

# Searching for Ultralight Dark Matter Conversion in Solar Corona using LOFAR Data

*Thursday, 3 August 2023 17:00 (20 minutes)*

Ultralight axions and dark photons are well-motivated dark matter (DM) candidates. The axion DM and dark photon DM (DPDM) can resonantly convert into electromagnetic (EM) waves in the solar corona when their mass is equal to the solar plasma frequency. The resultant EM waves are mono-chromatic in the radio-frequency range with an energy equal to the DM mass, which can be detected via radio telescopes for solar observations. We search for converted mono-chromatic signals in the observational data of the high-sensitivity Low Frequency Array (LOFAR) telescope. We find the upper limit on the kinetic mixing coupling between DPDM and photon can reach  $10^{-13}$  in the frequency range 30 – 80 MHz, which is about one order of magnitude better than the existing constraint from the cosmic microwave background (CMB) observation. In addition, we also get the upper limit on the axion-photon coupling in the same frequency range, which is better than the constraints from Light-Shining-through-a-Wall experiments but does not exceed the CAST or other astrophysical bounds.

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**Session Classification:** Parallel talks (3)