Report on One Week FDP (Hybrid mode) on

"Recent Advances and Research Trends in Microwave, Millimeter Wave Antennas and RF Communication Systems"

Event Type : FACULTY DEVELOPMENT PROGRAM (FDP)

Date / Duration : 4^{th} – 9^{th} May, 2026 (ONE WEEK)

Resource Persons :

1. **Dr. Shiv Narayan, Senior Principal Scientist, CSIR-National Aerospace Laboratories, Bangalore**
2. **Dr. Rajkishor Kumar, Associate Professor, VIT Vellore**
3. **Dr. Saptarshi Ghosh, Associate Professor, IIT Indore**
4. **Dr. P. Rakesh Kumar, Associate Professor, Lakireddy Bali Reddy College of Engineering, Mylavaram**
5. **Dr. Divya Chaturvedi, Assistant Prof, IIIT Pune**
6. **Dr. Sunil Chinnadurai, Associate Professor, SRM University - AP**

Convener : Dr. G.Srinivasulu, Professor & HoD

Coordinators : Dr. K Rani Rudrama, Associate Professor
Ms. M V L Bhavani, Sr. Asst. Professor

Co-Coordinator : Dr. P. Rakesh Kumar, Associate Professor

Total no of Participants: 134 (Internal Count=37 & External Count=97)

Objective of the event: The Faculty Development Program (FDP) on "Recent Advances and Research Trends in Microwave, Millimeter Wave Antennas and RF Communication Systems" was organized with the following objectives:

- To provide participants with knowledge of recent developments in microwave, millimeter-wave, and RF communication technologies.

- To familiarize faculty members, researchers, and students with emerging antenna design techniques and applications.
- To promote awareness of current research trends in wireless communication systems, aerospace applications, IoMT, and 6G technologies.
- To facilitate interaction with experts from reputed academic institutions and research organizations.
- To encourage research and innovation in antenna engineering and RF system design.

Outcome of event:

The FDP successfully achieved its intended objectives and resulted in the following outcomes:

- Participants gained comprehensive knowledge of advanced antenna technologies and modern RF communication systems.
- The sessions enhanced understanding of frequency selective surfaces, dielectric resonator antennas, meta surface antennas, and reconfigurable antennas.
- Participants were exposed to emerging applications of antennas in aerospace systems, healthcare diagnostics, IoMT, and next-generation 6G networks.
- The FDP provided valuable insights into current research challenges and future directions in microwave and milli meter-wave technologies.
- The program strengthened research interest and encouraged collaborative research activities among faculty members and scholars.

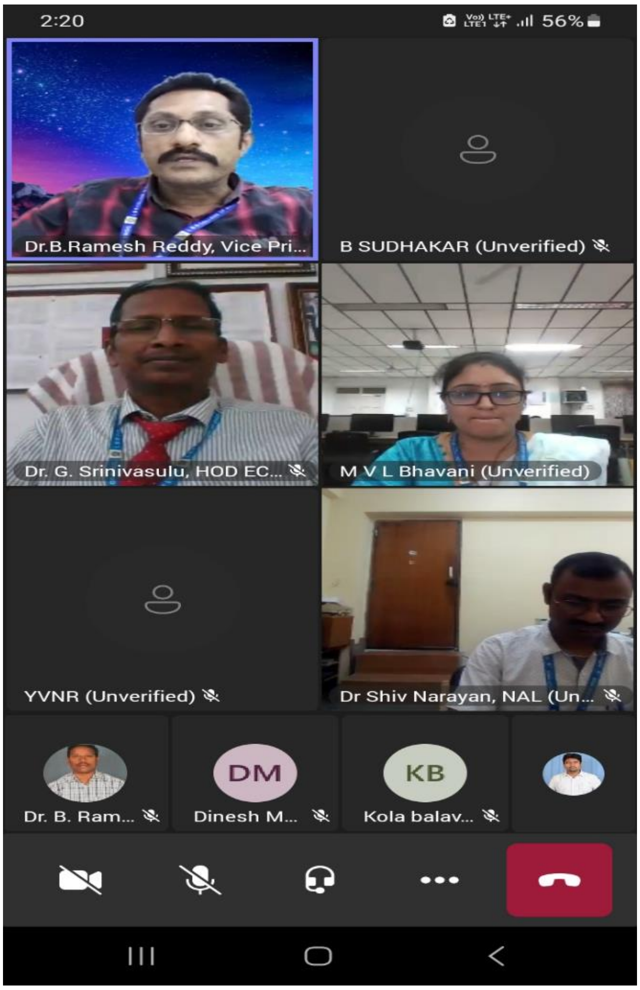
Description / Report on Event:

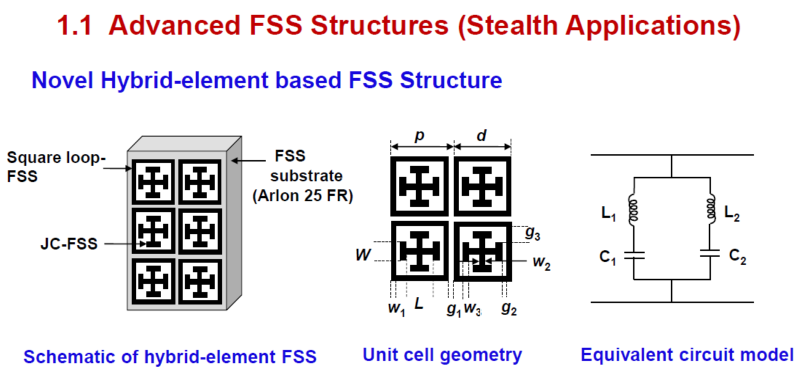
The one-week Faculty Development Program (FDP) on "Recent Advances and Research Trends in Microwave, Millimeter Wave Antennas and RF Communication Systems" commenced with an inaugural session organized by the Department of Electronics and Communication Engineering, LBRCE. The program was conducted in hybrid mode from 04th to 09th May 2026.

Day 1 – 04.05.2026

On Day 1, The inaugural session was graced by Dr. B. Ramesh Reddy, Vice Principal, LBRCE, and Dr. G. Srinivasulu, Head of the Department of ECE. Addressing the gathering, Dr. G. Srinivasulu emphasized the importance of staying updated with the latest developments in microwave engineering, antenna technologies, and RF communication systems. He highlighted the need for multidisciplinary research and encouraged faculty members, researchers, and students to explore emerging technologies and innovative applications in wireless communications. In his inaugural address, Dr. B. Ramesh Reddy appreciated the initiative taken by the department in organizing the FDP and emphasized the significance of continuous learning and research in rapidly evolving communication technologies. He mentioned that the FDP would provide an excellent platform for participants to interact with experts from reputed institutions, gain exposure to recent advancements, and strengthen their research capabilities in the areas of microwave, millimeter-wave, and RF communication systems.

Following the inaugural session, the first technical session was delivered by **Dr. Shiv Narayan, Senior Principal Scientist, CSIR–National Aerospace Laboratories, Bangalore**, on **“Frequency Selective Surfaces for Aerospace Applications: Antenna, Radome and Radar Absorbing Structures.”** The speaker discussed the design principles, characteristics, and applications of frequency selective surfaces in aerospace systems. The session provided valuable insights into antenna radomes, electromagnetic shielding techniques, and radar absorbing structures employed in modern aerospace platforms. Participants gained a comprehensive understanding of the role of these structures in improving antenna performance and reducing radar signatures in aerospace applications.

