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MINIATURE SEMICONDUCTOR WATER MAPPING NEUTRON SPECTROMETER HARDPIX

Abstract

A current renaissance of lunar exploration enables to search for lunar water deposits directly on the surface of the Moon with small robotic rovers. Institute of Experimental and Applied Physics, Czech Technical University in Prague (IEAP CTU) developed a miniature Timepix3-based detector Neutron HardPix capable of mapping the water deposits using non-invasive detection of neutrons created underground by cosmic rays and thermalized by hydrogen. This device consists of a neutron spectrometer to measure the flux of neutrons moderated by water and a cosmic radiation detector to monitor this natural source of neutrons. Neutron HardPix is based on the miniature (¡0.1 U, 150 g) radiation monitor HardPix launched into space in 2023 and planned to be part of ERSA radiation monitoring suite onboard the Lunar Gateway. A neutron conversion layer tested already at ATLAS CERN will give the Neutron HardPix ability to monitor the flux of thermalized neutrons and flux variations attributed to the hydrogen abundance in lunar subsurface.