

## **Overview**

We have received funding to perform an NSF investigation into the high-latitude ionosphere. Before deployment in Antarctica, it is necessary to build and test the new instrument.

## **Goal**

Design, build and test a HF radar suitable for sounding the bottomside ionosphere. This work is intended to take place prior to deployment in Antarctica (McMurdo and South Pole station). The observational objective of this experiment is to test the ionosonde's robustness, confirming the instrument's capabilities in detecting ionospheric densities. The goal of this experiment is to obtain specific characteristics of interest, such as the electron density and velocity of ionospheric features.

## **Instrument test requirements**

Based on historical data, the measurement requirements are to transmit and receive HF signals in the 3-30 MHz range and to determine received intensity, time-of-flight, Faraday rotation and Doppler shift through post-processing. One or more crossed dipole receive antennae will be operated, powered by a software-defined radio receiver capable of decoding transmissions from a broadband log-periodic antenna (or similar suitable design). The instrument's readiness test shall be performed at the JHU/APL campus in Laurel, MD.

Day and night transmissions will be made to test the instrument's operation in both low- and high-density ionospheric conditions. The resulting data will be processed to determine the electron density in the E- and bottomside F-region. The Doppler shift will be interpreted as a change of phase path or, if coherent scatter is detected, it will be treated directly as a velocity signature. The instrument will be operated for a minimum of seven days to gather sufficient data for the analysis.