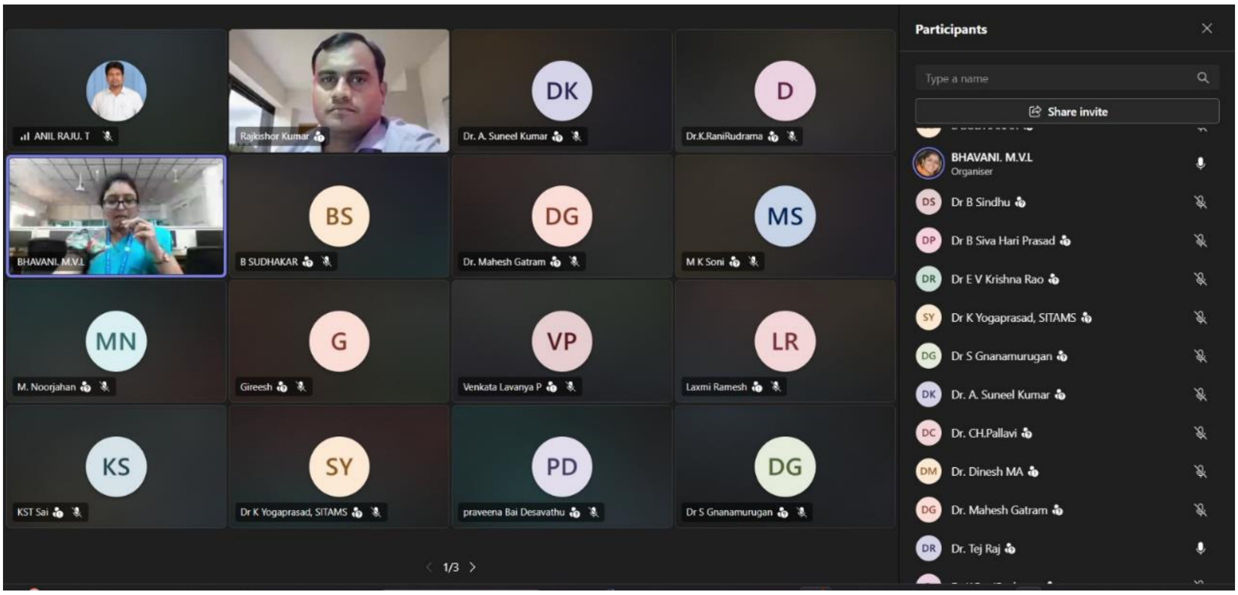


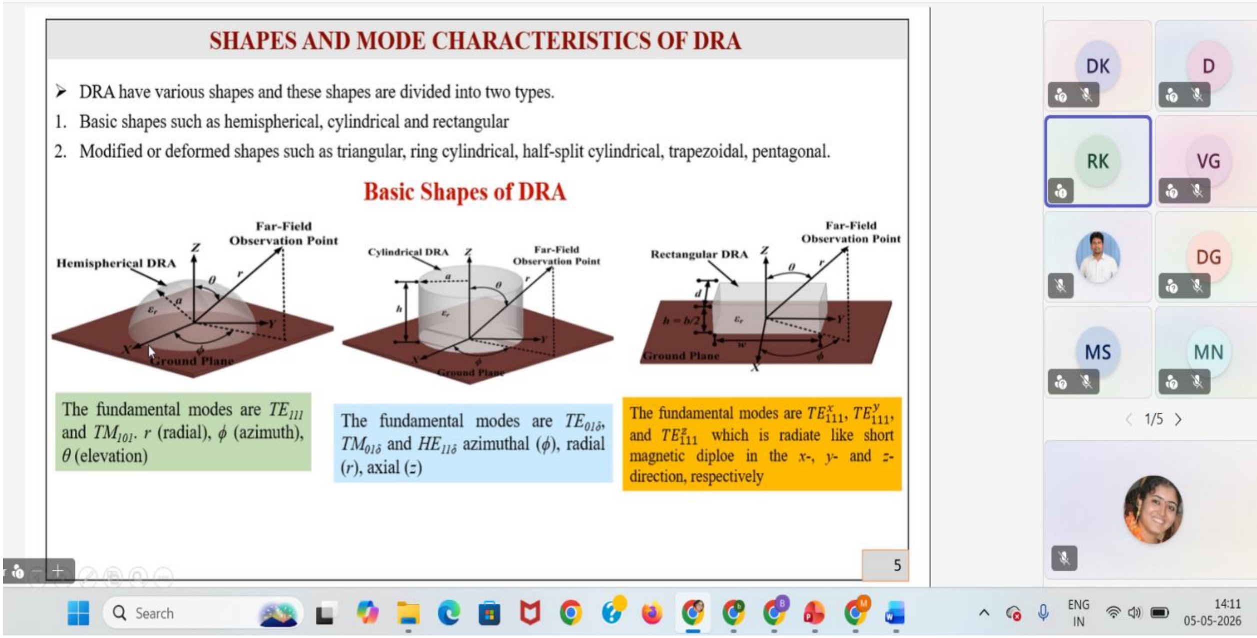


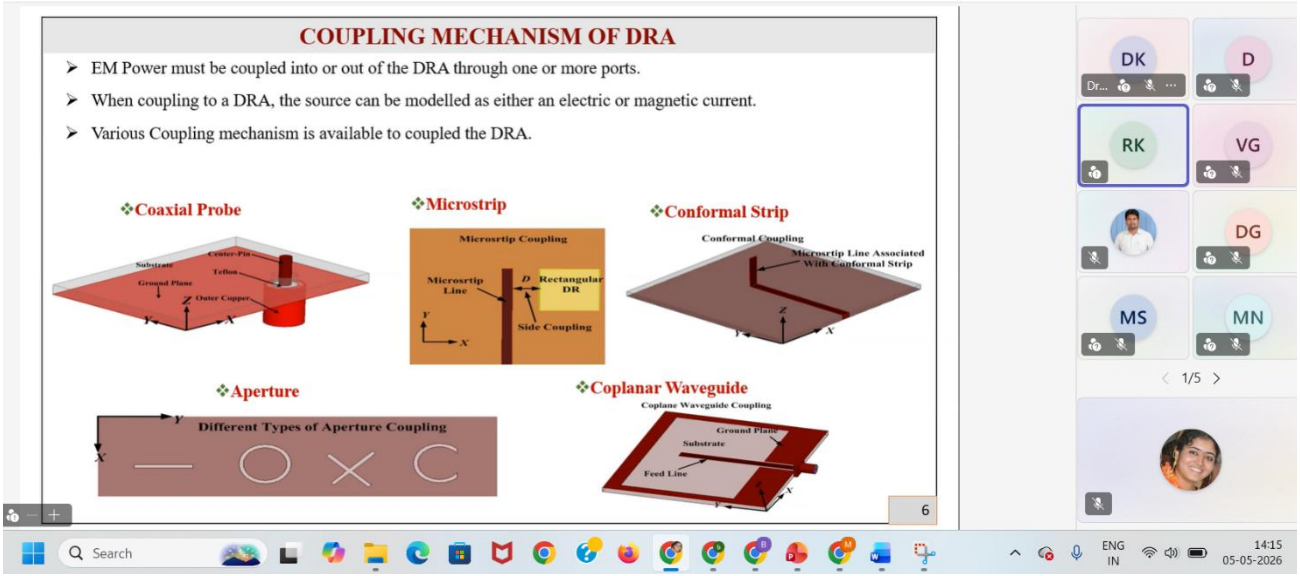
Day 1: Inaugural Session and Expert Lecture by Dr. Shiv Narayan

Day 2 – 05.05.2026

The second session was delivered by **Dr. Rajkishor Kumar, VIT Vellore**, on **"Different Feeding Techniques-Based Circularly Polarized Dielectric Resonator Antennas."** The lecture focused on dielectric resonator antenna technology and various feeding techniques employed to achieve circular polarization. Participants gained knowledge about antenna performance enhancement and applications in modern wireless communication systems.






