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Bistatic Radar: A New Method for Detecting Cosmic Rays

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Progress in the study of high energy cosmic ray physics is limited by low flux. In order to collect substantial statistics above 10^{19}~eV, the two largest ground arrays currently in operation cover 800~km^2 (Telescope Array, Utah) and 3000~km^2 (Auger Observatory, Argentina). The logistics and cost of an order-of-magnitude increase in ground array aperture is prohibitive. In the literature, radar detection experiments have been proposed but substantial results have not been reported. Here, we describe our plans to build and test a bistatic radar facility overlapping the Telescope Array (TA) in Delta, Utah. We have obtained an FCC license to broadcast a constant wave 54.1~MHz signal over the large TA ground array, with radar echoes to be received at our detection facility on the far side of the array. Systems monitoring and data logging systems are currently being developed. Our immediate goal is to detect cosmic rays in coincidence with TA by reflecting radar signals from the air shower ion core. Through subsequent detector advances we will seek to determine air shower geometry and energy.

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