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Semiclassical effects inside black holes

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All black holes in the Universe are believed to be rotating. This poses interesting questions, since rotating black hole solutions of Einstein's equations of General Relativity possess a so-called Cauchy horizon in their interior, beyond which Einstein's equations cease to be predictable (i.e., the Cauchy value problem is no longer well-posed). However, these exact solutions may not model sufficiently accurately black holes in Nature, which have classical matter in their neighbourhood and, furthermore, are inevitably surrounded by a quantum vacuum (which, in the exterior, is responsible for Hawking radiation). It is generally found that effects on Cauchy horizons from quantum fields are in fact dominant over those from classical matter. In this talk, we will present recent results on effects due to a quantum field on the Cauchy horizon of rotating (Kerr and Kerr-de Sitter) black holes which are evaporating via the emission of Hawking radiation. In particular, we will show that the (renormalized) fluxes from a quantum scalar field generically diverge on the Cauchy horizon and cause latitudes of infinite twisting separating regions of infinite expansion and contraction for spheres approaching this horizon.

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