

The Planckian Power Spectrum of Black Holes

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Abstract: *There are no "totally" black holes. The paradox proposed by Stephen Hawking highlighted a new correlation among quantum-mechanical, thermodynamic, and gravitational systems, known as black hole thermodynamics, in the early 1970s. One of the five predictions made by current theories of black hole thermodynamics is that all black holes emit thermal radiation (now known as Hawking radiation) with what can be viewed as a Planckian spectral distribution. In this paper, we outline the theoretical basis of this thermal radiation, its dependence upon either mass or spin, the effect of greybody corrections to the Planckian radiation, and current indirect observational results supporting Hawking's prediction. We describe several notable theoretical issues related to the discovery of black hole thermodynamics, including the information loss paradox and the scrambling of quantum information at a black hole's event horizon. Although we cannot yet directly detect Hawking radiation with current technology, the prediction that black holes emit Planckian radiation remains a highly stimulating area of research in high-energy particle physics and quantum gravity*

Keywords: Black Hole Thermodynamics; Hawking Radiation; Planckian Spectral Distribution; Greybody Corrections; Black Hole Mass and Spin; Information Loss Paradox; Quantum Information Scrambling; Indirect Observational Evidence