OBSERVATION OF ENERGY SPECTRUM OF ELECTRON ALBEDO IN LOW LATITUDE REGION AT HYDERABAD, INDIA.

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ABSTRACT

We present the preliminary results of the measurement of the energy spectrum of low energy (5-24 MeV) albedo electrons, moving upward as well as downwards, at about 37 km (~ 4 mb) altitude, over Hyderabad, India, in low latitude region. The flux and energy spectrum was observed by a bi-directional, multidetector charged particle telescope which was flown in a high altitude balloon on 8th December 1984. Results based on a quick look data acquisition and analysis system are presented here.

1. Introduction: The pioneer work of measurement of the flux and energy spectrum of electron and proton albedo was done at high altitude region over Palestine, Texas (Verma 1967) at high energies (20-1000 MeV). In low latitude region the flux of these albedo is expected to be somewhat less (Bhatnagar and Verma, 1983; Kothari and Verma, 1983) but larger at lower energies (5-40 MeV). In the present experiment measurements of low energy (5-24 MeV) Splash and Re-entrant albedo electron spectrum over Hyderabad at 4 mb altitude are reported. Details of the experimental set up and balloon flight are given by Verma et al (1985), for completeness a brief description is given in the next section.

2. Experimental Set-up: A multi detector charged particle telescope (Verma et al 1985) capable of observing simultaneously upward and downward moving singly charge particle (e,μ,p) was used. This telescope is shown in Fig.1. All particles incident on the telescope from above as well as below, and stopping in the central NaI (Tl) total energy detector C were selected for the present work. The arrival direction of the stopping particles was broadly known with the help of two sets of

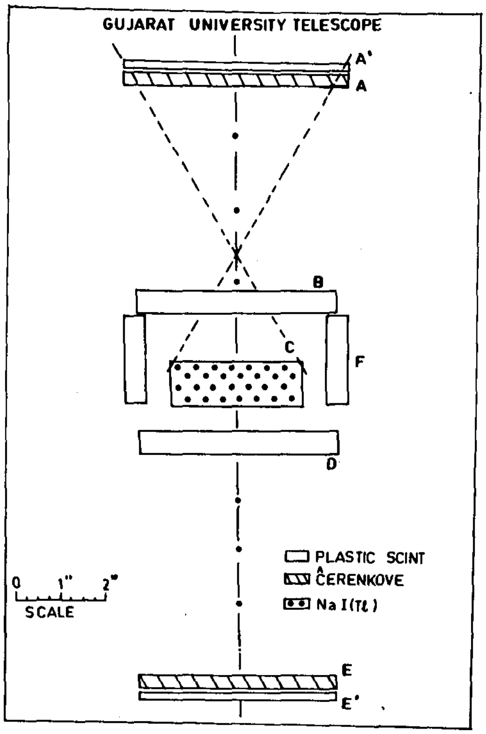

Fig.1

plastic scintillator detectors A B and D E in a combination such as AB C $\overline{DE}$ for downward and $\overline{AB}$ C DE for upward arriving particles. Cerenkov detectors A' and E' were used to identify relativistic electron among stopping singly charged particles. Pulses from total energy detector C and dE/dX detectors B and D were pulse height analysed event by event.

3. Energy Calibration: Various thin plastic detectors were tested using cosmic ray muons present at ground level. The total energy detector C was calibrated with γ-ray sources (e.g. Cs^{137} and Co^{60}) and mono-energetic electron beam of ~ 8 MeV of Microtron of the Department of Physics, Poona University, Poona, India. Cosmic Ray muons and gamma ray sources were also used to test, calibrate and for constant monitoring and preflight check out of various detectors of charged particle telescope. A linear pulse generator was used to test linearity and stability of B, C, D detectors, its electronics and corresponding A/D convertors. Thus all the three P.H.A.'s were calibrated as well as checked for continuous operation for several weeks.

Whole system of CPT and flight electronics was taken through a temperature cycle in completely operating condition and it was found to have practically no drift of muon peak between 15°C and 25°C. Various data matrices were recorded and printed out time to time by quick look system. During these tests and long duration tests singles and coincidence rates, as well as peaks of muon P.H. distributions were monitored which were observed to be quite stable.

4. Data Analysis and Results: A typical two-dimensional pulse height distribution for downward incident is shown in Fig.2. In this the

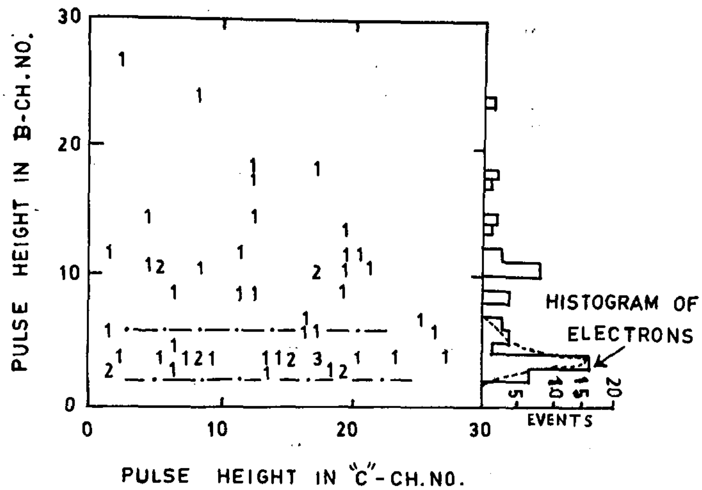

Fig. 2

channel number proportional to the energy deposited in thin detector B' is plotted vs channel number corresponding to energy observed in total energy detector C . Lines in the figure indicates expected track for stopping electrons. Histogram shows a clear peak for electrons. Energy observed in C is converted to the incident energy of the electrons. The events shown in the figure are part of sample of data recorded by quick look display and analysis system (Verma et al 1985). Using the event rate recorded, the geometrical factor (~ 13 cm^2 ster.) of the charged particle telescope and the two-dimensional matrix of stopping electrons shown in Fig.2 the flux and the energy spectrum of down moving low energy electrons were obtained. In the Fig.3 circles represent the flux and the spectrum of re-entrant albedo electronsat balloon altitude of ~ 4 mb in low latitude region, over Hyderabad, India, observed on 8th December 1984. Similarly squares represents the energy spectrum of splash albedo electrons.

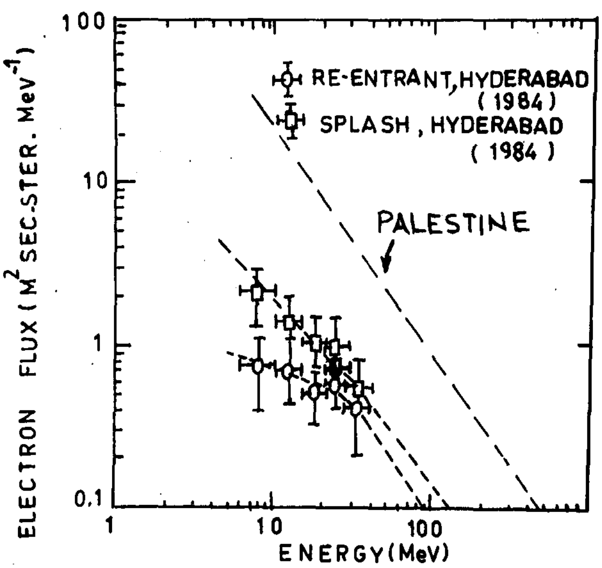

Fig.3

Lines shown in the figure are spectra observed over Palestine, Texas (Verma 1967).

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