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Doubly-charged scalar from the right-handed sector: complementary tests from $0\nu\beta\beta$ decay, parity-violating Møller scattering, and colliders

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In the context of the left-right symmetric model, we study the interplay of the neutrinoless double beta ($0\nu\beta\beta$) decay, parity-violating Møller scattering, and high-energy colliders, resulting from the Yukawa interaction of the right-handed doubly-charged scalar to electrons, which could evade the severe constraints from charged lepton flavor violation. The half-life
onbb decay calculated in the effective field theory (EFT) framework allows for an improved description of the contributions with a non-zero left-right mixing and light right-handed neutrino.
We find that the sensitivities of the low-energy (or high-precision) and high-energy experiments are complementary to each other. The reach of parity-violating Møller scattering in the MOLLER experiment is stronger than those of future ton-scale $0\nu\beta\beta$-decay for TeV scale right-handed neutrino if the left-right mixing is negligible. On the other hand, for a non-zero left-right mixing, the constraints set by the MOLLER experiment become complementary to future ton-scale $0\nu\beta\beta$-decay experiments as well as direct searches and precision measurements at high-energy colliders.

Mini Symposia (Invited Talks Only)

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