## Mode stability and shallow quasinormal modes of Kerr-de Sitter black holes

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**Abstract:** The Kerr-de Sitter metric describes a rotating black hole with mass $m$ and specific angular momentum $a$ in a universe, such as our own, with a positive cosmological constant. I will explain a proof of mode stability for the scalar wave equation on Kerr-de Sitter spacetimes for any fixed ratio $|a/m| < 1$ when the black hole mass is sufficiently small. Previously, mode stability was only known for very small $|a/m|$. We also obtain estimates for the location of quasinormal modes (resonances) in any fixed half space in the complex plane. Our results imply that solutions of the wave equation decay exponentially in time to constants, with an explicit exponential rate. The proof is based on careful uniform estimates for the spectral family in the singular limit $m \to 0$ in which, depending on the scaling, the Kerr-de Sitter spacetime limits to a Kerr or the de Sitter spacetime.