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# Seminar

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## Institute for Plasma Research

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**Title:** Design and Characterization of Curling Probe for density Measurements in reactive Plasmas

**Speaker:** Dr. Pawan Kumar  
Institute for Plasma Research, Gandhinagar

**Date:** 10<sup>th</sup> March 2023 (Friday)

**Time:** 10:30 AM

**Venue:** Committee Room 4, IPR

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### Abstract

A compact novel microwave resonator probe called as “curling probe” has been proposed for the density measurements in reactive plasmas. Microwave probe characteristic depends on the resonant frequency and the dielectric constant of the surrounding medium. The resonant frequency shifts in proportion to the permittivity of the surrounding medium. New type of microwave resonance probe is a spiral-shaped slot-type antenna known as “curling probe” is excited by a monopole antenna at its central aperture. The main advantage of this probe is planar geometry which allows the flexibility of directly embedded in the reactive chambers.

The design methodology of curling probe has been discussed in detail as the slot-type antenna is printed on top of substrate and bottom part is fully etched. The printed circuit board is placed inside the cavity which is acting as ground plane, the SMA connector is connected to the center of monopole acting as exciting aperture. The effects of different design parameters are studied on the basis of simulation. The antenna length plays an important role on the working frequency but the optimized value for the width has also been chosen to get the resonance. Current distribution at the resonance frequency is plotted in order to investigate the nature of curling probe resonator.

The curling probe is immersed in different dielectric medium and its resonant frequency shifts with the permittivity has been characterized. The curling probe is fabricated on FR4 substrate of thickness 1.6 mm, simulated and the measured results are good agreement in the air and shift in the frequency is also observed placing cardboard at 1mm distance. The objective of this work is to improve the physical understanding of curling probe and to measure the electron density in the reactive plasmas.

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