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OPTIONS OF NAVIGATION SYSTEMS FOR LUNAR EXPLORATION

Abstract

Conducting a detailed study of the Moon, as well as its future development, should be based on a high-precision positioning system for objects located on the Moon. Satellite global positioning systems on the Ground have been successfully operating for many years, allowing users to determine their position at any time with an error of less than 5 meters. Most projects on navigation systems offer the use of radio engineering tools. The authors of these projects suggest different schemes with a large number of lunar orbiters: according to different estimates, a grouping of 9-18 lunar navigation satellites, a lunar segment and a complex control system for this complex are required. There are also projects that use orientation on ground stations directly or through intermediate vehicles located between the Earth and the Moon. There are also a number of complex issues related to the delay of the signal from the Earth to the Moon. There is a variant of the system without reference beacons, which maintains its space-time position by itself, solely guided by the stars. There are also a number of questions about this concept. Therefore, it is extremely attractive to develop a lunar navigation communication system (LNSS) based on new principles that allow you to do with a minimum number of navigation satellites. In addition, we need a system that can be gradually increased from a local system (for a particular area of the Moon) to a global system (over the entire surface of the Moon), and from the periodic ability to position the object to the round-the-clock with high measurement efficiency. The main problem of creating such a navigation system is the optimal choice of the optical and physical characteristics of the design of the LED beacon. The task of the optical beacon is to fix the navigation reference point on the body of the Moon and to accurately measure its selenodesic coordinates. The proposed navigation system based on measuring optoelectronic devices on spacecraft and light beacons on the positioned objects will allow to have a high-precision navigation system that will provide spatial positioning of objects, both on the surface of the Moon and in the circumlunar space.