

Interactive Presentations (IP)
Topic 7 - Interactive Presentations (7)

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MINIATURISED IMAGING SYSTEM FOR SPACECRAFT MONITORING AND PROTECTION

Abstract

Technological and cost barriers have been gradually falling in the last decade, allowing new opportunities to emerge in most fields of the space industry. From new private actors attracted by telecom satellite mega-constellations benefits, to emerging economies interested in getting access to space, as well as historical actors strengthening their presence, the space exploration domain is being submitted to major evolutions. This turmoil is however promoting international collaboration - as well as competition in some case – characterized by ambitious scientific missions, high technological evolution and challenging schedules.

One of the key features needed to reach the goals drawn by these missions is the ability to efficiently monitor critical parts of future missions to secure their success. To answer these needs, 3D PLUS has developed a space grade, compact and modular CMOS microcamera, able to respond to a wide range of applications for future space missions. This off-the-shelf ITAR-free microcamera can be used for scientific needs such as planetology, cosmology, or Earth Observation, but is also an ideal tool for the monitoring needs of the platform: solar panels and antennas deployment, navigation tasks and close-surrounding monitoring, and payload operation.

This microcamera offers a 4 Megapixels sensor (2048x2048 pixels, RGB or Monochrome) allowing image capture up to 16 frames per second. A 12 Megapixels sensor camera currently in development. This microcamera has been integrated using 3D PLUS technology to provide a highly miniaturized instrument (35x35x80 mm and less than 150g with off-the-shelf optics), offering a compact reconfigurable FPGA-based architecture with embedded memory for storage and pre-processing purposes. The microcamera is radiation hardened by design, supporting a total ionizing dose of 40Krad(Si) and is immune to SEL and SEU. It also offers an innovative mechanical interface for easier integration that is also the main thermal interface, removing the need for Peltier elements. The microcamera is fully qualified (TRL9), and is embedded on multiple missions (Martian rover, lunar lander, deep-space spacecraft monitoring).

In order to facilitate the integration and operation of the camera, 3D PLUS offers the option of a standard space grade flight code performing sensor control, image data handling, preprocessing (binning, averaging, windowing), radiation mitigation, with a standard SpaceWire communication interface. Off-the-shelf wide angle optics are available (80 or 120 corner to corner). A complete lab environment has been developed, including an Evaluation Kit and PC software to communicate with the camera module during initial integration tests.