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Radiation Measurements with the Timepix based HERA Instrument on Artemis I and Biosentinel

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The Artemis I mission of November 22 marks the start of the NASA Artemis program to resume lunar exploration. It launched the Orion spacecraft into cis-lunar space on November 16th 2022 for 25 days before returning to Earth December 11th. During this mission the radiation levels and particle fluxes inside the crew cabin of the (unmanned) Orion spacecraft were measure by the NASA “HERA” instrument, which uses three Timepix hybrid pixel detectors in distinct for crew monitoring and protection. In addition, a fourth Timepix based instrument, the “LETS” on the Biosentinel cubesat was also launched on Artemis I and is now in heliocentric orbit. This instrument has been continuously (at the time of writing) monitoring the deep space environment since November 2022 and is slated to run until at least December 2023.

During this flight a number of distinct and interesting radiation environment have been measured by the Timepix based instruments, including the inner (proton rich) and outer (electron rich) Van Allen belts, the quiescent free space galactic cosmic rays and in the case of Biosentinel several small energetic solar particle events.

This contribution will briefly outline the motivations for space radiation measurement, the Artemis I mission, the design of the instruments and showcase a selection of interesting results from HERA and Biosentinel. Finally it will discuss planned measurements on the future Artemis missions and the lunar surface.

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