

Proposal Abstract:

Eclipsing black widow pulsars were previously believed to have large timing noise and orbital variations. However, we found several eclipsing black widow pulsars exhibit very high timing precision and excellent timing stability using public FAST data despite of the bad epoch coverage. We also found that the former large timing noise may be due to dispersion measure noise, which can be effectively removed using wide-band timing of FAST. Here we propose regular FAST observations for two bright eclipsing black widow pulsars and in order to carefully examine their long-term timing stability and determine their suitability for inclusion in the Chinese Pulsar Timing Array (CPTA). These systems offer an unparalleled opportunity to explore their underlying physics with remarkable precision using the FAST telescope, e.g., the magnetic environment and plasma lensing. If they can be added in CPTA, they would significantly increase the sensitivity of CPTA to gravitational waves, and give CPTA an advantage in the race to detect nanohertz gravitational wave.