Lunar Volatiles Mobile Instrumentation (LUVMI): low-mass, low-footprint, payload and robotic system for the sampling of volatiles at the Lunar poles D. A. Urbina[1], J. Gancet[1], K. Kullack[1], E. Ceglia[1], H. K. madakashira[1], J. Salini[1], S. Govindaraj[1], G. Fau[1], D. Fodorcan[1], L. Surdo[1], R. Aked[1], S. Sheridan[2], C. Pitcher[2] S. Barber[2], J. Biswas[3], P. Reiss[3], J. Rusthon[4], N. Murray[4], A. Evagora[4], L. Richter[5], D. Dobrea[5], M. Reganaz[5].

[1]Space Applications Services N.V./S.A Zaventem, Belgium; Noordwijk, The Netherlands diego.urbina@spaceapplications.com (corresponding author); [2]The Open University, Milton Keynes, United Kingdom; [3]Institute of Astronautics, Technische Universitaet Munchen, Munich, Germany; [4] Dynamic Imaging Analytics, Milton Keynes, United Kingdom [5]OHB System AG, Wessling, Germany

Introduction: The International Space Exploration Coordination Group (ISECG) identifies one of the first exploration steps as in-situ investigations of the Moon. Europe is developing payload concepts for drilling and sample analysis on static landers, and contributions to a 250kg rover as well as for sample return. The complexity and cost of such missions means that they are low cadence and require extensive international partnerships at agency level.

Within this context, there is opportunity for smaller, agile landed elements both to directly address Lunar Exploration Analysis Group (LEAG) recommendations and to support and de-risk larger missions by providing reconnaissance measurements at future landing sites, including local ground-truthing of wide-scale orbital observations.

The LUnar Volatiles Mobile Instrumentation (LUVMI) provides a smart, low mass, innovative, modular mobile payload comprising surface and sub-surface sensing with an in-situ sampling technology capable of depth-resolved extraction of volatiles, combined with a volatiles analyser (mass spectrometer) capable of identifying the chemical composition of the most important volatiles. The sampling and analysis system is optimized to maximize sample transfer efficiency and minimize sample handling and potential alteration, and to enable areal and sub-surface coverage for modest mass. This will allow LUVMI to: traverse the lunar surface prospecting for volatiles; sample sub-surface up to a depth of 10 cm (with a goal of 20 cm); extract water and other loosely bound volatiles; identify the chemical species extracted; access and sample permanently shadowed regions (PSR).

By building on national, EC and ESA funded research and developments, this project will develop to TRL6 instruments that together form a smart modular mobile payload that could be flight ready in 2020.

The LUVMI prototype is currently being built. The sampling instrument will be tested in a highly representative environment including thermal, vacuum and regolith simulant and the integrated payload demonstrated in a representative environment.