



Laboratoire LEPRINCE-RINGUET  
Ecole polytechnique IN2P3/CNRS

# Séminaire

## Anisotropies at ultra-high energies : an indication and a discovery

The Earth's atmosphere is constantly hit by charged particles from outer-space that carry individual energies of more than a Joule ( $6 \times 10^{18}$  eV or 6 EeV) : ultra-high energy cosmic rays. The constancy of their flux, their scarcity -a few per kilometer square every year -, and the uniformity - or isotropy -of their arrival directions over the sky could have made the quest for their origin illusory...

Because of their tremendous energies, ultra-high energy cosmic rays were often believed to be accelerated in extragalactic astrophysical sources. We report in this talk on the first significant observational evidence confirming this hypothesis : the discovery by the Pierre Auger Collaboration, at a  $5.4\sigma$  confidence level above 8 EeV, of a few-percent-amplitude deviation from cosmic-ray isotropy on large angular scales.

At higher energies, presumably higher rigidities (energy/charge), the deflections of cosmic rays within Galactic and extragalactic magnetic fields are expected to be reduced, possibly leaving an imprint of the sources at intermediate angular scales. We report on an indication, significant at the  $4.0\sigma$  level, of cosmic-ray anisotropy above 40 EeV obtained through a comparison with the flux pattern of starburst galaxies.

After a discussion of these exciting results, and necessary caveats in their interpretation, we depict some of the new opportunities observations bring to the revived quest for the origin of the most extreme particles known in the Universe.

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Salle conférence  
du LLR

**Lundi 22 Janvier**  
**14h00**

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Responsables séminaires

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