High energy collisions with finite forces near different types of black hole horizons: general classification of scenarios

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Abstract

We study the Banados-Silk-West effect in a general context, when both geometric and dynamic factors are
taken into account. We consider generic axially symmetric rotating black holes. We study this effect in a more general context, when both geometric and dynamic factors are taken into account.We consider generic axially symmetric rotating black holes. The near-horizon behavior of metric coefficients is determined by three numbers p, q, k that appear in the Taylor expansions for different types of a horizon. This includes nonextremal, extremal, and ultraextremal horizons. We also give general
classification of possible trajectories that include so-called usual, subcritical, critical, and ultracritical ones
depending on the near-horizon behavior of the radial component of the four-velocity.We assume that particles
move not freely but under the action of some unspecified force.We find when the finiteness of a force and the
BSW effect are compatible with each other.

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