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Development of a Cryogenic Irradiation Test Facility and the Initial Results from a CCD236 Swept Charge Device

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This paper describes the development of a cryogenic irradiation test facility and the initial test of the system to irradiate an e2v technologies CCD236 at -35.4 C with a 10 MeV equivalent proton fluence of 5.0×10^8 protons.cm⁻². The test facility has been developed for the ESA funded study into the radiation damage effects on a p-channel CCD204, and allows for the manipulation of shields and an X-ray fluorescence target to allow the post irradiation characterisation to be performed at the irradiation facility. The CCD236 is a large area (4.4 cm²) X-ray detector which is readout continually in order to benefit from intrinsic dither mode clocking, suppressing the surface component of dark current. This allows the detector to be operated at warmer temperatures than a conventional CCD, making it an excellent choice to test the facility without the need for extensive time cooling and heating the device under test. The CCD236 will be flown on-board the Chandrayaan-2 and HXMT spacecraft, and the fluence selected is equivalent to 1 year in orbit around the Moon. The analysis on the dark current and energy resolution at Mn-Ka are discussed for data collected pre and post irradiation, and after the device was held at room temperature for a period of 1, 7, 12 and 17 days after the irradiation.

KEYWORDS: Radiation Damage; Cryogenic Irradiation; X-ray detector; SCD

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