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Physics Potential of a Radio Surface Array at the South Pole

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A surface array of radio antennas at the location of the IceTop particle-detector array will enable a number of science cases complementary to the current goals of IceCube. First, the accuracy for cosmic-ray air showers will be increased, since the radio array provides a calorimetric measurement of the electromagnetic component and is sensitive to the position of the shower maximum. This enhanced accuracy can be used for a better measurement of the mass composition as a function of energy, for studying a possible mass dependence of weak anisotropies in the arrival directions of cosmic rays, and for more thorough tests of hadronic interaction models. Second, the sensitivity of the radio array to inclined showers will increase the sky coverage for cosmic-ray measurements. Third, the radio array can be used to search for PeV photons from the Galactic Center by searching for muon-poor showers with sizeable radio signal. This contribution will discuss ideas for this radio array. Since IceTop currently is being enhanced by a scintillator array, there is a window of opportunity to additionally install radio antennas with small additional effort and excellent scientific prospects.

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