



iWoRiD 2022

23rd International Workshop on Radiation Imaging Detectors

26 – 30 June 2022

Riva del Garda, Italy

Contribution ID: 205

Type: Poster

Water mapping neutron spectrometer HardPix for EL3 Polar Explorer

Monday 27 June 2022 16:27 (1 minute)

A current renaissance of lunar exploration enables to search for lunar water deposits directly on the surface of the Moon with robotic rovers like those onboard the planned EL3 Polar Explorer. IEAP CTU is participating on ESA study to trade-off possible mobile instruments and develop preliminary payload design for neutron spectrometer serving as the water ice detector. We developed a miniature Timepix3-based detector 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 HardPix neutron spectrometer to measure flux of neutrons moderated by water, a HardPix cosmic radiation detector to monitor the natural source of neutrons and an optional miniature gamma-ray spectrometer to provide a basic elemental composition of the lunar subsurface. Two HardPix units will also be part of ERSa for Lunar Gateway to monitor the radiation environment in deep space.

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Session Classification: Poster