# Seminar

# Institute for Plasma Research

**Title :** Perturbation Studies in a Plasma Confined by Multi-Pole Line-cusp Magnetic Field

**Speaker:** Ms. Meenakshee Sharma
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**Date :** 10th July 2020 (Friday)

**Time :** 02:30 PM

**Venue :** Online - Join the talk:
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**Abstract :**

Surprises are galore when quiescent plasma is perturbed by small periodic voltages. For that, the achievable quiescence level in plasma is very important to start with. Multi-pole cusp configuration is found to be an ideal configuration in which the field is B~0 in the center as well as the boundary field curvature is also good for confinement. The filamentary produced argon plasma confined in this configuration with six electromagnets is found to be very quiescent (<0.1%). In a quest for more quiescent plasma, experiments were done in the MPD set up with various configurations of line-cusp fields by changing the current directions in the electromagnets appropriately. The argon plasma confined in twelve pole with six magnets (TPSM) is found to be more suitable for perturbation studies than that of produced by the six poles with six magnets (SPSM) with same current in both the configurations. The quiescent plasma confined in TPSM has larger uniform volume (cylindrical volume of radius ~10 cm and length 80 cm). With this TPSM setup, small voltage perturbations are given to study the reaction of the quiescent plasma. The perturbations are applied at ion acoustic (IA) frequencies which can excite the well-studied low-frequency electrostatic waves. At these IA frequencies, both the ions and electrons participate in the periodic oscillations, while the temperature of the electrons (and ion) makes the wave to propagate by providing the restoring force. In a partially ionized plasma, the role of neutrals are mostly reported to only damp the wave propagation by ion-neutral collisions, when the wave frequency 'ω' is less than ion-neutral collision frequency ($\nu_{in}$). In these experiments, IA waves are excited in a condition such that $\omega \geq \nu_{in}$ and it is found that the increase in neutral pressure actually makes the waves to travel longer. Since the MPD has electromagnets and the plasma confined by these magnets can be micro-controlled using those magnets, the IA wave studies are done with varying cusp magnetic field strengths. In the central region where the IA waves are excited, the ions are unmagnetized, while the electrons are magnetized beyond some values in the cusp region. Since the cusp magnetic field confines the hot energy electrons by mirror effect, the increase in cusp field gives a variety of damping scenarios by the finite larmor radius effect of electrons. These phenomena have been studied in detail by varying the cusp magnetic field strength.