

# 超低周波電磁パルス波の地中伝搬特性とその大振幅電磁パルス伝搬実験

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# 1992 Fiscal Year Final Research Report Summary

## PROPAGATION EXPERIMENT AND THEORY OF THE VLF ELECTROMAGNETIC PULSE WAVE IN THE UNDERGROUND

Research Project

### Project/Area Number

03650321

### Research Category

Grant-in-Aid for General Scientific Research (C)

### Allocation Type

Single-year Grants

### Research Field

電子機器工学

### Research Institution

KANAZAWA UNIVERSITY

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### Project Period (FY)

1991 - 1992

### Keywords

VLF pulse generator / SIT / Deep underground / ELF / VLF propagation / EMTD

### Research Abstract

This research has been carried out over two years on the base of following two categories:

1. Design and production of an electromagnetic pulse generator.
2. Experiment and analysis of the wave propagation into the underground.

As for the item 1, we have developed a portable high power VLF pulse generator to transmit a VLF pulse into deep underground. The generator consists of a condenser bank, high-power static induction transistors(SIT) and a circuit to control them. A series of pulses with a current of 1000AT at the frequencies

ranging from 100Hz to 100kHz can be generated to drive a loop antenna. The driving current can be raised up to 2000AT by connecting the antenna directly to the condenser bank. As for the item 2, we carried out a propagation experiment of a pulse transmitted from a loop antenna with two turns and a radius of 2m using the pulse generator. The search coil sensor was set at a distance of 30m far from the transmitter and received the resultant pulse wave forms of a direct wave and a reflected wave from underground. We tried to separate a reflected wave from a deep surface under the ground into the resultant wave forms referring the calculated direct wave form from the antenna. The most suitable set up of the transmitter and receiver was discussed to obtain the reflected pulse wave form with better signal to noise ratio from the underground.

## Research Products (11 results)

All Other

All Publications (11 results)

- [Publications] 長野 勇,遠藤 恒常 他4名: "地下電磁波放射用低周電流パルス波の発生装置" 第2回地下電磁計測ワークショップ論文集. 71-78 (1992) ▼
- [Publications] 新保 哲也,長野 勇 他3名: "地中に置かれたボータイアンテナの動作特性の測定" 第2回地下電磁計測ワークショップ論文集. 33-38 (1992) ▼
- [Publications] M.Tsutsui et al.,: "Magnetic Radiations from Harness Wires of Spacecraft" IEICE TRANS.COMMN.E75-B. 174-182 (1992) ▼
- [Publications] S.Yagitani et al.,: "Comparison between particle simulation and full wave analysis for wave propagation in a nonuniform plasma" Radio Science. 27. 449-462 (1992) ▼
- [Publications] I.Nagano et al.,: "Intensity of the Australian Omega signal Observed by the AKEBONO satellite" Proceedings of ISAP'92. 1. 189-192 (1992) ▼
- [Publications] S.Yagitani et al.,: "Full wave calculation of ELF/VLF wave fields radiated from a dipole antenna in the ionosphere" Proceedings of ISAP'92. 1. 185-188 (1992) ▼
- [Publications] I. Nagano, K. Endo, K. Imai, S. Morita, Y. Ishiwaka and T. Shinbo: "A high-power VLF pulse generator for deep underground measurement" Proceedings of the 2nd Workshop on Subsurface Electromagnetic Measurements. 71-78 (1992) ▼
- [Publications] T. Shinbo, A. Okamoto, T. Abe, K. Date and I. Nagano: "Measurement for the characteristics of bow-tie antenna in soil:" Proceedings of the 2nd Workshop on Subsurface Electromagnetic Measurements. 33-38 (1992) ▼
- [Publications] M. Tsutsui, K. Kojima, I. Nagano, H. Sato, T. Okada, H. Matsumoto, T. Mukai and M. Kawaguchi: "Magnetic radiations from hanness wires of spacecraft" IECE Trans. Commun.E75-B. 174-182 (1992) ▼
- [Publications] S. Yagitani, I. Nagano, Y. Omura and H. Matsumoto: "Comparison between particle simulation and full wave analysis for wave propagation in a nonuniform plasma" Radio Science. 27. 449-462 (1992) ▼
- [Publications] I. Nagano, P. Rosen, S. Yagitani, K. Miyamura, M. Hata, I. Kimura, K. Hashimoto and T. Okada: "Intensity of the Australian Omega signal observed by the Akebono satellite: Comparison with a full wave calculation" Proceedings of ISAP'92. 189-191 (1992) ▼

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