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Z′-mediated Majorana dark matter: suppressed direct-detection rate and complementarity of LHC searches

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We study the direct-detection rate for axial-vectorial dark matter scattering off nuclei in an SU(2) × U(1) invariant effective theory and compare it against the LHC reach. Current constraints from direct detection experiments are already bounding the mediator mass to be well into the TeV range for WIMP-like scenarios. This motivates a consistent and systematic exploration of the parameter space to map out possible regions where the rates could be suppressed. We do indeed find such regions and proceed to construct consistent UV models that generate the relevant effective theory. We then discuss the corresponding constraints from both collider and direct-detection experiments on the same parameter space. We find a benchmark scenario, where even for future XENONnT experiment, LHC constraints will have a greater sensitivity to the mediator mass.

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