

# The Institution of Engineers (India)

## TIRUCHIRAPPALLI LOCAL CENTRE

BHEL Main Office Road, Tiruchirappalli – 620 014

# NEWS LETTER

ISSUE NO.11 | NOVEMBER 2021 | PAGES: 11

### EDITORIAL NOTE

Warmest Greetings from IEI TLC. On behalf of IEI TLC committee for the period 2021-2023, glad to share that IEI TLC is marching ahead and scaling new peaks based on the foundation and path laid by utmost dedication and Visionary leadership.

Today, IEI TLC has 2448 corporate members, 27 student chapters and 7 institutional members. Besides, it has more than 7000 ST members in its fold. IEI TLC will enter into the 50 year of its services by 2022 and the Golden Jubilee Celebrations will be in 2023.

Dr.A.P.J. Abdul Kalam, memorial status was inaugurated by Dr.Mrs.Mini Shaji Thomas, Director, National Institute of Technology, Tiruchirappalli, in our IEI TLC campus on 29<sup>th</sup> October 2021 in the presence of committee members and corporate members of The Institution of Engineers, Trichy.

Thank You

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### THE TEAM

#### Editors

Er.R.Selvaraj MIE

Dr.Ravimaran MIE

Dr.S.Titus MIE

#### Chairman

Er. N.Rajasekaran FIE

#### Hon. Secretary

Dr. Kevin Ark Kumar, MIE

#### Joint Secretary

Er.S.P.Lakshmanan MIE

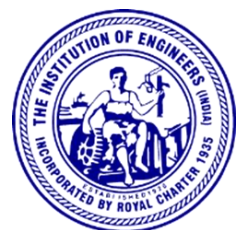
#### Joint Secretary

Dr.P.R.Venkateswaran MIE

### Important Communication from IEI

The national council election 2021 is under progress and it ends on 29<sup>th</sup> November 2021. Hence all corporate members are requested to vote for TLC members. The candidates are Dr. S. Karuppasamy, FIE(Mechanical) Dr. S.Dharmalingam, FIE (Electrical) Mr. R. Selvaraj, FIE (Production).

The 36th Indian Engineering Congress will be held in physical mode at Vigyan Bhawan, New Delhi during 26-28 December 2021 on the theme "Engineers for Viable Technology and \$5 Trillion Economy".



# About IEI Tiruchirappalli Local Centre (TLC)

The Institution of Engineers (India) or IEI is the largest multidisciplinary professional body that encompasses 15 engineering disciplines and gives engineers a global platform to share professional interest. Tiruchirappalli Local Centre of the Institution of Engineers (India) is located in Bharat Heavy Electrical Limited (B.H.E.L.) factory campus,

Tiruchirappalli. Tiruchirappalli Centre was inaugurated in the year 1973. Technical lectures are being conducted every week covering all branches of engineering. The new committee was constituted from 1<sup>st</sup> November 2021 under the chairmanship of Er.N.Rajasekaran, and leadership of Dr.Kevin Ark kumar Hon Secretary.

## Dr.A.P.J Abdul Kalam Statue Inauguration

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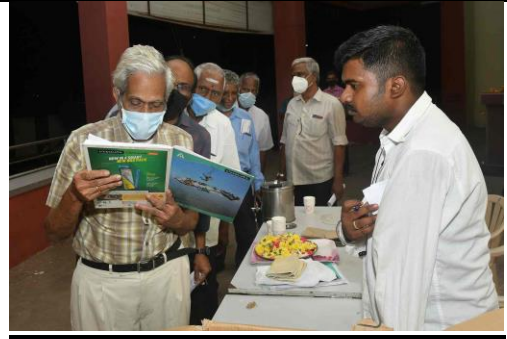
## New Committee Formation











## **New Chairman for IEI Tiruchirappalli Local Centre**

On 29th October 2021, **Er.N.Rajasekaran**, F.I.E., General Manager, B.H.E.L Trichy, has been elected as new Chairman for Institution of Engineers (India), Tiruchirappalli Local Centre. The IEI TLC team whole heartedly congratulates the new Chairman!!!



