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On-Ground and In-Orbit Characterisation Plan for the PLATO CCD Normal Cameras

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PLAnetary Transits and Ocillations (PLATO) is the third European Space Agency (ESA) medium class mission in ESA's cosmic vision programme due for launch in 2025. PLATO will carry out high precision un-interrupted photometric monitoring (months to years) in the visible band of large samples of bright solar-type stars. The primary mission goal is to detect and characterise terrestrial exoplanets with emphasis on planets orbiting in the habitable zone, this will be achieved using light curves to detect planetary transients. PLATO uses a novel multi-telescope instrument concept consisting of 26 small wide field telescopes. The 26 telescopes are made up of a telescope optical unit, four Teledyne e2v CCD270s, a custom Charge Coupled Device (CCD) designed for use in PLATO, mounted on a focal plane array and a set of Front End Electronics (FEE). There are 2 fast cameras with high read-out cadence (2.5 s) for magnitude ˜4-8 stars, being produced by the German Aerospace Centre (DLR) and 24 normal (N) cameras with a cadence of 25 s to monitor stars with a magnitude greater than 8. The N-FEEs are being developed at the Mullard Space Science Laboratory (MSSL) and will be characterised along with the associated CCDs. The CCD and N-FEE will undergo rigorous on-ground characterisation and the performance of the CCDs will continue to be monitored in-orbit. This paper discusses the initial development of the experimental arrangement, test procedures, N-FEE and initial results from the CCD. The parameters explored will include gain, quantum efficiency, pixel response non-uniformity, dark current and Charge Transfer Efficiency (CTE). The current in-orbit characterisation plan is also discussed which will enable the performance of the CCDs and their associated N-FEE to be monitored during the mission, this will include measurements of CTE giving an indication of the impact of radiation damage in the CCDs.

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