CHIEF PLANNER: DR.S.RAGHAVAN, PROFESSOR, ECE, NIT, TRICHY

EDITED BY: MS.S.IMACULATE ROSALINE, RESEARCH SCHOLAR, ECE, NIT, TRICHY

SUPPORTED BY: MS. ANANYA PARAMESWARAN,ECE, NIT, TRICHY

MS.P.VARALAKSHMI,ECE, NIT, TRICHY

MS.C.FLORINTINA, ECE, NIT, TRICHY

OUR SINCERE THANKS TO

Mr. Steve Huettner, Editor, www.Microwaves101.com

Mr.Gunasekar Mandalap, MD, Urgitha Electronics (Mini Circuits)

We thank Mr.Pradeep Kandaswamy, Technical officer, C.S.G., NIT, Trichy for making our workshop known world-wide.

CO-ORDINATORS

1. Dr.S.Raghavan, Professor, ECE, NITT
2. Dr.P.Muthuchidamabaranathan, Professor, ECE, NITT
3. Dr.D.Sriram Kumar, Professor, ECE, NITT
4. Dr.R.Pandeeswari, Professor, ECE, NITT

Core Team

Ms. S. Imaculate Rosaline, Mr. CHRV Mani Kumar,
Mr. Jim Godwin, Ms. Ananya Parameswaran,
Mr. Jithin M George, Ms. Florintina C

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8.	Ms.M.Shanmuga priya	Faculty
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6.	Mr.Jatin Kumar	M.tech I yr
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2.	Mr. Prasanth Kumar Engam	M.tech I yr
3.	Mr. Lakshmi Reddy	M.tech I yr
4.	Mr. Praveen Kumar	M.tech I yr

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Sl.No.	Name	Designation
1.	Ms..Florintina C (Head)	M.tech I yr
2	Ms.R.Hema Priya	B.Tech II yr

PREFACE

Euphoria is what I felt when the workshop on "Microwaves through software" attained the zenith of perfection. The workshop had its own strand of uniqueness from the moment it was initiated. It swore to prove to the delegates with certitude that it is not the possession of highly commercialized softwares but the voracity to achieve one's dreams and how committed they are towards their cause that really matters. While programmers all over world strive to design softwares that requires as little human intervention and understanding as possible, this team said otherwise. Writing one's own MATLAB code for implementing Microwave circuits demands an exhaustive knowledge of all the basic concepts of microwaves. Opting to remain blissfully ignorant of this might prove to be uncomplicated but it sure does not educate them. I am immensely gratified that the workshop has achieved what it had set out to. The proficient coding skills of the speakers and the efficacy with which they have demonstrated have fortified the agenda of this workshop. The entire mass, be it professors or students or corporate company employees, assembled on the same platform opening their mind to the fantabulous collage of ideas and views shared in the workshop. The various microwave circuits, which we have always been asked to visualize were shown to us by the unassuming Mr.Gunasekar Mandalap, the MD/CEO of Urjitha Electronics. When the feedback from the delegates expressed their content in attaining the purpose of their quest for knowledge in Microwaves, the success of the workshop was reiterated. I thank all the attendees for their zeal which motivated and triggered us. The success of the workshop was not one man's. The workshop team has spent many a sleepless night and many a starved day to mould the workshop into a perfect statuette. I thank the core team members Ms.S.Imaculate Rosaline, Mr.C.H.R.V.Mani Kumar, Mr.Jim Godwin, Ms.Ananya Parameswaran, Mr.Jithin M.George and Ms.C.Florintina and all the volunteers for their dedication and enthusiasm to exalt the workshop to the height it reached. From the time the registration started to the very end, the contribution of the newly joined teaching staff under the efficient leadership of Ms.C.G.Akalya is inimitable. I thank the Director and the Registrar of NIT, Tiruchirappalli for their logistic support.

Dr.S.Raghavan

Professor, ECE,

NIT Trichy

Dear Dr. Raghavan

The essence of the workshop is well brought out.

I am sure the workshop will be well conducted.

My best wishes

Dr. Bharathi Bhat

Retd. Professor, Centre for Applied Research in Electronics (CARE), *IIT, Delhi.*

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Dr. S. Raghavan
Professor, Dept. of ECE
NIT – Trichy
Tiruchirappalli, India

10 November 2015

Greetings from Microwaves101.com

I wish to send words of encouragement to your "Microwaves through Software" workshop instructors and attendees. I have read the workshop description and I believe it is an excellent idea to show students and engineers how to solve problems with simple and inexpensive tools; in this way they may learn more of the fundamental problem-solving skills that may be lost when commercial software products are used. Money saved on software can perhaps be better spent in prototyping and testing hardware to complete the design experience. In addition, some of the attendees may find a career path in developing new and more efficient coding for microwave circuit analysis that will bring competition to commercial companies world-wide.

Also, I wish to thank you and your students for submitting information on NIT Trichy, as well as microwave-related content for other Microwaves101 readers. We are happy to keep the "NITT" web page http://www.microwaves101.com/encyclopedias/466--national-institute-of-technology--trichy up to date for you and we wish that other colleges would observe your example and contribute more dialog to our small corner of the web. I especially love the colorful photos of students (future microwave technologists!), faculty and your various tributes such as floral designs.

I know I am speaking for entire staff at Microwaves101.com when I offer my best wishes to all of you, and keep up the good work.

Steve Huettner

The "Unknown Editor"

steve@microwaves101.com

Terry Cisco, Raghav Kapur, Brenda Huettner, Heidi Huettner and Steve Huettner are all affiliated with Microwaves101.com. Photo taken at IEEE MTT-S International Microwave Symposium, Phoenix Arizona, May 2015.

Dear Participants of the workshop on Use of CAD tools by NIT Trichy

I am glad the Professor Raghavan organized a workshop on the use of CAD tools for Microwave Circuit Design. The course should be very useful to students, teachers and researchers working in this important area. I send my best wishes to all- speakers, guests, participants, coordinator and ECE department of NIT Trichy for organizing and participating in this workshop.

Shiban K Koul
Deputy Director (Strategy &Planning)
Astra Microwave Dr RPShenoy Chair Professor
IIT Delhi Hauz Khas New Delhi

Message from The Director, NIT, Trichy

The Electronics and Communication Engineering Department, N.I.T., Trichy have decided to conduct a workshop on "Microwaves through Software", on the 6th and 7th of November, 2015. The theme of the workshop has astounded me with its exclusivity. They propose the radical idea of simplifying what has been assumed to be irrevocably complicated. When renowned scholars all over the world strive to introduce softwares that offer anticipated results with as less human intervention as possible, thereby simultaneously exponentially increasing the cost, this particular team has dared to oppose this idea with justifiable, sagacious means. They opine that conventional softwares that are easily acquirable could prove to be potent enough to accomplish what others would refuse to even attempt. Sessions have been planned to impart an exhaustive knowledge on how to achieve the same. The workshop has a positive aura promising enough to be a unique attempt at revolutionizing the field of Microwaves and at instilling unfathomable knowledge in the participants. I welcome all the delegates of the workshop and I am sure that everyone will get benefitted technically.

DIRECTOR

Director
National Institute of Technology
Tiruchirappalli - 620 015.
Tamil Nadu, India.

