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The Cabibbo Angle from Inclusive τ Decays

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The inclusive hadronic decays of the τ lepton are of great interest as they provide an alternative method for determining the CKM matrix elements V_{ud} and V_{us} . In this talk, I will present the results of the ETM Collaboration on the inclusive hadronic decay rate of the τ . Our results have been obtained in $N_f = 2 + 1 + 1$ QCD using the novel HLT method, which circumvents the well-known inverse Laplace transform problem that hinders this calculation, i.e. for the first time without relying on the operator-product expansion or on perturbative QCD.

Except for isospin-breaking effects, all sources of systematic errors are under control. We obtain a value for the Cabibbo angle of $|V_{us}|_{\tau\text{-latt-incl}} = 0.2189(7)\text{th}(18)\text{exp}$, which shows a 3σ tension with purely hadronic determinations of $|V_{us}|$. We believe that this tension, which can no longer be attributed to the OPE approximation, deserves further scrutiny of the experimental uncertainties and calls for a first-principles determination of the isospin-breaking corrections, which we are currently investigating.

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