Contribution ID: **240** Type: **Oral presentation**

Neutron stars as photon double-lenses: constraining resonant conversion into ALPs

Thursday 21 July 2022 14:40 (20 minutes)

Axion-photon conversion is a prime mechanism to detect axion-like particles that share a coupling to the photon. We point out that in the vicinity of neutron stars with strong magnetic fields, magnetars, the effective photon mass receives comparable but opposite contributions from free electrons and the radiation field. This leads to an energy-dependent resonance condition for conversion that can be met for arbitrary light axions and leveraged when using systems with detected radio components. I discuss the sensitivity of the method and its potential to improve current constraints on the axion-photon coupling over a broad mass range. I suggest that the method hosts a serious potential in the search for axion-like particles

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Session Classification: Parallel 3B - Axions