Contribution ID: **15** Type: **Oral Presentation**

Black holes and nilmanifolds: quasinormal modes as fingerprints of extra dimensions

Monday, 4 July 2022 11:45 (15 minutes)

Quasinormal modes (QNMs), the damped oscillations in spacetime that emanate from a perturbed body as it returns to an equilibrium state, have served for several decades as a theoretical means of studying n-dimensional black hole spacetimes. These black hole QNMs can in turn be exploited to explore beyond the Standard Model (BSM) scenarios and quantum gravity conjectures. With the establishment of the LIGO-Virgo-KAGRA network of gravitational-wave (GW) detectors, there now exists the possibility of comparing computed QNMs against GW data from compact binary coalescences. Encouraged by this development, we investigate whether QNMs can be used in the search for signatures of extra dimensions. To address a gap in the BSM literature, we focus here on higher dimensions characterised by negative Ricci curvature. As a first step, we consider a product space comprised of a 4D Schwarzschild black hole spacetime and a 3D nilmanifold (twisted torus); we model the black hole perturbations as a scalar test field. We find that the extra-dimensional geometry can be stylised in the QNM effective potential as a squared mass-like term. We then compute the corresponding QNM spectrum using three different numerical methods and determine constraints for the extra dimensions for a toy BSM model.

Apply to be considered for a student ; award (Yes / No)?

Yes

Level for award;(Hons, MSc, PhD, N/A)?

PhD

Consent on use of personal information: Abstract Submission

Primary authors: CORNELL, Alan (University of Johannesburg); DEANDREA, Aldo (IPNL); CHRYSOSTOMOU, Anna (University of Johannesburg); LIGOUT, Etienne (ENS Lyon)

Presenter: CHRYSOSTOMOU, Anna (University of Johannesburg)

Session Classification: Theoretical and Computational Physics

Track Classification: Track G - Theoretical and Computational Physics