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# Seminar

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## Institute for Plasma Research

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**Title :** Self-Multiplexing Antennas using Substrate Integrated Waveguide

**Speaker:** Dr. Shruti Priya  
IIT, Dhanbad

**Date :** 08th October 2021 (Friday)

**Time :** 03.30 PM

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

[https://meet.ipr.res.in/Dr.ShrutiPriya\\_PDFTalk](https://meet.ipr.res.in/Dr.ShrutiPriya_PDFTalk)

### **Abstract :**

To enhance the performance of multi-functional wireless communication systems a selfmultiplexing antennas using substrate integrated waveguide technique is highly demanded. In recent days, substrate integrated waveguide is a prominent technique to design the highperformance microwave circuits and antennas because of their inherent features like low loss, ease to fabrication, inexpensive, compatible with planar circuits, easy integration with other microwave circuits and self-consistent electromagnetic shielding. The antennas using SIW technique are very attractive for satellite, radar, missile and modern wireless communications.

In modern multi-functional wireless communication services, a dual-band and multi-band antenna took a vital role as it excludes the need of different antennas for different frequency of applications. To add additional features to combat the problem of multi-path fading and polarization mismatch caused by different orientation of transmitting and receiving antenna, dual-band and multi-band circularly polarized antennas are used. However, dual-band and, multiband antenna faces the problem of poor isolation and high inter-modal interference when they are used with various number of transceivers. To reduce the inter-modal interference and increase the isolation among the ports a multiplexer or filter circuits like diplexer, triplexer and quadruplexer are required. But, due to use of extra-multiplexer or filter circuits, the design complexity and its size are increased. Therefore, self-multiplexing antennas are developed for multi-functional wireless applications which do not require any extra-circuits like multiplexer or filter. Such antennas should be compact, cheap and suitable for high performance wireless communication systems.

This presentation includes novel design of wideband self-diplexing antenna, compact circularly polarized self-diplexing antennas, compact self-triplexing antenna and compact quadruplexing antenna using substrate integrated waveguide (SIW) technology for multi-functional wireless services. The wideband self-diplexing antenna solved the problem of narrow radiating bands of traditional self-diplexing SIW antennas by introducing stepped-impedance resonant slots etched on the top of a SIW cavity. Radiation in each band is obtained from two modes of the resonator, which helps the bandwidth improvement. Moreover, to add the extra-feature to combat the problem of multi-path fading and polarization mismatch caused by different orientation of transmitting and receiving antenna a compact circularly

polarized self-diplexing antennas are designed. However, self-diplexing antennas are designed for dual-band wireless applications. To incorporate the more than two frequency bands in communication systems a compact self-triplexing antenna using half-mode SIW cavity and compact self-quadruplexing antenna using SIW cavity are designed for triple and quad band wireless application services respectively. The self-diplexing and self-quadruplexing antennas are designed for X-band wireless services and whereas, self-triplexing antenna is designed for WLAN applications. Moreover, each band of these antennas can be controlled independently with keeping the other bands almost intact. In case of all the proposed antennas, the isolation among any two ports and separation between co-to-cross polarization in boresight direction are better than  $\geq 20$  dB. All the proposed antennas kept the advantages of high gain, high front-to-back ratio, directive radiation pattern, and compact size.

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