



**STTP- Sanction Letter**

Ref. No. 34-65/220/RIFD/STTP/Policy-1/2018-19

Date \_\_\_\_\_

To

The Drawing and Disbursing Officer,  
All India Council for Technical Education,  
Nelson Mandela Marg,  
Vasant Kunj, New Delhi – 110070

**Sub:** Release of grant for conduct of Short Term Training Programme (STTP) under AQIS 2018-19 during the financial year 2019-20– reg.

Sir,

This is to convey the sanction of the Council for payment of **Rs. 300000 /- (Rupees Three Lakh Only)** for conduct of Short Term Training Program as per details given below:-

1.	Name and address of the beneficiary University / Institution	VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE , VASANTHA NAGAR KANURU VIJAYAWADA - 7 AP, INDIA KRISHNA-520007 Andhra Pradesh
2.	Permanent ID of Institute	1-10213343
3.	Institute type	Unaided - Private
4.	Name of Coordinator	Dr. JHANSI ARETI
5.	Amount sanctioned	Rs. 300000/-
6.	Amount to be released	Rs.300000/- Full & final payment
7.	Head of account	<b>601.15(a) Gen. Short Term Training Programme (Plan)</b>
8.	The authorized officer in whose favour Cheque/ Demand Draft/ RTGS is to be made	REGISTRAR / DIRECTOR / PRINCIPAL
9.	Title of the programme	Trends and challenges in Design and implementation of Reconfigurable Antennas for increased spectrum access in Cognitive Radio Communication.

1. The amount of the grant shall be drawn by the Drawing and Disbursing Officer, All India Council for Technical Education on the grant-in-aid bill and shall be disbursed to and credited to the Registrar/ Director/Principal of the institute through RTGS.

2. This grant-in-aid is being released in conformity with the terms & conditions as well as norms of the scheme as already communicated, and also being communicated in this letter.
3. The Principal of the Institute and the Coordinator of the Program are requested to verify the correctness of the under-mentioned Bank Account / RTGS Details submitted by them alongwith the proposals, in which the grant is being released:-

Institute PAN No.	Bank Name	Bank Branch Name	Bank Branch Address	Account Holder Name	Account Type	Account Number	IFSC Code
AABTS1271J	SYNDICATE BANK	VRSECKANURU	VIJAYAWADA, ANDHRA PRADESH, PIN:520007	PRINCIPAL V R SIDDHARTH A ENGINEERING COLLEGE	Saving Account	33672200037089	SYNB0003367

### **Instructions/Guidelines to be followed by the University/Institution**

#### **I. Disbursement of funds to University/Institutions**

- a. The full amount of the grant sanctioned is being released as advance to the University/Institute.
- b. The amount spent by the institute on the conduct of STTP shall be adjusted on the basis of utilization certificate and detailed expenditure statement submitted by the University/Institution on the prescribed format along with other mandatory documents viz feedback form, copy of proceedings and completion report etc.
- c. The above said amount of grant shall be refunded back to AICTE if the Letter of Approval (LOA) / Extension of Approval (EOA) is not issued by AICTE to the institute for the academic year 2019-20.

#### **II Maintenance of Accounts**

- a. The Institute shall strictly follow the provisions laid down in the scheme document as available on the portal.
- b. Funds covered by this grant shall be kept separately and would not be mixed up with other funds so as to know the amount of interest accrued on the grant.
- c. The University/College/Institute shall maintain proper accounts of the expenditure out of the grants, which shall be utilized only on approved items of expenditure.
- d. The grant is intended to cover items of expenditure connected with the Short Term Training Programme such as Boarding & Lodging to the participants, TA to outstation participants, Honorarium to Course Coordinator, reading material to participants, Honorarium to resource persons, TA/DA to resource persons including two outstations resource persons & working expenses (reprographic services, postage, transport, daily wages, tea/coffee etc.

#### **III. Conduct of test and issuance of certificate**

A test shall be conducted by Program Evaluation Committee (PEC) at the end of the program and the certificates shall be issued to those participants who have attended the program and have qualified in the test.

#### IV. Submission of Documents by the University/Institutions to AICTE

- a. The following mandatory relevant documents are required to be submitted by the University/Institution within one month of the completion of the program:-
- (i) Original Statement of actual expenditure & Utilization Certificate in the prescribed proforma duly signed by the Head of the institution and countersigned by Registrar/Finance Officer/Govt. Auditor. In case of self-financing/private institutions, Statement of actual Expenditure & Utilization Certificate are required to be audited & signed and sealed by a Chartered Accountant endorsing the membership number and complete postal address. Format for the same is available on AICTE web portal.
- The University/Institution is not required to submit bills/vouchers/invoices etc for the expenditure incurred out of recurring grants. However, such copies of bills/vouchers/invoices shall be digitized by respective institutions receiving grant and uploaded scanned copies of such bills/vouchers/invoices etc on the portal for availability and view at any point of time.
- (ii) Feedback form in the prescribed proforma.
  - (iii) Copy of the proceedings and completion report.
  - (iv) List of candidates who have successfully completed the program on the basis of the test conducted by Program Evaluation Committee (PEC).
  - (v) Report submitted by Program Evaluation Committee (PEC).
- b. The amount of the grant shall be adjusted on submission of utilization certificate & detailed expenditure statement by University/Institution. On receipt of these documents, the total amount of financial assistance, admissible as per the norms, shall be worked out and grant-in-aid adjusted.

#### V. General instructions

- a. **Preferably 10% of the participants may be industry professionals deputed by industry. Further, not more than 2 participants shall be from the host institution/group of institutions.**
- b. **Money to be reimbursed on the grant (for any reasons to include unspent amount, interest , penalty if imposed) shall be refunded back to AICTE in the form of Demand Draft payable to Member Secretary, AICTE, New Delhi.**
- c. **As AICTE needs adequate time for depositing the Demand Draft in the bank, the same be immediately dispatched to avoid any lapse of the validity period.**
- d. **The STTP is a residential program of a duration of six days with minimum 40 participants.** The approved STTP shall be conducted within three months from the date of release of funds.
- e. **If programme is not conducted in the period of three months of the issuance of this Sanction Order, the released amount, alongwith interest accrued thereon, has to be necessarily returned back to AICTE within a month.**


- f. The expenditure under the Heads '**Honorarium to Course Coordinator**' and '**Honorarium to Resource Persons**' shall not exceed **1% & 20% respectively** of the total sanctioned grant for the Programme. However, overall expenditure shall not exceed the funds sanctioned for the Programme.
- g. Any extra money required to complete the programme must be borne by the institute from their own resources. But the quality of the activities should not be compromised.
- h. Any unavoidable circumstantial change in the program with respect to name of Project Coordinator, Venue and date for organizing STTP would mandatorily require prior approval of the Council. All such requests should be addressed to AICTE, in advance, recording the specific reasons for proposed changes, failing which the offer for the grant already issued would be treated as automatically withdrawn and the financial assistance released in favour of the beneficiary institution shall be refunded immediately to the Council. Kindly mention the File No. 34-65/220/RIFD/STTP/Policy-1/2018-19 in your future correspondence.
- i. **Program Evaluation Committee (PEC)** is required to be constituted at institutional level. The constitution of the PEC shall be as under:
- (i) Principal/Director/Registrar of the institution (Chairperson).
  - (ii) Coordinator of the program (Member Secretary).
  - (iii) Two HoDs and one subject expert (members).

The members of the said PEC shall not be below the rank of Associate Professor. A test shall be conducted by Program Evaluation Committee (PEC) at the end of the program and the certificates shall be issued to those participants who have attended the program and have qualified in the test. The minutes of the meetings, along with PEC report, are to be submitted to the Council at end of the program along with other mandatory documents.

- j. **GoI GFR rules** (@<https://doe.gov.in/order-circular/general-financial-rules2017-0>) should be followed during utilization of grant.
- k. This Sanction Order may be treated as Offer Letter for all purposes.

