

Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Investigation of the Scattering of Electromagnetic Signals from Low Frequency Turbulence¹ ERIK TEJERO, Naval Research Lab, LON ENLOE, US Air Force Academy, VLADIMIR SOTNIKOV, Air Force Research Lab, CHRIS CRABTREE, Naval Research Lab, ERIC GILLMAN, NRC-NRL Postdoctoral Fellow, BILL AMATUCCI, GURU GANGULI, Naval Research Lab — The linear Electron-Ion Hybrid (EIH) instability was previously predicted to explain the observation of waves in applications from the plasma sheet boundary layer to laser produced plasmas. PIC simulations have shown that a key feature of the nonlinear evolution of the EIH mode is that it leads to the formation of coherent, closed potential contours in the fluctuating electrostatic potential. We have expanded the theory to include collisional plasmas for applications to the plasma surrounding a hypersonic vehicle. In this collisional plasma, strongly sheared transverse flows can exist due to the relative motion of the vehicle and the surrounding atmosphere. If the scale size of these sheared flows is sufficiently small, they can give rise to the EIH instability. We are study whether the resulting lower hybrid turbulence can impede communication to and from a hypersonic vehicle. Experiments conducted in the Space Physics Simulation Chamber have demonstrated the existence of this instability in the linear phase in a collisional environment and have begun examining the nonlinear evolution of the instability. Results from laboratory experiments and theory on the generation of the EIH instability in a collisional plasma environment and microwave scattering will be presented.

¹This work is supported by AFOSR and the NRL base program.

Erik Tejero
Naval Research Lab

Date submitted: 11 Jul 2014

Electronic form version 1.4