COUPLING MECHANISM OF DRA
EM Power must be coupled into or out of the DRA through one or more ports.
When coupling to a DRA, the source can be modelled as either an electric or magnetic current.
Various Coupling mechanism is available to coupled the DRA.
Coaxial Probe
Microstrip
Microstrip Coupling
Microstrip Line
Rectangular DR
Side Coupling
Conformal Strip
Conformal Coupling
Microstrip Line Associated With Conformal Strip
Aperture
Different Types of Aperture Coupling
Coplanar Waveguide
Coplane Waveguide Coupling
Ground Plane
Substrate
Feed Line
6
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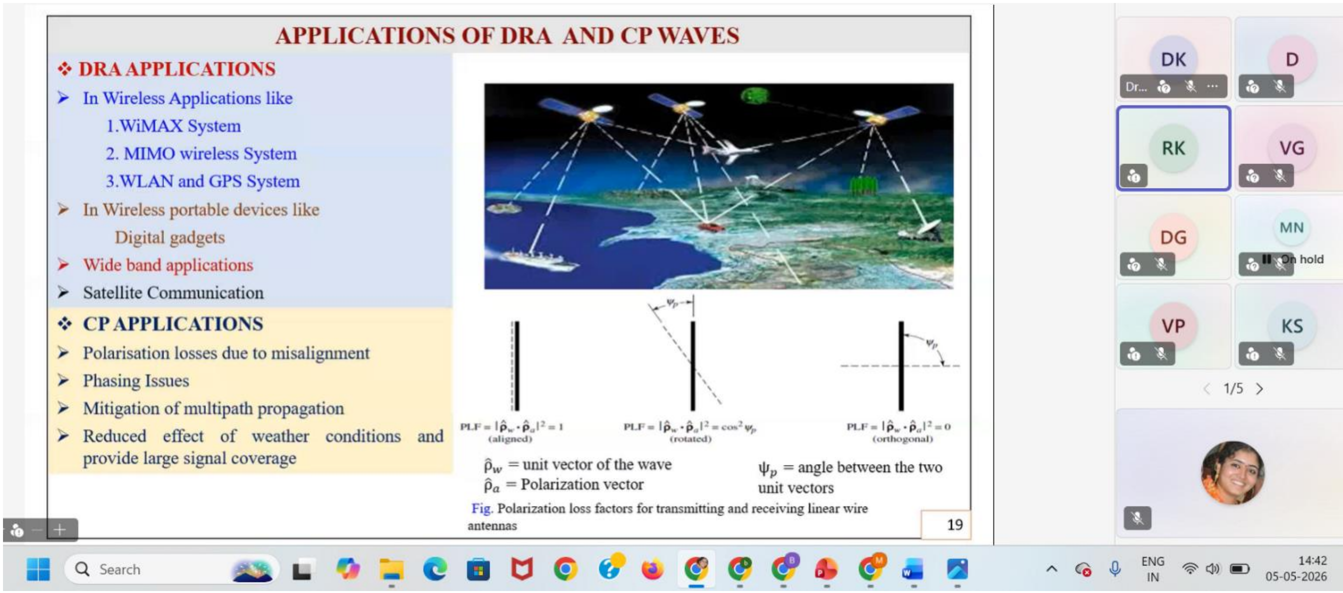
05-05-2026


