



$$I(J^P) = 0(\frac{1}{2}^+)$$

$$\text{Charge} = \frac{2}{3} e \quad \text{Charm} = +1$$

## c-QUARK MASS

The  $c$ -quark mass corresponds to the “running” mass  $m_c(\mu = m_c)$  in the  $\overline{\text{MS}}$  scheme. We have converted masses in other schemes to the  $\overline{\text{MS}}$  scheme using two-loop QCD perturbation theory with  $\alpha_s(\mu=m_c) = 0.38 \pm 0.03$ . The value  $1.275 \pm 0.025$  GeV for the  $\overline{\text{MS}}$  mass corresponds to  $1.67 \pm 0.07$  GeV for the pole mass (see the “Note on Quark Masses”).

VALUE (GeV)	DOCUMENT ID	TECN	COMMENT
<b>1.275±0.025 OUR EVALUATION</b>	See the ideogram below.		
1.261±0.016	<sup>1</sup> NARISON 12A	THEO	$\overline{\text{MS}}$ scheme
1.278±0.009	<sup>2</sup> BODENSTEIN 11	THEO	$\overline{\text{MS}}$ scheme
1.28 <sup>+0.07</sup> -0.06	<sup>3</sup> LASCHKA 11	THEO	$\overline{\text{MS}}$ scheme
1.196±0.059±0.050	<sup>4</sup> AUBERT 10A	BABR	$\overline{\text{MS}}$ scheme
1.28 ±0.04	<sup>5</sup> BLOSSIER 10	LATT	$\overline{\text{MS}}$ scheme
1.273±0.006	<sup>6</sup> MCNEILE 10	LATT	$\overline{\text{MS}}$ scheme
1.279±0.013	<sup>7</sup> CHETYRKIN 09	THEO	$\overline{\text{MS}}$ scheme
1.25 ±0.04	<sup>8</sup> SIGNER 09	THEO	$\overline{\text{MS}}$ scheme
1.295±0.015	<sup>9</sup> BOUGHEZAL 06	THEO	$\overline{\text{MS}}$ scheme
1.24 ±0.09	<sup>10</sup> BUCHMULLER06	THEO	$\overline{\text{MS}}$ scheme
1.224±0.017±0.054	<sup>11</sup> HOANG 06	THEO	$\overline{\text{MS}}$ scheme
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●			
1.299±0.026	<sup>12</sup> BODENSTEIN 10	THEO	$\overline{\text{MS}}$ scheme
1.261±0.018	<sup>13</sup> NARISON 10	THEO	$\overline{\text{MS}}$ scheme
1.268±0.009	<sup>14</sup> ALLISON 08	LATT	$\overline{\text{MS}}$ scheme
1.286±0.013	<sup>15</sup> KUHN 07	THEO	$\overline{\text{MS}}$ scheme
1.33 ±0.10	<sup>16</sup> AUBERT 04X	THEO	$\overline{\text{MS}}$ scheme
1.29 ±0.07	<sup>17</sup> HOANG 04	THEO	$\overline{\text{MS}}$ scheme
1.319±0.028	<sup>18</sup> DEDIVITIIS 03	LATT	$\overline{\text{MS}}$ scheme
1.19 ±0.11	<sup>19</sup> EIDEMULLER 03	THEO	$\overline{\text{MS}}$ scheme
1.289±0.043	<sup>20</sup> ERLER 03	THEO	$\overline{\text{MS}}$ scheme
1.26 ±0.02	<sup>21</sup> ZYABLYUK 03	THEO	$\overline{\text{MS}}$ scheme

<sup>1</sup> NARISON 12A determines  $m_c$  using sum rules for the vector current correlator to order  $\alpha_s^3$ , including the effect of gluon condensates up to dimension eight.

<sup>2</sup> BODENSTEIN 11 determine  $\overline{m}_c(3 \text{ GeV}) = 0.987 \pm 0.009$  GeV and  $\overline{m}_c(\overline{m}_c) = 1.278 \pm 0.009$  GeV using QCD sum rules for the charm quark vector current correlator.

<sup>3</sup> LASCHKA 11 determine the  $c$  mass from the charmonium spectrum. The theoretical computation uses the heavy  $Q\overline{Q}$  potential to order  $1/m_Q$  obtained by matching the short-distance perturbative result onto lattice QCD result at larger scales.

<sup>4</sup> AUBERT 10A determine the  $b$ - and  $c$ -quark masses from a fit to the inclusive decay spectra in semileptonic  $B$  decays in the kinetic scheme (and convert it to the  $\overline{\text{MS}}$  scheme).

