

The HEPD-02 Data Processing and Control Unit for the CSES-02 mission

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The China Seismo-Electromagnetic Satellite (CSES) is a multi-instrumental space mission devoted to the study of the ionosphere, with the main aim to investigate possible correlations between fluctuations of the ionosphere environment and the occurrence of an earthquake. The first satellite (CSES-01) was launched on 2018, while a second one (CSES-02) is currently under development and the launch is expected by 2022. As CSES-01, the second satellite includes a particle detector (HEPD-02, High-energy Particle Detector) to measure the increase of the electron and proton fluxes due to short-time perturbations of the radiation belts induced by solar, terrestrial, or anthropic phenomena [1]. The explored energy range is 3-100 MeV for electrons and 30-200 MeV for protons.

The HEPD-02 Electronic Subsystem (ELS) contains all the electronics that perform the control of the apparatus and the processing of the signals provided by the sensitive detectors. It consists of the following boards: Trigger, Tracker Data Acquisition (T-DAQ), and Data Processing and Control Unit (DPCU). The DPCU will carry out the functions of management and control of the HEPD-02 operations and the communication with the satellite computer. The DPCU board will implement HOT / COLD redundancy and rely on a Zynq XC7Z7045 Xilinx System on Chip (SoC). The boot and all the functional checks of the SoC will be carried out by a MI-CROSEMI ProASIC3E FPGA.

We present the main DPCU characteristics and functionalities, highlighting the electronic architectural choices to guarantee reliability and radiation tolerance during the entire mission life span.

REFERENCES

[1] The High Energy Particle Detector for the 2nd Chinese Seismo Electromagnetic Satellite, Masciantonio G., 2019 IEEE NSS/MIC, DOI:10.1109/NSS/MIC42101.2019.9060030

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CSES-Limadou

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