## **New Committee Members of IEI TLC 2021-23**

### **Chairman:**

Er. N.Rajasekaran FIE.( **F-1222127**)  
General Manager  
Bharat Heavy Electricals Ltd.  
Tiruchirappalli-14.  
944250283065  
[srirangamlc@gmail.com](mailto:srirangamlc@gmail.com)

### **Hon. Secretary:**

Dr. Kevin Ark Kumar MIE.(M-1506263)  
Deputy Manager  
Bharat Heavy Electricals Ltd.  
Tiruchirappalli-14  
94892 02825  
[Kevin@bhel.in](mailto:Kevin@bhel.in)

**Immediate Past Chairman:**

Dr. N. Kumaresan FIE (F-1218588)  
Dean (SW) & Professor (EEE)  
National Institute of Technology  
Tiruchirappalli-15.  
94890 89101  
nkumar@nitt.edu

**Immediate Past Secretary:**

Er. A. Anand MIE.(M-1539110)  
Manager, Bharat Heavy Electricals Ltd.  
Tiruchirappalli-14.  
94422 36476  
a.anand@bhel.in

**Committee Members:**

Er. R. Mani (AM-1081732)  
Former Chief Engineer  
Agricultural Engineering Department  
Government of Tamil Nadu.  
9443914418  
mani.ramasamy1960@gmail.com

Dr. G. Subbaiyan FIE (F-1259829)  
Professor.  
Department of Architecture  
National Institute of Technology  
Tiruchirappalli-15  
9842481311  
subbaiah@nitt.edu

Er. S. Arunvinthan AMIE.(AM-1711604)  
Senior Research Fellow  
Sastra Deemed University  
Thirumalaisamudram  
97878 73848  
sarunvinthan@gmail.com

Er. S. P. Lakshmanan MIE (M-1561612)  
Manager  
Bharat Heavy Electricals Ltd.  
Tiruchirappalli-14.  
94425 71576  
splakshmanan@bhel.in

Dr. S. Ravimaran MIE (M-1437156)  
Principal  
M.A.M. College of Engineering  
Tiruchirappalli  
9443076222  
diprivi@gmail.com

Dr. G. Swaminathan FIE.(F-1140287)

Dr. S. Dharmalingam  
Former General Manager,  
Bharat Heavy Electricals Ltd.,  
Tiruchirappalli-14.  
Contact no. 9443342066  
sdharma59@gmail.com

**Tamilnadu State Centre Member**

Dr.S.Karuppasamy FIE.(F-0176016),  
Former Additional General Manager,  
Bharat Heavy Electricals Ltd.,  
Tiruchirappalli-14.  
Contact no.94430 90460  
sksamy.bhel@gmail.com

Professor  
Department of Civil Engineering.  
National Institute of Technology  
Tiruchirappalli-15  
9443765457  
gs@nitt.edu

Er. R. Murugesan MIE (M-1557127)  
Managing Director  
Kanishya Properties  
D35A 7th Cross ,Thillai Nagar  
Tiruchirappalli -18  
9842412366  
valuermurugesan@gmail.com

Er. B. Chandrakanth MIE.(M-1465155)  
Managing Director  
CK Engineers  
94431 31373  
Chandrakanth.bala@gmail.com

Dr. Titus S. MIE.,(M-1437091)  
Professor, Department of EEE  
K. Ramakrishnan college of Engineering  
Tiruchirappalli-621 112.  
9443690147  
Drs.titus1@gmail.com

Dr. P. R. Venkateswaran (M-1423996)  
Manager, WRI  
Bharat Heavy Electricals Ltd.  
Tiruchirappalli-14  
9442293115, prveswaran@bhel.in

Er. S. Sundaramoorthy MIE (M-1206197)  
Former Deputy General Manager (Safety)  
Bharat Heavy Electricals Ltd.  
Tiruchirappalli-14.  
94425 02893  
ssmoorthybhel@gmail.com

Er. S. Lakshmanan MIE (M-1549728)  
Deputy Manager  
Bharat Heavy Electricals Ltd.  
Tiruchirappalli-14.  
94421 13936, laks@bhel.in

Former Dy. Supt. of Engineer (Mining)  
NLC India Limited  
Neyveli  
9715238001  
Kvac39@gmail.com