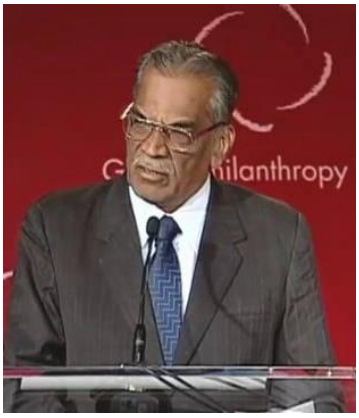
Message from The Registrar, NIT, Trichy

I understand that the unique workshop "Microwaves through Software" to be conducted by Electronics and Communication Department, N.I.T., Trichy during November 6th and 7th is an unconventional academic venture. By the word "unconventional", I mean that the workshop is going to inspire the participants to become expert in writing one's own codes. This will further convey the message that for academic purposes it is sufficient to have self-reliance and self-confidence to bring out pictorial outputs of the "Electromagnetic Analysis" in general and "Microwave Engineering" in particular. There is no doubt that this rare attempt will make especially student community to realize that "Microwave Engineering" is simply a child's play. I whole heartedly wish the workshop a GRAND TECHNICAL SUCCESS.

28.10.15

कुलसचिव / Registrar
राष्ट्रीय प्रौद्योगिकी संस्थान / National Institute of Technology
तिरुचिरापल्ली - 620 015 / Tiruchirappalli - 620 015.

ARAVIND
EYE CARE SYSTEM



Indian public face many problems with respect to healthcare, in spite of India's tag as a 'medical tourism' hotspot. These problems could be overcome by the help of telemedicine, such as tele-consultation and tele-cardiology, for which microwaves be the backbone. The tele-consultation can help reduce cost, increase transfer of information regarding medicine across various channels and help the healthcare of the rural population. I encourage students to not only pursue their passions, but also to try to give something to the society so as to make our country truly independent. I hope this workshop on "Microwaves through software", will motivate the research community to contribute towards Telemedicine.

Dr.P.Namperumalsamy

Chairman, Arvind Eye Care System

Humanity with
Wisdom

Cancer Institute (WIA)
Adyar, Chennai – 600 020

DATE : 3.11.2015

Here at the Institute,
a few labour so that many
may live and the fear of
cancer may forever be erased
from the lives of men

The Workshop on "Microwaves through Software" organized by Department of Electronics and Communication Engineering of the National Institute of Technology, Tiruchirappalli under the leadership of Dr. Raghavan is an extremely important academic effort. The objective of the course is to impart in depth knowledge in the Computer aided design of Microwave components etc. I am keenly aware of computer technology in our precision radiotherapy and conformal therapy, IGRT and responsible for phenomenal cancer treatment and reduction the significant contribution of passage from conventional to introduction of 3D planning, many more. These have been improvements in response to in radiation morbidities. I wish a successful meeting and continuing technology towards patient care.

(DR.V.SHANTA)
CHAIRMAN

I am immensely happy to hear about the workshop on “Microwaves through Software”. Hope this will enlighten many young minds about the recent developments in microwaves. Hearty wishes on its successful execution.

Dr. Ramesh Gupta,
Light Squared, Reston,
Virginia, United States,
Chair, MTT-S Education Committee.

Best wishes for the workshop.

Dr.S. K. Ramesh (Alumnus of NIT Trichy)
California State University, Northridge

I am very happy to note that Department of Electronics &Communication, National Institute of Technology, Trichy is organizing Workshop on the very important topic of "Microwave through Software". The Computational Electromagnetics CEM) tools are playing major role in optimum design ofAntennas,Microwave and RF circuits. The teaching of electromagnetic can be made very interesting using these tools. Only a caution to the users of theCEM tools that they should possess sufficient domain knowledge then one canutilize them more scientifically and rationally.I wish all success to the workshop on Microwave through Software.

Dr. DC Pande, Outstanding Scientist (Retd)
LRDE, DRDO, CV Raman Nagar,Bangalore - 560093

Department of Electronics and Electrical Communication Engineering
Indian Institute of Technology Kharagpur
Kharagpur 721302, India

Dr. Debatosh Guha, FNAE, FNASc
HAL Chair Professor

It's indeed a pleasure to express my happiness on the occasion of 'Microwaves through Software', organized by National Institute of Technology, Tiruchirappalli. Moreover, the Invitation for writing this message is received from Prof. S. Raghavan, an eminent Educator and researcher in this field.

The technical content appears to be well thought, rich, and varied with several important topics. Deliberations from industries will add a different flavor and importance. I do believe that this workshop will be of immense impact upon the young minds in deciding their future and career in the areas of applied electromagnetics.

This country is vast in all aspects, but the lack of serious education, state-of-the-art knowledge, and efforts towards high quality research have been a big concern, especially in the areas of microwave Engineering. This is going to create a crisis in quality and visibility in the international platform. It's therefore, the right time to think seriously and give efforts in creating high quality manpower in Electromagnetics in our country. I do believe that, this workshop will provide good opportunity to the students and young researchers to discuss new possibilities and learn new techniques to resolve their issues.

Thank you very much for participating in and contributing to 'Microwaves through Software'.

Debatosh Guha
November 1, 2015

NATIONAL INSTITUTE OF TECHNOLOGY PUDUCHERRY
(An Institute of National Importance under MHRD, Govt .of India)
AAGA&S COLLEGE CAMPUS
NEHRU NAGAR, KARAIKAL - 609 605

30/10/2015

Dr.(Mrs.) S. K. Pandey
Director

I am happy to know that Department of Electronics and Communication Engineering of National Institute of Technology Tiruchirappalli is organizing 2- day workshop on "Microwaves through Software" under the able leadership of Dr. S Raghavan, Professor, Dept. of Electronics and Communication Engineering, NIT Trichy. I am sure that this workshop will provide a platform for engineers and technocrats to gain in depth knowledge of designing microwave components through conventional coding by using MATLAB software. Electromagnetics is one of the abstract subject, this workshop will pave the way to explore the joy of studying electromagnetic by visualizing the concepts through software. Topics mentioned in the workshop such as CAD of microwaves using conventional coding, biological effects of microwave, secrets of micro measurements, patent filing tips etc., are much required for researchers in communication engineering. I am confident that the participants will be greatly benefitted by the discussion and interaction during 2-days workshop.

I extend my hearty greetings to the organizers and congratulate the microwave group of NIT Trichy for their commendable work at this occasion. Further I convey my best wishes for the grand success of the workshop.

SKPandey
Dr. (Mrs). S. K. Pandey

Dr.D.VENKAPPAYYA, M.Sc.,Ph.D.
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A9, Mahalakshmi Apartments,
No.61, Thiruvalluvar Street,
Srirangam,
Tiruchirapalli-620 006.
Phone : (0431) 2431170

I am glad to know that the Department of Electronics and Communication Engineering, NITT organizes a workshop on “Microwaves through Software” during November 6-7, 2015. The stated objective of the workshop is to impart in depth knowledge in the computer aided design of microwave components including antennae through the conventional coding (MATLAB). I am sure this will benefit immensely the participating Engineering faculty and other researchers in the field. I wish Dr.S.Raghavan and his team members all success in their enthusiastic mission of spreading far and wide high class education and research in “MICROWAVES”.

