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Electromagnetic acoustic transducers modelling, optimisation and realisation

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Abstract : The electroacoustic transduction processes governing an electromagnetic acoustic transducer operating in transmitting and receiving modes are presented. The present approach includes three separate modelling states: 1. Static magnetic field simulation of an electromagnet, 2. Pulsed eddy current distribution of a spiral coil, and 3. Acoustic field equation. An analytical solution of the diffusion equation and its computer implementation are developed to predict the behavior of the eddy current radiation into an isotropic half space owing to an excitation coil driven by a high frequency pulsed current. To demonstrate the flexibility of this approach, and the efficiency of the developed software, the current induced by a spiral coil suspended over a metallic specimen is calculated. The second part of the present paper consists of electromagnetic acoustic transducers (EMATs) conception and construction for the contactless excitation and detection of different wave types. Receivers and transmitters EMATs have been realized.

Keywords : computer simulation, electromagnetism, tranceivers