INDICATING THE DEEP STRUCTURE (BELOW THE ICY AND LIQUID LAYERS) OF EUROPA AND TITAN BY MEASUREMENTS WITH A GIANT SOLENOID SYSTEM ON BOARD OF AN ORBITING SPACE PROBE. T. Földi[1] and Sz. Bérczi[2], [1]FOELDIX, H-1117 Budapest, Irinyi J. u. 36/b. Hungary, (theofoldi@ludens.elte.hu), [2]Eötvös University, Dept. G. Physics, Cosmic Mat. Sp. Res. Gr. H-1117 Budapest, Pázmány Péter sétány 1/a. (berczi szani@ludens.elte.hu).

Introduction: We propose a large, few wind solenoid experiment to measure on a circular orbit the depth of the ice crust of Europa and Titan. The solenoid is orbiting the Jovian or Saturnian satellite, it represents an oscillator with ultralong wavelength, (from 100 Hz to 40.000 Hz). The diameter of the few wind solenoid may be between 200 m and 800 m.[1]. The oscillator is established as a putch-hull oscillator. We use the solenoid as a special antenna. We do not use it as a radar, so we do not consider its far field. Instead of it, we use the near field of the antenna.

The near field of the antenna can be deduced from the emitted and received oscillation. In an ideal case the near field is $\pi/2$ phase delayed as compared to the far field of the antenna. In a real case the phase delay between the two fields (because of the losses in the near field) is a little bit different from $\pi/2$ phase delayed. This difference from $\pi/2$ is caused by the ice covered deep mountains (if they exist) below the icy crust of Europa or Titan. By this measurement it can be derived that how deep is the rocky material below the volatile ice and liquid spheres [2].

The arrangement of the oscillator on board of the probe: For example we show how the system works with a two-wind solenoid with 500 m diameter. There are 3 poles of the solenoid. First (1) at the output of the No. 1. Amplifier, second (2) at the positive pole of the Dc battery (some volts), and third (3) at the output of the No. 2. Amplifier. The pole (1) is connected to pole (2) through a capacitor, the pole (2) -as was shown, - is connected to the battery, and pole (3) is connected to pole (1) through a capacitor. The negative pole of the battery is connected to the common "earth" pole of the two amplifiers. The phase-measuring unit is attached to pole (1). This oscillator arrangement emits not a sinuous but a square signal.

This square signal can be summarized from sinuous ν signals with frequencies of 1ν , 3ν, 5ν, 7ν, ...The penetration depth of the various frequencies is different and the penetration depth decreases with the increasing frequency. We measure the amplitude and phase of the different harmonics. By this measurement the depth and the horizontal extension of the rocky medium below the icy+liquid crust can be calculated.

An estimated numeric example. With 500 m diameter solenoid and with 1000 Hz frequency the penetration depth of the basic harmonic component is 50 km. [3].

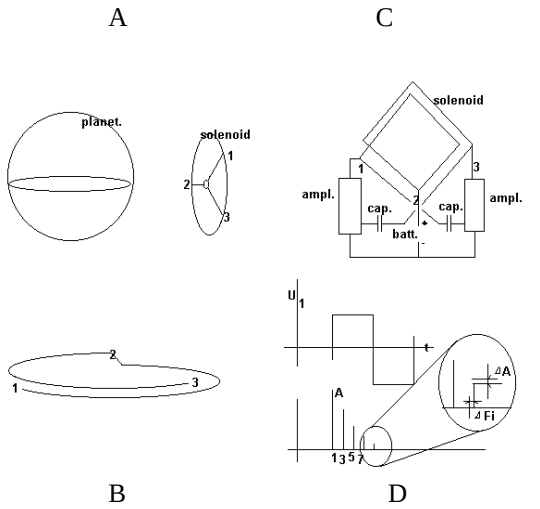

Fig. 1. A) The position of the solenoid as compared to the orbited satellite (Europa or Titan); B) The winding and poles of the solenoid; C) The circuit of connections of the Amplifiers and the Battery; D) upper function: the shape of the time function of the potential between the poles 1 and 3 of the solenoid; lower function: the Fourier spectra of the earlier function: enlarged is difference of phase and amplitude caused by the loss of the near filed power induced [3].

Technological realization: When operates in measuring mode the solenoid is embedded into a plastic torus which forms a hermetically closed container under pressure. In transportation mode the solenoid and its torus-conatiner is folded arranged in a Technologically the great circular solenoid consists of three geometrical constituents. 1) the circular winds of the solenoid [3], 2) the radial spokes with poles described, arranged with a 120 meeting angle at center of the ring, finally, 3) the central oscillator and measuring unit with radio connection to the on board telemetry.

Summary: The harmonics of the near field induced by the solenoid will change in amplitude (decreasing) and in phase (plus or minus) implicates the rocky surface below the ice and water spheres on the observed satellites because of the dissipation of energy from the near field. This effect is very different from the long wavelength radar and our method works with far lower energy consumption [3].

References: [1] Földi T. (1994): Inductivity method to search for ice-meteorites on Antarctica. (In: Evolution of Extraterrestrial Materials and Structures. B. Lukács, et al, Eds.) KFKI-1994-22/C. Report, Budapest, [2] Földi T., Bérczi Sz., Lukács B. (1995): Search for icy meteorites on Antarctica. *ANTARCTIC METEORITES XX*, 68; [3] Földi T., (1992): Hungarian Patent: Geofizikai mérõeszköz és eljárás réteghatárok kimutatására....(Geophysical instrument to measure boundary layers, especially for oil containing layers), Budapest;