

## **Sweeping Impedance Probe New Techniques for Ionospheric Plasma Diagnostics**

Julio Martin-Hidalgo\*, Charles M. Swenson, and Daniel Farr  
Utah State University, Logan, UT, 84322

The impedance of a probe immersed in ionospheric plasma at radio frequencies is an important technique for determining absolute electron density. Building on 50 years of history in developing and flying RF probes for plasma diagnostics at Utah State, a new SIP (Sweeping Impedance Probe) design has been completed which will obtain qualitative improvement over previous instruments in terms of accuracy and sweep rate. The new technique is based on sequential measurements to improve the error correction, and requiring simple components by using DC as intermediate frequency. This instrument will provide a continuous measurement of the plasma impedance magnitude and phase with an expected accuracy of 1% and 1 degree respectively over the 1 to 20 MHz range.

This new SIP will be launched in January 2014 onboard the Auroral Spatial Structures Probe (ASSP) NASA sounding rocket mission using a short monopole probe. The rocket apogee of 600 km will allow the characterization of the plasma in the E and F layers at auroral latitudes and the study of short term and spatial variations along the high-altitude profile of the sounding rocket.

Although this SIP design has been developed for a sounding rocket, its conceptually simple design allows optimizations in terms of power and mass. In this way it will be suitable for Cubesat missions and it can be included along other ionospheric diagnostic instruments such as double and Langmuir probes.

This presentation is focused on the overall design of the instrument, the tests results for the ASSP instrument and conceptual designs for future CubeSat mission similar to the NSF DICE mission.