

## SERENA particle package: the link between the environment and Mercury ready to launch on board BepiColombo

Stefano Orsini (1), Anna Milillo (1) Stefano Livi (2), Herbert Lichtenegger (3), Stas Barabash (4), Elisabetta De Angelis (1), Esa Kallio (5), Peter Wurz (6), Angelo Olivieri (7), Christina Plainaki (7), Alessandro Aronica (1), Francesco Lazzarotto (1), Rosanna Rispoli (1) and the SERENA Team

(1) INAF/IAPS, Rome, Italy; (2) SouthWest Research Institute (SwRI), USA; (3) Institut für Weltraumforschung (IWF), Austria; (4) Swedish Institute of Space Physics (IRF), Sweden; (5) Bern University (UniBe), Switzerland; (6) Finnish Meteorological Institute (FMI), Finland; (7) Italian Space Agency (ASI), Italy (stefano.orsini@iaps.inaf.it).

### Abstract

At October 2018 the ESA-JAXA BepiColombo mission to Mercury will be launched from Kourou site. The particle sensor package, Search for Exospheric Refilling and Emitted Natural Abundances (SERENA) on MPO is a key experiment for the investigation of the Mercury environment. SERENA is composed by four units devoted to the detection of neutral and ionised particles in the Hermean environment; the interaction between energetic plasma particles, solar radiation and micrometeorites with the Hermean surface gives rise to both thermal and energetic neutral particle populations in the near-planet space; such populations will be recorded by the SERENA Neutral Particle Analysers (NPA): a mass spectrometer and a Energetic Neutral Atom (ENA) imager (STROFIO and ELENA). The photo-ionised or charged component of the surface release processes as well as the precipitating and circulating plasma in the Hermean magnetosphere will be recorded by the SERENA ion spectrometers (IS): two ion sensors (PICAM and MIPA).

The experiment and the scientific objectives will be presented together with the performances of each unit: ELENA, STROFIO, PICAM and MIPA, also in the context of joint investigation with other BepiColombo instruments.

### 1. Introduction

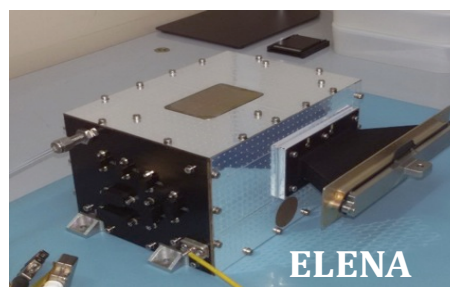
The proximity of Mercury to the Sun makes its environment particularly extreme. Mercury's weak intrinsic global magnetic field supports a small, but dynamic, magnetosphere. The plasma in Mercury's

space environment coexists with the planet's exosphere and strongly interacts with the surface. In fact, Mercury's environment is a complex and tightly-coupled system where the magnetosphere, exosphere, and surface experience temporal and spatial variations linked to each other [1].

For this reason, having the possibility of simultaneous information on the external conditions and the close-to-planet environment would greatly help in the definition of the active processes. SERENA [2], observing the environment from the MPO spacecraft is a key experiment being the link between the measurements in the solar wind or in the tail from the MMO and the surface observations from the MPO.

### 2. SERENA package

SERENA four sensors are: ELENA (Emitted Low Energy Neutral Atoms), STROFIO (Exosphere Mass Spectrometer), PICAM (Planetary Ion CAMera), MIPA (Miniature Ion Precipitation Analyzer) (Figure 1).



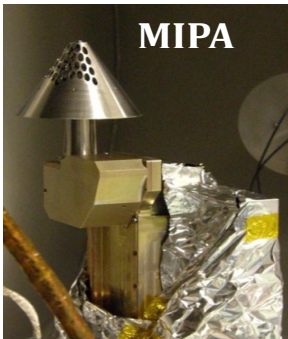
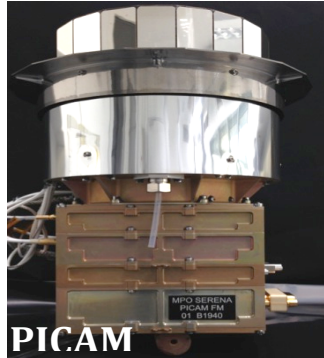
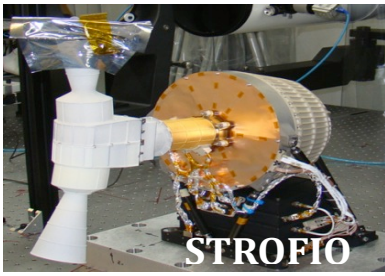


Figure 1: SERENA four sensors: ELENA, STROFIO, PICAM and MIPA.

## Acknowledgements

SERENA is primarily supported by the Italian Space Agency (SERENA ASI-INAF agreement), with contributions of other international partners for the provision of STROFIO, PICAM, and MIPA.

## References

[1] Milillo et al., BepiColombo Special Issue on Planetary and Space Science, doi:10.1016/j.pss.2008.06.005, Vol 58, pp 40–60, 2010.

[2] Orsini et al., BepiColombo Special Issue on Planetary and Space Science, doi:10.1016/j.pss.2008.06.005, Vol 58, pp 385-395, 2010 ,