Contribution ID: **163** Type: **poster**

Modelling CTI effects in irradiated Gaia CCDs

Wednesday, September 15, 2021 10:25 AM (1 minute)

The European Space Agency's Gaia spacecraft was launched in 2013 and has been in operation ever since. It has a focal plane of 106 Charge-Coupled Devices (CCDs) which are of the CCD91-72 variant, custom-designed by Teledyne e2v. The detectors have been making measurements of parallaxes, positions, velocities, and other physical properties of over one billion stars and other astronomical objects in the Milky Way. Whilst operating in space, CCDs undergo non-ionizing displacement damage from incoming radiation. This causes radiation induced defects to form in the silicon lattice which can trap electrons during readout and increase the charge transfer inefficiency (CTI) of the devices. From analysis of in-flight calibration data, Gaia's CTI values have been measured to be much lower than what was expected based on the on-ground pre-flight tests.

In this study, the CTI and trap landscape in both in-flight and irradiated on-ground devices are modelled to fit the new datasets. These results provide more insights into the nature of radiation damage and the resulting trap landscapes, both in space and from on-ground irradiations.

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Session Classification: Posters Session 1 (Applications in Astro-particle Physics; Applications in Astronomy, Planetary and Space Science; Applications in Life Sciences and Biology)

Track Classification: Applications in Astronomy, Planetary and Space Science