

Proposal Abstract:

We propose to utilize 70 hours of FAST observations to enhance our measurements of the longitude of the ascending node (Ω) for PSR J2222-0137 through the interstellar scintillation (ISS) technique. PSR J2222-0137 is a relativistic binary pulsar and one of the best laboratories to test gravity theories. With previous FAST observations, we detected one ISS arc from PSR J2222-0137 and measured the screen-to-pulsar distance, the longitude of the ascending node, and the velocity of the interstellar medium by modeling the arc curvature variations under an anisotropic scattering case. Since our measurement of Ω is entirely different from that given by VLBI, we propose to verify and improve Ω measures by utilizing more FAST observations. Additionally, further FAST observations are crucial for exploring the location and the anisotropic properties of the detected ionized scattering screen. The accurate determination of Ω is crucial for enhancing the precision of pulsar timing for PSR J2222-0137 and advancing its capability to test gravity. Measuring Ω through the ISS technique can also serve as a cross-validation for both timing and VLBI results.