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Rare FCNC radiative leptonic $B \rightarrow \gamma l+l^-$ decays in the standard model

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We revisit rare radiative leptonic decays $B_{(s,d)} \rightarrow \gamma e e$ and $B_{(s,d)} \rightarrow \gamma \mu \mu$ in the standard model and provide the updated estimates for various differential distributions (the branching ratios, the forward-backward asymmetry, and $R_{\mu=e}$, the ratio of the differential distribution for muons over electrons in the final state). The new ingredients of this work compared to the existing theoretical analyses are the following: (i) we calculate all $B \rightarrow \gamma$ form factors induced by the vector, axial-vector, tensor and pseudotensor quark currents within the relativistic dispersion approach based on the constituent quark picture; (ii) we perform a detailed analysis of the charm-loop contributions to radiative leptonic decays: we obtain constraints imposed by electromagnetic gauge invariance and discuss the existing ambiguities in the charmonia contributions.

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