**NOTE:- Any deviation from the above will invoke serious action against the Institute.**

Yours sincerely,

  
(Dilcep N Malkhede)  
Advisor-I (RIFD)

Copy forwarded for information and necessary action to: -

12 DEC 2019

1. **Name and Address of the Coordinator**  
Dr. JHANSI ARETI  
VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE  
VASANTHA NAGAR KANURU VIJAYAWADA - 7 AP, INDIA  
VIJAYAWADA 520007 Andhra Pradesh
2. **The Registrar / Director / Principal**  
VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE  
VASANTHA NAGAR KANURU VIJAYAWADA - 7 AP, INDIA  
VIJAYAWADA 520007 Andhra Pradesh

## REGISTRATION FORM

One Week National Level Online Short Term Training Program (STTP)

on

“Trends and Challenges in Design and Implementation of Reconfigurable Antennas for Increased Spectrum Access in Cognitive Radio Communication”

**STTP-III 14<sup>th</sup> -19<sup>th</sup> September 2020**

Name: \_\_\_\_\_

Designation: \_\_\_\_\_

Institution/Organization: \_\_\_\_\_

Address: \_\_\_\_\_

Contact Number: \_\_\_\_\_

Email: \_\_\_\_\_

Qualifications: \_\_\_\_\_

Experience in years: \_\_\_\_\_

Teaching: Research: Industry: \_\_\_\_\_

**Signature of the Participant**

**Last date for Registration: 10<sup>th</sup> September 2020**

**Address for Communication:**

**Dr. A. Jhansi Rani**

Professor, ECE Dept.

V.R. Siddhartha Engg. College

Kanuru, Vijayawada-520007, AP

**Mail id: [aicsttp2020.ece@gmail.com](mailto:aicsttp2020.ece@gmail.com)**

**Mobile. No: 9949894526 & 9494049281**

### Chief Patrons

**Sri N. Venkateswarlu**, President,

Siddhartha Academy of General & Technical

Education (SAGTE), Vijayawada

### Patrons

**Sri P. Lakshmana Rao**, Secretary, SAGTE

**Sri S. Venkateshwara Rao**, Treasurer, SAGTE

**Sri M. Rajayya**, Vice-President, SAGTE &

Convener, VRSEC

### College Advisory Committee

**Dr. A. V. Ratna Prasad**, Principal

**Dr. N. N. Sastry**, Prof. of ECE & Dean R & D

**Dr. B. Panduranga Rao**, Prof. of CE & Dean SA

### Convener

**Dr. P. V. Subbaiah**

Professor & Head of ECE

### Organizing Advisory Committee

Faculty members of ECE Department

### Registration link:

<https://tinyurl.com/VRSEC-ECE-STTP-III>

### Eligibility

The STTP is open to faculty members of AICTE approved Institutions, Research scholars and persons from industry and R&D organizations from all over country.

**Registration Fee: \*\*\*NIL\*\*\***

Online meeting link will be provided through **whatsapp**.

**The number of Participants will be limited to 150**

**\*Note:**E- Certificates will be provided to those participants who attend all the sessions of the program and also appear for the online test as per the norms of AICTE.

**AICTE Sponsored**



**ONE WEEK NATIONAL LEVEL ONLINE SHORT TERM TRAINING PROGRAM**

on

**“Trends and Challenges in Design and Implementation of Reconfigurable Antennas for Increased Spectrum Access in Cognitive Radio Communication”**

**STTP-III 14<sup>th</sup> -19<sup>th</sup> September 2020**

### Coordinators

**Dr. A. Jhansi Rani**, Prof. of ECE

### Co Coordinators

**Dr. M. Padmaja**, Prof. of ECE

**Mr. A. Raviraja** Asst. Prof. of ECE

**Organized by**



**Department of**

**Electronics & Communication Engineering**

**Velagapudi Ramakrishna**

**Siddhartha Engineering College**

(Autonomous)

(Sponsored by Siddhartha Academy of General & Technical Education)

Kanuru, Vijayawada-520007

Andhra Pradesh

[www.vrsiddhartha.ac.in](http://www.vrsiddhartha.ac.in)

**☎: 0866-2582333, 2584930**



### About the College:

Velagapudi Ramakrishna Siddhartha Engineering College (VRSEC) was established in the year 1977 as the first Self-financing Engineering College in the state of A.P. It is located in a vast expanse of 24.05 acres of land on the outskirts of Vijayawada city at a distance of about 6Kms from the city centre. The college is offering 7 UG (B.Tech) Courses with intake of 1140, 9 PG- M.Tech with 180, MBA with 60 and MCA with 60. The college has been accredited four times by National Board of Accreditation (NBA) of All India Council for Technical Education (AICTE), New Delhi in respect of all Engineering disciplines and also certified for ISO 9001:2008. It is affiliated to Jawaharlal Nehru Technological University, Kakinada, AP. Autonomous status was conferred by UGC in the year 2006 and extended for 10 years upto 2027-28 without visit to the college, first in AP. It is one among the top 16 Engineering Colleges selected with Rs 6 crores funding under World Bank aid for R&D and PG enhancement programme called TEQIP –II (S.C.1.2) by MHRD, Govt. of India. The institute secured AAA ranking and all India 7<sup>th</sup> position for the participation by students and faculty in NPTEL/SWAYM. The College received Platinum Award in years 2017, 2018 & 2019 as a Best Industry Linked Technical Institute by AICTE-CII Survey. It is also recognized as “Scientific & Industrial Research Organization (SIRO)” by DSIR, MST, Govt. of India since August 2017.

### About ECE Department:

Established in the year 1977, the department of ECE offers B.Tech Programme in Electronics & Communication Engineering with an intake of 240 and two M.Tech Programmes in Communication Engineering & Signal Processing and VLSI Design & Embedded Systems with an intake of 18 each. The department has been accredited by NBA of AICTE four times. More than 40% faculties are with Ph.D. qualification. Led by a team of highly qualified experienced faculty with specializations such as RF & Microwave, Antennae, Digital Signal

Processing, Wireless Communications, Digital Image Processing, VLSI and Embedded systems etc, the department provides excellent academic and research environment to the UG, PG and research students. A centre of Excellence (TIFAC CORE- DST) in Telematics was established in the year 2009 with the state of the art facilities. Having successfully completed many research projects funded by UGC, AICTE, NRSC-ISRO DLRL & ANURAG-DRDO etc., it is also recognized by JNTUK as "**Research Center.**" Faculty members extend guidance to research scholars, produce Ph.D.'s and publish their findings in peer reviewed national and international journals and conferences.

### About STTP:

Cognitive radio (CR) is a cutting edge technology for wireless communications that requires the design of novel spectrum sensing schemes with high degree of reliability. These networks can dynamically allocate spectrum to multiple users, thereby easing network congestion. Reconfigurable antennas play important roles in smart and adaptive systems which offer several advantages such as multifunctional capabilities, low front-end processing efforts with no need for a filtering element, good isolation, and sufficient out-of-band rejection. These make them well suited for use in wireless applications such as 4G and 5G mobile terminals.

**Note:** The STTP is planned in three phases. The basic concepts and fundamentals in the first STTP, current technologies and applications in the second STTP and futuristic trends and challenges in the third STTP. However they are independent.

### Objectives of STTPs:

The program focuses on Antenna design aspects and simulation for cognitive radio Communication with a synthesis approach and progressively builds up the background through an illustrative design and characterization set of learning activities of some of the basic concepts of spectrum access techniques

### Course Contents:

- Information Centric Networking
- Optimization Techniques
- 6-G Wireless Networks: Artificial Intelligence
- Future of Reconfigurable Antennas: Research Directions
- Challenging issues in Cognitive Radio Communication
- System Integration and Opportunistic Scheduling in Cognitive Radio Networks
- Antennas for 5G Communication
- Array antenna design for cognitive radio application using RF switch
- Integrated circuits for high speed communications –Future trends
- Necessity of integration between 5G and Satcom
- Standardization Efforts
- Possible TN-NTN integration architectures and challenges
- Visible light based communications for beyond 5G networks
- Antennas for airborne and ground applications

### Resource Persons:

**Dr. Samar Shailendra**, TCS Research & Innovation & Visiting faculty at IIIT Bangalore

**Dr. G. Rama Murthy**, Prof. of CSE Mahindra University, Hyderabad

**Dr. Dhananjay Kumar**, Prof. and HoD of IT, Anna University, MIT Campus, Chromepet, Chennai

**Dr. Abhinav Kumar**, Associate Professor, Dept. of Electrical Engineering, IIT Hyderabad

**Dr. P. Sreehari Rao**, Assoc Prof. of ECE, NITW, Warangal

**Dr. D. Vakula**, Assoc Prof. of ECE, NITW, Warangal

**Dr. A. Prakasa Rao** Assoc Prof. of ECE, NITW, Warangal

**Dr. S. Anuradha**, Assoc Prof. of ECE, NITW, Warangal

**Dr. V. Srinivasa Rao**, Scientist –F, RCI, Hyderabad

**Dr. Sumit Kumar**, Research Associate at the Interdisciplinary Centre for Security, Reliability, and Trust of the University of Luxembourg

