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Probing sterile neutrinos and axion-like particles from the Galactic halo with eROSITA

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The nature of dark matter remains an open question and could be in the form of warm dark matter. Sterile neutrinos are well motivated warm dark matter candidates and can decay into photons through mixing, which are consequently detectable by X-ray telescopes for sterile neutrino mass in the keV range. Moreover, axion-like particle are compelling warm dark matter candidates too and they can couple to standard model particles and decay into photons at keV range. Both particles could explain the observed unidentified 3.5 keV line and, interestingly, XENON1T observed an excess at a few keV that can originate from axion-like particles, which is not yet excluded by X-ray constraints for a suppressed coupling to photons with respect to the coupling to electrons.

We study the diffuse emission coming from the Galactic halo, and test the sensitivity of all-sky X-ray survey eROSITA to identify a sterile neutrino or axion-like particle. By Monte Carlo method, we set bounds on the mixing angle of the sterile neutrinos and coupling strength of the axion-like particles. I will show that with eROSITA, we will be able to set stringent constraints, and in particular, we will be able to firmly probe the best-fit of the unidentified 3.5 keV line, where we reach an order of magnitude better sensitivity. Moreover, eROSITA is able to confirm an axion-like particle origin of the XENON1T excess for an excess greater than ~ 3.5 keV.

Keywords

Sterile neutrinos; Axion-like particle; Dark matter; eROSITA

Collaboration

other Collaboration

Subcategory

Future projects

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