Dr. T. Senthil Kumar FIE.(F-1206458)  
Professor & Dean  
Anna University,(BIT Campus)  
Tiruchirappalli  
94432 67846  
kmtsenthil@gmail.com

Er. S. Kalidoss (AM-1460032)  
Professor  
Marine department  
Sri Venkateswara college of engineering  
Sriperumbudur.  
9500181788  
sambandomkalidoss1964@gmail.com

Er. V. G. Kadirvel FIE.( F-0184051)  
Former Additional General Manager  
Bharat Heavy Electricals Ltd.  
Tiruchirappalli-14.  
9442559559  
kadirvellvg@gmail.com


Er. R. Selvaraj FIE (F-1212636)  
Former Senior Deputy General Manager  
Bharat Heavy Electricals Ltd.  
Tiruchirappalli-14.  
94897 46623  
Selva.mkk3@gmail.com

Er. D. Varatharajalu MIE.(M-10544796)  
Former Deputy General Manager  
Bharat Heavy Electricals Ltd.  
Tiruchirappalli-14.  
Contact no.86102 69986  
dvrajalu@gmail.com

Er. P. V. Kandasamy MIE.(M-1489873)  
Correspondent  
Arul Murugan College of Engineering & Polytechnic  
college  
94439 42425  
karurpvk@yahoo.com

Er. V. Annamalai MIE.(M-1364965)

## **Technical activities carried out by Tiruchirappalli Local Centre**

Name of Centre / Overseas Chapter:		TIRUCHIRAPPALLI LOCAL CENTRE	
Title of Activity:		Antenna design and Measurement	
Activity under Divisional Board		Electronics & Communication Engineering	
Date:	02-11-2021 at 5.30 p.m.	Mode:	Online-Zoom
No. of Participants : 20			
<b>Speaker :</b> Mrs. S Kavitha, Assistant Professor. Electronics & Communication Engineering Department, MAM College of Engineering & Technology, Tiruchirappalli.		<b>Speaker :</b> 	



Tiruchirappalli Local Centre of The Institution of Engineers (India), organized a lecture on 2<sup>nd</sup> November 2021 at 5.30 pm through virtual mode. Mrs. S Kavitha, Assistant Professor, Electronics & Communication Engineering Department, MAM College of Engineering & Technology, Tiruchirappalli, delivered a lecture on the Topic "Antenna design and Measurement". More than 20 participants have attended the online programme.

Er. N. Rajasekaran, Chairman, Tiruchirappalli Local Centre of IEI presided over the event and welcomed the gathering. Er. S. Samidas, Past Chairman introduced the speaker to the audience. Er. J. Sankaran, Past Chairman proposed the vote of thanks. Er. R. Selvaraj, Past Chairman conducted the proceedings.

### **Salient Features of the Lecture:**

The Micro strip or patch antennas are becoming increasingly useful because they can be printed directly onto a circuit board. Micro strip antennas are becoming very widespread within the mobile phone market. Patch antennas are low cost, have a low profile and are easily fabricated. They have been widely employed for the civilian and military applications such as television, broadcast radio, mobile systems, global positioning system (GPS), radio-frequency identification (RFID), multiple-input multiple-output (MIMO) systems, vehicle collision avoidance system, satellite communications, surveillance systems, direction founding, radar systems, remote sensing, biological imaging, missile guidance, and so on. Despite the many advantages of typical microstrip antennas, they also have three basic disadvantages: narrow bandwidth, low gain, and relatively large size.

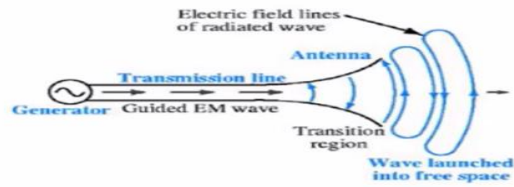
The narrow bandwidth is one of the main drawbacks of these types of antennas. The most common and desired measurements are an antenna's radiation pattern including antenna gain and efficiency, the impedance or VSWR, the bandwidth, and the polarization. For antenna testing, the most fundamental device is the VNA [Vector Network Analyzer]. The simplest type of VNA is a 1-port VNA, which is able to measure the impedance of an antenna Free space ranges are antenna measurement locations designed to simulate measurements that would be performed in space. That is, all reflected waves from nearby objects and the ground (which are undesirable) are suppressed as much as possible.