APPLICATIONS OF DRA AND CP WAVES
DRA APPLICATIONS
In Wireless Applications like
1.WiMAX System
2. MIMO wireless System
3.WLAN and GPS System
In Wireless portable devices like
Digital gadgets
Wide band applications
Satellite Communication
CP APPLICATIONS
Polarisation losses due to misalignment
Phasing Issues
Mitigation of multipath propagation
Reduced effect of weather conditions and provide large signal coverage
(aligned)
(rotated)
(orthogonal)
ρ̂w = unit vector of the wave
ρ̂a = Polarization vector
ψp = angle between the two unit vectors
Fig. Polarization loss factors for transmitting and receiving linear wire antennas
19
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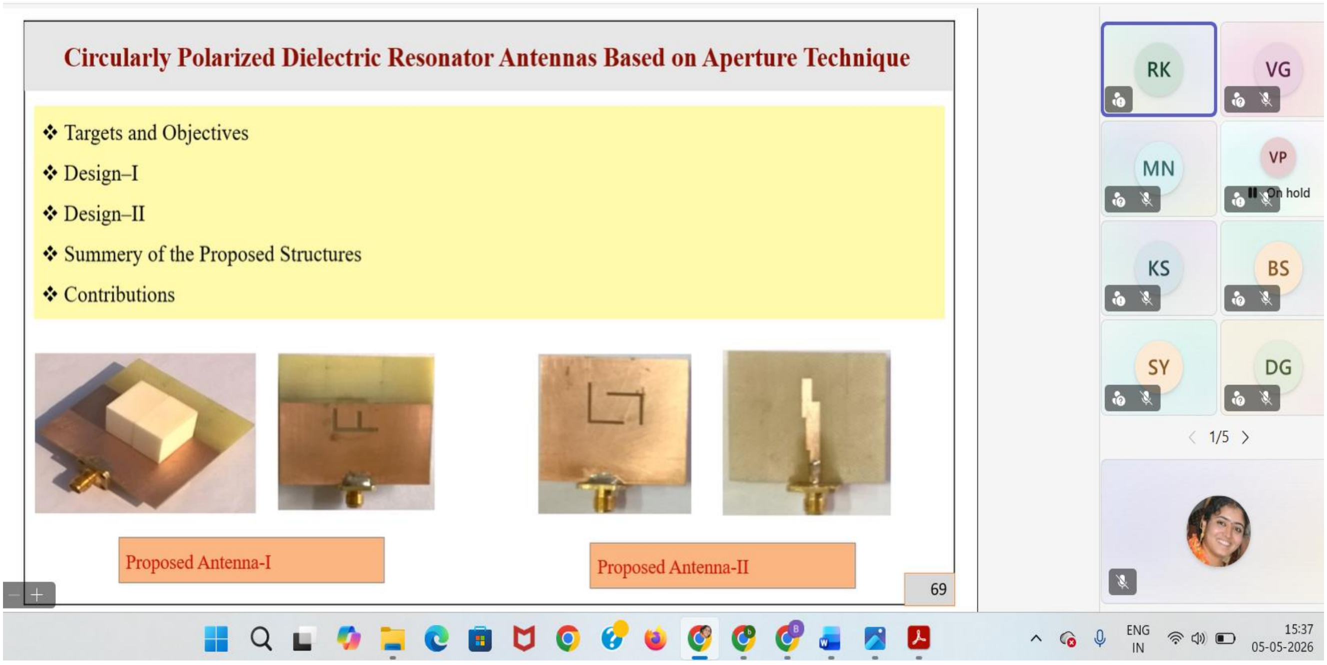
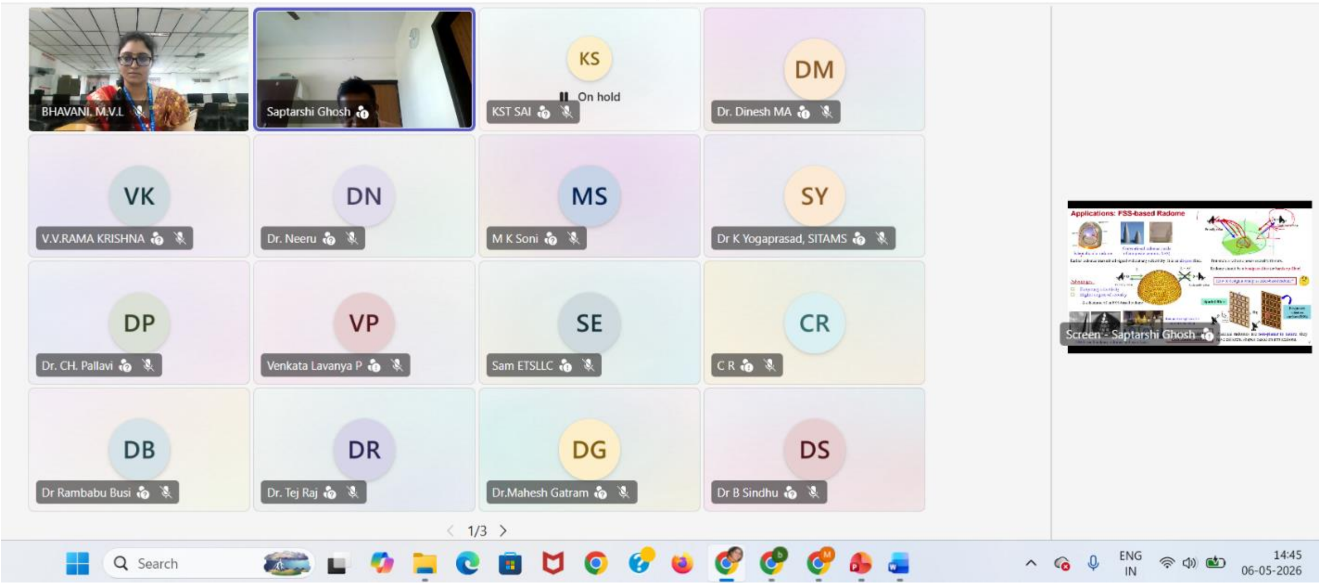
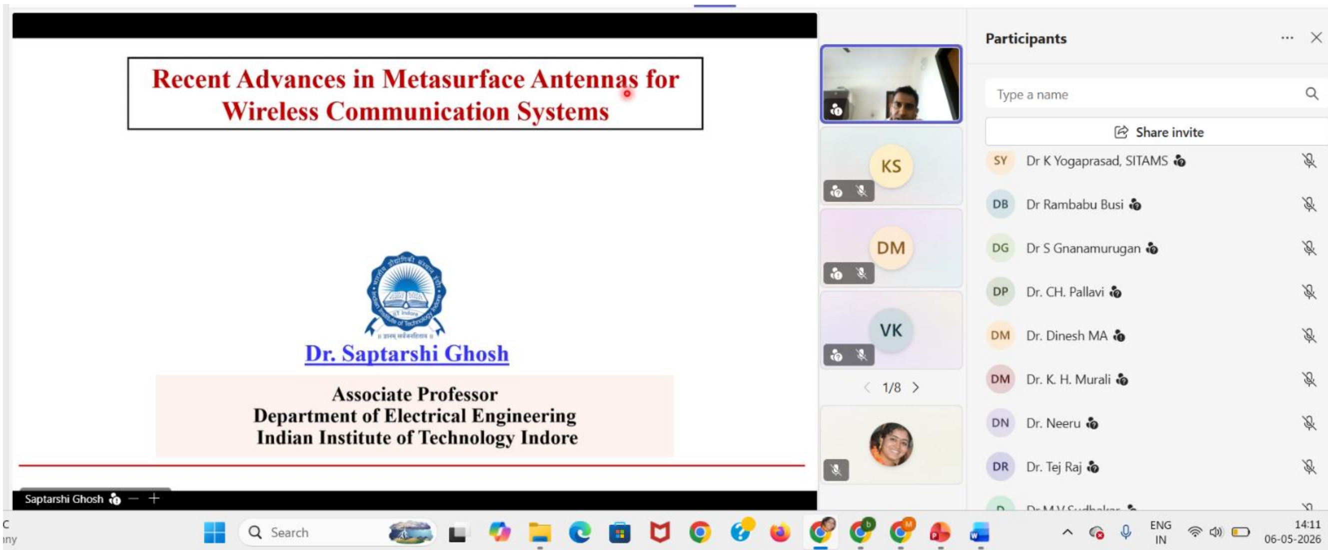
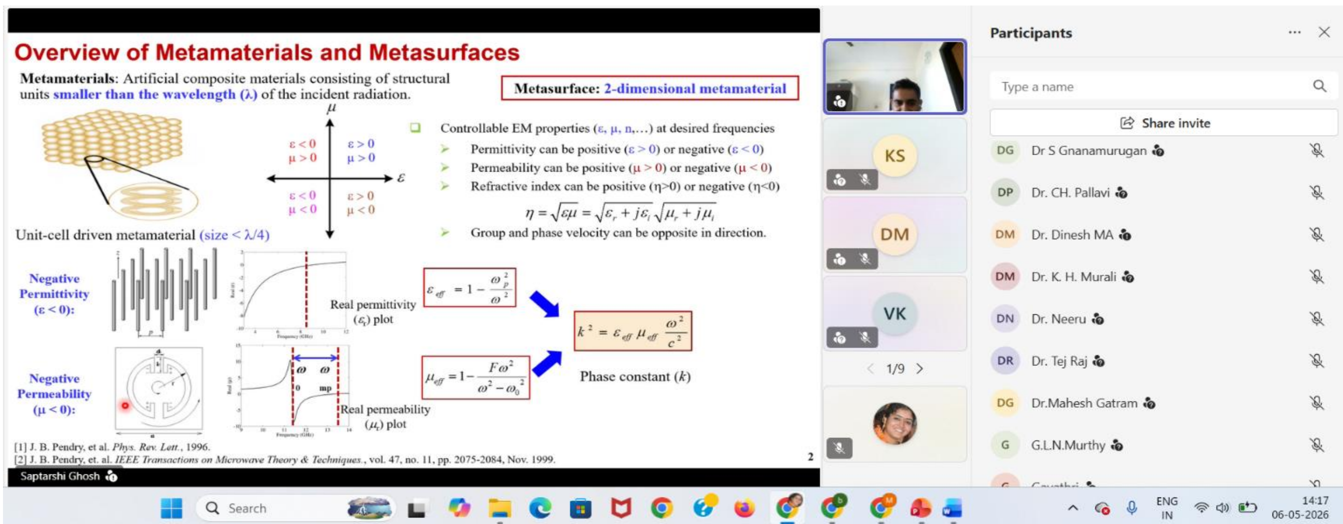

Circularly Polarized Dielectric Resonator Antennas Based on Aperture Technique
Targets and Objectives
Design–I
Design–II
Summery of the Proposed Structures
Contributions
Proposed Antenna-I
Proposed Antenna-II
69
15:37
05-05-2026