**Er. M. Vinoth Manoharan**, Co-Founder & CTO Wilma Communications Groups (Asia | US | Europe)



**AICTE Sponsored  
ONE WEEK NATIONAL LEVEL ONLINE SHORT TERM TRAINING PROGRAM**

on

**Trends and challenges in Design and Implementation of Reconfigurable Antennas for Increased  
Spectrum Access in Cognitive Radio Communication Dt: 14<sup>th</sup> -19<sup>th</sup> September 2020**

**STTP-III**

**Online Platform: ZOOM**



<b>Date</b>	<b>Expert Details</b>	<b>Timings</b>	<b>Module Content</b>
<b>Day-1 Monday 14.09.2020</b>	<b>Er. Samar Shailendra</b> Scientist at TCS Research & Innovation & Visiting faculty at IIIT Bangalore	10 AM to 11.30AM	Information Centric Networking
	<b>Dr. A Prakasa Rao</b> , Assoc. Prof., NITW, Warangal	2.30PM to 4.00PM	Optimization Techniques
<b>Day-2 Tuesday 15.09.2020</b>	<b>Dr. G. Rama Murthy</b> , Professor Dept. of CSE, Mahindra University, Hyderabad	10AM to 11.30AM	Reconfigurable Antennas: 6 -G Wireless Networks: Artificial Intelligence
		2.30PM to 4.00PM	Future of Reconfigurable Antennas: Research Directions
<b>Day-3 Wednesday 16.09.2020</b>	<b>Dr. S.Anuradha</b> , Associate Professor of ECE, NITW, Warangal	10.AM to 11.30AM	Challenging issues in Cognitive Radio Communication
	<b>Dr. D Vakula</b> , Assoc. Prof., NITW, Warangal	2.30PM to 4.00PM	Antennas for 5G Communication
<b>Day-4 Thursday 17.09.2020</b>	<b>Dr. Dhananjay Kumar</b> , Prof. and Head, Department of IT, Anna University, MIT Campus, Chromepet, Chennai.	10.AM to 11.30AM	System Integration and Opportunistic Scheduling in Cognitive Radio Networks
	<b>Er. M.Vinoth Manoharan</b> , Co-Founder & CTO Wilma Comm unications Groups (Asia   US   Europe)	2.30PM to 4.00PM	Array antenna design for cognitive radio application using RF switch
<b>Day-5 Friday 18.09.2020</b>	<b>Dr.P. Sreehari Rao</b> , Assoc. Prof, NITW, Warangal	10AM to 11.30AM	Integrated circuits for high speed communications – Future trends
	<b>Dr. Sumit Kumar</b> Research Associate at the Interdisciplinary Centre for Security, Reliability, and Trust of the University of Luxembourg	2.30PM to 4.00PM	Necessity of integration between 5G and Satcom Standardization Efforts Possible TN-NTN integration architectures and challenges
<b>Day-6 Saturday 19.09.2020</b>	<b>Dr. Abhinav Kumar</b> , Associate Professor, Department of Electrical Engg., IIT Hyderabad,	10AM to 11.30AM	Visible light based communications for beyond 5G networks
	<b>Dr.V.Srinivasa Rao</b> , Scientist –F , RCI ,Hyderabad	2.30PM to 4.00PM	Antennas for airborne and ground applications

Registration ID	Email address	Saltuation	Name of the participant	Designation	Name of the Department	Name of the Institution/University/Organization	Place of the Institution/University/Organization	State of the Institution/University/Organization	Contact Number
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VRECESTTP3015	pmkp70@gmail.com	Dr.	P.M.K.Prasad	Associate Professor	Electronics and Communication Engineering	GVP College of Engineering for Women	Visakhapatnam	Andhra Pradesh	9849962648
VRECESTTP3016	koresandhya1234@gmail.com	Ms.	Kore Sandhya	Other	ECE (communication engineering and signal processing)	Velagapudi Ramakrishna Siddharth Engineering college	Kanuru, Vijayawada-520007	Andhra Pradesh	07032543859
VRECESTTP3017	snehak@vrsiddhartha.ac.in	Mrs.	Sneha K	Assistant Professor	Electronics and Communication Engineering	Velagapudi Ramakrishna Siddhartha Engineering College	Vijayawada	Andhra Pradesh	9640028639
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VRECESTTP3020	guntu.raju21@gmail.com	Dr.	Guntu Nooka Raju	Assistant Professor	ECE	GMR Institute of Technology	Srikakulam	Andhra Pradesh	9959672818



Registration ID	Email address	Saltuation	Name of the participant	Designation	Name of the Department	Name of the Institution/University/Organization	Place of the Institution/University/Organization	State of the Institution/University/Organization	Contact Number
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VRECESTTP3022	srikanthkedari747@gmail.com	Mr.	Kedariseti srikanth	Other	Electronic and communication engineering	Kakinada institute of technology and science	Divili	Andhra Pradesh	8897201251
VRECESTTP3023	pranchithkumar@gmail.com	Mr.	P.RANCHITH KUMAR	Assistant Professor	ELECTRONICS AND COMMUNICATION ENGINEERING	UNIVERSITY COLLEGE OF ENGINEERING ARNI	UNIVERSITY COLLEGE OF ENGINEERING ARNI	TAMILNADU	9443963765
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# **STTP III**

## **REPORT ON TRENDS AND CHALLENGES IN DESIGN AND IMPLEMENTATION OF RECONFIGURABLE ANTENNAS FOR INCREASED SPECTRUM ACCESS IN COGNITIVE RADIO COMMUNICATION**

The STTP-III is organized by ECE department, VRSEC during **14<sup>th</sup> -19<sup>th</sup> September 2020**.

Cognitive radio (CR) is a cutting edge technology for wireless communications that requires the design of novel spectrum sensing schemes with high degree of reliability. These networks can dynamically allocate spectrum to multiple users, thereby easing network congestion.

Reconfigurable antennas play important roles in smart and adaptive systems which offer several advantages such as multifunctional capabilities, low front-end processing efforts. These make them well suited for use in wireless applications such as 4G and 5G mobile terminals.

**Er. Samar Shailendra**, Scientist at TCS Research & Innovation Visiting faculty at IIIT Bangalor is keynote speaker

### **The resource persons are:**

#### **Academicians**

1. **Er. Samar Shailendra**, Scientist at TCS Research & Innovation Visiting faculty at IIIT Bangalore
2. **Dr. Sumit Kumar** Research Associate at the Interdisciplinary Centre for Security, Reliability, and Trust of the University of Luxembourg
3. **Dr. G. Rama Murthy**, Prof. of CSE, Mahindra University, Hyderabad
4. **Dr. Dhananjay Kumar**, Prof. and Head, Department of IT, Anna University, MIT Campus, Chromepet, Chennai.
5. **Dr. A. Prakasa Rao**, Associate Professor, NITW, Warangal
6. **Dr. P. Sreehari Rao**, Associate. Professor, NITW, Warangal
7. **Dr. S.Anuradha** , Associate Professor of ECE, NITW, Warangal
8. **Dr. D Vakula**, Assoc. Prof., NITW, Warangal
9. **Dr. Abhinav Kumar**, Associate Professor, Department of Electrical Engineering., IIT Hyderabad,

#### **Industry experts**

1. **Er. M.Vinoth Manoharan** Co-Founder & CTO. Wilma Communications Groups (Asia | US | Europe)
2. **Dr.V.Srinivasa Rao**, Scientist –F , RCI ,Hyderabad

## Day 1: Session 1

**Er. Samar Shailendra**, Scientist at TCS Research & Innovation Visiting faculty at IIIT Bangalore. He delivered expert lecture on “**Information Centric Networking**”.

- Current internet architecture
- Challenges in the current internet
- Information centric networks
- Benefits of ICN
- ICN naming requirements

The screenshot shows a Zoom meeting interface. At the top, the time is 10:52 AM, and the meeting name is 'Zoom'. There are controls for 'REC', 'Leave', and a speaker icon. The main content is a slide titled 'Future with ICN – ICN in LTE Network'.

**Deployment Considerations**

- Support at User equipment
  - Native vs Dual Stack (ICN over IP)
- ICN at eNodeB and Mobile Gateways (SGW/PGW)
  - Has to be deployed as Dual Stack

The slide contains a network architecture diagram with the following components and layers:

- Application (Existing)**: Located at the User Equipment (UE).
- Native ICN Functions (New) + IP Functions**: Located at the UE.
- PDCP (Updated for ICN)**: Located at the UE.
- RLC (Existing)**: Located at the UE.
- MAC (Existing)**: Located at the UE.
- Physical (Existing)**: Located at the UE.
- Native ICN implementation at UE**: A label for the UE stack.
- eNodeB**: The radio access network node, with layers: PDCP, RLC, MAC, and Phy.
- ICN**: A label for the ICN stack at eNodeB.
- SGW**: The Serving Gateway, with layers: L2 and L1.
- PGW**: The PDN Gateway, with layers: L2 and L1.
- External Network**: The destination network, with layers: L2 and L1.
- Data Source**: Located at the External Network.

