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Detection of Subsurface Hydrogenous Material in Airless Planetary Bodies Using a Neutron Scintillation Cell Array ROBERT HAUN, University of Maryland, CHARLES CLARK, Joint Quantum Institute, National Institute of Standards and Technology and University of Maryland, MICHAEL COPLAN, University of Maryland, JOSHUA GRAYBILL, National Institute of Standards and Technology, TIMOTHY LIVENGOOD, LARRY LUTZ, University of Maryland, ANN PARSONS, NASA, Goddard Space Flight Center, LESTER PUTNAM, CHANDRA SHAHI, J.J. SU, University of Maryland — Neutrons generated by planetary bodies without an atmosphere are utilized as a measurement tool for locating subsurface hydrogenous material, namely water[1]. These neutrons are generated by subsurface spallation due to high energy cosmic rays incident on the airless planetary body. As neutrons diffuse out of the planetary body and undergo scattering events, the energy spectrum as seen by a surface or orbital observer will vary depending upon subsurface chemical composition. Hydrogenated materials are effective at moderating (or thermalizing) neutrons, which causes a large change of the thermal and epithermal neutron energy spectrum. This presents a clear signature of the presence of subsurface hydrogenous material. Our detector system consists of an array of scintillation cells utilizing thin film ^{10}B, xenon gas, silicon photomultipliers (SiPMs) and a suite of attachments for determining neutron energy and direction. The simplicity of our components allows for flexible packaging with optimization for specific applications. This simple, low voltage, low pressure system has advantages for both lander and orbiter neutron detection. Detector architecture, current developments and applications will be described. This

[1]Lawrence, D., J. Geophys. Res. Planets, 122, 21(2016)

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