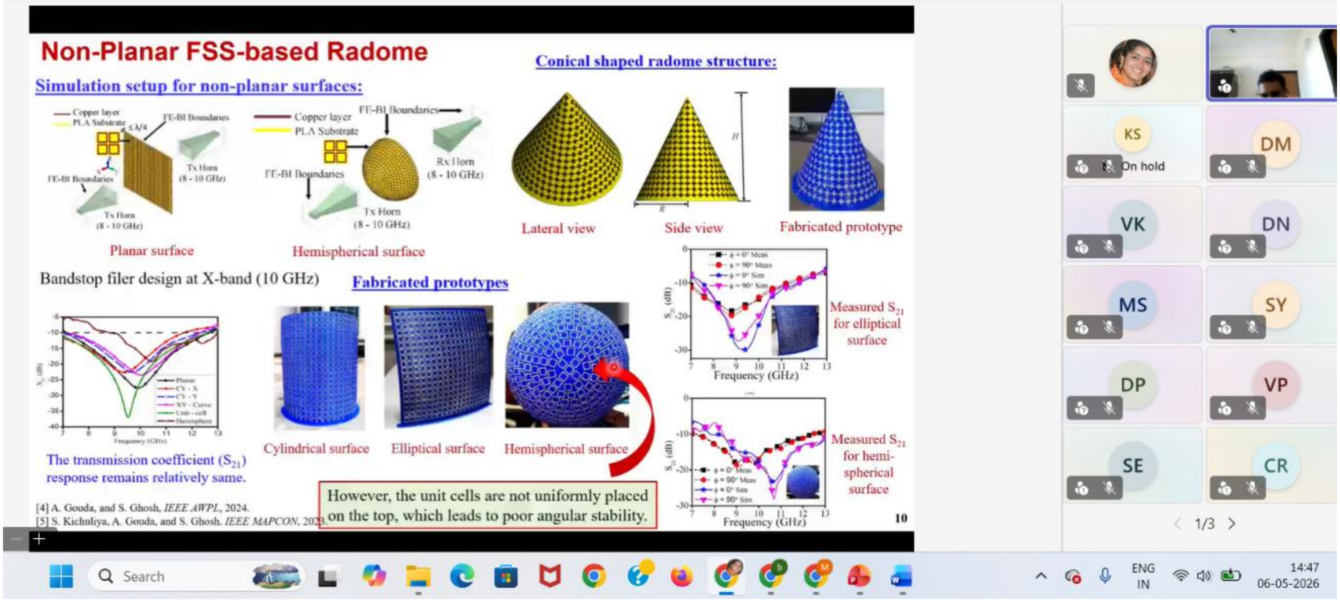
Day 3 – 06.05.2026

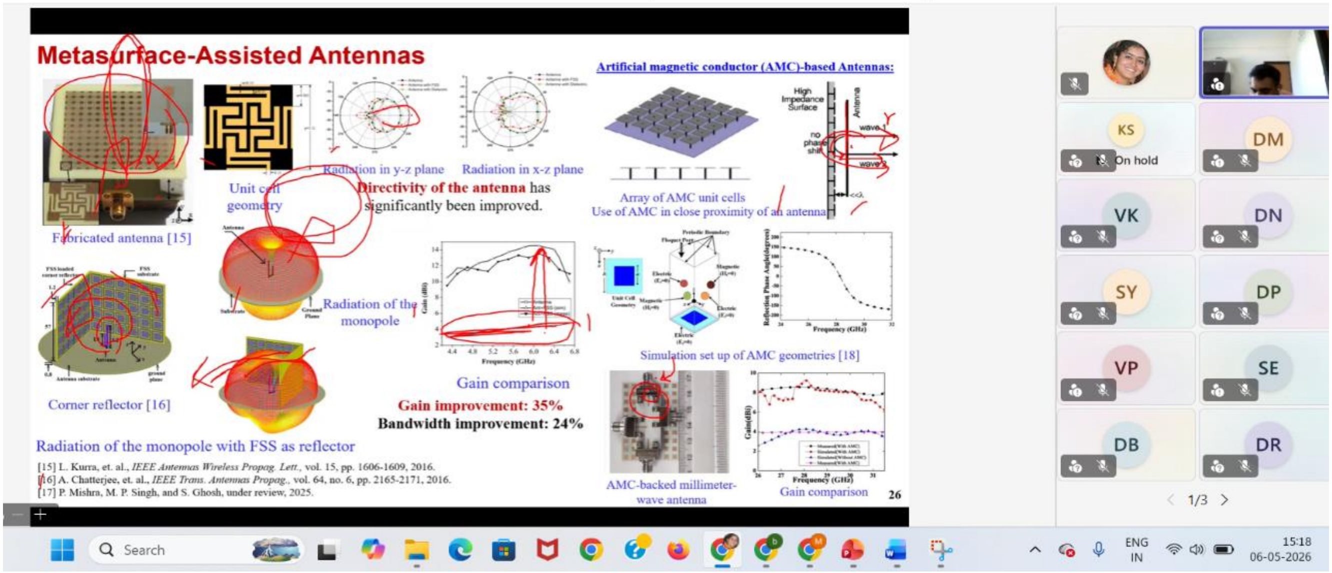
The third session was conducted by **Dr. Saptarshi Ghosh, IIT Indore**, on **"Recent Advances in Metasurface Antennas for Wireless Communication Systems."** The speaker explained the fundamentals of metasurface technology and its role in improving antenna characteristics such as gain, bandwidth, and beam steering. Recent research developments and future opportunities in wireless communication applications were also discussed.







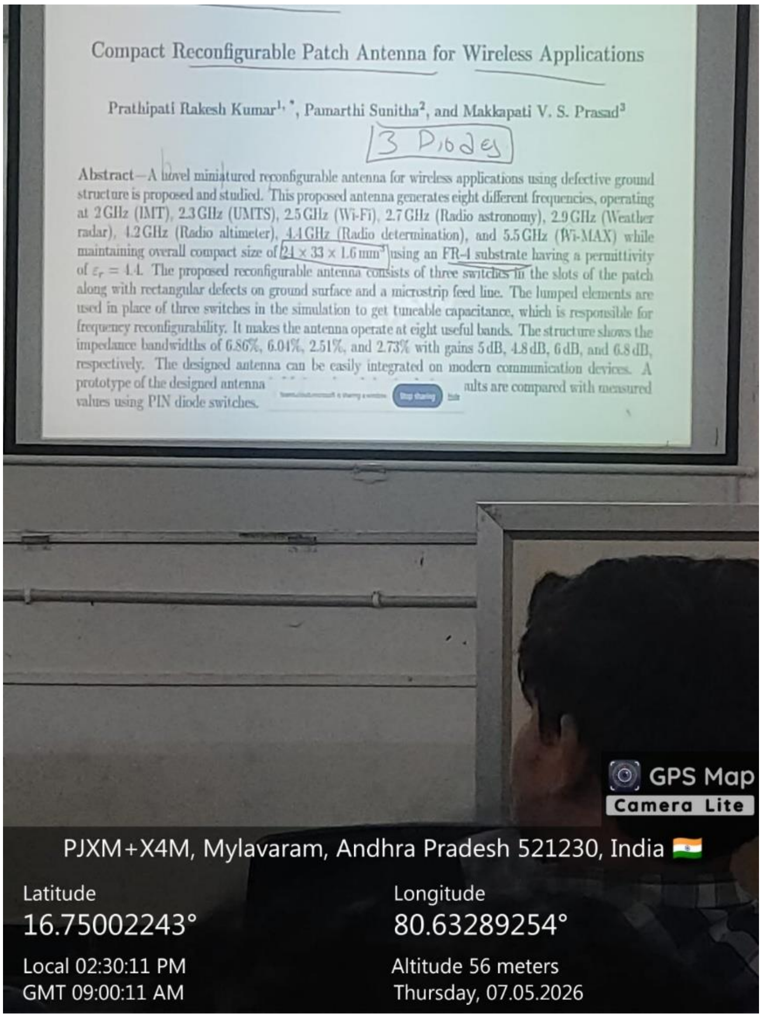


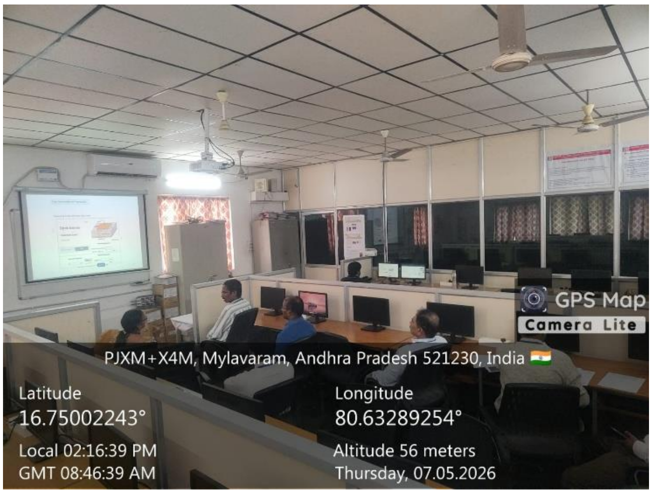


Day 4– 07.05.2026

The fourth day session was conducted in offline mode by **Dr. P. Rakesh Kumar, Associate Professor, Department of ECE, LBRCE**, on **“Design and Analysis of Reconfigurable Antenna.”** The session focused on the fundamental concepts, design methodologies, and performance analysis of reconfigurable antennas. Participants gained insights into frequency, pattern, and polarization reconfigurability and their significance in modern wireless communication systems.

