ID de Contribution: **1** Type: **Non spécifié**

Quasinormal mode applications in the epoch of gravitational-wave astronomy

jeudi 27 avril 2023 10:00 (30 minutes)

In the wake of a perturbation, a black hole will radiate gravitational waves (GWs). After an initial response to the external stimulus, the GW spectrum of the perturbed black hole is dominated by a discrete set of complex quasinormal frequencies (QNFs) whose values depend exclusively on characteristic black hole properties. With the advent of GW astronomy, we can test theoretical and numerical quasinormal mode (QNM) models against GW data and search for evidence of new physics. In this talk, I shall discuss some of these possibilities. In particular, I shall focus on how we can quantify the detectability of the QNMs through the computation of "quasinormal excitation factors" and introduce the question of whether QNMs can be used in the search for signatures of extra dimensions. To do so, I shall outline a possible means by which we can combine numerical computations of QNFs with tests for deviations from general relativity predictions in GW data to place a model-agnostic "detectability bound"beyond which extra dimensions cannot be detected using QNMs.

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