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The new horizon disclosed by the measurements of the chemical composition of the cosmic radiation above the ankle energy

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The measurements of the chemical composition of the cosmic radiation in the last years above the ankle energy have modified the foundation of Cosmic Ray Physics and have simple, compelling, unambiguous interpretation: (1) high energy cosmic rays in the band $3 \times 10^{18} - 3 \times 10^{20} \text{ eV}$ do not have an extragalactic origin; (2) the cosmic nuclei above the ankle are not dominated by protons but they have a mixed composition with a rising fraction of Iron up to highest observed energies $\approx 2 \times 10^{20} \text{ eV}$ where the Iron abundance dominates; (3) the cutoff of the spectrum observed at the incipient energy of $2.5\text{-}3 \times 10^{19} \text{ eV}$ is not due to the collisions of the extragalactic cosmic protons with the ubiquitous cosmic photons of $\approx 5 \times 10^{-4} \text{ eV}$ but to a galactic process.

The consistency of the experimental data on the chemical composition of various experiments are presented and shortly discussed. The focus of the presentation is on the severe and illuminating constraints implied by these measurements on the quest for the mechanism accelerating cosmic rays in the Galaxy which is presently unknown.

Collaboration

– not specified –

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153

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