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Small Scale Non-Invasive Imaging Using Magnetic Induction Tomography - Hardware Design

Abstract
This study is conducted to preliminary image the conductivity profile through the development of small scale non-invasive Magnetic Induction Tomography (MIT) system. It is proved that the Magnetic Induction Tomography interested in mapping the passive electrical properties of materials; conductivity (σ), permittivity (ε) and permeability (μ) in both process and medical tomography. The system is realized by designing the functional ferrite-core coil sensors, electronic measurements circuits for excitation and receiving coil, data acquisition system for transferring the data to the PC and suitable image reconstruction algorithm for providing the conductivity distributions measurement. The important characteristic for excitation coil is the one that can maintain the stability the optimum sine wave frequency ranging from 400 kHz up to 10 MHz. The sine waves are fed to the excitation coil through the application of high current amplifier component respectively. In the experiments, the copper phantom represent as high conductivity material were placed into the region of interest. The initial 16 channels MIT consists of 8 excitation coils and 8 receiving coils stacked alternately. On the receiving circuit, the major problem is the weak secondary signal perturbation sensed by the receiving coil has been improved by placing the variable amplifier on each receiver. The enhancement of conductivity profile imaging has been made by using a common Linear Back Projection (LBP) algorithm. The measurement was done on single and dual arrangement of copper phantom aligns in random coordinate so that the sensitivity of the excitation and receiving coil sensor can be experimentally observed. The imaging's results show that the hardware's and algorithm used was capable to process the data captured at the receiver. The results obtained can be useful for further improvement and research towards magnetic induction tomography.

Keywords
Excitation coil; Magnetic induction tomography; Receiving coil