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Radio measurements of air-showers with an IceCube Surface Array station

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The surface array of the IceCube Neutrino Observatory currently consists of 162 ice Cherenkov tanks and is used both as a veto for the in-ice neutrino observations and as a capable cosmic-ray detector. In order to further enhance the science case of the IceCube surface array, the existing detectors will be complemented by an array of scintillation panels and radio antennas. The scintillation detectors will lower the energy threshold and, especially for inclined showers at higher energies, the radio antennas will significantly improve the energy and Xmax reconstruction performance. The radio-quiet environment at the South Pole allows us to measure air-shower radio emission in the novel higher frequency band between 70-350 MHz which gives us a better signal-to-noise ratio and a lower shower detection threshold compared to traditional sparse cosmic-ray radio arrays. A prototype station consisting of 8 scintillation panels and 3 radio antennas has been deployed at the South Pole in January 2020 and has been collecting data since then. Detection and successful reconstruction of air showers using this single station has proven the viability of the hardware and informs further optimizations of the detector design and shower analysis techniques that will be applied to the full array when deployed in a few years. It has also been confirmed that we can indeed measure the radio emission from air showers with energies of a few 10^5 PeV. This talk will explain how the triggering, data acquisition and event selection of the IceCube Surface Array Enhancement works and show the radio air shower events detected so far.

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