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LUNAR WATER ANALYSIS MODULE WITH DIRECT MEASUREMENT

**Abstract**

For future lunar water resource utilization, water extraction and processing plant will be built on the moon for many purposes such as propellant for rockets, fuel for fuel cells that supply electricity during the nighttime, and the life support for daily use. 2030s. In determining the specifications and location of the plant, information on the distribution and properties of lunar water resources is extremely important. Also, finding out whether extracting water from lunar regolith is more efficient than sending water from the earth is a key for economy to create scenario in early stage for future business on the moon.

In order to discover those information, we need to develop a module which is able to be manufactured with low cost, fit to any lunar rovers, and survey the potential area on the moon where water exists from the commercial point of view by directly measuring at pin-point. And such data should be critical to make remote sensing data of water existence correlated and proven. This is why we, commercial companies, have been developing the lunar water analysis module which will shift such exploration's purpose from science to industry.

This lunar water analysis module consists with three parts; drilling, sampler/vaporizer, and unique laser spectroscopic analyzer. It will be designed to approx. 10 kg, and it is able to drill about 500 mm and heat regolith up to 100 degree Celsius. The system's electric power will be designed to be less than 30 W. As the laser spectroscopic analyzer, Tunable Diode Laser Spectroscopy (TDLS) developed by Yokogawa Electric is adopted to measure the amount of vapor from lunar regolith. Diverting this analysis equipment, which is widely used on the earth to space use, reduces development cost and enables to develop entire system faster. Now the module is under development and has been tested technical feasibility. And we are going to work on prototyping and environmental compatibility test in this coming year.

This module is targeting to collaborate with not only national space agencies and academia, but also commercial companies which are interested in lunar resources. Our goal is to create value chain on the moon where both space agencies and commercial companies can join and work together.

This report discusses about the breadboard model tests related to prospecting and measurement techniques of commercial-base lunar water analysis module, which has the characteristics of being compact, high performance and highly robust.