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Quasinormal modes in the large angular momentum limit: an inverse multipolar expansion analysis

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The quasinormal modes (QNMs) of a black hole (BH) may be identified as a class of damped, classical oscillations in spacetime, emergent as part of the late-stage response to a perturbation of the compact body. In the weak-field limit, the radial behaviour of these oscillations can be modelled as a wave equation whose potential varies to represent different fields. The choice of computational method applied to solve these QNMs must accommodate the specifics of the BH spacetime and wave equation dependencies, as a certain approach may fail under conditions where another proves more accurate. Through a novel exploitation of the null geodesics of spherically-symmetric BHs, Dolan and Ottewill recently constructed an inverse multipolar expansion method that allows for the efficient computation of BH quasinormal frequencies (QNFs). In a previous work, we have seen that this method is well suited to the exploration of the large angular momentum regime of QNFs of various spin for Schwarzschild, Reissner-Nordström, and Schwarzschild de Sitter BHs. Here, we extend this method to the computation of the QNM wavefunctions within a Schwarzschild BH spacetime, and subject the resulting expressions to the asymptotic limit of $\ell \to \infty$.

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Yes

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

MSc.

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