PROJECT FACTSHEET

www.list.lu/en/research/project/focal1ds/?no_cache=1&cHash=aec2cba46ce72eb7fbc9af7c9b1cbfa7

FOCAL1DS

Developing a space deployable 1D focal plane detector for a compact magnetic sector mass spectrometer as key technology for in order to lunar ice and regolith elementary analysis.

Inspiration

ispace, a Tokyo based lunar exploration company, develops small, lightweight landers and rovers that will be used to explore the surface of the Moon. ispace Europe, based in Luxembourg, has partnered with LIST, specifically with the team of the Advanced Instrumentation for Ion Nano-Analytics (AINA) group, to develop an innovative mass spectrometer for lunar resources elementary analysis.
This compact instrument will be specifically designed to measure selected elements and molecules such as hydrogen, oxygen, and water. The very important feature of this mass spectrometer will be its capability to capture simultaneously a wide range of mass spectrum, provided that it is equipped with an appropriate detection system wit a high performance focal plane detector. Such a 1D focal plane detector fulfilling the requirements is currently not existing and hence is targeted in this project.

Innovation

In FOCAL1DS, a space deployable high performance 1D focal plane detector for a compact magnetic sector mass spectrometer will be developed by LIST to be further integrated in ispace's rover. This development will be based on the multichannel plate (MCP) technology combined with the Delay-line (DL) anode readout.
Significant improvements in terms of detector's performance, including an enhancement of the local count rate (>10^6 cps) and local dynamic range (10^6) are targeted to optimize the performance and flexibility of the mass spectrometry technology. LIST and ispace will take benefits from their individual expertise and potential synergies to integrate the newly developed mass spectrometer into ispace's rover for testing in relevant space environment.

Impact

The developed mass spectrometer, with the new 1D focal plane detector as a key component, will aim to perform the unambiguous and in-situ measurement of water on the Moon. The detection and characterization of water should be the first milestone towards commercial water ISRU (In Situ Resource Utilization) on the Moon. The technology will further evolve in view of subsequent lunar missions to perform characterization of other molecules, elements and isotopes.
Furthermore, the impact of this project will not be limited to space applications. Successful development of the proposed detector technology will allow LIST to improve other instruments dedicated to high performance nano-analytics.

Partners
ispace Europe (LU)

Financial Support
Fonds National de la Recherche

Contact
5, avenue des Hauts-Fourneaux
L-4362 Esch-sur-Alzette
phone: +352 275 888 - 1 | LIST.lu

Quang Hung HOANG (hung.hoang@list.lu)

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST