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STABILITY OF BLACK HOLES

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Abstract: We consider decay of solutions of the Cauchy Problem for various fields in the Kerr (rotating Black Hole) geometry. We discuss the formulation of the problem in terms of the Teukolsky equation, a single second-order PDE depending on a real parameter s , the "spin". For various values of s , the Teukolsky equation describes different fields in the Kerr geometry: $s=0, 1/2, 1, 2$, correspond, respectively, to scalar waves, Dirac's equation, Maxwell's equations, and gravitational waves. We discuss our results for $s=0, 1/2$, as well as our rigorous proof of Penrose's proposal (1969) for energy extraction from a Kerr BH. For the Teukolsky equation in a Schwarzschild (non-rotating) BH geometry, we discuss our decay results, and hence stability of this BH, for all spin.