The most popular free space ranges are anechoic chambers, elevated ranges, and the compact range. Elevated Ranges are outdoor ranges. In this setup, the source and antenna under test are mounted above the ground. These antennas can be on mountains, towers, buildings, or wherever one finds that is suitable. This is often done for very large antennas or at low frequencies (VHF and below, <100 MHz) where indoor measurements would be intractable. Although 5G wireless requires more complex signal processing and the ability to handle much higher data rates than previous protocols, one of the keys to its success is antenna design. The challenge for antenna designers is physics. A 1GHz signal, which is in FR1, has a wavelength of about 30 centimeters (cm). A 28 GHz signal in FR2 has a wavelength of 1.07 mm. The same antenna will not work for these two signals, so 5G devices operating in both FR1 and FR2 bands will require at least two sets of antennas. This is manageable in large equipment and base stations that have room for multiple antenna arrays. It becomes a significant design challenge for small devices and cell phones.

***Until normalcy is restored, Tiruchirappalli Local Centre is planning to conduct the weekly lecture program every Tuesday evening by online mode.***

# ANTENNA

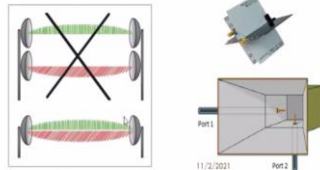
- An antenna is a device that provides a transition between guided electromagnetic waves in wires and electromagnetic waves in free space.



11/2/2021

## Dual Polarized Antenna

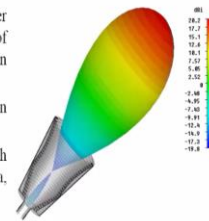
- A Dual Polarized Antenna can be used for transmitting or receiving both horizontal and vertical polarized signals instead of having two antennas which saves time and space.
- RF switching is needed as two of these ports have to be connected to the VNA



11/2/2021

## Antenna Gain

- Gain describes how much power is transmitted in the direction of peak radiation to that of an isotropic source
- Unlike directivity, antenna gain takes the losses into account
- It's expressed in dBi, with respect to an isotropic antenna, or in dBd, with respect to dipole



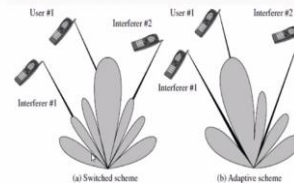
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## CELL SECTORING




Cell sectoring did not provide the adequate solution needed for the capacity problem. Therefore, a system required that could dynamically sectorize a cell.

## SWITCHED BEAM AND ADAPTIVE ARRAY RADIATION PATTERN



11/2/2021

Name of Centre / Overseas Chapter:		TIRUCHIRAPPALLI LOCAL CENTRE	
Title of Activity:		Artificial Intelligence-The Future World	
Activity under Divisional Board		Computer Engineering	
Date:	09-11-2021 at 5.30 p.m.	Mode:	Online-Zoom
No. of Participants : 45			
<b>Speaker :</b> <b>Dr.P.Gokulakrishnan,</b> <b>Professor,</b> <b>Department of Computer Science Engineering,</b> <b>PSNA College of Engineering and Technology,</b> <b>Dindigul.</b>		<b>Speaker</b> 	

The Tiruchirappalli Local Centre of The Institution of Engineers (India), jointly with Computer Society of India, Tiruchirappalli Chapter, organized a lecture on 9th November 2021 at 5.30 pm through virtual mode. Dr. P. Gokulakrishnan, Professor, Department of Computer Science Engineering, PSNA College of Engineering and Technology, Dindigul, delivered a lecture on the Topic “**Artificial Intelligence-The Future World**”. More than 45 participants have attended the online programme.

Er. N. Rajasekaran, Chairman, Tiruchirappalli Local Centre of IEI presided over the event and welcomed the gathering. Dr. S. Titus Committee Member Tiruchirappalli Local Centre of IEI, introduced the speaker to the audience. Er. R. Sivakumar, MIE, proposed the vote of thanks. Er. R. Selvaraj, Past Chairman conducted the proceedings.