At the bottom of the slide, there is a footer: 'TATA CONSULTANCY SERVICES Experience certainty. Copyright 2016 | Tata Consultancy Services Limited | Strictly Confidential 53'. Below the slide, there is a video feed of the presenter and a Zoom control bar with buttons for 'Unmute', 'Start Video', 'Share', 'Participants', and 'More'.

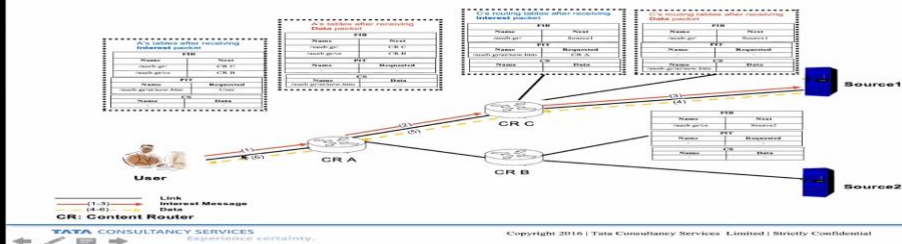
### State of The Art – NDN (3/3)

- **Caching**
  - ❖ Supports on-path and off-path caching
    - Each CR first consults its CS whenever it receives an INTEREST message
      - It caches all the DATA messages for the same INTEREST
      - CS uses LRU in general
    - Strategy layer can direct the INTEREST to a CDN server rather than to the originating publisher
- **Security**
  - ❖ Security layer added to provide security to the data
  - ❖ Each DATA message is secured through a signature over the name and the information content
- **Mobility**
  - ❖ User mobility – issue new INTEREST
    - Both routes will be having the data
  - ❖ Source mobility – FIB needs to be updated
    - Uses LBFL – Listen First Broadcast Later protocol

Samar's screen



### State of The Art – NDN (2/3)



Samar's screen



10:37 AM Zoom Leave

REC

### Caching in ICN

- > **Why Caching?**
  - Reduce redundant transmissions of same contents
  - ICN routers cache contents flowing through them – **multiple copies**
  - Can serve locally for any future demand of the content
- > **Caching as it Exists Today**
  - With reference to Web Caching
  - With reference to MANET
  - With reference to Operating System
- > **Why Caching is Different for ICN?**
  - Location of source, and caches is crucial
  - Improve local access instead of storage reliability
    - Storage efficiency is important,
    - Reliability is not the primary metric
  - Scale of data is much larger
    - One copy is always available at originator

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## Day 1 : Session 2

This session was presented by **Dr. A Prakasa Rao**, Associate. Professor, NITW, Warangal his talk on “**Optimization Techniques**”.

- Motivation
- Fundamental and antenna parameters
- Algorithm 1-LMS
- Algorithm 2-Gentic
- Algorithm 3- DE



REC

# Fundamental Parameters of Antennas

- Radiation Pattern
  - ▶ Isotropic, Directional, and Omnidirectional Patterns
  - ▶ Radiation Pattern Lobes
  - ▶ Field Regions
  - ▶ Radiation Power Density
  - ▶ Directivity
  - ▶ Gain
  - ▶ Antenna Efficiency
  - ▶ Half-Power Beamwidth
  - ▶ Beam Efficiency
  - ▶ Beamwidth
  - ▶ Polarization
  - ▶ Input Impedance

19

A Girdhar 8 NT-1's screen

3:45 PM 4G 44

Zoom

REC

Leave

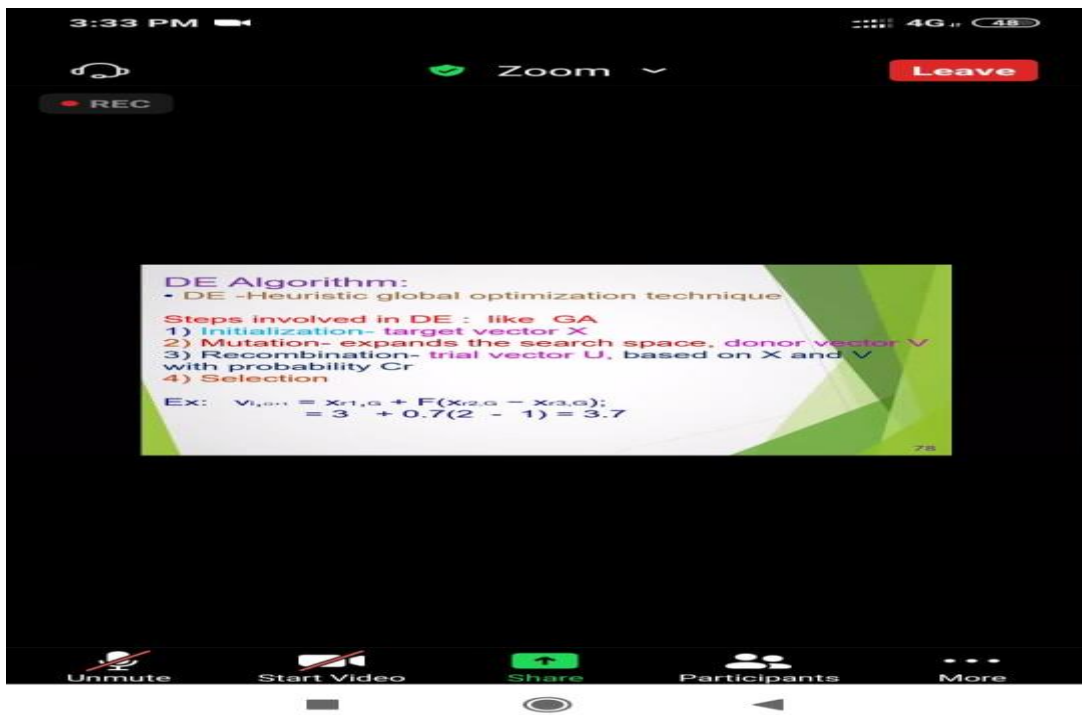
Simulation Results:

Two nulls at Undesired signal direction.

Fig. : Radiation pattern of 20 element linear array with nulls at  $25^\circ$  and  $45^\circ$  of the interference signals direction.

84

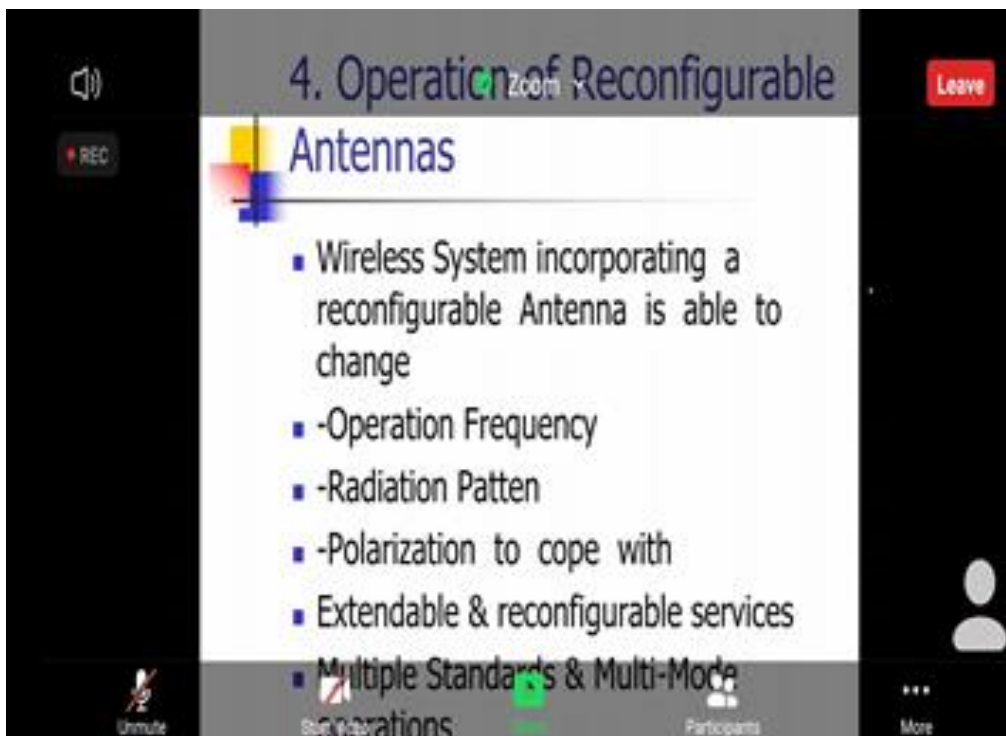
Unmute Start Video Share Participants More




## Day 2 Session 3

**Dr. G. Rama Murthy**, Professor Dept. of CSE, Mahindra University, Hyderabad his talk on “**Reconfigurable Antennas: 6 -G Wireless Networks: Artificial Intelligence**”.

