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Probing for New Physics with $b \to s\ell^+\ell^-$ and $b \to d\ell^+\ell^-$ Transitions at LHCb

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Flavour-changing neutral current processes, such as $b \to s\ell^+\ell^-$ and $b \to d\ell^+\ell^-$ transitions, are highly sensitive probes of new physics. In the Standard Model, their contributions are both loop and CKM suppressed, with $b \to d\ell^+\ell^-$ further suppressed by small off-diagonal quark-flavour mixing couplings and forbidden at the lowest perturbative order. The $b \to s\ell^+\ell^-$ decays have drawn increased interest over the past decade due to a pattern of self-consistent, sizeable and persistent tensions between measurements and Standard Model predictions. In contrast, $b \to d\ell^+\ell^-$ processes have remained largely unexplored due to their scarcity, although they are also sensitive to non-Standard Model loop contributions that can affect associated decay rates and angular distributions. This talk will present the latest LHCb results on amplitude analyses and branching fraction measurements of $b \to s\ell^+\ell^-$ processes, alongside an overview of recent $b \to d\ell^+\ell^-$ results obtained from data collected at LHCb. Future prospects in this field will also be discussed in view of the ongoing data taking.

Secondary track

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