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MAGNETO-TELLURIC LOW-FREQUENCY SOUNDING OF THE LUNAR SUBSURFACE
STRUCTURE (1-10 MHz) - METHODOLOGICAL AND EXPERIMENTAL POSSIBILITIES FOR
DETERMINING THE THRESHOLD (NOISE) CHARACTERISTICS FOR LONG-WAVE RADIO
ASTRONOMY ON THE LUNAR SURFACE

Abstract

On the basis of developments and international cooperation of IKI RAS partners, it is proposed to conduct a new design space experiment - integrated magneto-telluric sounding of the subsurface structure of the Moon in the future space missions to the Moon. Within the framework of this experiment, it is also planned to measure the background (noise) characteristics in the range 1-10 MHz. on the Moon surface, to determine the methodological and experimental possibilities of creating a lunar radiotelescope in the frequency range 1 MHz - 6 MHz, as well as the creation and testing of elements and a prototype of such a lunar radio telescope. The main scientific tasks of the lunar radio telescope: 1. Monitoring the geomagnetic activity of the magnetosphere. 2. Monitoring the atmospheric dynamics of Venus and Mars. 3. Monitoring the solar wind (solar type III radio bursts). 4. Monitoring the activity of the magnetospheres of the giant planets (maser emission). 5. Study of transient sources of radio emission. 6. Obtaining data on the processes during the "reionization" of hydrogen. 7. Search for exoplanets with terrestrial properties (SETI). The Earth's ionosphere does not transmit electromagnetic radiation in the frequency range below 10 MHz. Therefore, electromagnetic radiation of cosmic origin below this frequency is not available to a ground observer. A receiver on the lunar surface is devoid of such restrictions, since the signals reach the antenna unhindered, which makes it possible to carry out long-term measurements in stationary conditions, as well as measurements on the far side of the Moon under conditions of shielding by the Earth and the Moon of the direct solar wind, to measure the cosmic microwave background radiation, as well as other transient sources of radio emission, in the frequency range 1 MHz - 10 MHz. Within the framework of this project, it is planned to develop a prototype of a universal geophysical complex on the lunar surface to carry out a comprehensive program for studying the subsurface structure of the Moon to a depth of several kilometers, as well as large-scale measurements of noise (threshold) characteristics on the lunar surface caused by the solar wind and secondary subsurface sources of noise characteristics, which determine the threshold characteristics of the lunar radiotelescope receivers. The topic of fast radio bursts is currently being actively developed [1]. There is no doubt that the basic mechanisms of their generation will be well understood by the time of the construction of the radio telescope on the moon.