

A High-Precision Annual Parallax Measurement Program for PTA Pulsars with VLBI

Wednesday, 8 July 2026 14:30 (20 minutes)

Recent international PTA observations have provided compelling evidence for a primordial background gravitational wave, bringing its direct detection within reach. In light of this progress, we are planning precise measurements of the annual parallaxes of PTA pulsars in order to identify the astrophysical sources responsible for the background gravitational waves.

While the detection of the background gravitational waves is being pursued through correlations in pulsar timing residuals, identifying their astrophysical origins requires precise distance measurements to individual pulsars. Accurate pulsar distances enable the determination of the arrival directions of the background gravitational waves. The required accuracy corresponds to the gravitational-wave wavelength scale, on the order of several parsecs.

To achieve this goal, we plan high-precision astrometric VLBI observations at 1.4 GHz (L band) and 320 MHz (P band). In particular, VLBI observations using the Square Kilometre Array (SKA), currently under construction, are expected to provide a significant improvement in sensitivity as well as substantial gains in phase-referencing accuracy through multi-beam observing capabilities.

In this presentation, we report an overview of the proposed observing strategy and the current status of preparation for these VLBI astrometric observations.

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