高灵敏度、宽频带电磁传感器技术

the technique of High sensitivity and wide band electromagnetic sensor

感应式电磁传感器是地球物理勘探领域中电磁法的核心设备，如何制造出具有高灵敏度、宽频带的高性能电磁传感器是实现电磁法仪器设备国产化战略中亟待解决的关键技术问题。

Inductive electromagnetic sensor is the core equipment of electromagnetic method in geophysical exploration field,How to make a high performance electromagnetic sensor with high sensitivity and wide frequency band is a key technical problem to realize the localization strategy of electromagnetic instrument equipment.

课题依托国土资源部“深部矿产资源勘探技术”重大项目，从磁芯材料的组份配比、热处理工艺、磁芯制备等方面对磁芯制备工艺技术进行优化和筛选。通过对感应线圈、前置放大器以及传感器装配工艺等方面的综合研究，研制成功适合于瞬变电磁法（TEM）、可控音频源大地电磁测深（CSAMT）、音频源大地电磁测深（AMT）和大地电磁测深（MT）四种类型的高性能电磁传感器。

Based on the exploration technology of deep mineral resources of the ministry of land and resources,The technology of magnetic core preparation technology was optimized and screened from the components of core materials, heat treatment process and magnetic core preparation .By means of induction coil, preamplifier and comprehensive research in aspects of sensor assembly process, Transient electromagnetic method (TEM) and controlled source audio magnetotelluric sounding (CSAMT), audio source magnetotelluric sounding (AMT) and magnetotelluric sounding (MT) of these four types of high-performance electromagnetic sensors made out of success.

CSAMT/AMT 传感器

CSAMT/AMT sensor

磁芯材料

Magnetic core material

MT 传感器（MT sensor）

标定实验仓（Calibration laboratory）

TEM 传感器（TEM sensor）

磁传感器主要技术指标（Main technical indicators）

指标 technical	噪声 noise	灵敏度 sensitivity	频带范围 frequency band range	体积/重量 volume/ weight
CSAMT/AMT 传感器 CSAMT/AMT sensor	3×10-4 nT/√Hz@1Hz 5×10-7 nT/√Hz@1KHz	100mv/nt@Hz 500mv/nt@Hz	0.01Hz～10KHz	ϕ80×750mm 6.5Kg
MT 传感器 MT sensor	1×10-2nT/√Hz @0.01Hz 1×10-4nT/√Hz @1Hz	500mv/nt@Hz	0.0001Hz～300Hz	ϕ80×900mm 10.5Kg
TEM 传感器 TEM sensor	5×10^{-3}nt/Hz@1KHz	0.125mv/nt@1KHz	1Hz～250KHz	450×450×20mm 2.5Kg

研制的四种电磁传感器经实验室检测以及与国外同类型设备的对比试验，其技术性能已达到国外同类产品。

Through the detection of four kinds of electromagnetic sensor and the comparison test with foreign similar equipment, Its technical performance has reached foreign similar products.