

SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – Science, Instruments and Technologies (3B)

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WET – A SOIL WETNESS SENSOR FOR MARS

Abstract

We describe a new sensor that allows measurements of soil wetness and the detection of liquid in the shallow subsurface of Mars, as well as on other planetary bodies in our solar system. This soil wetness sensor (WET) uses an innovative technique that is sensitive to the complex permittivity of the soils in contact with the sensor, a microwave microstrip ring resonator. The sensor's circuit topology, key components, and packaging strategy developed are described. Preliminary results show that liquid brines are unambiguously detected when the resonator's fundamental frequency and the second or third harmonic are measured. Two WET prototypes are being developed and tested using the Michigan Mars Environment Chamber. This chamber can simulate the full range of Martian environmental conditions. Field tests will be conducted at the Owens Dry Lake in California to mature the instrument Technology Readiness Level (TRL) 6. WET is part of the Martian Aqueous Habitat Reconnaissance Suite (MAHRS) project led by the University of Michigan in collaboration with NASA Glenn Research Center. The MAHRS project has been maturing a set of instruments for detecting potentially habitable zones in shallow planetary subsurfaces, and for studying the exchange of matter between planetary atmospheres and shallow subsurfaces. The detection of brines in the shallow subsurface is very important because it can facilitate the search for microbial life and future manned missions to Mars.