

Phenomenology: Measuring deviations from the Kerr geometry with black hole ringdown

Thursday, September 7, 2023 3:15 PM (15 minutes)

Black holes in General Relativity are famously characterized by two “hairs” only, the mass and the spin of the Kerr spacetime. Theories extending General Relativity, however, allow in principle for additional black hole charges, which will generally modify the multipole structure of the Kerr solution. Here, we show that gravitational wave observations of the post-merger ringdown signal from black hole binaries may permit measuring these additional “hairs”. We do so by considering spacetime geometries differing from the Kerr one at the level of the quadrupole moment, and computing the differences of their quasinormal mode frequencies from the Kerr ones in the eikonal limit. We then perform a Bayesian analysis with current and future gravitational wave data and compute posterior constraints for the quadrupole deviation away from Kerr. We find that the inclusion of higher modes, which are potentially observable by future detectors, will allow for constraining deviations from the Kerr quadrupole at percent level.

Presenter: DEY, Kallol (Indian Institute of Science Education and Research, Thiruvananthapuram)

Session Classification: Parallel Sessions