Calibration of the Ultra-Wideband Software Defined Microwave Radiometer (UWBRAD) for Ice Sheet Thermometry

Mark J. Andrews*, Joel T. Johnson, Hongkun Li, Mustafa Aksoy
The Ohio State University, Columbus, OH, USA

The Ultra-wideband Software Defined Microwave Radiometer (UWBRAD) is currently being developed under the support of the NASA Instrument Incubator Program to provide measurements of ice sheet thermal emission over the frequency range 0.5-2 GHz. These measurements are being explored for their use in remotely sensing the internal temperature properties of the Greenland and Antarctic ice sheets.

UWBRAD is a "pseudo-correlation" radiometer design that includes a common 0.5-2 GHz front end used to create twelve 100 MHz channels with center frequencies ranging from 540 MHz to 1980 MHz. Each channel is fully digitized and processed in real time for identification and mitigation of radio frequency interference. The "pseudo-correlation" design of the RF front end was selected instead of a traditional Dicke switched design in order to eliminate the need for wideband isolator components. However, calibration of a "pseudo-correlation" design requires consideration of the multiple paths internal to the radiometer through which signals travel. The UWBRAD team is exploring multiple possible calibration methods for the system and their relative advantages and challenges.

The complete 12 channel UWBRAD system is currently being constructed. A 4 channel test system (center frequencies 540, 900, 1380, and 1740 MHz) was completed in August 2015, and is to be deployed Nov-Dec 2015 on a tower at Concordia Base, Antarctica as part of IFAC-CNR's DOMEX program. Results from calibration experiments with the four channel system will be described in the presentation. This presentation will also present analyses of calibration processes for pseudo-correlation radiometers, and the implications of these results for future UWBRAD measurements.