

LIMADOU-CSES

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CSES (China Seismo-Electromagnetic Satellite) is a scientific space mission dedicated to monitoring electromagnetic field and waves, plasma and particle perturbations of the atmosphere, ionosphere and magnetosphere induced by natural sources and anthropogenic emitters and to study their correlations with the occurrence of seismic events. More in general, the CSES mission investigates the structure and the dynamics of the topside ionosphere, the coupling mechanisms with the lower and higher plasma layers and the temporal variations of the geomagnetic field, in quiet and disturbed conditions. Data collected by the mission will also allow studying solar-terrestrial interactions and phenomena of solar physics, namely Coronal Mass Ejections (CMEs), solar flares and cosmic ray solar modulation. The satellite mission is part of a collaboration program between the China National Space Administration (CNSA) and the Italian Space Agency (ASI), and developed by China Earthquake Administration (CEA) and INFN, together with several Chinese and Italian Universities and research Institutes. All the information related to the first mission CSES-01, launched in February 2018 and currently in operation, has been provided in the previous LNF Reports (2018 and 2019). The LNF group participates in the data analysis of this first mission and in the organization and coordination of the publications and of the conference events through the LIMADOU Speaker and Publication Office.

In March 2019, the official agreement on the second mission, CSES-02, was signed between the Italian and Chinese Space Agencies, starting the activities for the preparation of the second satellite, whose launch is scheduled in December 2022. Italy has the responsibility of two detectors HEPD-02 (High Energy Particle Detector) and EFD-02 (Electric Field Detector), and the LNF group has taken the task to develop the whole Low Voltage Power System (LVPS) of the HEPD-02, namely the design, test, prototyping and production of the final flight system.

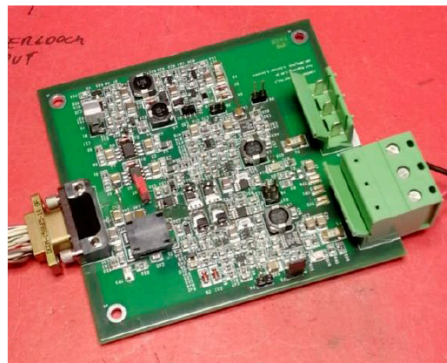


Figure 1: *Prototype of the LVPS board.*

During 2020, notwithstanding the Covid-19 pandemic, this work has been carried out almost continuously, fulfilling the tasks defined in the general schedule of the project. In particular, within

the LNF Service of Electronics and Design, the main parts of the LVPS prototype (Fig.1) have been designed and tested. The final flight model of the system is foreseen to be completed by mid-2021 for the integration with the other power and control systems of the HEPD-02.

In the following Reference are listed the papers published in 2020, related to the HEPD-01 detector and to first results achieved during the CSES-01 satellite mission.

References

1. G. Ambrosi *et al.*, "Beam test calibrations of the HEPD on board the China Seismo-Electromagnetic Satellite"; Nuclear Instruments and Methods in Physics Research **A974**, 164170 (2020).
2. S. Bartocci *et al.*, "Galactic Cosmic-Ray Hydrogen Spectra in the 40-250 MeV Range Measured by the High-Energy Particle Detector (HEPD) on board the CSES-01 Satellite between 2018 and 2020"; The Astrophysical Journal **901**, 8 (2020)
3. A. Sotgiu *et al.*, "Control and data acquisition software of the High-Energy Particle Detector on board the China Seismo-Electromagnetic Satellite space mission"; Journal of Software: Practice and experience (Wiley Online Library, 2020) <https://doi.org/10.1002/spe.2947>.