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Constraints on Heavy Dark Matter Annihilation and Decay from Electron and Positron Cosmic Ray Spectra

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Annihilation or decay of dark matter (DM) could contribute to the electron and positron cosmic-ray flux, thus the parameter space of DM candidate models can be probed by these messengers. The signature's location in energy is closely correlated with the DM mass, making the TeV-range of these spectra most important for studying heavy DM of models beyond the WIMP paradigm.

Among the ISS-based experiments, CALET (Calorimetric Electron Telescope) is directly measuring the energy spectrum of electron+positron cosmic rays up to 20 TeV, while the magnet spectrometer AMS-02 can also provide an exclusive positron-only spectrum below the TeV range. The combined analysis of both datasets allows for a sophisticated modeling of the astrophysical background to the DM signature, including pulsars as the origin of the positron excess and individual supernova remnant sources.

For generic annihilation/decay channels, as well as for meson-lepton channels as a possible signature of topological defects, limits ranging from GeV well into the TeV mass range have been calculated based on the latest available data from CALET and AMS-02. In addition to these resulting limits, the limit calculation method and the underlying models of cosmic-ray propagation and astrophysical background are presented.

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