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Determining the Orientation of Radio Antennas at the South Pole using Galactic Noise Measurements

The IceCube Neutrino Observatory is a multi-messenger observatory at the South Pole. As preparation for an enhancement of its surface array, IceTop, a prototype station consisting of elevated scintillation panels and radio antennas has been installed and is operating since 2020. The radio antennas detect emissions from cosmic-ray-induced air showers, and their precise orientation is essential for an accurate reconstruction of the air-shower properties. This work presents a novel method to determine the orientation by analyzing periodic variations of the Galactic background noise recorded by the antennas. In particular, we examine noise level variations correlated with the Earth's rotation and the apparent position of the Galactic Center. The method can provide a potential alternative or augment GPS-based measurements of the alignment of radio antennas at the South Pole.

Collaboration(s)

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