

Lawrence Berkeley National Laboratory

LBL Publications

Title

Design and Application of A Mega-Moment Electromagnetic Dipole Source

Permalink

<https://escholarship.org/uc/item/0m40n89j>

Authors

Riveros, C A

Goldstein, N E

Publication Date

1979-05-01

0 3 4 5 6 7 3

To be presented at the 49th International
Meeting, Society of Exploration Geophysicists,
New Orleans, LA, November 4-8, 1979

UC-66 *lv*
LBL-9273
Abstract

DESIGN AND APPLICATION OF A MEGA-MOMENT
ELECTROMAGNETIC DIPOLE SOURCE

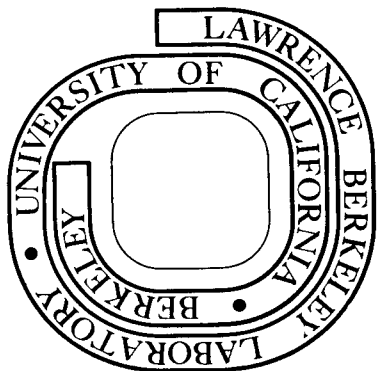
C. A. Riveros and N. E. Goldstein

May 1979

Prepared for the U. S. Department of Energy
under Contract W-7405-ENG-48

For Reference

Not to be taken from this room



LEGAL NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Department of Energy, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

DISCLAIMER

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor the Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or the Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or the Regents of the University of California.

0 0 3 4 0 2 8 7 6

DESIGN AND APPLICATION OF A MEGA-MOMENT
ELECTROMAGNETIC DIPOLE SOURCE

by

C. A. Riveros, University of Chicago

and

N. E. Goldstein, Lawrence Berkeley Laboratory

An electromagnetic transmitter capable of generating a magnetic dipole moment in excess of 10^6 MKS over a wide frequency range was designed and field tested in connection with geothermal exploration surveys. This paper will deal primarily with the engineering aspects of the transmitter pertinent the design and construction of similar transmitters for various geophysical applications.

The Lawrence Berkeley Laboratory, in association with the Engineering Geoscience Group, University of California, has been involved for several years in the Department of Energy, Division of Geothermal Energy's Exploration Technology Program. As the result of studies and evaluations of all geophysical techniques, it appeared that the controlled-source EM technique offered certain site-specific advantages over the commonly used dc resistivity and magnetotelluric methods for mapping the subsurface resistivity distribution. This seemed particularly true where it would be difficult to put sufficient current directly into the ground or where complex geology requires many MT stations for even a partial interpretation.

Existing EM transmitters were tested and found inadequate because they were too limited by the inductive nature of their loads to produce a sufficiently large dipole moment. We therefore designed a prototype transmitter specifically suited to, but not requiring adjustments for, the

reactive nature of the transmitter loop. This prototype was built around an existing 60 kW motor-generator set mounted on a one-ton 4-wheel-drive truck, and was designated as the EM-60 Controlled Source.

Field tests were carried out with a horizontal loop transmitter in both Grass Valley, Nevada and on the flanks of Mount Hood, Oregon. During these tests the magnetic moment exceeded 1×10^6 mks (rms) over the frequency range .02 to 500 Hz although only 1.4 to 1.6 km of #6 welding cable was used. The current was switched between ± 63 amperes. Field tests indicated that the transmitter design provides a safe and reliable system. As no special tuning or adjusting is required for frequency changes, the transmitter is easily operated by one man. However, in field tests we found it convenient to operate the entire system with a four-man crew, the same crew size used for dipole-dipole d.c. resistivity. Crew comments suggested that the EM technique is faster and easier than d.c. resistivity work in the flat, open terrain of a Basin and Range Valley.

This report was done with support from the Department of Energy. Any conclusions or opinions expressed in this report represent solely those of the author(s) and not necessarily those of The Regents of the University of California, the Lawrence Berkeley Laboratory or the Department of Energy.

Reference to a company or product name does not imply approval or recommendation of the product by the University of California or the U.S. Department of Energy to the exclusion of others that may be suitable.

TECHNICAL INFORMATION DEPARTMENT
LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA 94720