

## **Modeling and observational status of black hole vibrational spectra**

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Dark compact objects are nowadays routinely observed through multiple experimental schemes. Measurements of their vibrational spectra offer unprecedented opportunities to investigate the highly dynamical regime of General Relativity, search for signs of new physics, and increase the evidence for their “black hole nature”. After an introduction to the topic, I will review recent achievements of this scientific program enabled by gravitational-wave observations, and current efforts to extend it through the inclusion of nonlinear effects and generic orbital configurations of binary mergers. Prospects for high-precision measurements through next-generation interferometric detectors will also be discussed, together with their potential to address many open questions in fundamental physics.

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