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Axion Quark Nuggets: A Recipe for a Glowing Milky Way?

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Telescope observations of background radiation in the Milky Way point to an anomalous excess in ultraviolet, radio, and x-ray signals. The unconventional Axion Quark Nugget (AQN) dark matter model may provide an interpretation for this as-yet-unexplained excess. The model proposes that dark matter is dominated by macroscopic composite objects of nuclear density, in the form of matter and antimatter nuggets. Baryonic matter from ionized gas in the Warm Hot Intergallactic Medium (WHIM) surrounding the Milky Way may collide with antimatter AQNs and annihilate, resulting in an emission of a broad spectrum of electromagnetic radiation similar in form to Bremsstrahlung. The resulting spectrum was estimated to match the excesses in radio, UV, and x-ray signals in the galaxy. The aim of this project is to compare the AQN annihilation radio emissions with the observed radio haze from WMAP. This is done by computing the signal from AQN annihilations within a cosmological hydrodynamic simulation of a Milky Way-like galaxy, and using a Markov chain Monte Carlo method to produce constraints on the AQN mass range and the dark matter density distribution. Understanding the source(s) of this excess radiation in our galaxy may bring us a step closer to revealing the nature of dark matter.

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