Geophysical Research Abstracts
Vol. 19, EGU2017-6397, 2017
EGU General Assembly 2017

A generic testbed for the design of plasma spectrometer control software with application to the THOR-CSW solar wind instrument

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Modern plasma spectrometers require intelligent software that is able to exploit their capabilities to the fullest. While the low-level control of the instrument and basic tasks such as performing the basic measurement, temperature control, and production of housekeeping data are to be done by software that is executed on an FPGA and/or processor inside the instrument, higher level tasks such as control of measurement sequences, on-board moment calculation, beam tracking decisions, and data compression, may be performed by the instrument or in the payload data processing unit. Such design decisions, as well as an assessment of the workload on the different processing components, require early prototyping. We have developed a generic simulation testbed for the design of plasma spectrometer control software that allows an early evaluation of the level of resources that is needed at each level. Early prototyping can pinpoint bottlenecks in the design allowing timely remediation. We have applied this tool to the THOR Cold Solar Wind (CSW) plasma spectrometer. Some examples illustrating the usefulness of the tool are given.