PROJECT FACTSHEET

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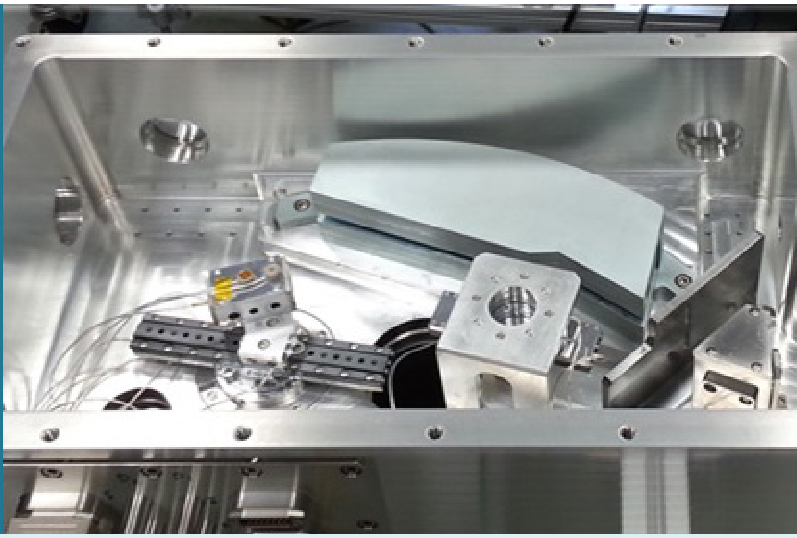
MS-SPACE

To adapt and pursue the development of the mass spectrometry technology developed by LIST for space applications



INSPIRATION

Mass spectrometry is one of the most important in-situ analysis tools in planetary science and astrobiology. It can help answer some of the big questions in planetary exploration, such as elemental and isotopic compositions of the solar nebula; the origin, dynamics and surface interactions of the planetary atmospheres; or the origin of life on Earth and the evidence for past or present life on Mars and other planets. In order to operate in space missions, an instrument of this kind needs to be of highest performance, but yet lightweight, compact and compatible with the harsh environment of outer space. However, a mass spectrometer combining all these characteristics is conspicuous by its absence: for example, the current tools are too heavy or do not offer sufficiently high performance.

At the same time, within the last few years, LIST developed a mass spectrometer called FieldSpec in a different project and for a completely different use. Although it was originally designed for hydrological purposes, thanks to its compact size and high mass resolution, this tool has considerable potential for different applications, including space exploration. Hence, there have been in-depth discussions between LIST specialists and those at NASA's Ames Research Center concerning the numerous possibilities offered by FieldSpec. It was noted that FieldSpec technology could potentially be used in planetary science and astrobiology. Therefore, if adapted to meet the requirements of space, this mass spectrometer could be used to analyse atmospheric evolution and Solar system origins, water cycle and history, surface volatile concentration and surface history, or surface soil and atmosphere bulk composition.

INNOVATION

The objective of MS-SPACE is to adapt the FieldSpec mass spectrometer, previously developed by LIST, to space applications. In order to achieve this, both the performance specifications and the physical and technical specifications of the future mass spectrometer will need to be identified. It will then be necessary to adapt the current FieldSpec technology to these specifications and produce a prototype, before conducting feasibility tests to validate the prototype. While LIST and NASA's Ames Research Center will work together to identify the requirements and specifications and test the prototype, the adaptation of FieldTech will be carried out by specialists in charged particle optics, mechanics and electronics from LIST.

This new space-deployable mass spectrometer will make it possible to obtain in-situ chemical information and detect stable isotopes with high sensitivity and precision. Its main asset will be its capability of acquiring wide-range mass spectra simultaneously with high mass resolution. This will not only enable it to overcome the limitations of current tools, but will also make it flexible for a wide range of applications in a single instrument. Another feature of the FieldSpec concept will be its limited use of complex ion optical systems, which will also help it to further reduce its size and overall weight.

IMPACT

At the end of the project, a prototype will be produced to demonstrate the feasibility for space applications of the compact FieldSpec mass spectrometer developed at LIST. Being space-deployable for NASA, this instrument will be a potential candidate for the American space agency's future missions. As a first step towards establishing a long-term collaboration between NASA and LIST, this project will enable LIST not only to raise its profile in the field of space instrumentation development, but also to acquire new knowledge in the areas of engineering and technology for space applications.

Partners

NASA Ames Research Center (USA)

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Contact

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

Dr Tom WIRTZ (tom.wirtz@list.lu)

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY LIST