

Abstract (paper not available)

multi-Needle Langmuir Probe System for Electron Density Measurements and Active Spacecraft Potential Control on CubeSats

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We present the CubeSat version of a scientific instrument called the multi-Needle Langmuir Probe (m-NLP). The m-NLP instrument measures the electron density with kHz sampling rate, yielding meter scale resolution on low earth orbit satellites. The sounding rocket version of m-NLP has flight heritage from seven sounding rockets. However, to get an in-orbit demonstration of the system a CubeSat implementation has now been developed. This version will fly on 11 satellites in the QB50 satellite program and the University of Oslo's 2-Unit CubeSat, CubeSTAR. The m-NLP measurement principle is based on several fixed bias probes of which each have to be biased above the spacecraft potential. To ensure that this requirement is fulfilled, the CubeSat version of the m-NLP features a new miniaturized thermionic electron emitter which actively controls the potential of the satellite. The emitter has been designed to accommodate the challenges associated with the CubeSat platform, such as the limited amount of available power and size. Together with the in-flight determination of the spacecraft floating potential it will autonomously control the potential of the spacecraft by emitting electrons. Preliminary test results from the plasma chamber at the European Space and Technology Center in Holland verifies that the miniaturized electron emitter is able to actively control the floating potential of the spacecraft and hence improve the accuracy of the electron density measurements.
