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New decay modes of gravitino dark matter

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We consider the three-body decays of gravitino dark matter in supersymmetric scenarios with bilinear R-parity violation. In particular, gravitino decays into lepton+ W^+ ($lepton f\bar{f}'$) and $\nu+Z^0$ ($\nu f\bar{f}$) are examined for gravitino masses below M_W . After computing the gravitino decay rates into these three-body final states and studying their dependence on supersymmetric parameters, we find that these new decay modes are often more important than the two-body decay, into a photon and a neutrino, considered in previous works. Consequently, the gravitino lifetime and its branching ratios are substantially modified, with important implications for the indirect detection of gravitino dark matter.

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