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Author: Dr. Leonardo Tommasi
Leonardo Spa, Italy

Mr. Iacopo Ficai Veltroni
Leonardo Spa, Italy
Mr. Marco Baroni
Leonardo Spa, Italy
Mr. Franco Boldrini
Leonardo Spa, Italy
Mr. Donato Borrelli
Leonardo Spa, Italy
Mr. Michele Dami
Leonardo Spa, Italy
Dr. Emiliano Di Carmine
Leonardo Spa, Italy
Mr. Riccardo Paolinetti
Leonardo Spa, Italy
Dr. Cremonese Gabriele
Italy
Dr. Capaccioni Fabrizio
Italy
Prof.Dr. Pasquale Palumbo
University of Napoli – Parthenope, Italy
Dr. Yves Langevin
Institut d'Astrophysique Spatiale, France
Dr. Alain Doressoundiram
Observatoire de Paris, France
Prof. Stefano Debei
CISAS – "G. Colombo" Center of Studies and Activities for Space, University of Padova, Italy
Dr. Francesca Altieri
INAF-IAPS, Italy
Dr. Vania Da Deppo
INAF-IAPS, Italy
Dr. Vincenzo Della Corte
INAF-IAPS, Italy
Dr. Gianrico Filacchione
INAF-IAPS, Italy
Dr. Cristina Re
Italy
Dr. Emanuele Simioni
Italy
Dr. Michele Zusi

National Institute for Astrophysics (INAF), Italy
Prof. Enrico Flamini
Italian Space Agency (ASI), Italy
Mr. Francesco Longo
Agenzia Spaziale Italiana (ASI), Italy
Mr. Roberto Formaro
ASI - Italian Space Agency, Italy
Prof. Luigi Colangeli
ESA - European Space Agency, The Netherlands

# SIMBIO-SYS FOR BEPI COLOMBO: KEY ENABLING TECHNOLOGIES FOR MERCURY EXPLORATION

**Abstract**

The SIMBIO-SYS instrument (Spectrometers and Imagers for MPO Bepi Colombo Integrated Observatory System), devoted to Mercury surface exploration on board the Bepi Colombo mission, has been developed by Leonardo (formerly Selex ES) under ASI funding and coordination and in collaboration with several Italian and French research Institutes and Universities. It has been delivered to ESA and integrated on the MPO satellite in April 2015. The Launch of Bepi Colombo is planned in 2018. SIMBIO-SYS is a suite of three optical channels for Mercury remote sensing which includes a High Resolution Imaging Channel (HRIC), a Stereo imaging Channel (STC) and a Visual and Infrared Hyperspectral Imager (VIHI). The three channels are integrated on a single optical bench: this solution optimizes the overall mass and allow the best co-alignment between the channels. To fulfill the scientific goals of the mission, in compliance with the limited resources available on MPO and the harsh operative environment, several innovative solutions and technologies have been implemented:

- a very compact design for HRIC,
- a wide spectral coverage with a single channel instrument for VIHI,
- a single detector dual channel design for STC,
- a special coating (ITO) and baffle (Stavroudis design) for heat load rejection,
- diamond turned mirrors in RSA905 aluminum alloy,
- spectral and radiometric in-flight calibration unit with no moving parts,
- a large use of composite materials for the structural parts capabilities for stereo imaging.

In addition, an instrument architecture with three dedicated Proximity Electronics and a common Main Electronics was designed, aimed at the best use of available electrical resources thanks to sharing of functions among the three channels. The SIMBIO-SYS Flight model (FM) has been successfully tested and characterized at Leonardo Spa premises in Campi Bisenzio (FI) by means of two dedicated Optical Ground Support Equipment (OGSE) which have been developed and manufactured for this purpose. The data obtained during the optical calibration campaign show a good agreement between the required performance and the experimental results and are presented in this paper.