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Charmed meson masses and decay constants in the continuum from the tadpole improved clover ensembles

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We present the determination of the charm quark mass, the masses and decay constants of charmed mesons using thirteen 2+1 flavor full-QCD gauge ensembles at five different lattice spacings $a \in [0.05, 0.11]$ fm, 8 pion masses $m_\pi \in (130, 360)$ MeV, and several values of the strange quark mass, which facilitate us to do the chiral and continuum extrapolation. These ensembles are generated through the stout smeared clover fermion action and Symanzik gauge actions with the tadpole improvement. Using QED-subtracted D_s meson mass and non-perturbative renormalization, we predict the charm quark mass in the continuum with physical light and strange quark masses to be $m_c(m_c) = 1.289(17)$ GeV in \overline{MS} scheme, with the systematic uncertainties from lattice spacing determination, renormalization constant, and fit ansatz included. Predictions of the open and close charm mesons using this charm quark mass agree with the experimental value at 0.4% level uncertainty. We obtained $D_{(s)}$ decay constants and also by far the most precise $D_{(s)}^*$ decay constants $f_{D^*} = 0.2304(30)$ GeV and $f_{D_s^*} = 0.2724(34)$ GeV, with the charm quark improved vector current normalization.

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