

# Phenomenology: Constraining modifications of black hole perturbation potentials near the light ring with quasinormal modes

*Thursday, September 7, 2023 4:00 PM (15 minutes)*

In modified theories of gravity, the potentials appearing in the Schrödinger-like equations that describe perturbations of non-rotating black holes are also modified. In this talk, we ask how such modifications can be constrained with future, high-precision measurements of quasi-normal modes. We use a perturbative framework that allows one to map modifications of the effective potential, in powers of  $M/R$ , to deviations in the quasi-normal mode spectrum. Using MCMC methods, we recover the coefficients in the  $M/r$  expansion in an “optimistic” scenario where we vary them one at a time, and in a “pessimistic” scenario where we vary them all simultaneously. In both cases, we find that the bounds on the individual parameters are not robust. However, inspired by WKB theory, we demonstrate that the value of the potential and its second derivative at the light ring can be robustly constrained. These constraints allow a more direct comparison between tests based on black hole spectroscopy and observations of black hole “shadows”.

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**Session Classification:** Parallel Sessions