(Dr. D. Venkappayya)

Dean/Exams, SASTRA University, Thanjavur

9 November 2015

FROM: Mini-Circuits, Urjita electronics Pvt. Ltd.

TO: The National Institute of Technology, Tiruchy

SUBJECT: Statement for Microwaves through Software Conference

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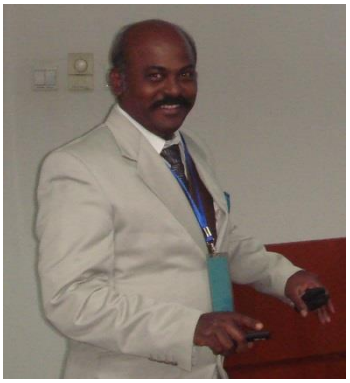
MESSAGE

Advances in RF & microwave technology and products have enabled dramatic changes that have had profound effects on our societies over the past twenty years. Breakthroughs in RF simulation tools have accelerated the pace of innovation in our field, making even more advances possible. Circuit, linear, non-linear, 2.5 and 3D synthesis and analysis software have allowed designers to closely approximate the performance of complex circuits and structures, shortcutting the tedious path of trial and error that was traditionally accomplished on the prototype bench. Combined with fundamental knowledge of microwave theory and design, the contribution of these tools to the research and development community in terms of speed, accuracy and flexibility is extremely powerful and will continue to enable RF engineers to create next generation systems and products. Accordingly, Mini-Circuits congratulates the National Institute of Technology, Tiruchy for conducting the Microwaves through Software conference. It is an honor to participate in this event with friends and peers to propel the advancement of our technology and our industry.

Ted Heil

President

Mini-Circuits



Dr. S. SELVAKUMAR

HOD/ CSE/ NIT TRICHY

I Congratulate the ECE Department of our Institute and in particular Prof. S. Raghavan for conducting a workshop on 'Microwaves through Software' during 6-7, Nov.'15. The title of the workshop is so apt and timely as radio communication has penetrated into all walks of our day-to-day life including health, space, and military applications. The objective of the workshop is to give importance to indigenous design of microwave components through computer aided tools and kindle the creativity in the minds of young researchers leading to Intellectual Property Rights (IPRs).

I appreciate Prof. S. Raghavan for having taken up such an initiative at a time when the Ministry of Human Resource Development is promoting applied research in Science and Technology.

Best Wishes!

वैद्युतिकी व कणकीय अभियांत्रिकी
राष्ट्रीय प्रौद्योगिकि संस्थान, तिरुच्चिराप्पल्लि, तमिलनाडु - 620 015, भारत
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Dr. K. Sundareswaran Professor & HOD (i/c)

I understand that 'Microwave through software' workshop November 6 & 7 will inspire microwave researchers to write one's own code (especially MATLAB) to solve any level of microwave research. I congratulate the coordinators for their technical attempt and wish the workshop a grand success.

Dr. K. Sundareswaran

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Dr. K. R. Kashwan, PhD

Professor & DEAN-PG
HOD, Department of Electronics and Communication Engineering - PG

It is my immense pleasure and happiness to learn that the Department of Electronics and Communication Engineering, National Institute of Technology, Tiruchirapalli, is

conducting a two day workshop on Microwaves Through Software during November 6-7, 2015. I sincerely appreciate and congratulate Dr. S. Raghavan, Professor and a Pioneering Leading Scientist in the field of Microwave Integrated Circuits, for convening such a wonderful workshop to provide learning ambience and opportunity to the participants. Dr. Raghavan has been the national and international authority on the topic for long and hence there cannot be a better opportunity than this workshop. I am sure a huge learning will take place and the participants get benefitted immensely during two days.I wish a very best to all participants and organizers for a grand success of the workshop. Microwaves are a quite challenging field and this type of workshops will definitely help researchers and academic fraternity to learn much focused area. I once again extend my hearty wishes to Dr. Raghavan and his team for a successful accomplishment of workshop.With my all the best wishes for happy learning.

(Dr. K.R.
Kashwan)

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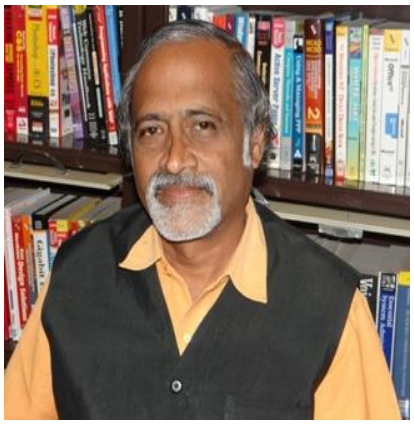
Estd -1994
DNV

Dr. V. ShanmuganathanB.E., M.Sc(Engg.),Ph.D,
Adviser Date: 4/11/2015

Prof. Raghavan

Greetings! Hearty Congratulations workshop on “Microwave through Software” involving group of scholar and teachers of NITT. This is one more colorful feather on your cap. It is highly appreciated that responsibility and credit of organizing such workshop to create an expertise among budding engineers is being shared by all your team members.

Wishing the workshop a grand success.



Message from The Co-Ordinators

Dr.S.Raghavan

Professor, ECE, NIT, Trichy

I am immeasurably gratified in addressing all the participants of the workshop on "Microwaves Through Software" conducted by the Electronics and Communication Engineering Department of NIT, Tiruchirappalli on the 6th and 7th of November, 2015. The uniqueness of this workshop lies in the competent way with which it evinces that one's strength in the fundamentals of Electromagnetic theory and possession of an exhaustive knowledge in MATLAB (in and out of it), is all that essentially matters. The workshop stands testimony to the fact that MATLAB offers the shortest technical code among all other available programming languages with the aid of the various inbuilt functions. But, unfortunately, the toolbox (strictly speaking, the smith chart) offers very less information, in pertinence to RF and microwaves. I sincerely hope, at least few among the delegates would certainly emerge as successful, globally renowned practical microwave scientists. Educating the mass on the significant phenomena of the impact of microwaves in health care is also dealt in this workshop. I utilize this opportunity to invite every one of the delegates for IAW2016 (Indian Antenna Week, 2016), to be held in Madurai (prevalently known as the Temple city) with the sponsorship of the Thiyagaraja College of Engineering, the best Engineering college in Tamil Nadu for Electronics and Communication, and make IAW2016 also one of the most memorable technical events in this country. I am zealously awaiting your arrival.

Dr. P. Muthuchidambaranathan

Associate Professor, ECE, NIT, Trichy

I am very happy to be a part of MICROWAVES THROUGH SOFTWARE, the unique workshop organized by our beloved professor Dr.S.Raghavan. The objective of this workshop, imparting in depth knowledge in CAD of microwave components including antenna through MATLAB, attracts the best minds across the world.

I heartily welcome the participating delegates and other guests. I express my gratitude to the visiting luminaries who have consented to share their expertise with us, despite their busy schedule. I am sure this two day event will be an enriching and motivating experience for all the participants.

I wish all success to the organizers of MICROWAVES THROUGH SOFTWARE in their endeavors. I have no doubt that all participants will find this workshop interesting and intellectually stimulating.

