

[online] BSW effect and general approach to high energy collisions in strong gravitational field

During last decade and a half many results are obtained that show when (i) particle collisions in a strong gravitational field lead to an unbounded energy in the center of mass $E_{\text{c.m.}}$ of two colliding particles, (ii) when the process leads also to significant energy extraction measured at infinity. The set of possible scenarios can be divided to three main cases: (i) collisions near black holes, (ii) near wormholes, (iii) near singularities. Case (i) is mainly connected with what is called the Bañados-Silk-West (BSW) effect. We suggest a brief review of such processes. In doing so, we make an accent on recent developments and quite unexpected results. We include into consideration the presence of a force. Some general statement on possible or forbidden scenarios are formulated. In particular, it is shown that such collisions are possible even near the Schwarzschild horizon, provided a white hole or mirror region is included in consideration. It turns out that for collisions near black holes an unbounded energy extraction (so-called super-Penrose process) is impossible. However, this happens for collisions near wormholes.

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