A new compact and low cost Langmuir Probe and associated onboard data handling system for CubeSat

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A new compact and low cost Langmuir Probe and associated onboard data handling system are being developed at Instituto Nacional de Pesquisas Espaciais for launching on board one of the future 2U CubeSat missions. The system is a simplified and compacted version of the Langmuir Probe payloads launched on board several Brazilian SONDA III rockets and also developed for the Brazilian scientific satellites SACI-1 and SACI-2. The onboard data handling system will have the dual functions of preprocessing the data collected by the Langmuir Probe and acting as the interface between the experiment and the on board computer. The Langmuir Probe sensor in the form of two rectangular stainless steel strips of total surface area of approximately 80cm2 will be deployed soon after the injection of the CubeSat into orbit. A sweep voltage varying linearly from 0V to 3.0V in about 1.5 seconds and then remaining fixed at 3.0V for 1 second will be applied to the LP sensor to obtain both the electron density and electron temperature. A high sensitivity preamplifier will be used to convert the sensor current expected to be in the range of a few nano amperes to a few micro amperes into a varying potential. In order to cover the large dynamic range of the expected sensor current the preamplifier output will be further amplified by a logarithmic amplifier before being sampled and sent to the data handling system. The data handling system is projected to handle 8 analog channels and 4 digital words of 8 bits each. The incoming data will be stored in a RAM and later sent to the on board computer using a serial RS422 communication protocol. The interface unit will process the telecommands received from the on board computer. The interface is also projected to do FFT analysis of the LP sensor data and send the averaged FFT spectral amplitudes in place of the original unprocessed data. The system details are presented here.

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