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Modeling a Feedback Concept in a Spherical Thundercloud Cell

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Abstract : Relativistic runaway electron avalanches (RREAs) are generally accepted as a source of thunderstorms gamma-ray radiation. Avalanches' dynamics in the electric fields can lead to their multiplication via gamma-rays and positrons, which is called relativistic feedback. This report shows that a non-uniform electric field geometry leads to the new RREAs multiplication mechanism - “geometric feedback”, which occurs due to the exchange of high-energy particles between different accelerating regions within a thundercloud. This report will present the results of the simulation in GEANT4 of feedback in a spherical cell. Necessary conditions for the occurrence of geometric feedback were obtained from it.

Keywords : electric field, GEANT4, gamma-rays, relativistic runaway electron avalanches (RREAs), relativistic feedback, the thundercloud
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