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Non-perturbative bounds for the semileptonic $B \to D^{(*)}\ell\nu_\ell$ decays and phenomenological applications

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We apply a novel method to a non-perturbative determination of the hadronic form factors describing the exclusive semileptonic $B \to D^{(*)}\ell\nu_\ell$ decays. The method is based on the non-perturbative calculation of the dispersive bounds due to unitarity and analyticity, and it allows to determine in a model-independent way the form factors in the full kinematical range of the recoil, starting from existing lattice data which are available only at small recoil (including preliminary ones). We investigate the extraction of the Cabibbo-Kobayashi-Maskawa entry $|V_{cb}|$ from the experimental data on the semileptonic $B \to D^{(*)}\ell\nu_\ell$ decays, obtaining $|V_{cb}| = (40.7 \pm 1.2) \cdot 10^{-3}$ from $B \to D$ decays and $|V_{cb}| = (40.6 \pm 1.6) \cdot 10^{-3}$ from $B \to D^*$ decays. Our esclusive results are consistent within ~ 1 standard deviation with the most recent inclusive determination $|V_{cb}|_{incl} = (42.00 \pm 0.65) \cdot 10^{-3}$. We address also the issue of Lepton Flavor Universality thanks to new theoretical estimates of the ratios $R(D^{(*)})$, namely $R(D) = 0.289(8)$ and $R(D^*) = 0.249(21)$. Our findings differ respectively by $\sim 1.6\sigma$ and $\sim 1.8\sigma$ from the latest corresponding experimental determinations.

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