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The Dispersive Matrix perspective on Lepton Flavour Universality observables

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The ratios $R(D^{(*)})$ are defined as the τ/μ ratio of the branching fractions of semileptonic $B \to D^{(*)}$ decays. They are a powerful test of Lepton Flavour Universality (LFU) and are determined by the hadronic Form Factors (FFs) describing the $B \to D^{(*)}$ decays. Through the novel Dispersive Matrix (DM) approach, we describe these FFs without assumptions on their functional dependence on the momentum transfer. The DM method is based on the non-perturbative determination of the dispersive bounds due to unitarity and analyticity, and allows to determine in a model-independent way the FFs in the full kinematical range, starting from existing Lattice QCD data which are available only at large momentum transfer. Using the unitarity bands of the FFs, which are then independent of the experimental determinations of the differential decay widths, we compute new fully-theoretical expectations of the LFU ratios. Our results read $R(D) = 0.296(8)$ and $R(D^*) = 0.275(8)$, each of which is compatible with the corresponding world average of the measurements at the 2.0σ and 0.6σ level, respectively. We will also discuss the application of the DM method to semileptonic $B_s \to D_s^{(*)}$ decays and present new results for the LFU ratios $R(D_s^{(*)})$, which offer a complementary way to test LFU in $b \to c$ quark transitions.

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