Dr. D. Sriram Kumar

Associate Professor, ECE, NIT, Trichy

Workshops provide an ideal venue for presenting novel ideas and research results in a less formal and more interactive setting than the main conference. We are very proud to note that, Microwave group of NIT Trichy is organizing “Microwaves through Software” workshop during 6th and 7th November, 2015. I am very happy in welcoming all the delegates, guests and participants for this unique workshop. I am sure this two day workshop will be very interesting and motivating. I hope you would be inspired in your research from this workshop.

Dr.R.Pandeeswari

Assistant Professor, ECE, NIT, Trichy

I am delighted that Microwave Group led by Dr. S. Raghavan, Professor, ECE Department, NIT, Trichy is organizing a Two Days workshop on "MICROWAVES THROUGH SOFTWARE" on NOV 6 and 7, 2015. The theme chosen for the workshop is of topical interest. I have no doubt that this workshop will provide adequate input to scholars who are going to begin their research on microwaves. It is a very good opportunity to see the research work done by microwave scholars / CAD experts of NITT. Demonstration using Conventional coding and comparing the solutions with commercial simulation softwares like HFSS, CST, IE3D, Fidelity, ADS will be an exciting experience. In addition to that topics like Secrets of Microwave measurement, patent filling tips from industrial experts will be added features of this workshop.

I congratulate the Volunteers and Organizers and wish the Workshop a great success.

WISHES FROM DELEGATES

I congratulate the organizers of the workshop on MICROWAVES THROUGHSOFTWARE to be held at NIT, Trichy during 6th and 7th NOV 2015 for inviting the stalwarts in the subjects for guest lectures and for making elaborate arrangements to ensure that the full benefits of Microwave Engineering is highlighted and its benefits reach the society by attracting the best talents among the young students. I appeal to the participants to sincerely attend the sessions and adopt the techniques learned through the workshop in their parent organization to benefit their students.

Dr.B.Venkataramani
Professor, ECE, NIT Trichy

My best wishes for the successful implementation of workshop on "Microwaves Through Software". I hope that the participants would be truly benefitted with lectures from experts and will have something to pass on their colleagues.

Dr.G.Lakshmi Narayanan
Associate Professor,ECE,NIT Trichy

Dear Sir,

I am happy to hear that Microwave group of NIT Trichy is conducting a workshop based on an interesting theme. I wish that the theme will surely reach the participants and they will have something priceless at the end of the two days' workshop.

Prof.P.Somaskandan,
ECE, NIT Trichy

Respected Sir,

My best wishes for successful organization of the two days workshop on “Microwaves Through Software”. I also congratulate the organizers of the workshop for their sincere effort for the same.

Dr.P.Palanisamy
Associate Professor,ECE,NIT Trichy

Respected Sir,

Hearty Congratulations for the workshop “Microwaves through Software”. Hope the participants will make best use of it.

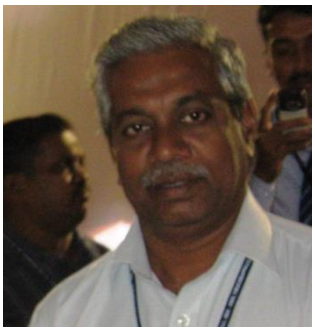
Dr.B.Malarkodi,
Associate Professor,ECE,NIT Trichy

Dear Sir,

My best wishes for the workshop.

Best wishes for the workshop on Microwaves through software.

Dr.T.K.Radhakrishnan
Professor,ECE.NIT Trichy



Dear Prof. Raghavan,

Happy to hear about the workshop. Best wishes for its success.

Dr. D. Sastikumar
Professor,Physics,NIT Trichy

In the last two decades, the microwave research community has slowly drifted from analytical approach to powerful simulation platforms. This made more young researchers to come into this field and contribute to the areas of filters, antennas, passive and active circuits and systems. This workshop with a strong contribution from industries would give more exposure and as well motivation to the budding young microwave design engineers and research personnel. Wish you all a wonderful two day event.

Prof A. Alphones
Programme Coordinator (Research)
School of EEE, Nanyang Technological University, Singapore

Respected Dr.S.Raghavan,

I received the invitation. Thank you so much. I am hearing a lot about the workshop sir. As a prelude to Indian Antenna Week 2016, I sincerely feel this will create a lot of interest among the antenna and RF community to attend antenna week as well. I wish all the best for your event. I will depute at least one faculty and few students from our college.

Dr. S. Raju, Professor and Head,
TCE, Madurai.

I am extremely delighted to note that the Microwave Group of ECE Department of NIT-Trichy is organizing a Rare and Unique Workshop on CAD of Microwaves during 6-7Nov 2015.It is interesting to understand that many UG, PG students, Research scholars and even Alumni of Microwave Group are sharing their ideas and demonstrating theircontributions made to Microwave antenna and components designs through their different coding skills and creative innovations, in addition to price worthy resource persons. I wish the programme a grand success with overwhelming response from participants. My special and hearty congratulations too.

Dr.S.Suganthi, B.E, B.E., M.E., Ph.D., (Alumnus of NIT-T)
Professor/ECE, Christ University Faculty of Engineering, Bangalore

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Department of ECE is always pioneering in organizing innovative workshops, and with Prof. S.Raghavan's lead I always find a blend of microwave and medicine, and so much of social responsibility. My best wishes to the organizers.

With Kind Regards
Dr. M.Durai Selvam, NIT, Trichy

Best wishes.

K.J. Vinoy, Professor
Electrical Communication Engineering
Indian Institute of Science, Bangalore 560 012 ,India

Dear Prof. Raghavan

Microwaves and Antenna theory have been my favorite subjects when I was a B.Tech. (ECE) student, and I always appreciate the importance of these in the information

revolution. I am sure that the workshop throws light on the recent trends in the design of antennas. I wish the workshop a grand success and something worth remembering for a long time."

Dr. Ramakalyan Ayyagiri,

Associate Professor, Dept of ICE, NIT, Trichy.

Dear Prof. Raghavan,

I feel very happy that you are amalgamating health care with microwaves. Let the society get the best benefit out of it. I am proud to inform our attempt in using microwaves in agriculture will create an impact.

Dr.N.Sivakumaran,

HOD, ICE Dept., NITT

Dear Prof.Raghavan

This is with reference to your invitation for workshop on “Microwaves through Software” to be held at NIT, Trichy by Electronics and Communication Engineering department. I feel glad to see that the senior most professor Dr.S.Raghavan valuing the hidden talents in the young minds and thus one of our college students recognized and encouraged to present her project on this wonderful occasion where eminent persons from various concerns are planned to share their ideas. This effort by dedicated senior professors like you at NIT, Trichy, is highly commendable and were looking forward to be a part of such event and make it a success.

Mrs.B.Murugeshwari, HOD-ECE
K. Ramakrishnan College of Engineering, Trichy.

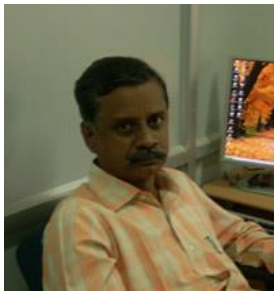
Dear Sir,
Thanks a bunch for personal invitation. Many worthy information are waiting for the audience. Many more thanks to this programme in NITT. I wish to pray the Almighty for his showering to all organizers of this programme to continue your service for our NITT.

