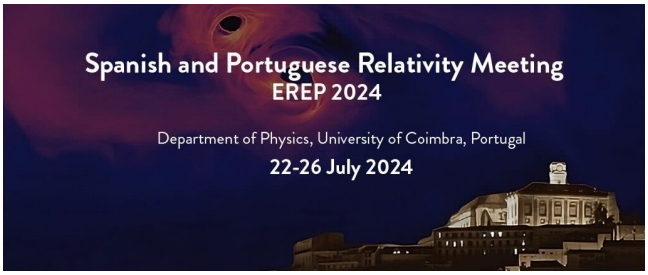

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Hidden symmetries in the dynamics of perturbed black holes

Monday 22 July 2024 16:30 (15 minutes)

Perturbation theory of vacuum spherically symmetric spacetimes is a crucial tool for understanding the dynamics of black hole (BH) perturbations as well as BH scattering phenomena and the ringdown signal of binary BHs. Since the pioneering work of Regge and Wheeler it is known that the equations for the perturbations can be decoupled in terms of (gauge-invariant) master functions that satisfy 1 + 1 wave equations. However, while in the literature only few master equations are known, the full landscape of master equations was recently found, clarifying that Einstein equations actually allows for an infinite set of them. These findings pave the way to the introduction of some new hidden symmetries governing the dynamics of perturbed non-rotating BHs: Darboux covariance and the infinite hierarchy of Korteweg-de Vries (KdV) deformations of the master equation. This generates a novel connection with integrable systems that relates the physical description of the perturbed BH, such as the greybody factors, to the KdV conserved quantities.

Authors: Dr SOPUERTA, Carlos F. (Institute of Space Sciences (ICE-CSIC, IEEC), Barcelona); LENZI, Michele (Institute of Space Sciences (ICE-CSIC))

Presenter: LENZI, Michele (Institute of Space Sciences (ICE-CSIC))

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