

A PORTABLE LOCAL VLF TRANSMITTER FOR GEOLOGICAL
FRACTURE MAPPING

by

J.G. Hayles¹ and A.K. Sinha²

ABSTRACT

A portable low-power very low frequency (VLF) transmitter using a large square loop antenna has been designed, assembled and tested by the Geological Survey of Canada (GSC) to assist Atomic Energy of Canada Limited (AECL) in geological studies of fracture patterns in igneous rock masses. Standard laboratory equipment, consisting of a signal generator, a 1100-W power amplifier and several high-power tuning capacitors, was used for the purpose.

Field tests at the Chalk River facilities of AECL have demonstrated a remarkable similarity between survey results obtained using the VLF signals from the local loop VLF transmitter and distant U.S. Navy VLF transmitters. The local loop was used to simulate the fields from navy stations NAA in Cutler, Maine and NSS in Annapolis, Maryland. Conductor axes, mapped by using these VLF stations, and the loop antenna yielded almost identical results. A survey was also done in the same area with the local loop placed in such a manner that the direction of the VLF field was 45° with respect to the field directions from NAA and NSS. In this case, the same conductor axes were located with a few minor shifts in position, indicating thereby that conductors whose axes lie within 45° of the direction of the primary horizontal magnetic field are mapped. Thus, it is probably sufficient to have two VLF sources at right angles to each other to map all VLF conductors in an area. Since in most areas at least one navy VLF station can be used, the local loop transmitter can be used to generate a signal at right angles to the direction from the navy transmitter to allow a more complete VLF survey coverage.

¹Atomic Energy of Canada Limited

²Geological Survey of Canada

Geological Survey of Canada
Energy, Mines and Resources Canada

Work done for

Atomic Energy of Canada Limited
Whiteshell Nuclear Research Establishment
Pinawa, Manitoba ROE 1LO
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