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Hunting decaying gravitino dark matter with the Fermi LAT

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If dark matter particles are not perfectly stable, their decay products could be seen in the cosmic-ray fluxes. A natural candidate for decaying dark matter is the gravitino in R-parity violating scenarios. In the relevant GeV-TeV energy range, the Fermi Large Area Telescope (LAT) is now measuring cosmic gamma-ray fluxes with an unprecedented precision. We use the public gamma-ray data to search for signatures from gravitino dark matter: For gravitino masses below ~ 200 GeV, the most distinct feature is an intense gamma-ray line, which could show up in a spectral analysis of high latitude fluxes. For larger gravitino masses, nearby galaxy clusters are very promising targets. Our results allow us to put strong limits on the gravitino lifetime. These limits imply lower bounds on the decay length of next-to-lightest superparticles, which could be observed at the LHC in the future. Details on our data analysis as well as implications for the standard WIMP dark matter scenario will be discussed.

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