

Purely leptonic decays of heavy-flavored charged mesons

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We study the purely leptonic decays of heavy-flavored charged pseudoscalar (P) and vector (V) mesons ($D_{(s)}^{(*)+}$, $B_{(c)}^{(*)+}$) in the relativistic independent quark (RIQ) model based on an average flavor-independent confining potential in equally mixed scalar-vector harmonic form. We first compute the mass spectra of the ground-state-mesons and fix the model parameters necessary for the present analysis. Using the meson wave functions derivable in the RIQ model, and model parameters so fixed from hadron spectroscopy. Our results: $(f_{D^+}, f_{D_s^+})=(219.58_{-11.49-9.33}^{+10.72+8.76}, 253.50_{-14.03-10.06}^{+13.12+9.46})$, $(f_{D^{*+}}, f_{D_s^{*+}})=(256.09_{-7.79-13.03}^{+7.49+12.45}, 285.97_{-10.38-13.37}^{+9.92+12.75})$, $(f_{B^+}, f_{B_c^+})=(161.34_{-7.81-6.14}^{+7.42+5.8}, 249.50_{-11.45-9.85}^{+10.68+9.29})$ and $(f_{B^{*+}}, f_{B_c^{*+}})=(172.61_{-5.06-8.93}^{+4.9+8.54}, 258.66_{-10.47-10.68}^{+9.85+10.1})$ in MeV are in good agreement with the available experimental data and other model predictions including those obtained from the LQCD calculations. The ratios of decay constants: f_V/f_P , f_{P_1}/f_{P_2} , f_{V_1}/f_{V_2} and the branching fractions (BFs): $calB(P(V) \rightarrow l^+ \nu_l)$, $l = e, \mu, \tau$ are also obtained in reasonable agreement with the available experimental data and other Standard Model (SM) predictions. For the unmeasured decay constants especially in the purely leptonic decays of the charged vector mesons, our predictions could be tested in the upcoming Belle-II, SCTF, CEPC, FCC-ee and LHCb experiments in near future.

Track type

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