Seminar

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Institute for Plasma Research

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Title: Study of Two-Electron-Temperature Plasmas Confined by Different Multipole Line-Cusp Magnetic Fields

Speaker: Dr. Shaikh Zubin Abdulfarid
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Date: 15th December 2025

Time: 10:30 AM

Venue: Seminar Hall, IPR

Online Link: https://bharatvc.nic.in/join/7958694699

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Abstract

The Multi-Pole Line Cusp Plasma Device (MPD) is a versatile experimental system in which the magnitude of the pole-cusp magnetic field can be precisely controlled. By adjusting the strength of this cusp field, it is possible to systematically modify the confinement characteristics of the plasma. In filament-produced plasmas confined within the MPD, the relative proportions of the two electron-temperature components (cold and hot electrons) are found to depend sensitively on the applied cusp magnetic field. Thus, tuning the pole-cusp magnetic field provides an effective means to regulate the formation and dominance of two-temperature electron populations in multipole line-cusp confined plasmas.

In filamentary discharge–produced plasmas confined within this adjustable cusp system, the plasma consistently exhibits a two-electron-temperature structure, consisting of cold bulk electrons and a population of energetic hot electrons. In this study, the two selected cusp configurations are analyzed to understand how variations in magnetic field strength and topology influence the confinement of primary energetic electrons. Langmuir probe measurements show that stronger cusp fields enhance the retention of high-energy electrons, while weaker fields allow increased electron loss through cusp regions, thereby altering the relative proportions of the hot and cold electron components. These results demonstrate the significant role of cusp magnetic field strength and configuration in shaping electron dynamics and overall plasma behavior in multi-cusp confinement devices.

References

A.D. Patel, M. Sharma, N. Ramasubramanian, R. Ganesh, and P.K. Chattopadhyay, Rev. Sci. Instrum. **89**, (2018).

A.D. Patel, M. Sharma, N. Ramasubramanian, J. Ghosh, and P.K. Chattopadhyay, Phys. Scr. **95**, (2020).

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