Dr.T.N.Janakiraman, Professor,
Department of Mathematics, NIT, Trichy

Thank you, Prof., for the kind invitation. Your initiative is much appreciated.

Dr. S. Raman Sankaranarayanan
Associate Professor,Department of Metallurgical and Materials Engineering, NITT

Dear Dr Raghavan my best wishes you are real in public service health is wealth all other services are next to it once again my wishes take care of your health first



Mr. S.S. Arulappan
Department Of Mechanical Engineering, NITT

Dear Dr S Raghavan,

I am glad to know that you are coordinating a Workshop on "Microwaves through Software" during November 6-7, 2015, organized by the Dept. of ECE, NIT, Trichy. The stress of the Workshop seems to be in the practical design of microwave components. I am sure that such a workshop will give a hands-on experience to all the participants and will be of immense practical value. As it is a workshop, I am sure that with your guidance, they will be doing the design individually and learn. I wish the Workshop all success.

With best wishes,

Dr.B.Ilango
Professor, EEE, NITT

Best Wishes for the success of the Micro wave workshop

G.Swaminathan

Professor,
Civil Engineering Department,
NIT Trichy -620015

Dear Sir,

My wishes for the Microwave Workshop sir.

Dr.D.Srinivasan,
Principal,
K.Ramakrishna college of Engineering

National Institute of Technology: Tiruchirapalli-620015

Dr.D.Deivamoney selvam **Date: 5-11-2015**
Dean (Faculty Welfare)

To
Dr.S.Raghavan
Professor, Dept, ECE
NITT

Greetings. It is indeed one of important emerging area and this two-day Workshop on Microwaves through Software is one of the sequence of great events organized by the Department of ECE, NITT and in particular by Professor Dr. S.Raghavan for the benefit of students and Research Scholars. Bringing together eminent people from academic and practice sectors in this field and sharing their knowledge to the benefit of the Society is

a good endeavor. I wish Professor S.Raghavan and his team of people a grand success of this event.

D.Deivamoney selvam
Dean (Faculty welfare)

NATIONAL INSTITUTE OF TECHNOLOGY
TIRUCHIRAPALLI - 620 015. TAMIL NADU, INDIA.

Dr.M.Punniyamoorthy,

Professor and Nodal Officer Date: 05.11.15

Dear Prof. Raghavan,

Best wishes fir your workshop on Microwaves Through Software

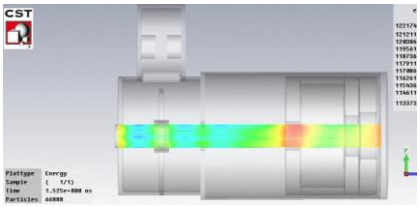
Regards,

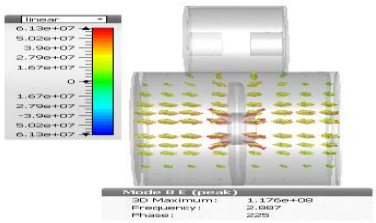
ABSTRACTS OF PRESENTATION

RELATIVISTIC KLYSTRON

Abstract: Relativistic klystron will simulate using particle-in-cell (PIC) code, CST, to investigate the operating characteristics of high power RELTRON (Relativistic klystron) tube with self-modulation beam and post-acceleration of modulated beam. In the RELTRON, the mode of operation is π/2-mode, providing the means to modulate an electron beam in short distances. Simulations show that ultra-compact RELTRON with a beam voltage of 120 kV and an acceleration voltage of 800 kV generates 38.3 MW high power microwave at 2.887 GHz with an electronic efficiency of 52.7%.

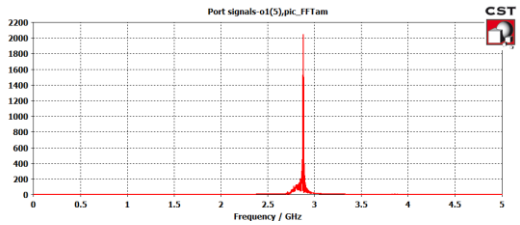
Simulation Design:

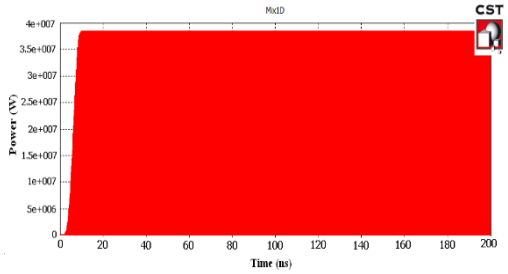




Electric vector field of π/2-mode.

Expected Results:





Frequency spectrum integrated along the output cavity

Response of the RF voltage

Mr. Mohammed Wasim, Assistant Professor, Mam College of Engineering and Technology

DESIGN OF SUBSTRATE INTEGRATED WAVEGUIDE (SIW) USING HFSS

Abstract: Substrate Integrated Waveguide (SIW) is high performance device with excellent immunity to electromagnetic interference, suitable for microwave and millimeter-wave communications. It is synthesized by placing two rows of metallic via-holes in a substrate where the field distribution is similar to a conventional rectangular waveguide. SIW structures preserve most of advantages of conventional metallic waveguides, namely high quality factor and high power handling capability with self-consistent electrical shielding. SIW technology has the possibility of integrating all the components on the same substrate, including active elements, passive

components and even antennas. These structures can be easily fabricated using a standard low cost printed circuit board (PCB) process.

R.Rajkumar,Research Scholar,VIT University,Chennai

ANTENNA DESIGN USING 4NEC2

Abstract: 4nec2 software is based on Numerical Electromagnetics Code (NEC). It is an antenna modeler and optimizer which is available at free of cost. It works in both windows and Linux. It is based on integral equation solver ie., method of moments. This tool is used for creating, viewing antenna and knowing 2D and 3D radiation patterns. It also has an optimizer and frequency sweep. It can compare near-field and far field radiation patterns. It calculates SWR, Gain and Front to Back Ratio (FBR). This also displays output in linear or logarithmic graph, and smith charts. Its advanced versions have genetic algorithm based optimizers. Design can be done using Notepad, or NEC editor or Geometry editor. This is mainly used in the design of wire antennas and analysis. This software package itself comes with many examples and good documentation. This presentation includes information about installation, steps in design and an example antenna design and simulation.

R.Boopathi Rani, Assitant Professor, ECE Department, NIT Puducherry, Karaikal

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FINITE-DIFFERENCE TIME-DOMAIN METHOD

Abstract: The Finite-Difference Time-Domain method (FDTD) is today's one of the most popular technique for the solution of electromagnetic problems. It has been

successfully applied to an extremely wide variety of problems, such as scattering from metal objects and dielectrics, antennas, Microstrip circuits, and electromagnetic absorption in the human body exposed to radiation. The main reason of the success of the FDTD method resides in the fact that the method itself is extremely simple, even for programming a three-dimensional code. The technique was first proposed by K. Yee, and then improved by others in the early 1990s. This presentation summarizes the status of Computational Electromagnetics through FDTD modelling in Antenna field.

Dr.T.Shanmuganantham, Pondicherry University

Implantable Antennas for Biomedical Applications

Abstract:A novel coplanar waveguide (CPW) fed implantable antennas are proposed for biomedical applications. To make it suitable for implantation, it is printed on biocompatible alumina ceramic (Al2O3) substrate. A study of the understanding of the antenna performance as a function of its dielectric parameters of the environment in which it is immersed was performed. Simulations in various states of slot widths, structures and dimensions demonstrate that the antenna covers the complete ISM band. The SAR distribution induced by the implantable antenna inside a human body phantom liquid is evaluated.

