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Virtual radiative Leptonic decays of charged Kaons

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We present preliminary results for $K \rightarrow l\nu_l l'^+ l'^-$ decays, which are mediated by an off-shell W boson and a virtual photon. These decays are suppressed in the Standard Model since their rates start at $\mathcal{O}(\alpha_{em}^2)$, making them very interesting in the search for new physics.

We compute the four form factors needed to describe the structure-dependent part of the decay amplitudes using the $N_f = 2 + 1 + 1$ gauge ensembles generated by the Extended Twisted Mass Collaboration (ETMC) at the pion physical point.

We choose several values of both the momentum and the virtuality of the photon k^2 to cover all the allowed kinematic range. In the region above the two-pion threshold ($k^2 > 4m_\pi^2$), where issues related to the analytic continuation are present, we reconstruct the form factors employing the so-called HLT method.

As a byproduct of our analysis, we reassess the form factors entering $K \rightarrow l\nu_l \gamma$.

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