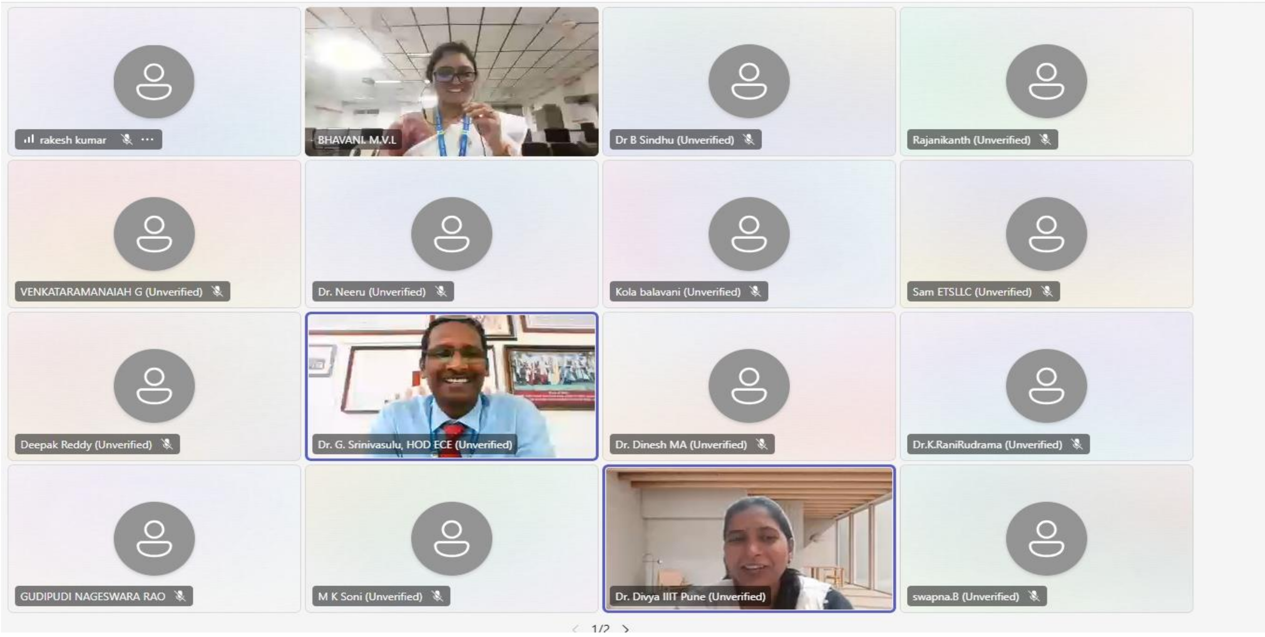
The session also included a **hands-on training component using ANSYS HFSS**, where participants were introduced to the practical aspects of antenna design and simulation. Dr. P. Rakesh Kumar demonstrated the modeling, simulation, and performance evaluation of antennas using HFSS software. The hands-on experience enabled participants to understand the complete antenna design workflow, including parameter optimization, radiation pattern analysis, gain evaluation, and impedance matching techniques. The interactive session enhanced the practical skills of the participants in antenna design and electromagnetic simulation.





Day 5 – 08.05.2026

The fifth day session was delivered by **Dr. Divya Chaturvedi, IIIT Pune**, on **"IoMT Enabled Antenna Array Sensors for Non-Invasive Breast Cancer Detection."** The session highlighted the integration of antenna sensor technologies with the Internet of Medical Things (IoMT) for healthcare applications. The speaker discussed microwave imaging techniques and the development of non-invasive systems for early breast cancer detection.


