

Abstract number: S4-227

4. High energy cosmic rays (HE-CR I)

Analysis of Cosmic Rays with the HADES tRPC wall

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During the commissioning of the HADES tRPC TOF wall at the GSI (Darmstadt, Germany), around 40 million cosmic ray data were taken with a stack of two high-granularity detectors with an area slightly greater than one square meter, a mean cell size of about 100 cm² and a time resolution below 100 ps. The detectors were placed horizontally, with their axes pointing in the East-West direction, at a distance of about 30 cm. The mean position resolution was approximately 1cm in North-South and about 3 cm in the East-West directions. This arrangement did allow to reconstruct the arrival direction of cosmic rays with an accuracy of about 1 in the north-south and about 3 in the east-west directions.

The knowledge of the time of arrival of the particles, together with its position and direction, did also allow to estimate the arrival direction of the cosmic air showers and to analyze their temporal microstructure with a resolution never reported before at the Earths surface. Several analysis has been also undertaken related with several fields of interest like the study of the Earths magnetic field, the solar activity or the temperature of the stratosphere.

The obtained results show that high granularity and high time resolution tracking detectors can be of interest for improving our understanding of the evolution of cosmic ray induced air showers in the atmosphere, to find new signatures allowing a better estimation of the parameters describing the high energy primary cosmic rays and to develop new techniques allowing the use of those cosmic ray detectors for the study of other phenomena.