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Shining Light through walls using dark matter - Axion-photon mixing in astrophysics

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Abstract content
 (Max 300 words)

Axions or axion-like particles remain a prime candidate for a component of dark matter. Not only do they have the potential to resolve open questions about the structure of QCD but they are also ubiquitous in high-energy theories and possess the novel property of mixing with photons in the presence of magnetic fields. This mixing process provides a mechanism which allows for the conversion of photons to axions and vice-a-versa. Mixing could also manifest in an observable flux of photons emanating from dark matter halos or in particular distortion effects on the spectra of astrophysical sources and may also serve to increase the transparency of the universe to high energy radiation by “hiding” high energy photons from being lost to pair production processes (or similarly allowing light to shine through walls). Thusly, this process not only provides strong avenues for the potential observation of axionic dark matter but also bears many resemblances to Compton scattering phenomena and the physical basis of this comparison is examined and illustrated in this work. This central focus of this study is the astronomical search for axionic dark matter by examining the effects of axion-photon mixing on observable astrophysical phenomena.

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