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Deflection of ultra-high energy heavy nuclei in magnetic fields

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In this work, we investigate the impacts a potential shift towards a heavy composition at the end of the spectrum would have on the future data. We present detailed simulations for the propagation of ultra-high energy heavy nuclei, with $E > 60$ EeV, within recent Galactic Magnetic Field (GMF) models. We both consider the regular and turbulent components of the GMF. We show that with UHE heavy nuclei, there is no one-to-one correspondence between the arrival directions of cosmic rays measured at Earth and the direction of their extragalactic sources. Sources can have several distorted images on the sky. We compute images of galaxy clusters and of the supergalactic plane in recent GMF models and show the challenges, but also the possibilities, of "UHECR astronomy" with heavy nuclei. Finally, we present a quantitative study of the impact of the GMF on the (de-)magnification of source fluxes, due to magnetic lensing effects. Such effects cannot be neglected in case of a heavy composition.

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