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Enhancement of Particle Phenomena by High-Spin Black Holes

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As a black hole tends towards maximal spin the near-horizon region develops a throat-like geometry of divergent proper volume. The development of this throat has consequences on observable phenomena. Herein we will examine two such examples. First we consider adiabatic growth of a black hole within a cloud of particles. For a high-spin black hole this process results in a finite nonzero matter density within the near-horizon region. While the matter density remains finite the total mass enclosed within the near-horizon region diverges. Secondly we consider collision between in-falling particles and those at the innermost stable circular orbit. These collisions can have arbitrarily high center of mass energy when they occur around a high-spin black hole. In this regime we examine the specific case of proton-electron bremsstrahlung and calculate properties of the photons that constitute the collision ejecta.

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