This work has been made by developing a human body phantom liquid that is suitable for in body communications. Materials such as deionized water, sugar, salt, vegetable oil, and flour deionized water are used to develop a human body phantom such that its behavior is closer to that of human tissues. The developed phantoms are biocompatible and are essentially nontoxic

whereas conventionally available phantoms are toxic in nature. Different kind of implantable antennas are working at 2.45GHz industrial, scientific and medical (ISM) band are studied and developed for the biomedical applications.

In this work, implantable antennas were designed and successfully tested in human body phantom liquid and animal tissue. In the first case, electrical properties of the test tissue can be measured using a dielectric probe kit and a vector network analyzer (R&S ZVA40-10MHz to 40GHz). The use of pork tissue samples provides an easy approach to mimic the frequency dependent characteristics of the electrical properties of tissues. Vivo testing of the proposed implantable antenna was performed in pork and the results cover the way for future research oriented in the making of complete telemedicine systems.

Due to better dielectric constant of the biocompatible alumina ceramic substrate, implantable antennas are shows the miniature, lower return loss and better impedance matching and high gain compared with other conventional implanted antennas. Therefore, the implantable antenna is suitable platform for biomedical applications.

S. Ashok Kumar, Vel Tech University, Chennai.

T. Shanmuganantham, Pondicherry University, Pondicherry.

IMPLEMENTATION OF RAY TRACING FOR MICROWAVE PROPAGATION PREDICTION

Abstract: In wireless communications, understanding of the propagation channels is necessary to achieve optimum performance of a communication system. Even though direct

measurements enable accurate evaluation of onsite performance, it requires a considerable amount of time and efforts. Therefore, a computer tool that could characterize the wireless channel from the building plans and material properties would be a good solution. Ray tracing is one of the widely used techniques for developing such a simulation tool. Assuming that the scattering objects are much larger than the wavelength, the micro waves could be modelled as rays. By launching the rays from the transmitter in all directions, their interactions with the surroundings, i.e. reflections and transmissions, should be tracked. From the ray tracing results, received field strength could be computed based on the theory of Geometrical Optics. Other than signal reflections and transmissions, diffraction from diffracting corners and edges may also be included whereby the received field strength should be determined using the Uniform Geometrical Theory of Diffraction. This tutorial describes various ray tracing algorithms that are to be usedand how to implement them in MATLAB, in the prediction of received field strength at microwave frequencies.

P.Thirumaraiselvan,Assistant Professor,Adhiparasakthi Engineering College, Melmaruvathur

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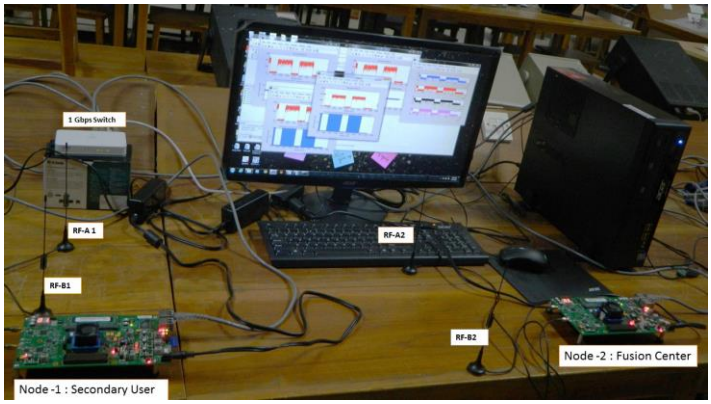
MULTIPLE-ANTENNA TECHNIQUES FOR WIRELESS COMMUNICATIONS

Diversity is a powerful communication receiver technique that provides wireless link improvement at relatively low cost. It exploits the random nature of radio propagation by finding independent (highly uncorrelated) signal paths for communication. Larger diversity gains can be achieved when each user has multiple antennas. MIMO systems allow higher data throughput without additional spectrum usage by spreading the same total transmit power over the antennas, which improves spectral efficiency.

Cooperative radio transmissions improve both reliability and data rate by exploiting distributed spatial diversity in a multiuser environment. Cooperative techniques include relaying, cooperative MIMO, and multi-cell MIMO. Single-user or multi-user relaying facilitates the signal transmission between the source and the destination utilizing less power. Cooperative MIMO, which forms a distributed antenna system employing antennas of different users, is effective for poor line-of-sight propagation and for cell-edge users. Cooperative MIMO utilizes the advantages of both MIMO and cooperative communications techniques.



WARP-MATLAB (WARPLab) is a framework for rapid physical layer prototyping that allows for coordination of arbitrary combinations of single and multi-antenna transmit and receive nodes. WARP board allows the creation of hardware platform involving processors andperipheral cores and development of embedded software for that hardware platform. This flexibility helps in designing systems where part of the work is done by hardware and part by software. The link between the software and the hardware are the shared memories. The platform has been used for cutting-edge research on a wide of topics, including full-duplex wireless, cooperative communications, localization and multi-user MIMO. WARP v3 is the latest generation of WARP hardware, integrating a high performance FPGA, two flexible RF interfaces and multiple peripherals facilitate rapid prototyping of custom wireless designs.

Dr.P.Muthuchidambaranathan,

Associate Professor, ECE, NIT, Trichy

PHOTOCONDUCTIVE TERAHERTZ ANTENNA

Terahertz is the set of frequencies between the microwave and optical frequencies. Terahertz waves exhibit certain unique properties and so find application in different fields like spectroscopy, biomedical imaging and telecommunication field as antenna etc. THz imaging systems are able to provide images with higher resolution than microwave imaging systems and are nonionizing. There are different structures of THz antenna such as the THz dipole antenna, Yagi–Uda antenna, spiral-type antenna, bowtie-shaped THz antenna etc. Two approaches are mainly used for terahertz wave generation namely Microstrip antenna and photoconductive antenna. Here, dipole THz antenna, which can be fabricated in India, is discussed. This Photoconductive antenna can be used for generation as well as detection. Few applications of photoconductive THz antenna along with the performance evaluation of PCA with different parameters and materials are also discussed.

Dr.D.Sriram Kumar,

Associate Professor and Head, ECE, NIT, Trichy

MATLAB ILLUSTRATIONS USING MATLAB

The new trend in learning concepts using MATLAB programming is illustrated with few examples in this session.

Dr.E.S. Gopi,
Assistant Professor, ECE, NIT, Trichy

CAD OF METAMATERIALS

Metamaterials are artificial structures designed to display unusual properties. It derives its property from its structures not from composition. Both constitutive parameters permeability and permittivity are negative for left-handed metamaterial. Artificial material was first speculated by Russian scientist Victor Vesalago in the year 1968.Due to extraordinary properties of

metamaterial, it has been explored for the performance improvement of microwave components and antennas. Split ring resonator (SRR) and Complementary split ring resonator (CSRR) are basic component of metamaterial and offer negative permeability and negative permittivity, respectively. Procedure to extract metamaterial properties will be demonstrated by using both Matlab and HFSS. Transmission Line approach of metamaterial will be discussed. Composite Right/Left Handed Transmission Line design and parameters extraction would be demonstrated by using both Matlab code and ADS.

