Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

A new regime of whistler propagation in the laboratory GARIMA JOSHI, Nirma University, G. RAVI, Institute for plasma Research — Experimental observations of a new regime of whistler propagation in the laboratory are reported in this paper. The experiments are carried out in a large laboratory unbounded uniform plasma with density n_e ~10^{10} – 10^{12} cm^{-3} and magnetic field B_0 ~1 – 20 G. Studies are performed in the electron magnetohydrodynamic regime which is governed by electron dynamics with $\rho_{Le} << L << \rho_{Li}$, and $\tau_{ci} >> \tau >> \tau_{ce}$, where L and τ are spatial and temporal scale lengths of the perturbations, ρ_{Le} and ρ_{Li} the electron & ion Larmour radii respectively and τ_{ci} & τ_{ce} the temporal scales corresponding to the ion gyro frequency and electron gyro frequency respectively. The complete topology of the perturbed wave magnetic field is unraveled by mapping it on a two dimensional grid over repeated plasma shots. It is observed that the excited waves are elongated whistlers in the propagation direction, with the perpendicular extent limited to scale lengths of the order of natural scale length of plasma i.e. the skin depth (~c/ω_{pe}), rather than being more oblique as predicted by theory and observed in other experiments. The waves do not show any dispersive nature, contrary to the whistler characteristics, while still being able to maintain the whistler speed for the given plasma and pulsed current parameters. The above observed results are explained in terms of a new physical model.

Garima Joshi
Nirma University

Date submitted: 13 Jul 2017 Electronic form version 1.4