Contribution ID: **63** Type: **not specified**

Novel Polarization Modes of Gravitational Waves

Wednesday, 9 July 2025 17:40 (20 minutes)

In this talk, we present the discovery of two previously unrecognized gravitational wave polarization modes—namely, shear modes. We explore the polarization structure of gravitational waves in torsionless spacetimes with non-metricity, which constitute one of the most widely studied classes of non-Riemannian geometries. Since gravitational wave polarization modes are characterized by the relative motion of test particles, we begin by deriving the general form of the relative motion equations. Our analysis reveals that non-metricity can induce entirely new shear polarization modes when test particles carry hypermomentum, thereby extending the conventional classification of six standard polarization modes. After establishing this result from the perspective of particle dynamics, we proceed to examine the problem from the viewpoint of the field equations. We illustrate that certain modified gravity theories admit shear-mode gravitational waves as solutions to their field equations. In particular, we show that in general second-order symmetric teleparallel gravity theories, shear modes propagating at the speed of light necessarily emerge when test particles possess hypermomentum.

Presenter: DONG, Yu-Qi (Lanzhou U)

Session Classification: Parallel 1