- Reconfigurable antennas
- Overview of transition from 1G to 5G networks.
- Issue in design of 6G wireless system
- Innovations in design of 6G networks



 **Outline of the Talk**

- (1) Introduction to Wireless Communication System & Reconfigurable Antennas
- (2) Overview of Transition from 1G to 5G
- (3) Innovations in 6G Networks
- (4) Innovations in 6G Handsets
- (5) 6G Networks: Internet of Things (IoT)
- (6) 6G Networks: Artificial Intelligence
- (7) Future of 6G Networks

 **3. Innovations in Design of 6G Networks:**

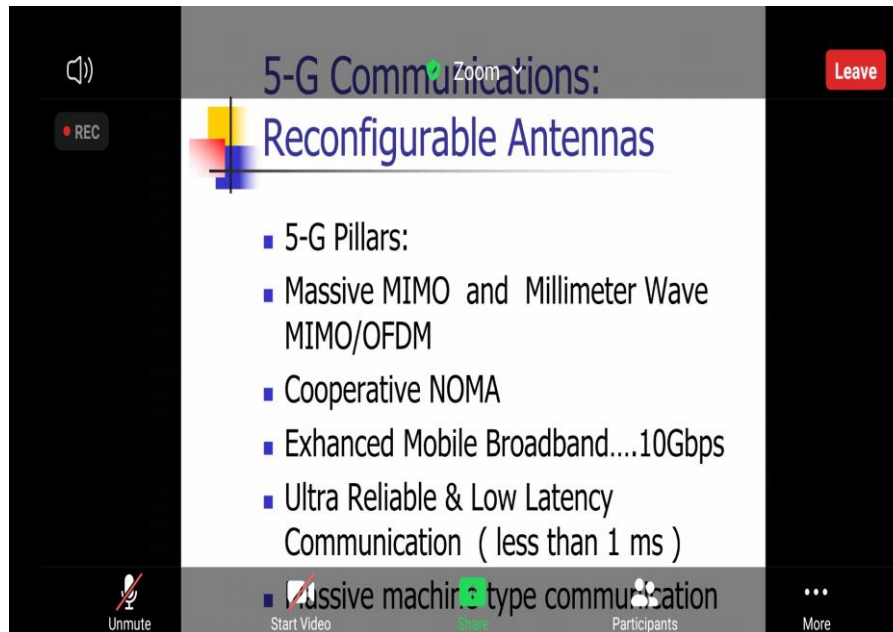
- Operations Support Systems:
  - -Network Management Systems
  - -Prediction of Seasonal Call Traffic
  - -Enable taking Intelligent Decisions for Network Operation & Maintainance
- Network Expansion & Network Upgradation---AI approaches

## Day 2 Session 4

**Dr. G. Rama Murthy**, Professor Dept. of CSE, Mahindra University, Hyderabad delivered lecture on “**Future of Reconfigurable Antennas: Research Directions**”.

The presentation is on

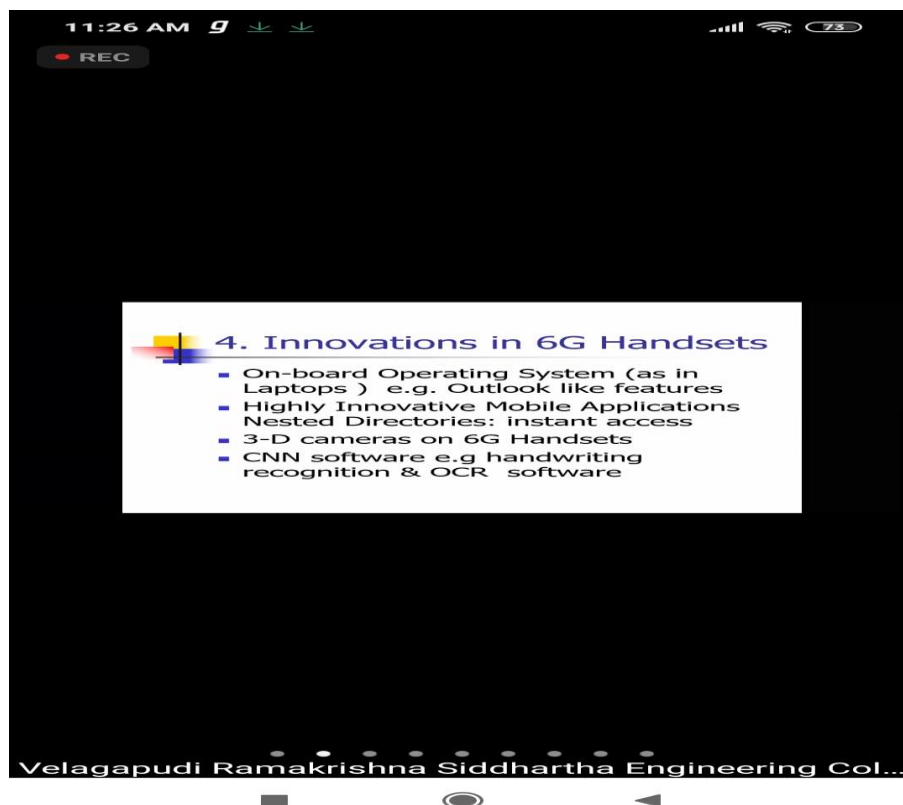
- Operation of reconfigurable antennas
- single reconfigurable features in antenna
- multiple reconfigurable features in antenna



A screenshot of a Zoom meeting slide. The slide title is "5-G Communications: Reconfigurable Antennas". The content includes a list of 5-G Pillars: Massive MIMO and Millimeter Wave MIMO/OFDM, Cooperative NOMA, Enhanced Mobile Broadband....10Gbps, Ultra Reliable & Low Latency Communication ( less than 1 ms ), and Massive machine type communication. The Zoom interface shows a "Leave" button in the top right, a "REC" indicator in the top left, and controls for Unmute, Start Video, Share, Participants, and More at the bottom.

### 5-G Communications: Reconfigurable Antennas

- 5-G Pillars:
  - Massive MIMO and Millimeter Wave MIMO/OFDM
  - Cooperative NOMA
  - Enhanced Mobile Broadband....10Gbps
  - Ultra Reliable & Low Latency Communication ( less than 1 ms )
  - Massive machine type communication



A screenshot of a Zoom meeting slide. The slide title is "4. Innovations in 6G Handsets". The content includes a list of innovations: On-board Operating System (as in Laptops ) e.g. Outlook like features, Highly Innovative Mobile Applications, Nested Directories: instant access, 3-D cameras on 6G Handsets, and CNN software e.g handwriting recognition & OCR software. The Zoom interface shows a "REC" indicator in the top left, a status bar at the top with the time 11:26 AM, and a footer at the bottom that reads "Velagapudi Ramakrishna Siddhartha Engineering Col...".

### 4. Innovations in 6G Handsets

- On-board Operating System (as in Laptops ) e.g. Outlook like features
- Highly Innovative Mobile Applications
- Nested Directories: instant access
- 3-D cameras on 6G Handsets
- CNN software e.g handwriting recognition & OCR software