<sup>5</sup> BLOSSIER 10 determines quark masses from a computation of the hadron spectrum using  $N_f=2$  dynamical twisted-mass Wilson fermions.

<sup>6</sup> MCNEILE 10 determines  $m_c$  by comparing four-loop perturbative results for the pseudoscalar current to lattice simulations with  $N_f = 2+1$  sea-quarks by the HPQCD collaboration.

- 7 CHETYRKIN 09 determine  $m_c$  and  $m_b$  from the  $e^+ e^- \rightarrow Q\bar{Q}$  cross-section and sum rules, using a four-loop computation of the heavy quark vacuum polarization. They also determine  $m_c(3 \text{ GeV}) = 0.986 \pm 0.013 \text{ GeV}$ .
- 8 SIGNER 09 determines the  $c$ -quark mass using non-relativistic sum rules to analyze the  $e^+ e^- \rightarrow c\bar{c}$  cross-section near threshold. Also determine the PS mass  $m_{PS}(\mu_F = 0.7 \text{ GeV}) = 1.50 \pm 0.04 \text{ GeV}$ .
- 9 BOUGHEZAL 06 result comes from the first moment of the hadronic production cross-section to order  $\alpha_s^3$ .
- 10 BUCHMULLER 06 determine  $m_b$  and  $m_c$  by a global fit to inclusive  $B$  decay spectra.
- 11 HOANG 06 determines  $\bar{m}_c(\bar{m}_c)$  from a global fit to inclusive  $B$  decay data. The  $B$  decay distributions were computed to order  $\alpha_s^2\beta_0$ , and the conversion between different  $m_c$  mass schemes to order  $\alpha_s^3$ .
- 12 BODENSTEIN 10 determines  $\bar{m}_c(3 \text{ GeV}) = 1.008 \pm 0.026 \text{ GeV}$  using finite energy sum rules for the vector current correlator. The authors have converted this to  $\bar{m}_c(\bar{m}_c)$  using  $\alpha_s(M_Z) = 0.1189 \pm 0.0020$ .
- 13 NARISON 10 determines  $m_c$  from ratios of moments of vector current correlators computed to order  $\alpha_s^3$  and including the dimension-six gluon condensate.
- 14 ALLISON 08 determine  $m_c$  by comparing four-loop perturbative results for the pseudoscalar current correlator to lattice simulations by the HPQCD collaboration. The result has been updated in MCNEILE 10.
- 15 KUHN 07 determine  $\bar{m}_c(\mu = 3 \text{ GeV}) = 0.986 \pm 0.013 \text{ GeV}$  and  $\bar{m}_c(\bar{m}_c)$  from a four-loop sum-rule computation of the cross-section for  $e^+ e^- \rightarrow$  hadrons in the charm threshold region.
- 16 AUBERT 04X obtain  $m_c$  from a fit to the hadron mass and lepton energy distributions in semileptonic  $B$  decay. The paper quotes values in the kinetic scheme. The  $\overline{MS}$  value has been provided by the BABAR collaboration.
- 17 HOANG 04 determines  $\bar{m}_c(\bar{m}_c)$  from moments at order  $\alpha_s^2$  of the charm production cross-section in  $e^+ e^-$  annihilation.
- 18 DEDIVITIIS 03 use a quenched lattice computation of heavy-heavy and heavy-light meson masses.
- 19 EIDEMULLER 03 determines  $m_b$  and  $m_c$  using QCD sum rules.
- 20 ERLER 03 determines  $m_b$  and  $m_c$  using QCD sum rules. Includes recent BES data.
- 21 ZYABLYUK 03 determines  $m_c$  by using QCD sum rules in the pseudoscalar channel and comparing with the  $\eta_c$  mass.



ABDALLAH	06B	EPJ C45 35	J. Abdallah <i>et al.</i>	(DELPHI Collab.)
BOUGHEZAL	06	PR D74 074006	R. Boughezal, M. Czakon, T. Schutzmeier	
BUCHMULLER	06	PR D73 073008	O.L. Buchmuller, H.U. Flacher	
HOANG	06	PL B633 526	A.H. Hoang, A.V. Manohar	
AUBERT	04X	PRL 93 011803	B. Aubert <i>et al.</i>	(BABAR Collab.)
BAUER	04	PR D70 094017	C. Bauer <i>et al.</i>	
HOANG	04	PL B594 127	A.H. Hoang, M. Jamin	
DEDIVITIIS	03	NP B675 309	G.M. de Divitiis <i>et al.</i>	
EIDEMULLER	03	PR D67 113002	M. Eidemuller	
ERLER	03	PL B558 125	J. Erler, M. Luo	
ZYABLYUK	03	JHEP 0301 081	K.N. Zyblyuk	(ITEP)

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