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The Stereo Camera on the BepiColombo mission, a novel approach

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The Stereo Camera for the BepiColombo mission to Mercury, integrated in the SIMBIO-SYS suite, has been designed to provide the three dimensional global mapping of the surface.

The harsh environment of Mercury will strongly affect the functionalities and performance of the instruments reducing the resources allocated to the payload. Even for the stereo camera, as other instruments on board BepiColombo, a novel design had to be considered.

In order to satisfy the tight requirements on the resources we have implemented an original optical design, modifying a classical configuration, and a new technique of acquiring the stereo pairs for generating the Digital Terrain Model (DTM) of the surface. The new technique will have an impact on the software chain generating the DTM and on the observation strategy.

The stereo camera consists of two channels, looking at the surface at $\pm 20^\circ$ from the nadir direction, converging on the same bidimensional focal plane assembly, with no mechanical movable parts. The configuration of the focal plane assembly, with the filters deposited on the window on top the detector, allows to apply the push-frame technique to acquire the stereo images.

We will describe the design and performance obtained in laboratory during the calibration campaign. In particular, an innovative laboratory optical setup has been designed, tested on a breadboard model and applied to the flight model to collect stereo images of rock samples at laboratory scale. The first DTM generated by image matching from such stereo pairs reveal a vertical accuracy of 90 μm at laboratory scale. This value corresponds to a vertical accuracy of 38 m when STC will be around Mercury at the perihelion, with a ground resolution of 50 m per pixel.