

## High Energy Cosmic Rays

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### High Energy Cosmic Rays

In astroparticle physics, an ultra-high-energy cosmic ray ( UHECR) is a cosmic ray with an energy greater than 1 EeV (10<sup>18</sup> electronvolts, approximately 0.16 joules ), far beyond both the rest mass and energies typical of other cosmic ray particles. An extreme-energy cosmic ray ( EECR) is an UHECR with energy exceeding 5 × 10<sup>19</sup> eV (about 8 joule ), the so-called Greisen-Zatsepin-Kuzmin limit (GZK limit).

### Ultra-high-energy cosmic ray - Wikipedia

Ultra-high energy cosmic rays ( UHECR s) are extremely energetic subatomic particles (mostly protons, but also some heavier atomic nuclei) with energies greater than 10<sup>15</sup> eV. The record holder so far is a UHECR with an energy of 3×10<sup>20</sup> eV - equivalent to a baseball thrown at 160 km/hr! Currently it is only possible to observe UHECR s through the cosmic ray showers produced as they interact with the Earth's atmosphere.

### Ultra-high Energy Cosmic Rays | COSMOS

Cosmic rays are high-energy protons and atomic nuclei which move through space at nearly the speed of light. They originate from the sun, from outside of the solar system, and from distant galaxies. Upon impact with the Earth's atmosphere, cosmic rays can produce showers of secondary particles that sometimes reach the surface.

### Cosmic ray - Wikipedia

Cosmic rays of modest energy are measured directly by sending detectors to heights above most of the earth's atmosphere, using high-flying balloons and satellites. For high-energy cosmic rays, however, it is more efficient to exploit the atmosphere, measuring each cosmic ray indirectly by observing the shower of particles it produces in the air.

### The Mystery of High-Energy Cosmic Rays

Cosmic rays have been detected with energies beyond 10<sup>20</sup> electronvolts (eV); by comparison, the Large Hadron Collider near Geneva, Switzerland, the world's most powerful particle accelerator,...

### High-energy cosmic rays come from outside our Galaxy ...

Cosmic rays provide one of our few direct samples of matter from outside the solar system. They are high energy particles that move through space at nearly the speed of light. Most cosmic rays are atomic nuclei stripped of their atoms with protons ( hydrogen nuclei) being the most abundant type but nuclei of elements as heavy as lead have been measured.

### Cosmic Rays - Introduction

Most cosmic rays are atomic nuclei: most are hydrogen nuclei, some are helium nuclei, and the rest heavier elements. Although many of the low energy cosmic rays come from our Sun, the origins of...

### What Are Cosmic Rays? | Space

Many ultra-high-energy cosmic neutrinos come from the interactions of cosmic rays with the cosmic

microwave background (CMB), the faint afterglow of the Big Bang.

### **Mysterious particles spewing from Antarctica defy physics ...**

Cosmic rays are high energy charged particles, originating in outer space, that travel at nearly the speed of light and strike the Earth from all directions. Most cosmic rays are the nuclei of...

### **FACT CHECK: Dangerous Cosmic Rays Will Pass Close to Earth ...**

Cosmic rays are bullets from deep space, atomic shrapnel raining down constantly on our heads. These violent objects are the long-time quarry of Noémie Globus, a high energy astrophysicist at New York University and the Center for Computational Astrophysics at the Flatiron Institute.

### **Cosmic Rays May Explain Life's Bias ... - Quanta Magazine**

The Mystery of High-Energy Cosmic Rays Hold out your hand for 10 seconds. A dozen electrons and muons just zipped unfelt through your palm. The ghostly particles are what scientists call "secondary cosmic rays" -- subatomic debris from collisions between molecules high in Earth's atmosphere and high-energy cosmic rays from outer space.

### **The Mystery of High-Energy Cosmic Rays | Science Mission ...**

Article on mystery surrounding cosmic rays, high-energy-particles that hit Earth from outer space, and impact it may have on Einstein's theory of relativity; physicists say answer will come from ...

### **Interpreting the Cosmic Rays - The New York Times**

Scientists shed new light on mystery origin of ultra-high-energy cosmic ray hotspot Among many particles arriving from outer space, there are ones with the extremely high energy that travel at...

### **High-energy cosmic rays news and latest updates**

The cosmic ray detector known as CREAM is headed for the International Space Station, with a goal of measuring the highest energy possible for direct measurement of high-energy cosmic rays.

### **The Mystery of High-Energy Cosmic Rays | Science Mission ...**

Contents: (1) Why bother with ultra-high-energy cosmic rays? (2) Observational data: Energy spectrum and composition of high-energy particles. Observed anisotropy of high-energy cosmic rays. Specific identified sources of cosmic rays. (3) Acceleration mechanisms: Problems associated with statistical acceleration. Direct acceleration. Final comments. (4) Propagation of cosmic rays: Propagation ...

### **The Origin of Ultra-High-Energy Cosmic Rays - NASA/ADS**

Cosmic radiation, or cosmic rays, consists of very high-energy particles. These particles come from outer space (the 'cosmos') and from our own solar system. Scientists first called these particles "rays" because they thought they were a form of electromagnetic radiation. But they are not rays at all - they're particles!

### **What are Cosmic Rays? | Let's Talk Science**

Ultra High-Energy Cosmic Rays. NSF/J. Yang. The origin of high-energy cosmic rays has been a 100-year astronomy mystery. But a study revealed on Feb. 14, 2013, unveiled conclusive proof that they ...

### **100-Year Cosmic Ray Mystery Solved with Supernovas (Photos ...**

The lowest-energy cosmic rays (yellow band) come from the sun, intermediate-energy cosmic rays (blue band) originate in our galaxy while the highest-energy cosmic rays (purple band) are...

### **An extragalactic mystery: where do high-energy cosmic rays ...**

The main goal of the experiment is to unveil the nature and origin of the highest energy cosmic rays. When cosmic rays hit the Earth's atmosphere an air shower is produced. This air shower can be detected by an array of particle detectors (water tanks), but also by air fluorescence telescopes overlooking the array.