### **ARTIFICIAL INTELLIGENCE - THE FUTURE WORLD**

The webinar presented on the topic “Artificial Intelligence - The Future World” focuses on how the AI will contribute in the future for diverse applications to the mankind. Much focus is given on the top five emerging domains in 2021.

Intelligence can be expressed as:

- i. the ability to comprehend; to understand and profit from experience.
- ii. general mental capability that involves the ability to reason, plan, solve problems, think abstractly, comprehend ideas and language, and learn.
- iii. effectively perceiving, interpreting and responding to the environment.

Artificial Intelligence is termed as:

- i. Field of computer science
- ii. associated with the concept of machines “thinking like humans”.
- iii. to perform tasks such as learning, problem-solving, planning, reasoning, and identifying patterns.
- iv. Theory and Development of Computer Systems,
- v. able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.

The applications of Artificial Intelligence is very vast and a few are:

- i. Autonomous Planning and Scheduling
- ii. Logistics / Transportation, Smart Vehicles
- iii. Game Playing (Chess, Tic-Tac-Toe)
- iv. Autonomous Control (Smart machines)
- v. Diagnosis (Medical)
- vi. Intelligent Transportation
- vii. Robotics (Automation)
- viii. Language understanding and problem solving (NLP, Voice/Speech Recognition / Synthesis), etc.

To be specific it is assumed that AI is emerging in the following domains in 2021:

1. *Conversational AI*
2. *Ethical AI*
3. *The Fusion of AI and IoT (AIoT)*
4. *AI in Cyber-security*
5. *Quantum AI*

### Top 5 Emerging AI Trends in 2021

1. **Conversational AI**

Chat-bots,  
Virtual Personal Assistants,  
Virtual Customer Assistants

- AI will boost 95 percent of customer interactions by 2025
- Voice assistants to triple in usage from 2.5 billion in 2018 to 8 billion by 2023.
- Around 80 percent of businesses will use some form of chat-bot systems by the end of 2021.

3. **The Fusion of AI and IoT (AIoT)**

AIoT enables an organization to reach greater heights by providing:

- Intelligent decision-making,
- Customer delight,
- Accurate prediction,
- Identification of cost savings,
- and Increased operational efficiency.

"A report by Business Insider predicts that by 2025, companies are likely to invest up to USD 15 trillion in IoT."

### An Example – Vacuum Cleaner Agent

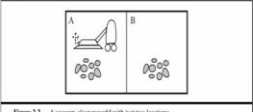


Figure 2.2 A vacuum-cleaner world with just two locations.


Percept sequence	Action
[A, Clean]	Right
[A, Dirty]	Suck
[B, Clean]	Left
[B, Dirty]	Suck
[A, Clean], [A, Clean]	Right
[A, Clean], [A, Dirty]	Suck
...	...
[A, Clean], [A, Clean], [A, Clean]	Right
[A, Clean], [A, Clean], [A, Dirty]	Suck
...	...

Figure 2.3 Partial tabulation of a simple agent function for the vacuum-cleaner world shown in Figure 2.2.

### Problem Solving - Water Jug Problem(1)

**Water Jugs Problem**


Given 4-liter and 3-liter pitchers, how do you get exactly 2 liters into the 4-liter pitcher?



State: (x, y) for # liters in 4-liter and 3-liter pitchers, respectively  
 Actions: empty, fill, pour water between pitchers  
 Initial state: (0, 0)  
 Goal state: (2, \*)

## Intelligence?

- The ability to comprehend; to understand and profit from experience.
- A general mental capability that involves the ability to reason, plan, solve problems, think abstractly, comprehend ideas and language, and learn.
- Is effectively perceiving, interpreting and responding to the environment.

