E1-25: Long wire antenna set-up for the measurement of local, global and extraterrestrial effects of air-earth conduction current

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Two lengths of stainless steel wires (diameter 1.50 mm) each 500 m long,

were selected to construct two sets of antennas. Ten S-lon pipes (external diameter 5.0 cm) erected at a distance of 50 m apart were used to mount each wire antenna parallel to the earth surface. Heights of antenna from the ground was 2 m.

As the current measurements involved were of the order of 10^{-12} Am^{-2}, a teflon insulator (length 7.0 cm, diameter 4.2 cm) with grooves cut around it to increase the surface area, was mounted on top of each S-lon pipe. This would ensure minimum leakage current to the earth. To prevent the teflon insulator surfaces getting wet due to rain or getting damp due to humidity on deposited dust particles, each insulator was covered by a metal cylindrical unit with a cap which touched the insulator only at the top. Finally to prevent any loss of surface resistivity of these teflon insulators, a circular heating element ($R=500\ \Omega$) powered by a 24 V ac supply was connected at the bottom part of each insulator. A very sensitive current to voltage amplifier (bias current < 0.1 pA, current to voltage transfer coefficient adjustable up to 100 mV/nA, time constant 1 s), mounted inside a metal box of size 11.0 x 6.5 x 5.0 cm, was fixed at one end of each antenna to measure the collected conduction current.

A 16 channel data acquisition system was constructed and coupled to an Apple Macintosh computer for continuous recording of air-earth conduction current. Provision was made for the simultaneous measurement of atmospheric vertical electric field, space charge density, positive and negative ion concentrations and conductivity, temperature gradient and wind profile. Preliminary, simulataneous measurements made at two stations, 40 km away from each other, indicated the existence of extra-terrestrial current pulses of duration ca. 1s.

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