

What is the GRAPES-3 experiment?

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About GRAPES-3 experiment:

- **Gamma Ray Astronomy PeV EnergieS phase-3** (GRAPES-3) is designed to **study cosmic rays** with an array of air shower detectors and a large area muon detector.
- **Location:** It is located in Ooty, India.
- It is operated by the **Tata Institute of Fundamental Research**.
- It aims to probe acceleration of cosmic rays in different astrophysical settings.
- **Its objectives are** to study

o The **origin, acceleration and propagation** of $>10^{14}$ eV cosmic rays in the galaxy and beyond.

o **Existence of “Knee”** in the energy spectrum of cosmic rays.

o Production and/or acceleration of highest energy ($\sim 10^{20}$ eV) cosmic rays in the universe.

o Astronomy of multi-TeV γ -rays from neutron stars and other compact object.

o Sun the closest astrophysical object, accelerator of energetic particles and its effects on the Earth.

Key facts about Cosmic rays

- These rays were discovered more than a century ago.
 - They are considered to be **the most energetic particles** in the universe.
 - Our planet is constantly bombarded by them from outer space almost uniformly from all directions at a constant rate.
 - They enter into Earth's atmosphere and induce a shower of particles that travel to the ground almost at the speed of light.
 - The shower particles constitute electrons, **photons, muons, protons, neutrons** etc.
 - They have been observed over a remarkably wide energy range (108 to 1020 eV).
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Q1: What are Muons?

Muons are subatomic particles raining from space. The muon was discovered as a constituent of cosmic-ray particle "showers" in 1936 by the American physicists Carl D. Anderson and Seth Neddermeyer. They are created when the particles in Earth's atmosphere collide with cosmic rays — clusters of high-energy particles that move through space at just below the speed of light.

Source: [A new kink in the proton spectrum to enhance our knowledge of cosmic ray origin](#)

Source: <https://vajiramandravi.com/current-affairs/what-is-the-grapes-3-experiment/>

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