

# Constraining the multipolar magnetic field of millisecond pulsar PSR J0030+0451 via NICER X-ray light curve fitting

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The Neutron star Interior Composition Explorer (NICER) has been operating since 2017 with the major aim of gaining a better understanding of the extreme nature of neutron stars (NSs). With its exceptional sensitivity, it hopes to constrain the equation of state of NSs to high precision. Modelling thermal X-ray light curves (LCs) of pulsars can provide us with insights into the magnetic field structure of an NS and the morphology of the surface hot spots.

Recent studies strongly indicate a multipolar magnetic field for the millisecond pulsar PSR J0030+0451 using NICER data, while constraining the parameter space for the field configuration. We are refining the offset dipole+quadrupole model of Kalapotharakos et al. (2021), by including a multipolar magnetic field configuration, going up to an  $l=3$  component, and using Markov chain Monte Carlo (MCMC) methods to fit the NICER X-ray LCs.

Exploring the general magnetic multipolar parameter space using MCMC would help us constrain the field structure, and eventually the stellar mass and radius more robustly. In this talk, the optimal multipolar field configuration and an exploration of the MCMC parameter space will be shown.

## Track

Pulsars

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