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HIGH STABILITY AND POINTING PERFORMANCE AOCS FOR THE ECULID MISSION

Abstract

The science observations to be performed with the ESA Euclid missions require a level of pointing performance, and more in particular stability, which exceed significantly those implemented in previous missions. The Euclid AOCS introduces a very specific subsystem design especially oriented to the minimisation of the pointing stability disturbances, while maintaining a top level pointing accuracy, and still allowing maximisation flexibility and science observation time throughout the mission. Euclid is the Second Medium Class (M2) mission from the Cosmic Vision 20152025, which responds to the ESA's long-term planning for space science missions. The mission is dedicated to the investigation of the Dark Energy and Dark Matter, and will operate in a large amplitude Lissajous orbit around the Sun-Earth Lagrangian point L2. The AOCS includes specific sensors and actuators (e.g. Fine Guidance Sensor, Micro-Propulsion System with variable thrust [1N to 1mN]), each of them providing cutting edge technology performance. Additionally the AOCS includes careful handling and compensation of disturbances, either internal from the AOCS, or from moving elements in the SC (e.g. Instruments mechanisms), or the usual environmental disturbances. The avoidance of the Reaction Wheels micro-vibrations during observation is one major issue, while a dedicated wheel is also applied for the compensation of the instrument mechanical disturbance, all of that requiring a special characterisation and modelisation of the mechanical disturbance and the wheels responses. The AOCS design has been successfully validated at CDR, with demonstration of the achievement of the challenging requirements. In particular, a pointing stability(RPE) better than of 75 milli-arcsec (99.7SENER is the overall responsible and prime contractor of the EUCLID AOCS, with Airbus Defence and Space Netherlands as main partner, while 7 additional direct subcontractors contribute with different components of the subsystems, apart from the elements provided by the EUCLID system (Thales Alenia Space Italy), who acts as prime contractor and customer. The paper will present the overall design of the Euclid AOCS, architecture, HW and SW elements with special emphasis on the most critical aspects for the science mode, performance, and specific findings during the development, without forgetting the application of SW autocoding techniques.