

THE STUDY INTERACTION ELECTROMAGNETIC WAVES ELF–ULF RANGE (0.1–200 Hz) WITH THE EARTH CRUST AND THE IONOSPHERE IN THE FIELD OF INDUSTRIAL POWER TRANSMISSION («FENICS» EXPERIMENT)

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Abstract. The article is devoted to description of the theory, technique and the first experimental results of control source electromagnetic (CSEM) study of the Earth crust and ionosphere with the use of two mutually orthogonal industrial transmission lines of 109 и 120 km length in frame of experiment «FENICS» (Fennoscandian electrical conductivity from natural and induction control source soundings). The main part of the measurements has been executed on the territory of Fennoscandian shield at distances up to 856 km from transmitter with the purpose of the deep electromagnetic sounding of the Earth crust and upper mantle. According to the results of these studies clarified the parameters of «normal» (standard) geoelectric section of the lithosphere to the depth of 60–70 km, the anisotropy parameters evaluated and executed geothermal and rheological interpretation in conjunction with the analysis of the seismic data. Alongside with this some part of measurements have been executed apart from Fennoscandian shield at distances up to 5600 km from the source (in Ukraine, Spitsbergen, Poland, Kamchatka and other areas) for the purpose to study the propagation of ultra low frequency (ULF) and extra low frequency (ELF) waves (0.1–200 Hz) in a waveguide «Earth–Ionosphere». By results of these studies the experimental the new estimates of the influence of the ionosphere and of the displacement currents on the propagation of ULF–ELF waves in the upper half-space are obtained at the different azimuths radiation of the primary field.

Keywords: electromagnetism, deep sounding, controlled sources, extremely low frequency band (ELF), ultra low frequency band (ULF), industrial power lines, resistivity, normal resistivity section, numerical modeling, inverse problem, interpretation, Moho boundary, geothermal section, rheology.