rakesh kumar
BHAVANI. M.V.L
Dr B Sindhu (Unverified)
Rajanikanth (Unverified)
VENKATARAMANAIAH G (Unverified)
Dr. Neeru (Unverified)
Kola balavani (Unverified)
Sam ETSLLC (Unverified)
Deepak Reddy (Unverified)
Dr. G. Srinivasulu, HOD ECE (Unverified)
Dr. Dinesh MA (Unverified)
Dr.K.RaniRudrama (Unverified)
GUDIPUDI NAGESWARA RAO
M K Soni (Unverified)
Dr. Divya IIIT Pune (Unverified)
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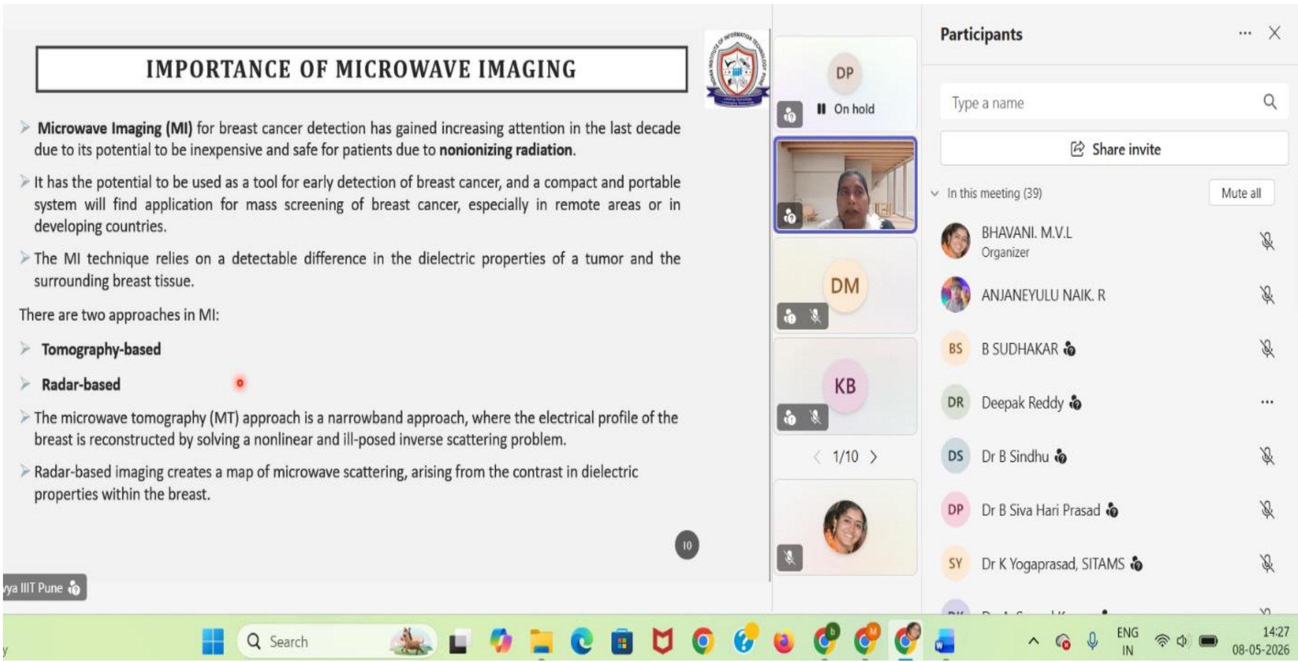
IMPORTANCE OF MICROWAVE IMAGING
Microwave Imaging (MI) for breast cancer detection has gained increasing attention in the last decade due to its potential to be inexpensive and safe for patients due to nonionizing radiation.
It has the potential to be used as a tool for early detection of breast cancer, and a compact and portable system will find application for mass screening of breast cancer, especially in remote areas or in developing countries.
The MI technique relies on a detectable difference in the dielectric properties of a tumor and the surrounding breast tissue.
There are two approaches in MI:
Tomography-based
Radar-based
The microwave tomography (MT) approach is a narrowband approach, where the electrical profile of the breast is reconstructed by solving a nonlinear and ill-posed inverse scattering problem.
Radar-based imaging creates a map of microwave scattering, arising from the contrast in dielectric properties within the breast.
10
Participants
Type a name
Share invite
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Organizer
ANJANEYULU NAIK. R
B SUDHAKAR
Deepak Reddy
Dr B Sindhu
Dr B Siva Hari Prasad
Dr K Yogaprasad, SITAMS
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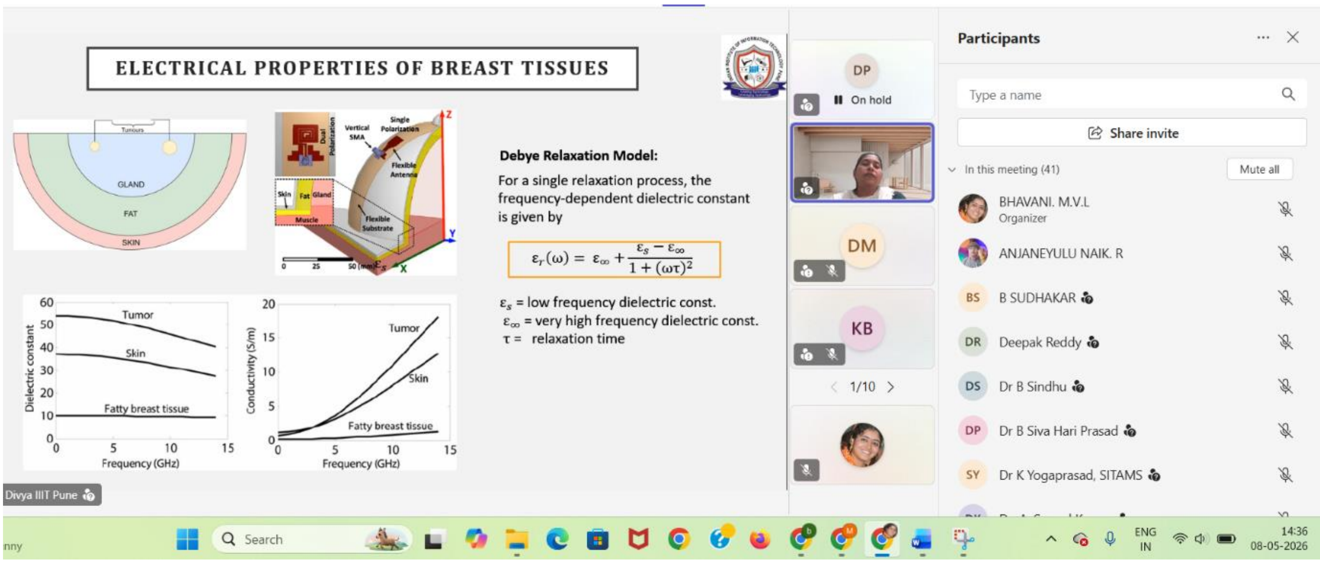
ELECTRICAL PROPERTIES OF BREAST TISSUES
GLAND
FAT
SKIN
Tumor
Skin
Fatty breast tissue
Dielectric constant
Frequency (GHz)
Conductivity (S/m)
Debye Relaxation Model:
For a single relaxation process, the frequency-dependent dielectric constant is given by
$\varepsilon_r(\omega) = \varepsilon_\infty + \frac{\varepsilon_s - \varepsilon_\infty}{1 + (\omega\tau)^2}$
ε_s = low frequency dielectric const.
ε_∞ = very high frequency dielectric const.
τ = relaxation time
Divya IIIT Pune
Participants
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Dr B Sindhu
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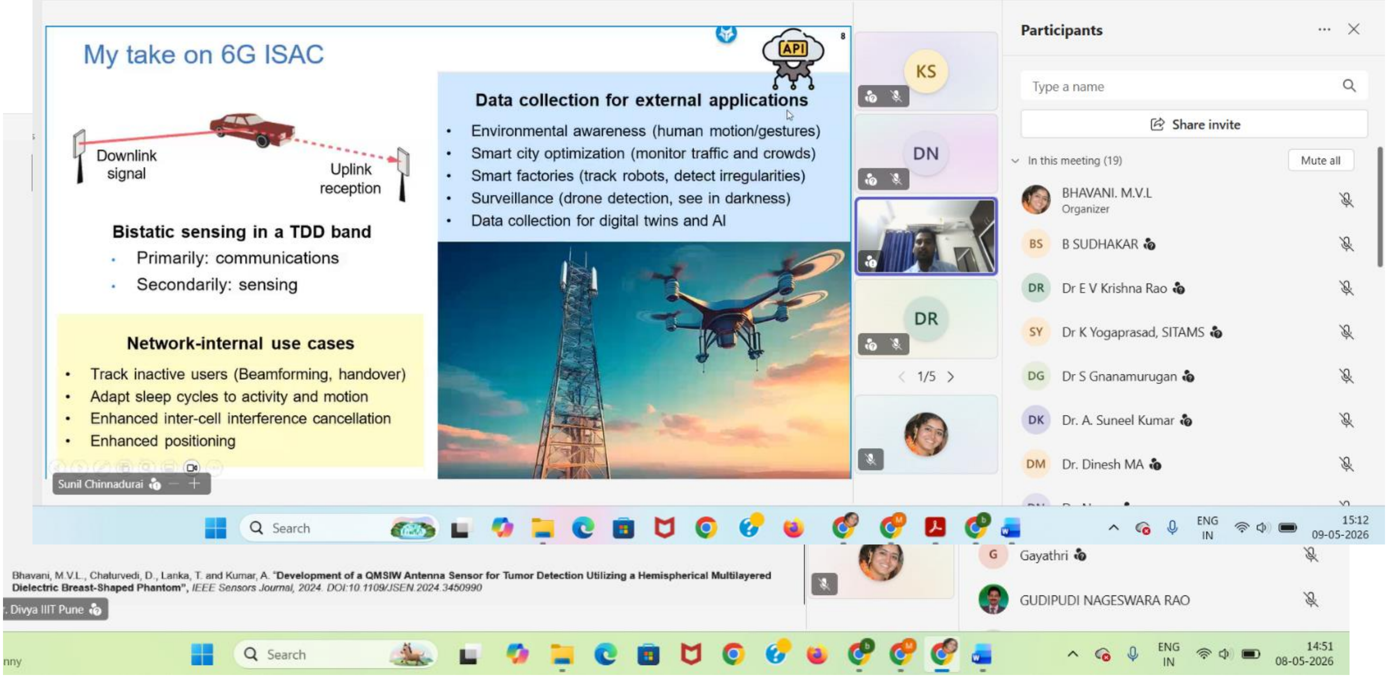

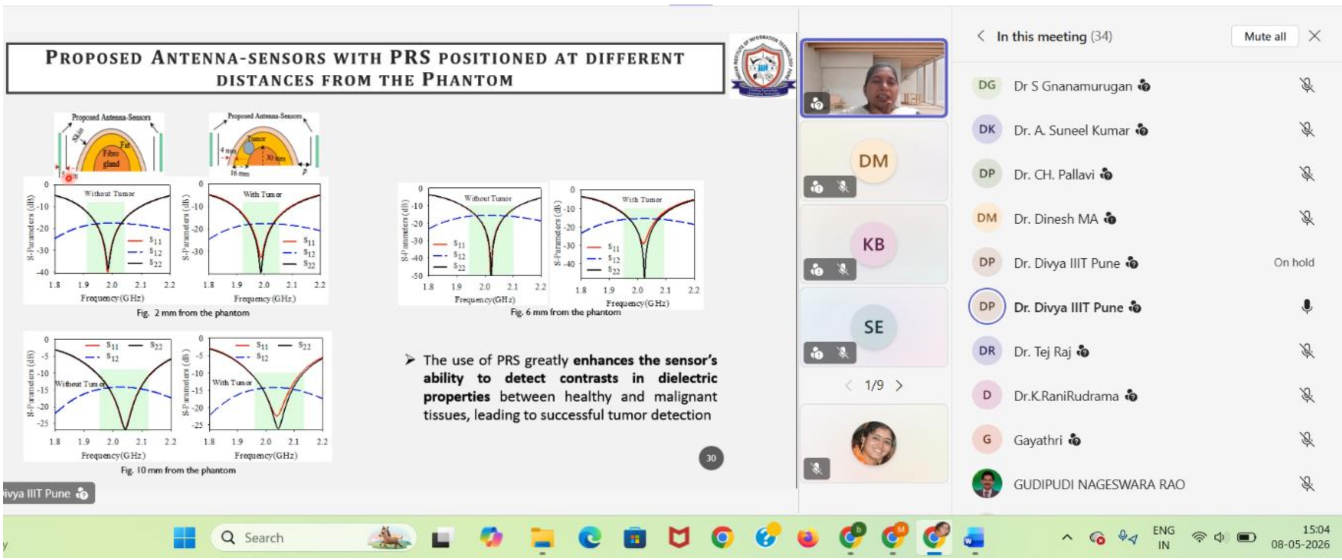

Day 6 – 09.05.2026

The valedictory technical session was delivered by **Dr. Sunil Chinnadurai, SRM University-AP**, on **"ISAC for 6G: Redefining the Role of Antennas in Next-Generation RF Systems."** The speaker introduced the concept of Integrated Sensing and Communication (ISAC) and its importance in future 6G networks. The session explored how antenna technologies will support simultaneous communication and sensing functionalities in next-generation wireless systems. The FDP concluded with an interactive discussion and participant feedback.


