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Induction magnetometers response speed control

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The time domain or transient electromagnetic method (TEM) and controlled source audio-frequency magnetotellurics (CSAMT) have been broadly used in shallow geological structure mapping, underground mineral, geothermal and hydrocarbon resource investigations. These methods use strong artificial pulse-like electric or magnetic signal produced by a powerful generator and then measurement of the sounded medium response to such a signal. They are particularly fast developed during the past decades and are placing greater demand on instrumentations used.
Such instrumentation has to have very wide dynamic band (at least 120 dB) to register both relatively high amplitude signals coming first to the receiver and very weak signals appearing closer to the end of the measurement cycle.
As theoretical considerations and practical experience show, the best set of parameters to solve the task of measurements of such signals have induction or search-coil magnetometers (IM). The main features of IM are low own magnetic noise level and wide operation frequency and dynamic bands. Geophysical research in different transient mode types raises an important design objective that the recovery time of this instrumentation after applying strong pulse would be as small as possible: the smaller is this transient time, the shallower crust layers may be sounded. So, high response speed has to be ensured to provide quick instrument recover after strong magnetic field impact which gives the opportunity to explore the smaller depth layers of the sounded crust.
In this paper the problem of induction magnetometers response speed control was considered. A good agreement of theoretical calculations and experimental tests was demonstrated and the efficiency of the proposed approach is confirmed.
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