EICKER	97	PL B407 290	N. Eicker <i>et al.</i> (SESAM Collab.)
GAO	97	PR D56 4115	D.-N. Gao, B.A. Li, M.-L. Yan
GOUGH	97	PRL 79 1622	B. Gough <i>et al.</i>
GUPTA	97	PR D55 7203	R. Gupta, T. Bhattacharya
LELLOUCH	97	PL B414 195	L. Lellouch, E. de Rafael, J. Taron

ANISOVICH	96	PL B375 335	A.V. Anisovich, H. Leutwyler
LEUTWYLER	96	PL B378 313	H. Leutwyler
BIJNENS	95	PL B348 226	J. Bijnens, J. Prades, E. de Rafael (NORD, BOHR+)
JAMIN	95	ZPHY C66 633	M. Jamin, M. Munz (HEIDT, MUNT)
NARISON	95C	PL B358 113	S. Narison (MONP)
CHOI	92	PL B292 159	K.W. Choi (UCSD)
DONOGHUE	92	PRL 69 3444	J.F. Donoghue, B.R. Holstein, D. Wyler (MASA+)
DONOGHUE	92B	PR D45 892	J.F. Donoghue, D. Wyler (MASA, ZURI, UCSBT)
NEFKENS	92	CNPP 20 221	B.M.K. Nefkens, G.A. Miller, I. Slaus (UCLA+)
GERARD	90	MPL A5 391	J.M. Gerard (MPIM)
LEUTWYLER	90B	NP B337 108	H. Leutwyler (BERN)
MALTMAN	90	PL B234 158	K. Maltman, T. Goldman, Stephenson Jr. (YORKC+)

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