Rover Mounted Dielectric Spectrometer (RDS) for Planetary Exploration

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Target: Mars and Lunar subsurface.

Science:

- Detection and characterization of Mars hydrate minerals (e.g, gypsum, kieserite, epsomite) and ice at local scale down to 5m depth combined with subsurface stratigraphy.
- Detection and characterization of Lunar water-ice/hydroxyl group.
- Selection of sampling sites for biosignatures through detection of Martian evaporitic sulfates, a promising target for exobiology on Mars. Such evaporates would contain permineralized microfossils, if life ever arose on Mars.
- Detection of bulk hydrate minerals and water-ice for future in situ resource utilization.

Objectives:

- Development of a prototype RDS. Major development effort will be on an efficient antenna-sensor structure (current TRL2 to TRL4) and miniature electronics for RDS.
- Integration of the RDS with a heritage miniature ground penetrating radar (GPR, TRL4).
- Functional integration and interpretation of data between GPR and RDS. Software development for signal processing and integration of RDS/GPR data.

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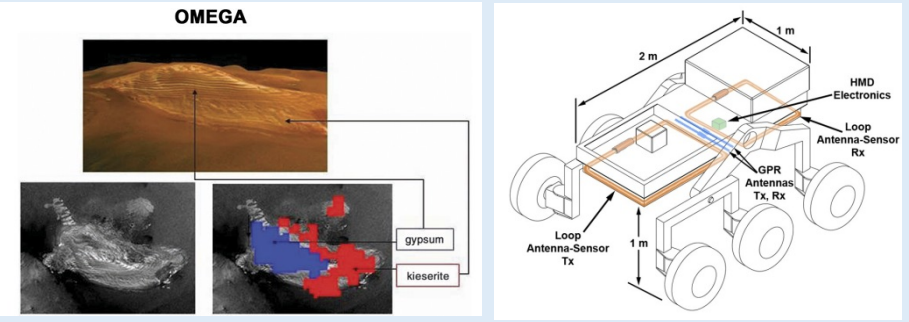

Figure : Left, OMEGA Visible-IR spectrometer data showing sulfate-rich layer deposit in Valles Marineris, Juventae Chasma. RDS/GPR will detect and characterize subsurface hydrate minerals and stratigraphy to 5 m depth. Right, Deployment concept of the RDS/GPR on a MSL size rover. Loop Antenna-sensors and GPR antennas are integrated underside of the rover, with their electronics inside a warm electronics box.

Key Milestones:

Year 1 (6/30/2017-6/30/2018):

- Antenna-Sensor: Design/Modeling/Analysis (UCLA), 6/30/2018.
- Antenna-Sensor Fabrication/Laboratory Testing (JPL) 6/30/2018

Year 2 (7/01/2018-6/30/2019):

- Antenna-Sensor Optimization (UCLA), 6/30/2019
- RDS Electronics/Rover Integration/Field Testing (JPL) 6/30/2019

Year 3 (7/01/2019-6/30/2020):

- RDS/GPR Functional Integration (JPL), 6/30/2020
- Field Testing at analog sites/Optimization (JPL), 6/30/2020

TRL (2) to (4)