

Radiative leptonic decays of pseudoscalar mesons from lattice QCD

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Radiative leptonic decays of the form $P \rightarrow l \nu \gamma$, where P is a charged pseudoscalar meson and l a lepton, are interesting probes of New Physics beyond the SM. When the pseudoscalar P is heavy (e.g. for $P=D, D_s, B$) and the lepton l is light, the structure-dependent contributions to the decay rate are enhanced w.r.t. the point-like one by a factor $(m_P/m_l)^2$, making the corresponding decay rate very sensitive to the internal structure of the decaying meson. As a part of the Soton/RM123 collaboration program to provide an high-precision lattice QCD determination of the $P \rightarrow l \nu \gamma$ decay amplitude for all heavy mesons, we considered the case $P=D_s$ and computed the axial (FA) and vector (FV) form factors, which parameterize the $P \rightarrow l \nu \gamma$ amplitude, over the whole allowed phase space. Our calculation makes use of the gauge-field configurations produced by the ETM collaboration using $N_f=2+1+1$ flavours of Wilson-clover twisted-mass fermions at maximal twist. Our determination of the $D_s \rightarrow e \nu \gamma$ decay rate turns out to be much lower than existing model-dependent calculations, and well within the experimental bound set by the BESIII collaboration.

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