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Abstract:

One of the most promising research themes in modern physics is the detection of gravitational waves (GWs) and understanding their nature. In the case of the low-frequency regime, the pulsar-based pulsar timing arrays (PTAs), which are based on the high precision timing of millisecond pulsars, have been formed for decades. With the improvement of telescope sensitivity and the development of new algorithms, the S/N and timing precision of pulsar observations has been steadily improved. For this purpose, we propose an elaborate and comprehensive study to measure profile variability and pulse phase-jitter noise and evaluate their limitation to the future pulsar timing sensitivity. According to the European PTA (EPTA) observing priority and Chinese PTA (CPTA) observing list, we plan to observe 30 MSPs using FAST High Time Resolution Observation. These pulsars, which have been timed for decades, will help us understand the pulsar timing potential, which would be crucial in the coming SKA era. This proposal lays the foundation for future pulsar timing potential. In addition, we expect to evaluate the pulsar priority for the CPTA endeavor.