
Voyager probing dark matter

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Abstract

MeV dark matter particles annihilating or decaying to electron-positron pairs cannot, in principle, be observed via local cosmic-ray measurements because of the shielding solar magnetic field. Here, we take advantage of spacecraft Voyager 1's capacity for detecting interstellar CRs since it crossed the heliopause in 2012. This opens up a new avenue to probe DM in the sub-GeV energy/mass range. From a complete description of the transport of electrons and positrons at low energy, we derive predictions for both the secondary astrophysical background and the pair production mechanisms relevant to DM annihilation or decay down to the MeV mass range. We combine the constraints from the Voyager and AMS-02 data to get novel limits covering a very extended DM particle mass range, from MeV to TeV. Though extracted from a completely different and new probe, these bounds have a strength similar to those obtained with the cosmic microwave background - they are even more stringent for p-wave annihilation.

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