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Wide Angle and Stereo Cameras for JGO

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Abstract

In May 2009 we have submitted to ESA a Declaration of Interest for a camera package to be placed onboard the ESA-led Jupiter Ganymede Orbiter, the JGO-WASC (JGO Wide Angle and Stereo Cameras).
The camera package we are proposing includes the wide angle and the medium resolution cameras (WAC and MRC), that will be used for the scientific investigation and imaging exploration of the Jovian system and Ganymede in the visible spectral range (350-1050nm) and in stereo mode.
The study will be carried out by a consortium currently led by INAF-OAPD (Italy) and including INAF-IFSI (Italy), INAF-IASF (Italy), CISAS & DEI & dep.Geosciences & dep.Physics-University of Padova (Italy), University Parthenope Napoli (Italy), INAF-OAC Napoli (Italy), IAS-Orsay (France), Free University of Berlin (Germany), IAA-CSIC Granada (Spain), DLR Berlin (Germany), Technical University Berlin (Germany), University of Muenster (Germany), University of Colorado Boulder (USA), ISAS-JAXA Kanagawa (Japan), Galileo Avionica (Italy).

Overview of the instrument

The Medium Resolution Camera (MRC) is a medium resolution stereo camera with two channels: one looking at nadir direction and the other one looking at 20°, in order to fulfill the global topographic model reconstruction resolution requirements. The optical concept that is currently foreseen is based on the stereo camera (STC) of the SIMBIO-SYS instrument we are developing for the BepiColombo mission. The camera has a catadioptric novel optical design with the two channels sharing most of the optical elements and the detector unit. The system is without a central obscuration, that is well known for their loss of contrast in extended object images and for the stray light problems, it will allow to achieve the high contrast ratio needed. In order to avoid mechanism (moving parts) in the instrument, the concept of single 2kx2k detector with stripe-butted filters has been considered. Following the STC heritage, the camera will be based on a novel approach that is the 'push frame' able to acquire extended 2-D portions of the target surface in order to reduce the number of images to mosaic to get the global mapping and to enhance the stereo reconstruction having a larger number of tie points in the same stereo pair. This concept will be very useful for the JGO scientific objectives providing full frame images of Jupiter and the other satellites without the scanning system adopted by the push-broom stereo cameras.
The wide-angle camera (WAC) is a dioptric design with 5 mm focal length; the focal ratio will be kept as high as possible, compatible with scientific and mechanical constraints, and in order to have a considerable depth of field. The large field of view FoV 117° requested to the camera drives the optical designer towards the choice of a fish-eye layout. A filter wheel mechanism is currently foreseen to mount the 12 scientific filters needed. It will be based on similar device realized for OSIRIS in the Rosetta mission.
Both cameras will be based on the same detector adopted for SIMBIOSYS for the BepiColombo mission, that is, a Si-PIN hybrid based on CMOS technology 2kx2k with a pixel size of 10 µm.

This work will show the preliminary concept of the camera package taking into account that the study started in July 2009 is ongoing and it shall end by June 2010.