Contribution ID: **27** Type: **Oral talk**

An Axion Pulsarscope

Thursday, 12 June 2025 11:00 (20 minutes)

Electromagnetic fields of pulsars can generate coherent axion signals at their rotational frequencies, which may be detected by laboratory experiments—pulsarscopes. As a promising case study, we model axion emission from the well-studied Crab pulsar, predicting a signal at $f \approx 29.6$ Hz that would be present regardless of whether axions contribute to the dark matter abundance. We evaluate the sensitivity of upcoming axion dark matter detection experiments, such as DMRadio-GUT, Dark SRF, and CASPEr, to this pulsar-sourced axion signal, using different magnetosphere models to capture uncertainties in astrophysical modeling. For instance, the Dark SRF experiment could probe axions with any mass below 10^{-13} eV down to $g_{a\gamma\gamma} \sim 3\times10^{-13}$ GeV^{-1} with one year of data, assuming the vacuum magnetosphere model. This sensitivity may be lower depending on the degree to which the magnetosphere is screened by plasma. The potential of pulsar-sourced axions as a well-defined target for direct detection experiments motivates dedicated simulations of axion production in pulsar magnetospheres.

Primary authors: KHELASHVILI, Mariia (SISSA); Prof. LISANTI, Mariangela; Dr PRABHU, Anirudh; Prof. SAFDI, Benjamin

Presenter: KHELASHVILI, Mariia (SISSA)

Session Classification: Astrophysics and Cosmology

Track Classification: Astrophysics and Cosmology