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FIRST IN FLIGHT RESULTS FROM THE SUN INVESTIGATION MICRO-SATELLITE PICARD

Abstract

PICARD is a scientific micro satellite (140 kg) developed and operated by CNES, with international partnerships; it was launched on June 15, 2010 and has been successfully operating since then. Its mission is devoted to sun variability observation, through imagery and radiometric measurements, with the goal to provide data for scientific investigation first in the area of solar physics, and second in the assessment of the influence of the solar variability on the earth climate variability. The launch took place at the beginning of sun cycle 24 which will culminate in 2013. It forms the first sun metrology mission with a high level of performances required, regarding the dimensions and shape of the sun, the data necessary for helio seismology and the measurement of the solar irradiance value. The requirement is to measure variation of the sun diameter down to a few 10^{-3} of an arcsecond, that is 1 ppm: the same accuracy is expected from the solar irradiance measurement. A stabilization of the sun picture on the CCD detector is required to be better than 0,1 arc sec. The development had to make compatible this quest for performances with the limited budget associated with the technical and programmatic capacities of a micro satellite leading to compromises whose relevance could finally be checked in orbit. Innovative solutions were implemented at the level of the satellite (enhanced satellite pointing system) and at the level of the imaging telescope (use of material with a high level of stability such as zerodur, carbon/carbon, Invar, accurate thermal control, active image stabilization device, internal calibration system). The paper will describe the mission with emphasis put on its original features. The final system and conduction of operations will then be described. It will state the performances of both the spacecraft and the instruments as observed in orbit and present the first results obtained which, at the moment, demonstrate the adequacy of the selected design. Some experience feed back and how the minor discrepancies encountered in orbit were fixed will also be addressed in the presentation.