Dr.R.Pandeeswari,
Assistant Professor, ECE, NIT, Trichy

METHOD OF MOMENTS(MOM) IN MATLAB

Aim: Calculate the current distribution and impedance of a dipole antenna and a circular loop antenna at 2.4 GHz using Method of Moments(MoM) in Matlab

The antenna structures are created using MATLAB PDE toolbox, or using triangulation method. Here, the surface of antenna is divided into triangles .Next the RWG (Rao-Wilton-Glisson) elements are found from the triangles and the impedance matrix is calculated. The matrix is used to solve the Method of Moments equation to obtain the current distribution and the impedance. The voltage source is modelled using delta-gap source modelling. Pocklington's integral is used to solve the integral equation for current distribution.

Ms. Archana, Research Scholar, NIT, Trichy

FDTD ANALYSIS

The numerical approximation of Maxwell's equations, computational electromagnetics (CEM), has emerged as a crucial enabling technology for radio-frequency, Microwave, and wireless engineering. Three most popular "full-wave" methods are Finite Difference Time Domain method

(FDTD), Method of Moments(MoM) and Finite Element Method(FEM).

FDTD, a differential type time domain approach is a versatile method requiring almost no preprocessing of Maxwell's equations to arrive at governing equations. The FDTD method has seen robust growth in research activity in the last decadedue to its applications in almost all areas, including communications, computing,and bio-medicine.One-dimensional FDTD analysis is applied to study basic phenomenonlike reflection at an interface between two media, determination of propagation constant in lossy medium and design of material absorbers.The pulse undergoesmany reflections in to-and-fro manner between the discontinuities and a steadystate is reached after a few nanoseconds.

Two-dimensional FDTD is used to analyze guiding structures called waveguides where the transverse modes (TE and TM)are propagated along the guiding structures. Three dimensional FDTD is used to analyze real-world problems.

Domma Veeralavenkaiah, M.Tech II year, ECE, NIT, Trichy

Ananya Parameswaran, Research Scholar, ECE, NITT

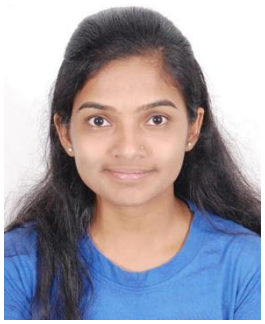
MATLAB WORK ON CPW FILTER DESIGN

I am Sneha Balan, (2010-14) ECE student, NIT-Trichy and passed out with the CGPA of 9.77/10. I am the recipient of the Best Outgoing ECE Student Award and will present a Matlab work on CPW Filter Design - One of the most effective filters with reduced component dimensions and ease of series and shunt connection. Using Butterworth and Chebyshev filter equations and elements, the design of CPW filter is done in MATLAB.

Ms. Sneha Balan, Alumnus of NITT

ASIC Digital Design Engineer, Synopsys Inc.

MICROWAVE AMPLIFIER DESIGN



The MICROWAVE AMPLIFIER DESIGN is basically different from conventional low frequency amplifier in the sense that one should be careful in choosing the INPUT MATCHING and

OUTPUT MATCHING networks. For that, one should be thorough with the L-MATCHING principles. The demo will show the design Principles of L MATCHING and BRANCH LINE COUPLER.

Ms. Smita Patil, M.Tech I year, Communication Systems, NITT

STABILITY CIRCLES ON SMITH CHART

Stability circles are very important in the case of Microwave amplifier design. Stability circles determine what load or source impedances should be avoided for stable or non-oscillatory amplifier behavior. Because reactive loads are being added to amplifier the conditions for oscillation must be determined. Unconditional Stability occurs when amplifier remains stable throughout the entire domain of the Smith Chart at the operating bias and frequency. Here MATLAB code is evaluated for both determination of stability parameters and plotting them on smith chart.

Ms.K.Veena, M.Tech II year, Communication Systems, NITT

DESIGN OF LARGE MODE AREA (LMA) LEAKAGE CHANNEL FIBERS (LCF) FOR HIGH POWER LASING APPLICATIONS

Recent years have witnessed an exponential growth in high-power fiber lasers for industrial applications. Most of the commercial fiber lasers are based on ytterbium (Yb)-doped system that provide lasing window from 1.0-1.1 μm. The power scaling in high-power fiber lasers are limited by the nonlinear and thermal effects. Large mode area (LMA) fibers have emerged as a promising tool to reduce detrimental effects, while satisfying stringent requirements of single-mode (SM) operation to ensure high beam quality. In practical environments, LMA fibers are bent to make the compact fiber lasers systems that lead to the severe reduction in the mode area and beam quality of LMA fibers. To overcome mode area shrinking and degraded beam quality, researchers have looked into modifying fiber designs in several ways. Leakage- channel fibers (LCFs), a variant of photonic crystal

fibers have been reported as an alternative solution to realize LMA. In this talk, a simple all-solid LMA single-mode LCF designs with asymmetric cladding will be discussed. The modal properties of the LCF designs have been investigated through FEM based commercial Comsol software.

Mr.G.Thavasi Raja, Assistant Professor, ECE, NIT, Trichy

SMITH CHART AND ITS APPLICATIONS THROUGH MATLAB

Many of the computations required to solve transmission line problems whose solutions are tedious and difficult because they necessitate accurate manipulations of numerous equations. To simplify solution of such problems a graphic method is needed to arrive at a quick answer. One of the most used graphical is smith chart.

The smith chart consists of a plot of the normalized impedance or admittance with the angle and magnitude of a generalized complex reflection coefficient in a unity circle. In this Assignment we plot smith chart using MATLAB code and we find out some transmission line parameters like reflection coefficients, VSWR and amplifier stability circles, and constantgain circles with MATLAB code.

Kapil Singh Thakur, Venkatrao T, Ramesh M
M.Tech I year, Communication Systems, NITT

SUBSTRATE INTEGRATED WAVEGUIDE

An overview of the new technology called substrate integrated waveguide had emerged and is used in microwave devices and the SIW components come up with greater advantage. A SIW rat race coupler has been designed using HFSS tool.

Ms.Sujitha Shree, M.Tech II year, Ramakrishna Engineering College, Trichy

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INTELLECTUAL PROPERTY RIGHTS

Intellectual property rights (IPR) have become important in the face of changing trade environment which is characterized by global competition, short product cycle, need for rapid changes in technology, high investments in research and development (R&D), production and marketing and need for highly skilled human resources.

The session covers the following the topics:

1. Introduction to Intellectual Property (IP) rights.
2. Basics of IPR: Patents and utility model, Copyrights, Trademarks, Geographical Indications, Industrial Designs
3. The Patent Cooperation Treaty (PCT)
4. IP Process Flow
5. Role of IP in Industry, Academia, individual.
6. Trends in IPR filing
7. IP Asset in Revenue
8. IP filing in Microwave design and software.

INTRODUCTION TO HFSS AND CST

Design of microstrip patch antennas is the simplest way to start learn the printed antennas. In this talk , dependency of resonant frequency on length and permittivity of substrates used, bandwidth on antenna volume and quality factor and input impedance on microstrip feed width and substrate height will be discussed. The use of conventional MATLAB codes and comparison of the obtained results with the softwares like CST and HFSS will be presented.

