

Relativistic runaway electron avalanche acceleration in complex thunderstorm electric structures

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Thunderstorms in the Earth's atmosphere produce short and intense gamma-ray bursts [1]. Such bursts are called Terrestrial Gamma-ray Flashes (TGF). One of possible mechanisms of thunderstorm gamma-radiation – acceleration of Relativistic Runaway Electron Avalanches (RREA) in thunderstorm electric fields [2]. Gamma-rays are produced by relativistic electrons bremsstrahlung.

RREAs are formed by secondary cosmic rays within thunderstorm media. In strong electric fields RREAs are further multiplied by positive feedback mechanisms, which can lead to self-sustainable high-energy particles generation in thunderstorms (infinite feedback) [2,3]. In complex thunderstorm electric structures RREAs are multiplied efficiently due to high-energy particles exchange (reactor feedback) between different electric regions (cells) [3].

In this research, reactor feedback by runaway electron transport between cells is studied. It is shown that runaway electron propagation between cells with its further acceleration and multiplication plays an important role in the RREA dynamics. The conditions necessary for TGF by this mechanism are derived.

The speaker is a student or young scientist

Yes

Section

1. Applications of nuclear methods in science and technology

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