Name of Centre / Overseas Chapter:		TIRUCHIRAPPALLI LOCAL CENTRE	
Title of Activity:		Reconfigurable Computing for Wireless Applications	
Activity under Divisional Board		Electronics & Communication Engineering	
Date:	23-11-2021 at 5.30 p.m.	Mode:	Online–Zoom
No. of Participants : 35			
<b>Speaker :</b> Dr C Vennila, Professor, Department of Electronics & Communication Engineering, Saranathan College of Engineering, Tiruchirappalli.		<b>Speaker :</b> 	

The Tiruchirappalli Local Centre of The Institution of Engineers (India) in association with Computer Society of India, Tiruchirappalli Chapter, organized a lecture on 23<sup>rd</sup> November 2021 at 5.30 pm through virtual mode. Dr C Vennila, Professor, Department of Electronics & Communication Engineering, Saranathan College of Engineering, Tiruchirappalli, delivered a lecture on the Topic “**Reconfigurable Computing for Wireless Applications**”. More than 35 participants have attended the online programme. Er. N. Rajasekaran, Chairman, Tiruchirappalli Local Centre of IEI presided over the event and welcomed the gathering. Er. S. Samidas, Past Chairman introduced the speaker to the audience. Er. R. Sivakumar MIE proposed the vote of thanks. Er. R. Selvaraj, Past Chairman conducted the proceedings.

## RECONFIGURABLE COMPUTING FOR WIRELESS APPLICATIONS

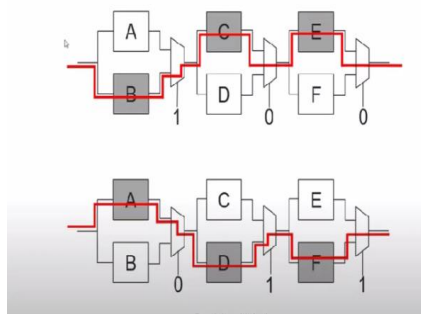
The semiconductor industry has evolved from the first ICs of the early 1970s and matured rapidly since then. Field programmable gate-arrays (FPGAs) are one of the largest growing segments of the semiconductor industry. FPGAs are mainly used today for rapid-prototyping purposes. They can be reconfigured many times for different applications. There is a new concept evolving in FPGA industry to create systems that are able to manage configuration at runtime. These systems use the flexibility of an FPGA by changing the configuration partially. Only the necessary functions are configured in the chip's memory.

A function can be replaced by another function while other parts stay operative. The so-called dynamic partial reconfiguration (DPR) can be exploited in many application fields, for instance to fulfill space requirements in small portable systems, to create a system-on-a-chip with a very high level of flexibility, to realize adaptive hardware algorithms, and so on. Modern state-of-the-art FPGA devices like Xilinx FPGAs additionally support dynamic partial run-time reconfiguration which reveals new aspects for the designer who wants to develop future applications demanding adaptive and flexible hardware. Especially in the domain of wireless communication applications will benefit from the capabilities of the new generation.

Reconfigurable computing is used in a variety of applications such as wireless communications, data encryption, audio and video processing, automatic target recognition and in space-based applications. Its key feature is the ability to perform computations in hardware to increase performance, while retaining much of the flexibility of a software solution. Modern wire line and wireless communication devices are multimode and multifunctional communication devices. In order to support multiple standards on a single platform, it is necessary to develop a reconfigurable architecture that can provide the required flexibility and performance.

In recent years, a number of wireless protocols are emerging. There is a demand for incorporating many of these protocols in a single hand-held wireless device. There is a high demand for a common hardware platform that can support multiple standards to provide the flexibility for supporting seamless services between various wireless protocols/ networks in a single hand-held wireless device.

### Hardware Adaptation: Multiplexing



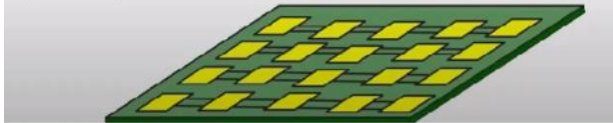
### Partial Reconfiguration (PR)

- Selectively modifying portions of FPGA configuration
- Remaining portions continue to operate.
- Allows time multiplexing of functionalities.
- Increased effective logic capacity.
- Reduces power consumption.
- Can reduce overall system cost.
- Virtualization (Sharing of same FPGA among multiple users)



## Partial Reconfiguration Terminology

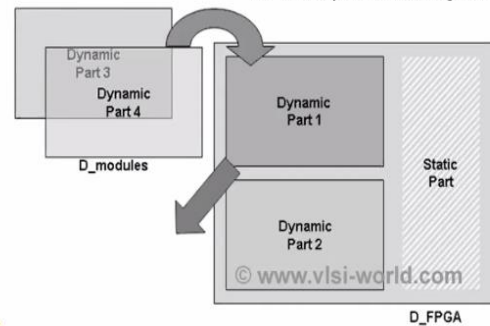
- PR region (PRR): area on the device reconfigured at runtime.
- Static region : Portion of FPGA which is not reconfigured
- Reconfigurable Module: A module targeted for runtime reconfiguration in the design.
- Modes: mutually exclusive implementations of the module.
- Configuration : set of co-existent modes that make up a functional processing chain



