Complex angular momentum in black hole physics and quasinormal modes
Yves Décanini decanini@univ-corse.fr Antoine Folacci folacci@univ-corse.fr UMR CNRS 6134 SPE, Equipe Physique Semi-Classique (et) de la Matière Condensée
Bruce Jensen Bruce.Jensen@marconi.com Department of Mathematics, University of Southampton, Southampton SO17 1BJ, United Kingdom

abstract

By using the complex angular momentum approach, we prove that the quasinormal mode complex frequencies of the Schwarzschild black hole are Breit-Wigner type resonances generated by a family of surface waves propagating close to the unstable circular photon (graviton) orbit at $r = 3M$. Furthermore, because each surface wave is associated with a given Regge pole of the $S$-matrix, we can construct semiclassically the spectrum of the quasinormal-mode complex frequencies from Regge trajectories. The notion of surface wave orbiting around black holes thus appears as a fundamental concept which could be profitably introduced in various areas of black hole physics in connection with the complex angular momentum approach.