

# Conceptual design of a permanent lunar outpost: Surface experiments and instruments for geophysics and geodesy study case

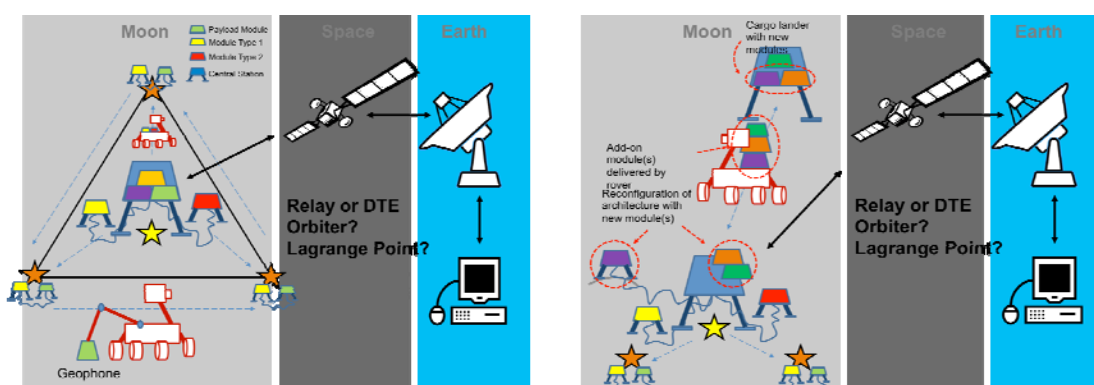
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**Abstract.** Within the Helmholtz Alliance's "Robotic Exploration of Extreme Environments (ROBEX)", a significant effort is being put towards exploring synergies between two up to now unrelated research fields: deep sea exploration and lunar exploration. Drawing upon this collaboration the deployment of a possible geophysical study network on the Moon's surface is designed. Breadboards are planned to be built and field test should be done in the end of the project (from 2016 on). Since the Apollo missions, the internal composition and structure of the Moon has been a primary topic of study. Despite the importance of the Apollo data, execution of complex tasks in extreme, uncooperative and difficult-to-access areas was not possible by the Apollo astronauts. A higher degree of autonomy in terms of energy supply, instrumentation, communication and navigation, when realized as a permanent, scalable and modular lunar outpost, could guarantee a wider and longer range of operations. A central 'smart' module, a lunar rover, power generation and storage modules, communication terminals and sensor arrays would compose the baseline of an outpost's infrastructure. Utilizing modular characteristics for the base would allow the capabilities of the base to expand, permitting new missions to be accommodated. Scientific requirements for geophysical and geodetic investigation of the Moon would dictate landing sites and system architecture for the overall mission.



**Fig.1** Concept of a lunar outpost for geophysical and geodetic investigation of the Moon. Left: Interaction and cooperation of the different modules of the lunar outpost for a first reference mission. Right: New module connection to the existing infrastructure for a later mission.