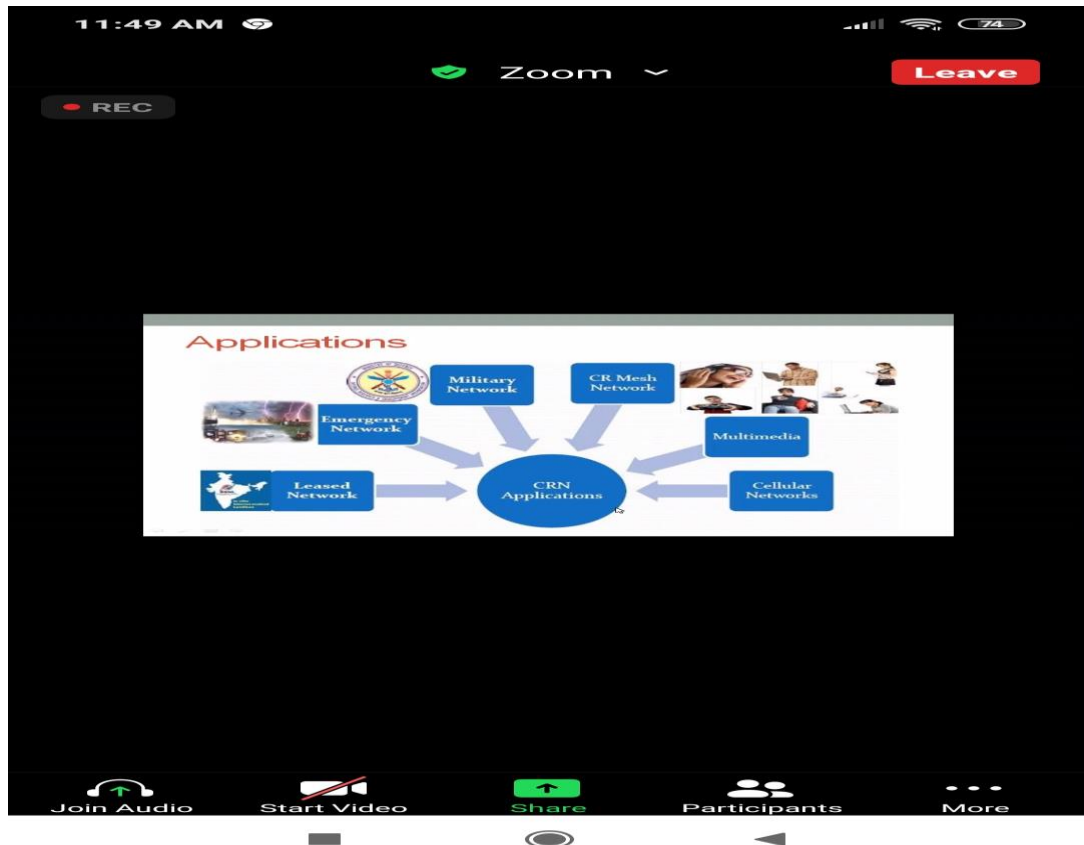
Velagapudi Ramakrishna Siddhartha Engineering Col...

## Day-3 Session 5

**Dr. S. Anuradha**, Associate Professor of ECE, NITW, Warangal presented about “**Challenging issues in Cognitive Radio Communication**”

The deliberations are about

- Modulation over AWGN channel
- Modulation schemes
- Adoption for FEC for massive wireless communications.



11:48 AM [Signal] [Wi-Fi] [74]

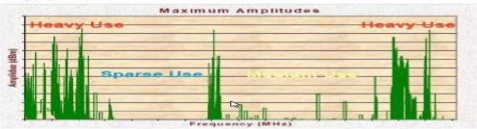
Zoom [Dropdown]

REC [Red]

**Cognitive Radio : It's a Radio technique that aims to utilize Radio Spectrum more efficiently by intelligently exploiting licensed spectrum.**

Need to exploit spectrum :  
 There is increasing number of smartphones & laptops every year which have different QoS requirements :

- Web browsing
- Faster Internet
- Multimedia downloads



Maximum Amplitudes

Heavy-Use Sparse-Use Medium-Use Heavy-Use

Amplitude (dB)

Frequency (MHz)

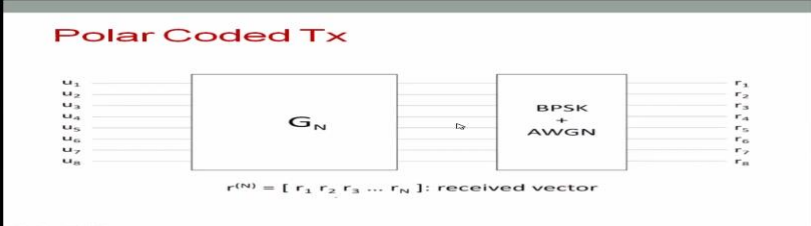
Join Audio Start Video Share Participants More

11:13 AM [Signal] [Wi-Fi] [76]

Zoom [Dropdown]

REC [Red]

**Polar Coded Tx**



$r^{(N)} = [ r_1 r_2 r_3 \dots r_N ]$  : received vector

Join Audio Start Video Share Participants More

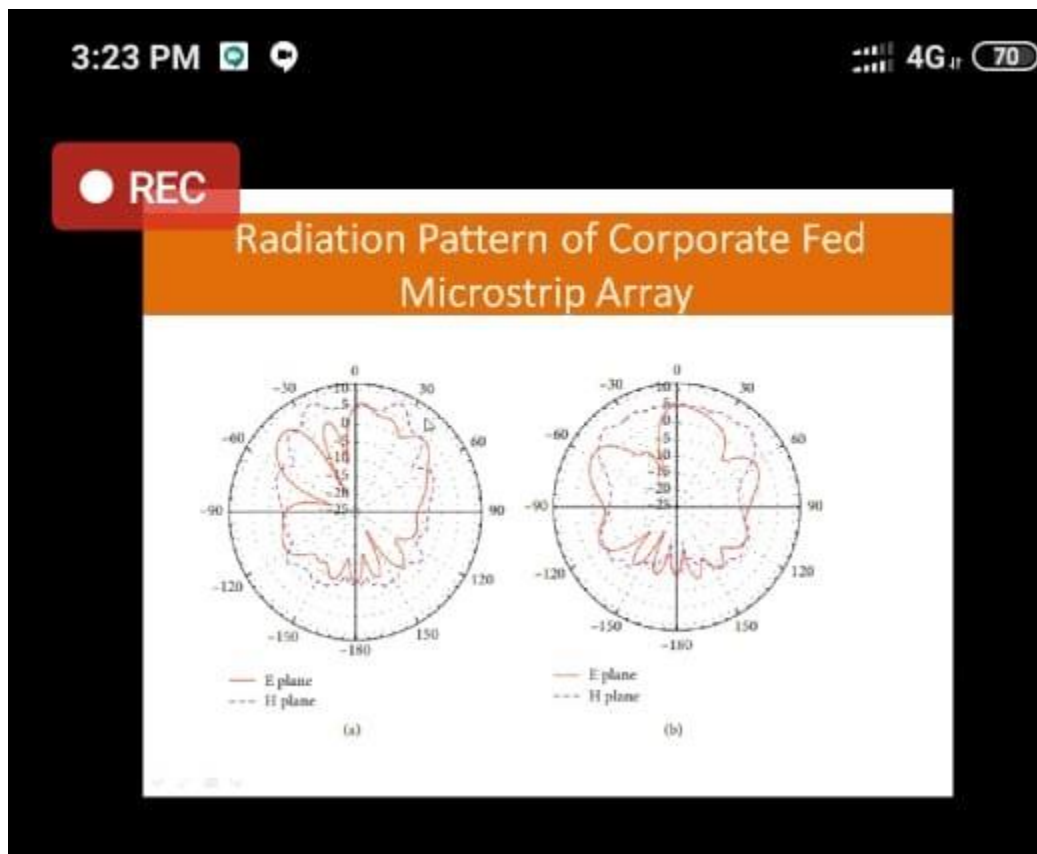


## Day-3 Session 6

**Dr. D Vakula**, Associate Professor, NIT Warangal presented her talk on “**Antennas for 5G Communication**”,

She explained about

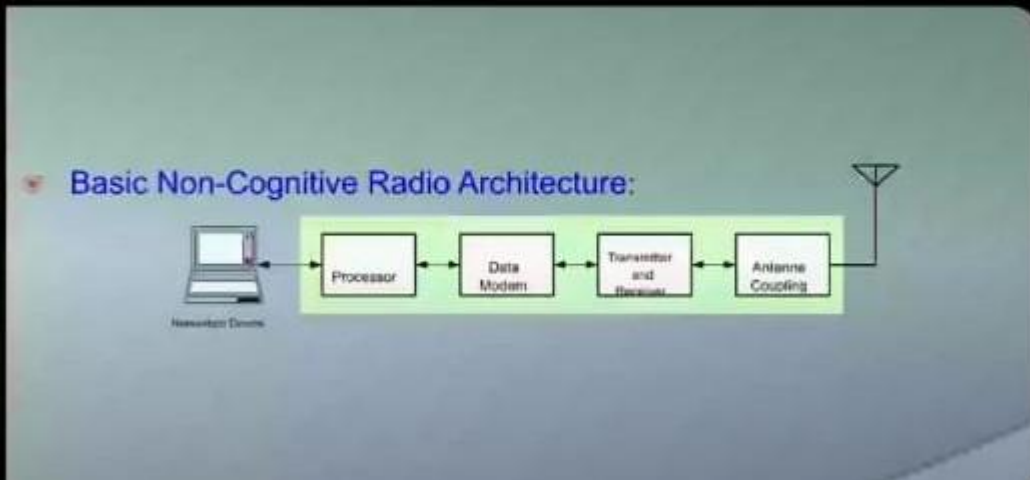
- 5G communication
- Millimeter antenna for 5G
- Corporate for microstrip array



## Day4 Session 7

**Dr. Dhananjay Kumar**, Professor. and Head, Department of IT, Anna University, MIT Campus, Chromepet, Chennai presented his talk on “**System Integration and Opportunistic Scheduling in Cognitive Radio Networks**”.

