

ENTREPRENEURSHIP & INVESTMENT SYMPOSIUM (E6)  
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MOONSHOT: A FIRST DUTCH FOOTPRINT ON THE MOON

**Abstract**

This paper is intended for session E6.3: Entrepreneurship investment: Synergy of Entrepreneurship, Investment, Government Industry [this session could not be selected on the [iafastro.com](http://iafastro.com) website]

Coinciding with the transition from Space 1.0 to Space 2.0, a new phase of commercial lunar exploration ('Moon 2.0') was initiated by the announcement of the Google Lunar X Prize. Participation in Moon 2.0 requires a new approach for conducting space projects as schedules are tight, additional and non-traditional risks are involved, new types of requirements are imposed on scientific payloads and, most of all, non traditional ways of funding seems to be the key to project success.

MoonShot is a project led by the Dutch Organisation for Applied Scientific Research TNO, with partners from industry and university planetary science research centers in the Netherlands, that aims to provide a combined Raman/LIBS instrument as scientific payload for Odyssey Moon's MoonOne mission.

The Raman/LIBS instrument is a fundamental, next-generation instrument for mineralogical and elemental (atomic) characterization of lunar soil and rock samples. It uses an optical head to illuminate samples with laser light that generates physical phenomena (Raman shift and plasma for the LIBS) with light emission. Emitted light is collected and relayed to a spectrometer using optical fibres to record a spectrum on a CCD for sample identification. It is the first time that Raman spectroscopy and LIBS are combined into one miniaturized instrument with minimum mass, volume and use of resources, a high spectral performance and rapid analysis.

The main science objective of the instrument onboard a lunar mission would be to determine the mineralogical and elemental composition of the lunar surface, to (a) provide details on the geological and geochemical evolution of the Moon (b) perform detailed in situ mapping of lunar material of interest for lunar exploitation means and the realization of a future lunar base (c) demonstrate technology for future planetary exploration missions and terrestrial spin-offs.

The Raman/LIBS instrument was previously pre-selected as part of the ExoMars rover's Pasteur payload and its end-to-end functional performance has been demonstrated in an Elegant Bread Board using natural samples under mission representative conditions. Subsequently a Development Model (DM) of the spectrometer was built, which is intended to be adapted (interfaces, temperature, atmospheric pressure, radiation, dust environment) for accommodation on a lunar mission.

The efforts to finance project MoonShot are ongoing and connections are searched for in the mining industry, multimedia branding companies and the food industry.