Geophysical Research Abstracts,
Vol. 10, EGU2008-A-12371, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-12371
EGU General Assembly 2008

Compact sensor-controller for space applications

W. Schmidt(1), A.Mälkki(1)

(1) Finnish Meteorological Institute, Helsinki, (2) Academy of Finland, Helsinki

Satellite-based instrumentation requires a system design which takes the harsh environment and high reliability requirements into account. At the same time all used resources like volume, mass and energy consumption have to be minimized. Off-the-shelf components fulfilling all these re-quirements are normally not available, which makes it necessary to develop often expensive hard-ware and system solutions. For the ESA SMART-1 mission we provided a plasma instrument which was designed to monitor the electron- and ion-density around the spacecraft in very different space environments: inside the Earth radiation belt, inside the Magnetosphere and around the Moon either with the electric propulsion system active or passive. Besides needing a large dy-namic range and high resolution the instrument had to work under extreme radiation conditions and at times with only little power available.

In the developed instrument most analog functions were replaced by digital implementations, inte-grated together with processor and real-time related hardware components into one Field Pro-grammable Gate Array (FPGA) suitable for space applications. From the beginning of the devel-opment all digital aspects of the instrument including the flight and ground software were included into a simulation environment used for optimization of hardware, software and operations scenar-ios. The same simulator was later used for instrument commanding, operations planning and data analysis. All software tools were based on platform independent Open Source programs and are used again for other instrument development projects

In this presentation the key elements of the approach in the space segment, the ground control sys-tem and for the verification tasks are presented. The system design approach and compact hard-ware design allow the development of space-qualified instruments also for research institutes with very limited funding possibilities.