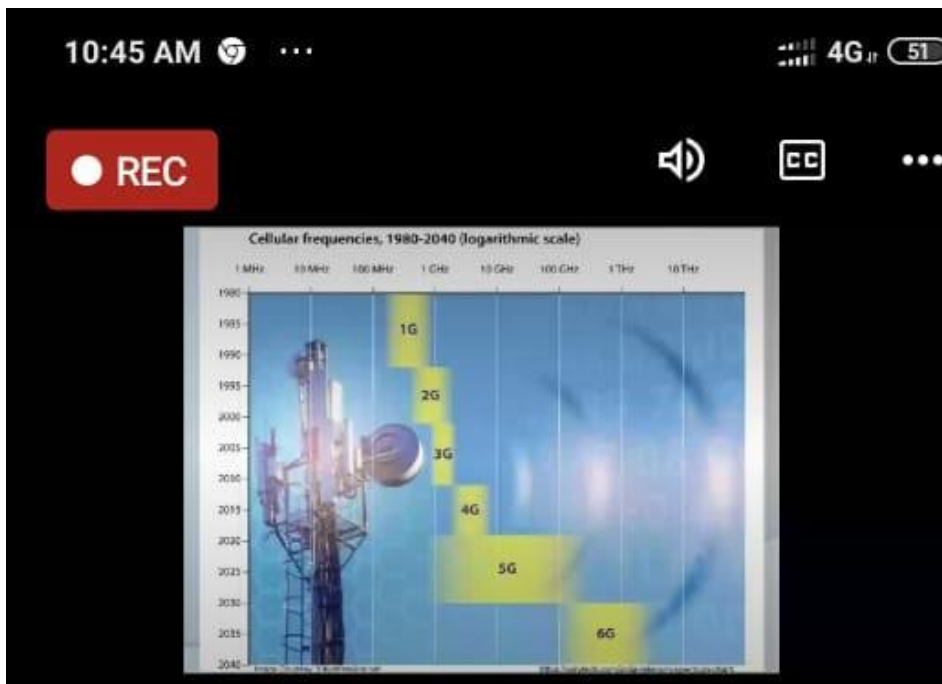
- System integration
- Cognitive radio
- Machine learning



### Pan India 2019 Spectrum Holding Chart

Circle\Operator	Bharti Airtel	Vodafone Idea	Reliance Jio
Delhi	7	8	5.1
Mumbai	0.2	5	10.2
Bilkate	5	2	5
Andhra Pradesh	5	2.4	5.8
Gujarat	0.2	10	9
Karnataka	0.5	0	5
Maharashtra	0.2	5	5
Tamil Nadu	3	5	0.2
Haryana	0.2	2.5	4
Goa	0.2	5	5
Madhya Pradesh	0.2	5	4.6
Punjab	0.2	1.8	5.1
Rajasthan	0.2	1.8	10
Uttar Pradesh East	10	1.8	1
Uttar Pradesh West	0.2	2	5

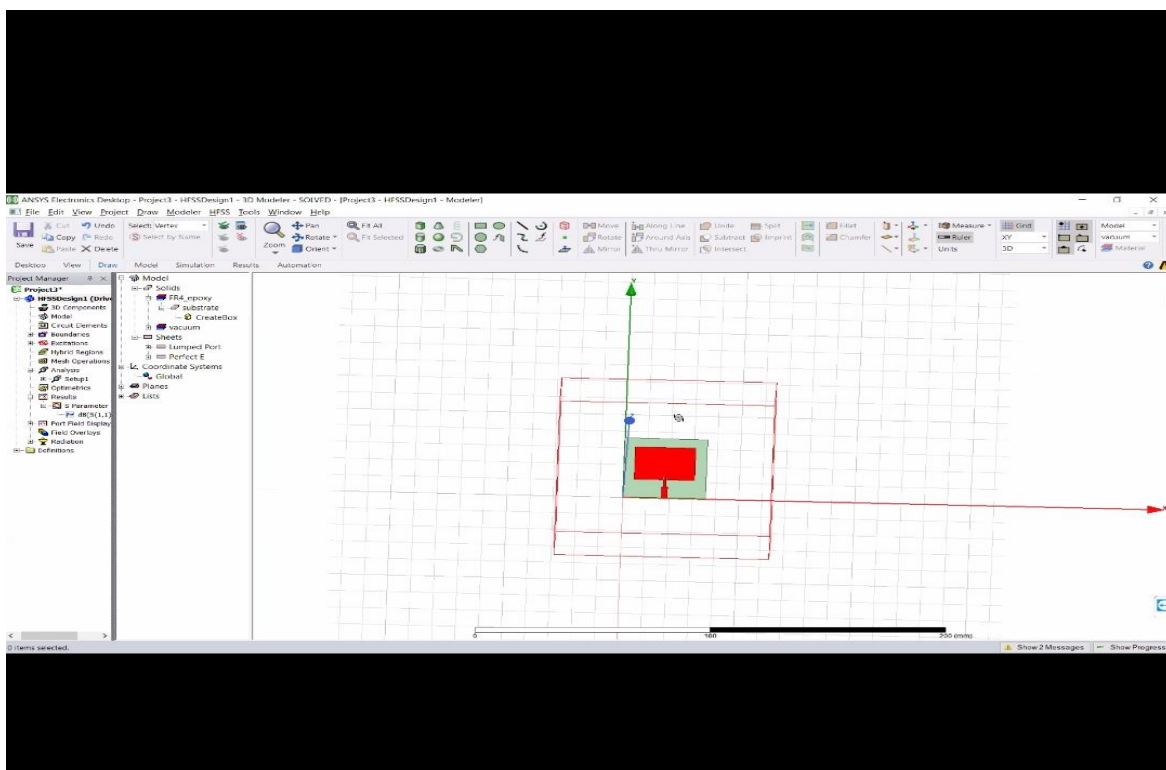
Block size for 700 MHz band is 5 MHz, for 800 MHz it is 1.25 MHz, for 900 and 1800 MHz bands it is 0.2 MHz, for 2100 MHz it is 0.5 MHz, for 2300 and 2500 MHz bands it is 10 MHz.

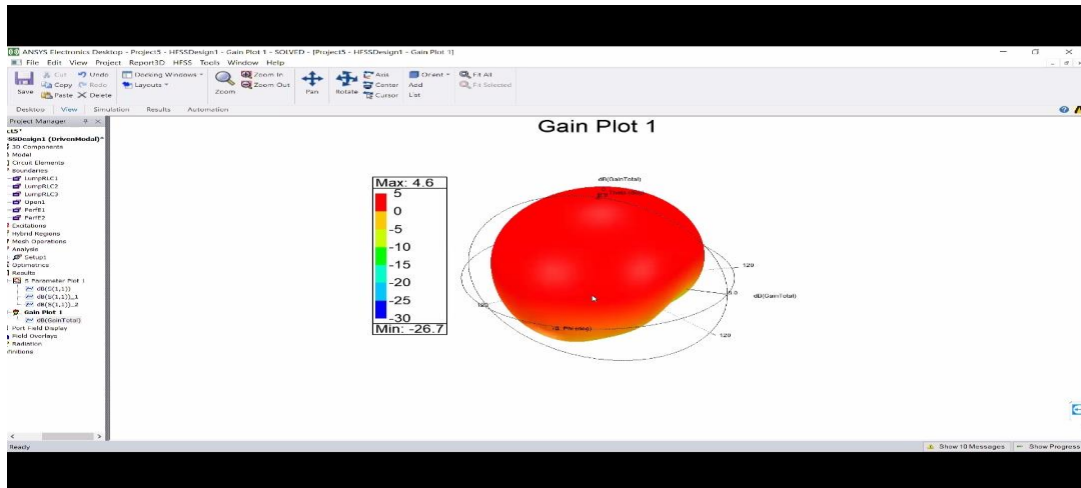


## Day4 Session 8

Er. M.Vinoth Manoharan , Co-Founder & CTO Wilma Communications Groups (Asia | US | Europe) presented his talk on “Array antenna design for cognitive radio application using RF switch,” .The session was designed in such a that the simulations were done for

- AI-SDN Adhoc network architecture for vehicle design
- Intelligent connectivity in transport network





## Day 5 Session 9

Dr.P. Sreehari Rao , Associate Professor, NITW, Warangal

The talk is on “Integrated circuits for high speed communications –Future trends”

