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Dark-matter relay for ultra-high-energy cosmic rays

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Astrophysical sources of ultra-high-energy cosmic rays (UHECRs) remain unidentified, and no nearby cosmic accelerators are established even for the highest-energy events. In addition, puzzling correlations of a fraction of UHECR flux with distant blazars were found by HiRes and, recently, Telescope Array experiments. Here we propose that dark matter can provide a mechanism to effectively transfer UHECRs from distant sources: dark-matter particles are boosted by UHECRs near the source and pass their momentum to baryons close to the observer. The probability of this relay is not negligible because of the growth of dark-matter–baryon cross section with energy. We demonstrate that the effect is observable for the fermionic dark matter of the mass $m_{\text{DM}} \sim 25 \text{ MeV}$ and discuss possible observational signatures of this mechanism.

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