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A search for dark matter using sub- PeV gamma-rays observed by Tibet ASγ

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The discovery of diffuse sub-PeV gamma-rays by the Tibet AS_γ collaboration promises to revolutionize our understanding of the high-energy astrophysical universe. It has been shown that this data broadly agrees with prior theoretical expectations. We study the impact of this discovery on a well-motivated new physics scenario: PeV-scale decaying dark matter (DM). Considering a wide range of final states in DM decay, a number of DM density profiles, and numerous astrophysical background models, we find that this data provides the most stringent limit on DM lifetime for various Standard Model final states. In particular, we find that the strongest constraints are derived for DM masses in between a few PeV to few tens of PeV. Near future data of these high-energy gamma-rays can be used to discover PeV-scale decaying DM.

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