He explained about

- Characteristics of THZ spectrum
- Electromagnetic spectrum and its designated frequency bands

10:49 AM  
REC

- Increasing demand for faster data rate and lower latency communication capabilities → higher Quality of Service (QoS) is expected.
- Applications, such as Virtual-Reality (VR), Augmented Reality (AR), and Internet-of-Things (IoT), point toward a landscape of demanding applications
- 5G caters to a wide range of applications—
  - smart homes to smart cities, and recreational services to mission critical applications, as shown in
- Enabling these applications and meeting the growing demand for wireless from all sectors of the economy → increased demand for the radio frequency spectrum.
- 5G is already being deployed
  - → spectrum expansion underway

5G usage case

Source: ITU

You

10:45 AM REC

THz Signal spectrum  
– challenges and opportunities for communications beyond 5G

Dr Sreehari Rao Patri,  
Head, Center for Innovation and Incubation  
NIT Warangal

You

11:15 AM REC

Total Pathloss from 0.1 to 10 THz frequency with 20% (5 g/m<sup>3</sup>) concentration of water vapor at 25°C

- As we move higher in the spectrum, the path loss is not constant.
- Instead, it has occasional attenuation peaks of more than 200 dB, *which makes it challenging to use a continuous frequency band*
- These peaks are specific to an operating frequency and **need to be avoided for higher throughput.**
- However, avoiding these peaks results in *the reduction of the size of channels.*
- Availability of continuous bandwidths and operating frequency becomes condition environment

You

## Day 5 Session 10

Dr. Sumit Kumar, Research Associate at the Interdisciplinary Centre for Security, Reliability, and Trust of the University of Luxembourg presented his talk on “Necessity of integration between 5G and Satcom Standardization Efforts, Possible TN-NTN integration architectures and challenges”.

- Introduction to 4G/5G and satellite communication
- Standardization efforts



3:28 PM REC

### Timing Advance – Principle

SNT securityandtrust.hu

43

You

2:56 PM REC

### What an integrated TN and NTN will look like

SNT securityandtrust.hu

43

You

2:53 PM REC

### Non Terrestrial Network Platforms General Specifications

Platforms	Altitude range	Orbit	Typical beam footprint size
Low-Earth Orbit (LEO) satellite	300 – 1500 km	Circular around the earth	100 – 1000 km
Medium-Earth Orbit (MEO) satellite	7000 – 25000 km		100 – 1000 km
Geostationary Earth Orbit (GEO) satellite	35 786 km	notional station keeping position fixed in terms of elevation/azimuth with respect to a given earth point	200 – 3500 km
UAS platform (including HAPS)	8 – 50 km (20 km for HAPS)		5 - 200 km
High Elliptical Orbit (HEO) satellite	400 – 50000 km	Elliptical around the earth	200 – 3500 km

SNT securityandtrust.hu

44

You



## Day6 Session 11

- **Dr. Abhinav Kumar**, Associate Professor, Department of Electrical Engg., IIT Hyderabad,

The talk is on “Visible light based communications for beyond 5G networks”.

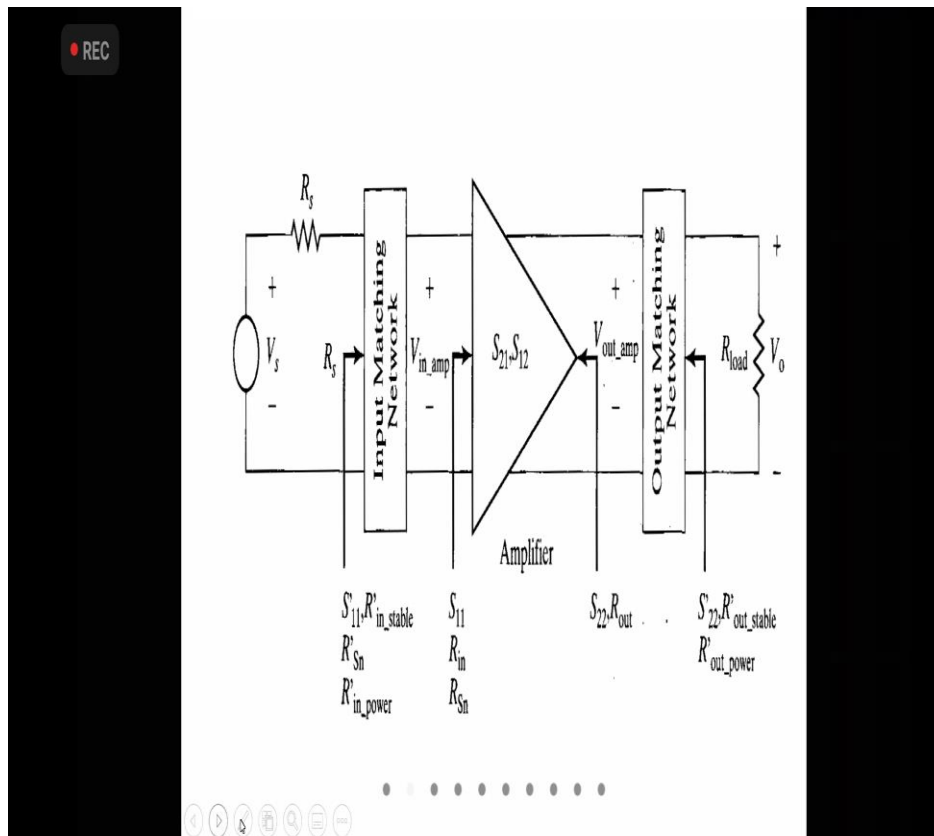

- perfectly DC balanced codes
- low complexity high rate codes

REC

### APPROACH

- i) lumped parameter approach:
  - Stability, gain and noise performance are obtained using bode plots
  - Here  $V$  and  $I$  are the variables of interest and 2-port representations such as  $y, z, h$  and  $g$  are adopted.
- ii) Distributed parameter approach
  - → takes into account the distributive nature of the ckts and Smith charts are used
  - Devices and termination networks are considered together
  - Primary variable of interest: Power
  - S-parameters!

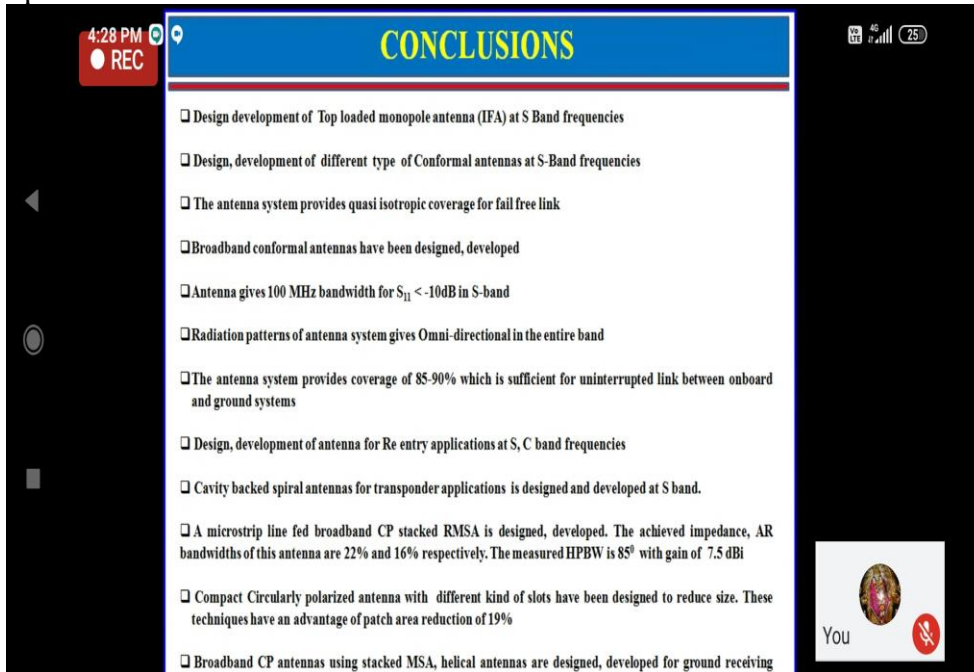
SREE HARI RAO P's screen



## Day 6 Session 12

**Dr. V. Srinivasa Rao**, Scientist –F, RCI , Hyderabad, Presented his talk on“ **Antennas for airborne and ground applications**”

- Types of antennas
- Basic parameters
- Link budget
- Monopole antennas
- Spiral antenna



At the end **Dr. A.Jhansi Rani** , coordinator of STTP proposed vote of thanks and conducted the online exam to the participants and issued e-certificates to the all eligible participants.