Contribution ID: **323** Type: **not specified**

The Square Kilometre Array: a unique high-precision cosmic-ray observatory

Wednesday, 13 September 2023 17:45 (15 minutes)

The PeV-EeV range of the cosmic ray energy spectrum is a complex region that probably harbours the transition from Galactic to extragalactic origins. It is unclear where this transition occurs and whether a secondary Galactic component is required to explain the observations. Measuring the mass composition of cosmic rays is essential to disentangle the fluxes and gain better understanding of the sources and their acceleration mechanisms. We propose to use the Square Kilometre Array (SKA) to perform ultra-high precision air shower measurements and make a unique contribution to mass composition analysis between the knee and the ankle.

The low-frequency part of the SKA, to be built in Australia, will have an extremely high antenna density of roughly 60.000 antennas within one square kilometer, and is the perfect site for high-resolution studies of air showers. Individual showers will be observed with thousands of antennas simultaneously. The depth of shower maximum Xmax can be reconstructed with a resolution of 10 g/cm^2 using methods currently used by LOFAR and the Pierre Auger Observatory. However, the high-resolution SKA data allows the development of new methods that can reconstruct more features of the longitudinal development of air showers. In particular, we have shown that SKA can measure the shower length, which contains further information on the primary mass and can be used to validate hadronic interaction models.

In this contribution, we present our plans to prepare the SKA for cosmic-ray observation by deploying a particle detector array. Furthermore, we show simulation studies that demonstrate the unique capabilities of SKA and discuss how it contributes to solving the cosmic-ray origin puzzle.

Primary author: BUITINK, Stijn (Vrije Universiteit Brussel (VUB))

Presenter: BUITINK, Stijn (Vrije Universiteit Brussel (VUB))

Session Classification: CCR: Charged Cosmic Ray

Track Classification: Charged Cosmic Rays