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CHIME is Secretly an Axion Experiment

Saturday, 4 May 2024 13:00 (55 minutes)

In the presence of radiation from bright astrophysical sources at radio frequencies, axion dark matter can undergo stimulated decay to two nearly back-to-back photons, meaning that bright sources could have faint counterimages in other parts of the sky. The counterimages will be spectrally distinct from backgrounds, taking the form of a narrow radio line centered at half the axion mass with a spectral width determined by Doppler broadening in the dark matter halo. In essence, axions behave as an imperfect monochromatic mirror. The morphology of the induced images can be nontrivial, with blurring due to the geometry of the source and image as well as spatial smearing due to the galactic kinematics of axion dark matter. I will show that the axion decay-induced counterimages of galactic sources may be bright enough to be detectable with archival data from CHIME and other ongoing or planned radio surveys. CHIME therefore can run as a competitive axion experiment simultaneously with other science objectives, requiring no new hardware.

Are you willing to consider presenting a poster instead?

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Session Classification: Invited Talk