

Chinese Pulsar Timing Array and Nanohertz Gravitational Waves

Dr. Heng Xu (胥恒)

Heng Xu is a postdoc at the National Astronomical Observatories of Chinese Academy of Sciences, he obtained the PhD degree from Peking University. Heng's research interests are pulsar timing, gravitational wave and fast radio burst.



Gravitational waves (GWs)—the space-time ripples, were predicted by Einstein's general theory of relativity in 1916. It was until 2015 when GWs was directly detected by LIGO, though their existence was first demonstrated in the 1970s and 1980s through the observations to a pulsar binary system. The GWs detected by LIGO were generated by compact stellar compact object binaries, thus the frequency is about 100 Hz, and the sources are mainly in the local Universe. However, the nanohertz GWs produced by supermassive black hole binaries in the center of galaxies, early Universe processes, cosmic strings, etc, have not been detected yet. These nanohertz GWs can provide crucial information about the supermassive black holes, the history of galaxy mergers, and the formation of large-scale structures in the Universe. Currently, the only known way to detect nanohertz GWs is pulsar timing array (PTA) —long term timing monitoring of a group of stably rotating millisecond pulsars using radio telescopes. Three regional PTA collaborations have made decades of efforts in this field, but no detection had been made until this year. The detection of nanohertz GWs holds great potential for advancing our understanding of the Universe. In this talk, I will briefly introduce the historical studies on nanohertz GWs, and then talk about the recent results from the Chinese Pulsar Timing Array (CPTA) collaboration including the CPTA timing data collected using FAST and the searching the nanohertz stochastic gravitational wave background (GWB). I will also shortly discuss the recent results of searching nanohertz GWB from the major regional PTAs, and the implications from these results.

时间： 2023年12月20日 (星期三) 10:00

地点： 北京师范大学物理楼402