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FINE LATERAL AND LONGITUDINAL SENSOR (FLLS) ON-BOARD ESA'S PROBA-3 MISSION

Abstract

PROBA-3 is a European Space Agency (ESA) mission to study the Sun's corona, and is the world's first precision formation flying mission. The mission will comprise a pair of satellites separated by 150 m, whose relative displacement must be monitored to within 300 m in order to produce an accurate coronagraph. This measurement is provided by FLLS – the Fine Lateral and Longitudinal Sensor – being built by Neptec UK and Neptec Design Group Canada.

FLLS uses a retro-reflected laser beam to monitor the position of the occulter-disc satellite with respect to the coronagraph satellite. Phase measurements of the reflected beam are used to determine the longitudinal displacement between the two satellites – up to 250 m – while the motion of the returning beam on a CMOS sensor measures the lateral displacement. This system is being designed in collaboration with Surrey Space Centre, and presents exciting challenges in performance testing and ground-based calibration over its full operating range.

The completed FLLS system will be suitable for any type of mission requiring accurate displacement measurements. This could be between a constellation of satellites observing the Earth, or within a science mission monitoring instrumentation positions. FLLS could allow large-scale structures to be deployed and maintained in space, monitoring structural distortion before, during, and after deployment, and providing in-flight corrections to data collection. Examples of such future applications include in-orbit observatories, positioning of telecommunication satellite antennas, and deployable mechanisms on lunar or Martian missions.

The paper and presentation will provide a comprehensive overview of FLLS including technical designs, calibration and test plans, and the envisaged scope for future applications.