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Anapole Dark Matter Direct Detection and Gravitinos

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We explore direct detection constraints on the anapole form factors of massive spin-3/2 Majorana dark matter particle. From supergravity, the gravitino naturally emerges as a candidate. We calculate the anapole form factors of the LSP gravitino in N = 1 broken supergravity, analyzing their dependence on the parameters of the theory and evaluating the prospects for its direct detection.
Furthermore, the general interactions between spin-3/2 fermions and lower-spin particles are explored, revealing stringent constraints on a renormalizable realization of one-loop interactions with a photon. Based on our findings, we propose an extension to the Standard Model incorporating a dark sector with spin-3/2 dark matter. Current direct detection limits tightly constrain the parameter space of this model.

Primary author: YONAR, Onur

Presenter: YONAR, Onur

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