

Onboard data processing and compression for a four-sensor suite: the SERENA experiment.

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Abstract

SERENA (Search for Exospheric Refilling and Emitted Natural Abundances) is an instrument package that will fly on board the BepiColombo/Mercury Planetary Orbiter (MPO). SERENA instrument includes four units: ELENA (Emitted Low Energy Neutral Atoms), a neutral particle analyzer/imager to detect ion sputtering and backscattering from Mercury's surface; STROFIO (Start from a Rotating Field mass spectrometer), a mass spectrometer to identify atomic masses released from the surface; MIPA (Miniature Ion Precipitation Analyzer) and PICAM (Planetary Ion Camera), two ion spectrometers to monitor the precipitating solar wind and measure the plasma environment around Mercury. The System Control Unit architecture is such that all four sensors are connected to a high resolution FPGA, which dialogs with a dedicated high-performance data processing unit. The unpredictability of the data rate, due to the peculiarities of these investigations, leads to several possible scenarios for the data compression and handling. In this study we first discuss about the predicted data volume that comes from the optimized operation strategy, and then we report on the instrument data processing and compression.