Contribution ID: **429** Type: **Oral**

Constrain modified gravities with pulsar timing arrays

Pulsar timing arrays (PTAs) have emerged as powerful tools for constraining modified theories of gravity through the detection and characterization of nanohertz gravitational waves, with recent observations from major collaborations (NANOGrav, PPTA, EPTA, InPTA, CPTA, and MPTA) revealing evidence for a stochastic gravitational wave background. This talk presents comprehensive constraints on various modifications to general relativity using PTA data, including: (1) the propagation speed of gravitational waves, yielding c_g ⊠ 0.85c from overlap reduction function analysis and c_g ⊠ 0.61c from scalar-induced gravitational wave models; (2) massive gravity theories with upper bounds on the graviton mass of m_g ⊠ 8.2×10^-24 eV; and (3) alternative polarization modes beyond standard tensor transverse modes, where intriguingly both tensor transverse and scalar transverse correlations appear disfavored at 90% confidence level, suggesting either unknown systematic effects or new physics. These results demonstrate PTAs' unique capability to test fundamental gravitational physics at frequencies inaccessible to ground-based detectors, while also exploring connections between primordial scalar perturbations, scalar-induced gravitational waves, and primordial black hole formation as potential sources of the observed signal, thereby advancing our understanding of modified gravity in the era of multi-messenger gravitational wave astronomy.

Collaboration you are representing

Author: Dr CHEN, Zu-Cheng (Hunan Normal University)

Presenter: Dr CHEN, Zu-Cheng (Hunan Normal University)

Session Classification: Gravitational Waves

Track Classification: Gravitational Waves