S.Imaculate Rosaline, Research Scholar, ECE, NITT

CONSEQUENCES OF BIOLOGICAL EFFECTS ON HUMAN HEALTH DUE TO NON-IONIZING RADIATIONS

Various sources of microwave exposures and related phenomenon of microwave interaction with human tissues have been explained. In this presentation, measurement of radiation with specific tool SAR, innumerable diseases because of long duration of exposure, protection methods, Case studies based on available database of research have been investigated. Main concern of this paper to make aware people about inauspicious outcomes of microwave radiations on human body, which affect directly or indirectly our daily life. MATLAB programs have been added to show variation of different parameters graphically in body tissues of skin, fat, muscles, and brain. These programs show variations in graphs of SAR, Skin depth, Power density vs frequency.

Ms.Divya Chaturvedi, Research Scholar, ECE, NIT, Trichy

Ms.Seema R. Tirkey, M.Tech II year, Communication Systems, NITT

DESIGN OF SRR AND RETRIEVING ITS NEGATIVE PERMIABILTIY CHARACTERISTICS USING CST and MATLABA split-ring resonator (SRR) is an artificially produced structure common to metamaterials. Their purpose is to produce the desired magnetic susceptibility in various types of metamaterials. A single cell SRR has a pair of enclosed loops with splits in them at opposite ends. The loops are made of nonmagnetic metal like copper and have a small gap between them. The loops can be concentric,or square, and gapped as needed. A magnetic flux penetrating the metal rings will induce rotating currents in the rings, which produce their own flux to enhance or oppose the incident field.

Due to splits in the rings the structure can support resonant wavelengths much larger than the diameter of the rings. The small gaps between the rings produces large capacitance values which lower the resonating frequency. The dimensions of the structure are small compared to the resonant wavelength. The design of SRR and retrieving its negative permeability characteristics flowchart is as shown below

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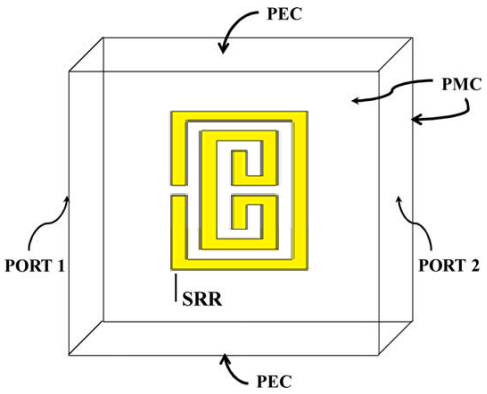

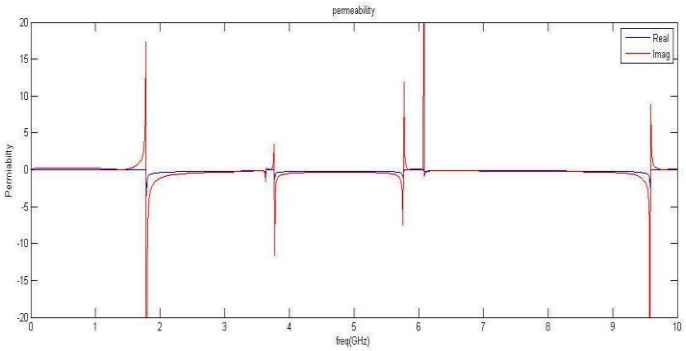

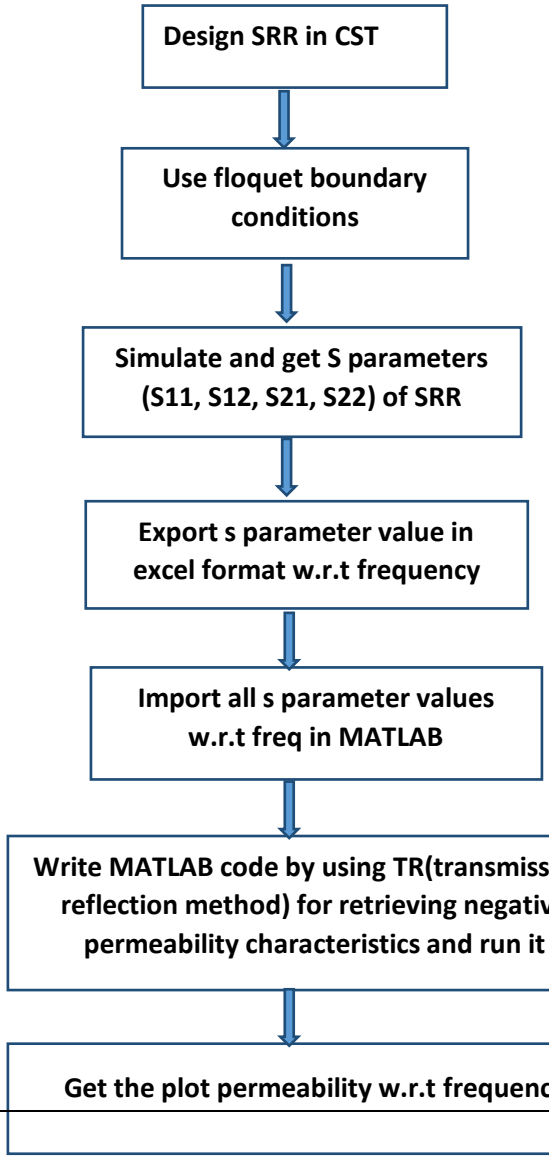

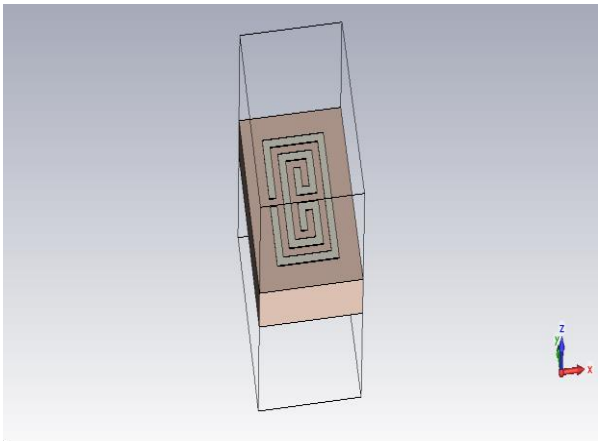


Workshop on
Microwaves Through Software
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MICROWAVES
THROUGH
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2015

“MICROWAVES THROUGH SOFTWARE” IN THE NEWSPAPER – THE HINDU DATED 23/11/2015

The Department of Electronics and Communication Engineering at National Institute of Technology, Tiruchi, hosted a workshop on “Microwaves through software”. Prominent ophthalmologist P. Namperumalsamy, Chairman Emeritus of Aravind Eye Hospital, Vision Centres, spoke about the current problems faced by the Indian public with respect to healthcare and explained how these problems could be overcome by the help of telemedicine. Tele-consultation can help reduce cost, increase transfer of information regarding medicine across various channels, and help improve the healthcare for rural population, he said.

S. Raghavan, professor, NIT, elaborated the importance of microwaves in various fields of technology.