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Inclusive hadronic decay rate of the τ lepton from lattice QCD

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Inclusive hadronic τ decays are very interesting from the phenomenological viewpoint since they give access to the CKM matrix elements V_{ud} and V_{us} . In this talk, exploiting flavour diagonal vector and axial two-point correlators produced with high statistics by ETMC within the muon $g - 2$ HVP project, we apply the HLT method for hadronic smeared spectral densities to study the inclusive decay $\tau \rightarrow \nu + X_{ud}$ and compute its rate over $|V_{ud}|^2$. The computation avoids any recourse to OPE and/or perturbative methods, is performed in isospin symmetric $N_f = 2 + 1 + 1$ QCD, using three lattice spacings, two volumes and physical quark masses and, taking all uncertainties (apart from isospin breaking effect) into account, yields a subpercent error for $|V_{ud}|$. These findings motivate extension to the inclusive decay $\tau \rightarrow \nu + X_{us}$ and inclusion of the leading isospin-breaking effects, in order to obtain a precise first principles determination of $|V_{us}|$ from inclusive τ decay.

Topical area

Quark and Lepton Flavor Physics

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