Contribution ID: **14** Type: **Talk**

Initial trap pumping results from the Euclid CCD273 radiation campaign

Tuesday 5 September 2017 17:05 (20 minutes)

The Visible imager instrument (VIS) on board the Euclid mission will deliver high resolution shape measurements of galaxies down to very faint limits (R˜25 at 10σ) in a large part of the sky, in order to infer the distribution of Dark Matter in the Universe. To mitigate radiation damage effects that will accumulate in the detectors over the mission lifetime, the properties of the radiation induced traps needs to be known with as high precision as possible. For this purpose the trap pumping method will be employed as part of the in-orbit calibration routines.
Using trap pumping it is possible to identify and characterise single traps in a charge-coupled device (CCD), thus providing information such as the density, emission time constants and sub-pixel positions etc. of the traps in the detectors.

This paper presents the trap pumping algorithms used for the radiation testing campaign of the CCD273 detectors, performed by the Centre for Electronic Imaging at the Open University, that will be used for the VIS instrument. The CCD273 is a 4-phase device with uneven phases, which complicates the trap pumping analysis. However, we find that by optimising the trap pumping algorithms and analysis routines it is possible to obtain sub-pixel and even sub-phase positional information about the traps. Further, by performing the trap pumping at various temperatures it is possible to infer energy levels and emission cross sections of the trap species in question.

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Session Classification: Detectors for ground and space-based astronomy, planetary and space science (II)