



Contribution ID: 74

Type: talk

TARA: Forward-Scattered Radar Detection of UHECR at the Telescope Array

Wednesday, February 15, 2012 6:25 PM (20 minutes)

Increased event statistics will be required to definitively answer the question of the origin(s) of Ultra-High Energy Cosmic Rays (UHECR). Using current technologies however, achieving the necessary statistics may be financially and practically impossible.

We describe the status and plans of the TARA project, an effort to detect Ultra-High-Energy Cosmic Rays by their forward scattered or “bistatic” radar signature. Bistatic radar holds promise as a new remote sensing technique for UHECR, without the duty cycle limitations of nitrogen fluorescence detectors. Such a technique could prove key in advancing the study of UHECR beyond the constraints of the current generation of cosmic ray observatories.

TARA consists of a low-VHF television transmitter illuminating the air above the Telescope Array (TA), and a set of radio receivers on the far side of TA approximately 50 km distant from the transmitter. We have collected radar data since April 2011 using a 2 kW transmitter at 54.1 MHz. Recently, we received permission to increase our broadcast power to 40 kW and our effective radiated power (ERP) to 6 MW. On the receiver end, we are employing software-defined radio receivers and developing real-time trigger algorithms based on the expected air shower radar echo.

In addition to presenting an overview of the project status and future plans, we will present the most recent results of searches for coincidences between radar echoes and Telescope Array air shower events.

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Session Classification: New detection techniques and detector designs