

Ultra-high energy collisions in static space-times: single versus multi-black hole cases

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Abstract

© 2015, Springer Science+Business Media New York. We consider collision of two particles near static electrically charged extremal black holes and elucidate the conditions under which the energy in the centre of mass frame $E_{c.m.}$ grows unbounded. For a single black hole, we generalize the results obtained earlier for the Reissner-Nordström metric, to distorted black holes. In the multi-black hole space-time, qualitatively new features appear. If the point of collision is close to at least two horizons simultaneously, unbounded $E_{c.m.}$ are possible (i) without fine-tuning of particles' parameters, (ii) for an arbitrary mutual orientation of two velocities. Such a combination of properties (i) and (ii) has no analogues in the single black hole case and facilitates the condition of getting unbounded $E_{c.m.}$ Collisions in the electro-vacuum Majumdar-Papapetrou metric (several extremal black holes in equilibrium) is analyzed explicitly.

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Keywords

BSW effect, Event horizon, Majumdar-Papapetrou systems