ISAC Vision and Evolution Path
Comms
Radar
Monitoring
Incident detection
High-speed Coverage
Multi-user Comms
Vehicular DFRC
Perceptive Network
Joint Signaling and Processing
Co-located Hardware
Spectral Coexistence
F. Liu, Y. Cui, C. Masouros, J. Xu, T. X. Han, A. Hassanien, Y. Eldar, S. Buzzi, "Integrated Sensing and Communications: Towards Future Dual-functional Wireless Networks", IEEE Journal on Sel. Areas Comms., in press
Sunil Chinnadurai
Participants
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Dr K Yogaprasad, SITAMS
Dr S Gnanamurugan
Dr. A. Suneel Kumar
Dr. Dinesh MA
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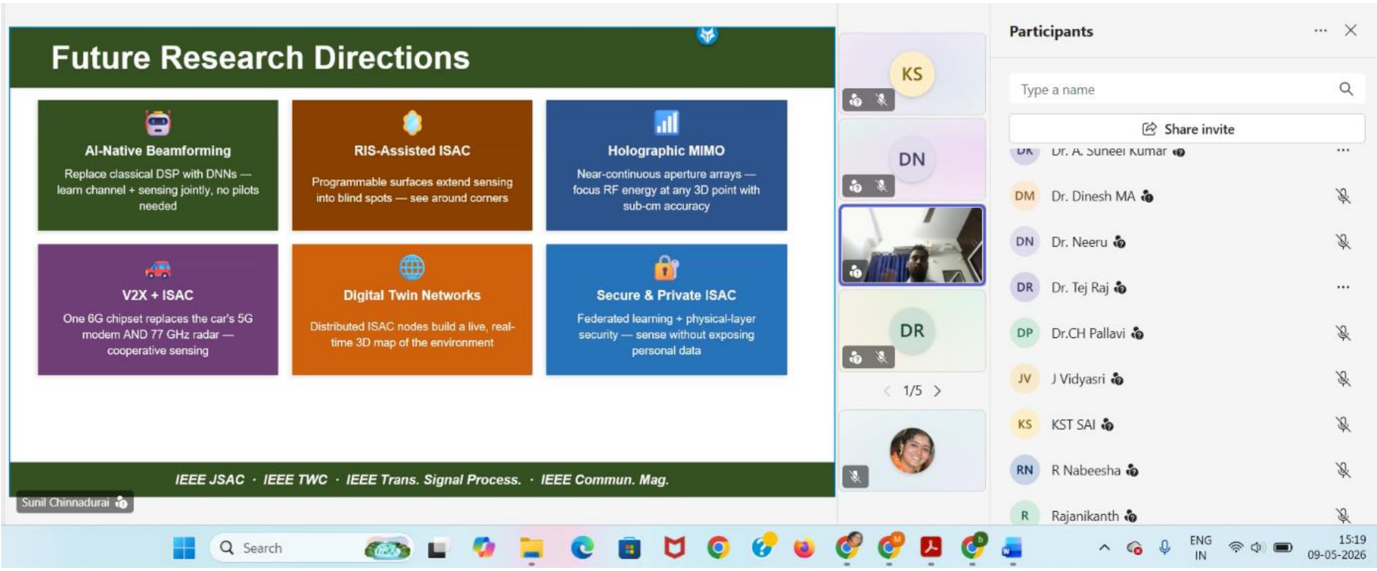
Future Research Directions
AI-Native Beamforming
Replace classical DSP with DNNs — learn channel + sensing jointly, no pilots needed
RIS-Assisted ISAC
Programmable surfaces extend sensing into blind spots — see around corners
Holographic MIMO
Near-continuous aperture arrays — focus RF energy at any 3D point with sub-cm accuracy
V2X + ISAC
One 6G chipset replaces the car's 5G modem AND 77 GHz radar — cooperative sensing
Digital Twin Networks
Distributed ISAC nodes build a live, real-time 3D map of the environment
Secure & Private ISAC
Federated learning + physical-layer security — sense without exposing personal data
IEEE JSAC · IEEE TWC · IEEE Trans. Signal Process. · IEEE Commun. Mag.
Sunil Chinnadurai
Participants
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Dr. Dinesh MA
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Dr. Tej Raj
Dr.CH Pallavi
J Vidyasri
KST SAI
R Nabeesha
Rajanikanth
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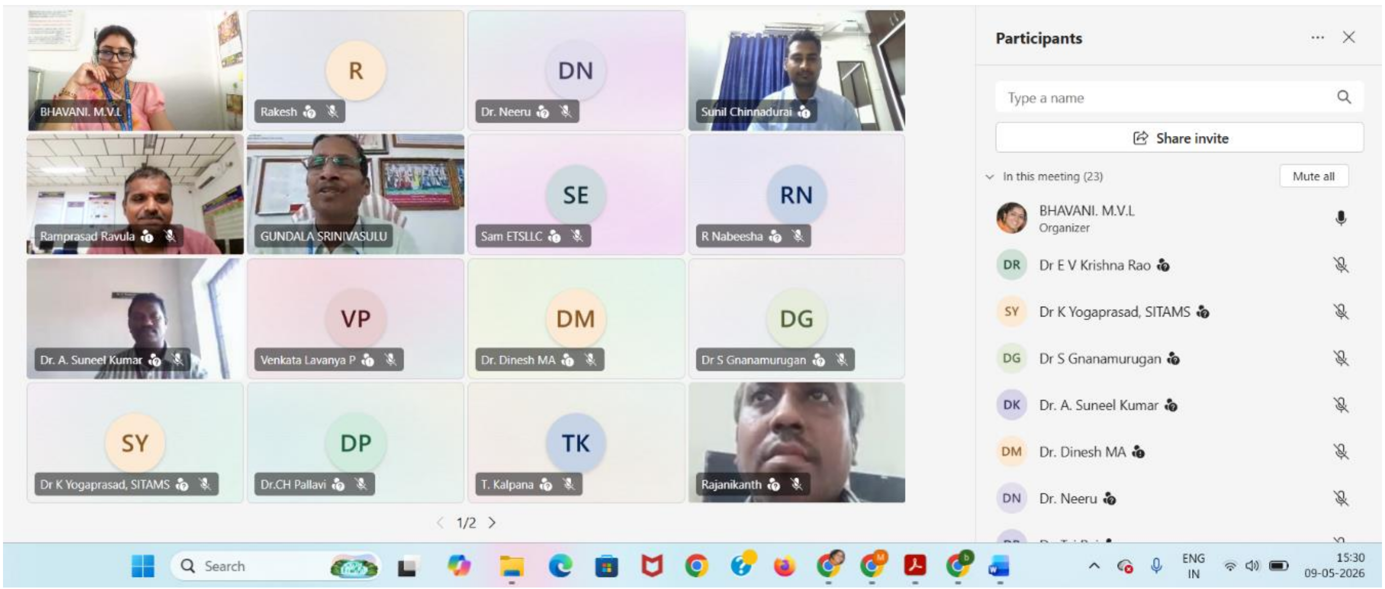
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Ramprasad Ravula
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Dr S Gnanamurugan
Dr K Yogaprasad, SITAMS
Dr.CH Pallavi
T. Kalpana
Rajanikanth
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