Contribution ID: **101** Type: **not specified**

Dipolar tidal effects in gravitational waves from scalarized black hole binary inspirals in quadratic gravity

Tuesday 4 July 2023 15:40 (20 minutes)

As gravitational waves (GW) probe the strong field regime of gravity, they are an important tool for testing gravitational models. This requires an accurate description of the gravitational waveforms in modified gravity theories. In this work we focus on scalar Gauss Bonnet gravity (sGB), a promising extension of General Relativity (GR), to include finite size effects in the modelling of the inspiral of a black hole (BH) binary. sGB introduces on top of the Hilbert Einstein action, a topological invariant quadratic curvature term coupled to a scalar field, leading to the possibility of having black hole solutions with non zero scalar hair. We find that the scalar-induced tidal corrections related to the scalar Love number, contribute at the same PN order and scale the same with distance and frequency as the sGB correction to the gravitational wave (GW) phase. Finally, we investigate the dependency of the sGB correction and tidally induced correction on the physical properties of the binary and find that the tidal effects dominate over the sGB corrections for large separations of the black holes.

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Session Classification: Poster session