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Three-Dimensional Mapping of Static Magnetic Fields over a Semi Anechoic Chamber

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Abstract— Geomagnetic field is a kind of natural potential field in the Earth. A three years research for exploration of this field has been conducted in the Lombok Island-Indonesia, where extreme geomagnetic anomalies with two very strong dipolar structures exist. The research aims to construct a system to collect and concentrate geomagnetic fields, in order to possibly use the concentrated fields for geomagnetic power plants or to integrate the system with a fields picking-up scheme by means of wireless power transfer. The designed geomagnetic concentrator system has been tested in a self arranged semi anechoic chamber with a pair of Helmholtz coil, induced with DC currents to simulate the regional ambient static geomagnetic fields. Several tests have proven the performance of system in one dimensional space. This paper presents results of detailed three dimensional measurements of static magnetic fields in the semi anechoic chamber. Static magnetic fields over the entire chamber are drawn in their magnitudes and directions, by interpolating data obtained in regular grids of 50 cm x 50 cm. In specific areas, where the Helmholtz coil is placed, extra grids of 25 cm x 25 cm are inserted to sharpen fields' depictions. Results show that by inducing 1 A current on each of coils will produce magnetic fields, concentrated over the surrounding area of Helmholtz coil. The intensities of magnetic fields over this area are about 15,000 - 45,000 nT, which can be used to model the geomagnetic fields of the Lombok Island. Using the results of 3D field mapping, it will be possible to get the optimum placement of the geomagnetic concentrator system when it is tested on the chamber.

Keywords— Anechoic chamber; Geomagnetic fields; Helmholtz coil; Lombok Island

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