## DYNAMIC PARTIAL RECONFIGURATION:

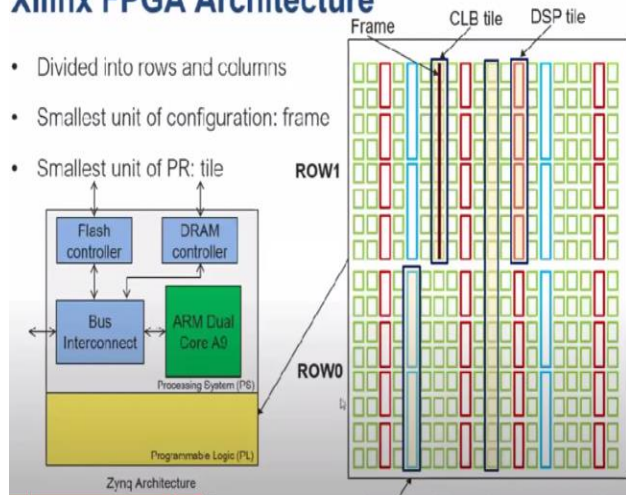
Partial reconfiguration (PR) is the ability to reconfigure selected areas of an FPGA any time after its initial configuration.

- ⇒ Two groups of PR:
1. Dynamic partial reconfiguration (DPF)
  2. Static partial reconfiguration.

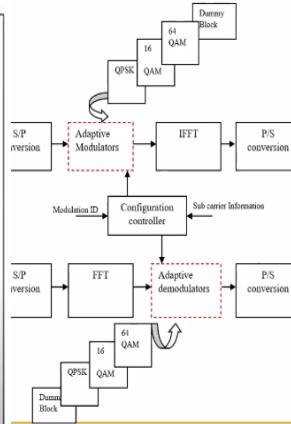


## Xilinx FPGA Architecture

- Divided into rows and columns
- Smallest unit of configuration: frame
- Smallest unit of PR: tile



## Proposed Methodology



• The proposed method can reconfigure transmission parameters to adapt to the changing of environment (i.e. SNR), which can improve the PAPR performance of cognitive radio.

• Can implement reconfigurable modulation schemes efficiently on FPGA and can save lot of resources (area) and power.

• Based on the SNR value, the correct modulation scheme is determined to reduce computational complexity and hardware resources efficiently by secondary users.

## Special meeting with Former chairmans

The IEI TLC committee held on 20th November 2021 has unanimously decided to have a meeting with all past chairmen and to seek their guidance and views on providing better service to the engineering fraternity and Er R Selvaraj coordinated with all the past chairman's. Er.N.Rajasekaran, Chairman IEI TLC Tiruchirappalli, organized the meeting with past chairman's to share their views and experience and briefed about the present scenario and requested the suggestions from past chairman's to promote the IEI TLC to higher level.

Er.N.Rajasekaran, IEI TLC chairman marching ahead and scaling new peaks based on the foundation and path laid by utmost dedication and Visionary leadership.

## Future Events – February 2022

S. No	DATE & TIME	EVENT TITLE
1	07.12.2021 / 17.30 Hrs.	Future of E - Vehicles
2	14.12.2021 / 16.00 Hrs.	Special Lecture on “Do’s & Don’ts In Construction”
3	14.12.2021 / 17.30 Hrs.	Energy Conservation Day Celebrations - Conserve Energy Save The Future
4	21.12.2021 / 19.00 Hrs.	Committee Meeting
5	21.12.2021 / 19.00 Hrs.	Living in Nature Vs Living with Nature
6	28.12.2021 / 17.30 Hrs.	5G Technologies

**Published by,**

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Tiruchirappalli Local Centre

BHEL Main Office Road, Opp. Bldg. 79

Boiler Project Post, Tiruchirappalli 620014