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Search for isotropic microwave radiation from electron beam in the atmosphere

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We report a search for 12.5 GHz microwave radiation from electron beams in the atmosphere. Ultrahigh-energy cosmic rays (UHECRs) are observed indirectly through extensive air showers (EASs) by particle detectors on the ground or fluorescence detectors using a remote sensing method. If isotropic radiation of microwave from EAS is detected, it can be used for future observation of the UHECR based on a remote sensing method just like fluorescence detector with 100 % duty cycle like particle detectors. Weak attenuation in the atmosphere is another advantage to measure microwave radiation. To study microwave radiation from EAS, we used Electron Light Source (ELS) located at the Telescope Array Observatory in Utah, USA. The ELS emitted electron beams vertically into the atmosphere. Energy of the electron in the beam is 40 MeV which is similar to that in the EAS. About 600 million electrons are contained in a beam, which is equivalent to the shower maximum of an air shower created from 10 to 17 eV cosmic ray. The beam is triangular pulse of which the base is 20 ns. Commercial equipment for the satellite television are utilized for the microwave detection system. 1.2 m diameter parabola with 12.5 GHz receiver which measures vertical and horizontal polarizations is fixed on a concrete pad which is located at 80 m away from the electron beam. About 1500 beam shots were observed and no microwave signal has been detected. In this contribution we will report details of this detector, its calibration and obtained upper-limit on the intensity of isotropic radiation of 12.5 GHz microwave.

Collaboration

– not specified –

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Primary author: Prof. YAMAMOTO, Tokonatsu (Konan University)

Co-authors: Dr IKEDA, Daisuke (ICRR, Tokyo University); Prof. SAGAWA, Hiroyuki (ICRR, Tokyo University); Dr OHOTA, Izumi (Konan University); MATTHEWS, John (University of Utah); Prof. OGIO, Shouichi (Osaka City University); SAKO, Takashi (Nagoya University); Prof. SHIBATA, Tatsunobu (KEK); Mr INOME, Yuusuke (Konan University)

Presenter: Prof. YAMAMOTO, Tokonatsu (Konan University)

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