中華民國天文學會
The Astronomical Society of the Republic of China (Taiwan)

Contribution ID: **123** Type: **Either**

Pulsar Scintillation as a Probe of ISM Magnetic Fields: An Innovative Method

The interstellar medium (ISM) is inherently non-uniform. The inhomogeneous structures on both large and small scales influence the propagation of EM waves. Theoretical studies and simulations of the ISM are typically performed on parsec-scale resolution, yet, structures on AU or sub-AU scales are not well explored. Pulsar scintillation is a powerful probe of the small scale structures utilizing pulsars as coherent sources. Scattering in underdense or overdense plasma splits the wavefront into multiple path, creating an interference pattern—manifested as modulation in intensity—shedding light on the physical properties of the obstructing small scale structure, and allowing sky mapping via VLBI.

We present a novel method to constrain an AU-scale structure's magnetic field (B-field) using polarized scintillation data. Specifically, we study a "1 ms feature"in PSR B0834+06, a 1 ms time-delayed pulse signal thought to arise from light bent at a secondary lens—referred to as the "1 ms lens."By measuring the phase difference of the 1 ms feature between right- and left-circular polarization data in the conjugate wavefield (a representation of the data), we obtain the rotation measure (RM), which enables both a measurement and an upper limit of the B-field in the 1 ms lens. Our technique offers a new way to probe RM (and thus magnetic fields) in the smallest observable ISM structures, opening a window into plasma dynamics far below the resolution of conventional methods. The 1 ms lens is also valuable, as it acts as a telescope that enables work in cosmology and measurements of the Hubble constant.

Section

Galaxy/Extragalactic

Primary author: YEN, Jacob (National Taiwan University)

Co-authors: Dr BAKER, Daniel (ASIAA); Dr LI, Dongzi (Princeton University); PEN, Ue Li (ASIAA)

Presenter: YEN, Jacob (National Taiwan University)

Session Classification: Poster-EA