Simultaneous Electron Temperature Measurements at EISCAT Through ISR and SEE

***S.J. Briczinski*[1], *P.A. Bernhardt*[1], *M. Kosch*[2], *A. Senior*[2], *and M. Reitveld*[3]**

[1]Naval Research Laboratory, Plasma Physics Division, Washington, DC 20375, USA

[2]Department of Physics, University of Lancaster, UK

[3]EISCAT Scientific Association, Tromso, Norway

High power HF radio waves exciting the ionosphere provide aeronomers with a unique space-based laboratory capability. Stimulated Electromagnetic Emission (SEE) is of interest to the ionospheric community for its diagnostic purposes. Typical SEE experiments have focused on characterizing the parametric decay of the electromagnetic pump wave into several different wave modes such as upper and lower hybrid, ion acoustic, ion-Bernstein and electron-Bernstein. These production modes have been extensively studied at heating facilities.

A new study for comparing electron temperature measurements was conducted in July 2012 at the EISCAT heating facility in Tromso, Norway. Previous studies of SEE at the High-Frequency Active Auroral Research Program (HAARP) in Gakona, Alaska have produced electron temperature estimates through Stimulated Brillouin Scattering (SBS) [1]. The SBS scatter could not be compared to other temperature estimates as HAARP lacks the facilities capable of performing such diagnostics. The new campaign provides the first simultaneous measurement of electron temperatures from both SEE and incoherent scatter radar measurements using the 930 MHz radar in Tromso. The results of both techniques are presented and discussed comparing and validating the theory developed for SEE at HAARP. The dual SEE and UHF measurements are also used to probe the method of generating low frequency electrostatic modes from a high power electromagnetic pump.

1. Bernhardt, P.A., C.A. Selcher, R.H. Lehmberg, S.P. Rodriguez, J.F. Thomason, M.J. McCarrick, and G.J. Frazer, *Determination of the electron temperature in the modified ionosphere over HAARP using the HF pumped Stimulated Brillouin Scatter (SBS) emission lines.* Annales Geophysicae, 2009. 27: p. 4409-4427.