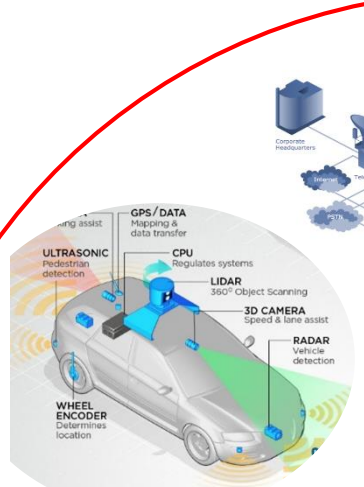
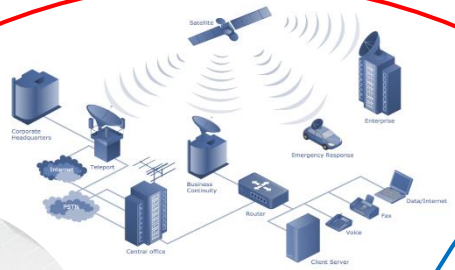
Department of Electronics and Electrical Engineering

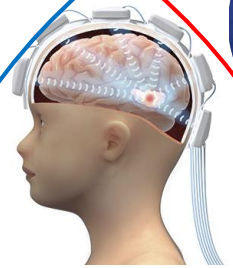
RF and Photonics



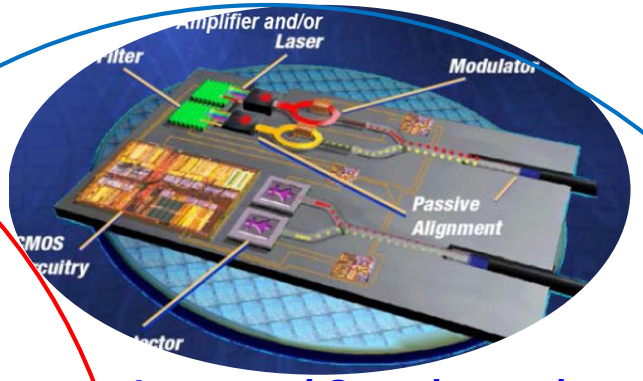
Automated Vehicle



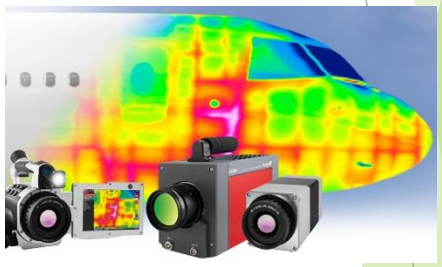
Telecomm



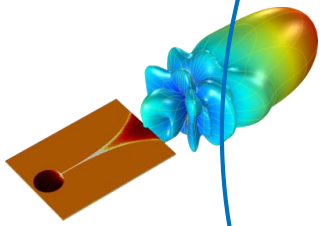
Biomedical



Integrated Optoelectronics

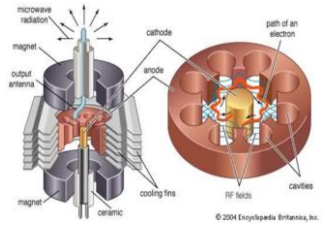


Non-destructive testing

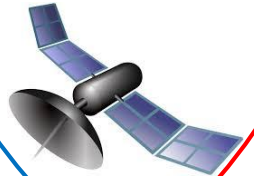


Antenna

THz Metamaterials



High-Power μ-wave



Space

Fibre Optics

Defence

Plasmonic Metamaterials

Image Courtesy: www.google.com

RF and Photonics Group

- Radio-frequency (**RF**) engineering deals in devices that are designed to operate within the range of about 3 kHz up to 300 GHz. RF engineering finds applications into all systems that transmits or receives radio waves, (eg. mobile phones, radar, Wi-Fi, just to name a few).
- **Photonics** engineering deals in light generation, manipulation, waveguiding and detection (even down to nanoscale) in optical and NIR regime. It also includes optical signal processing, switching, amplification, and sensing.
- **RF photonics**: The availability of wideband photonic devices (sources, modulators, and detectors) essentially extend the frequency and bandwidths of typical RF systems. This allows the student to learn to amalgamate RF and photonics systems in order to leverage some of key advantages over the conventional communication transmission mediums such as reduced size and weight, low cost, improved immunity to electromagnetic interference and high data transfer capacity.

RF and Photonics group offers academic training and research expertise in the following fields

- Antenna Design
- Microwave Passive and Active Circuit Design
- RFIC Design
- Computational Electromagnetics
- Optoelectronic Devices
- Photonics Integrated Circuits
- CMOS compatible photonics
- Nanophotonics, Plasmonics, and Metamaterial
- Optical Metrology
- Optical Sensors
- Silicon Photonics
- Engineering Optics

Department of Electronics and Electrical Engineering

RF and Photonics Group Members

Prof. Anup K. Gogoi

Prof. Ratnajit Bhattacharjee

Prof. K. Rakhesh Singh

Dr. Ramesh K. Sonkar

Dr. Debabrata Sikdar

Dr. Rishikesh D. Kulkarni

Dr. Mahima Arrawatia

Prof. Ratnajit Bhattacharjee
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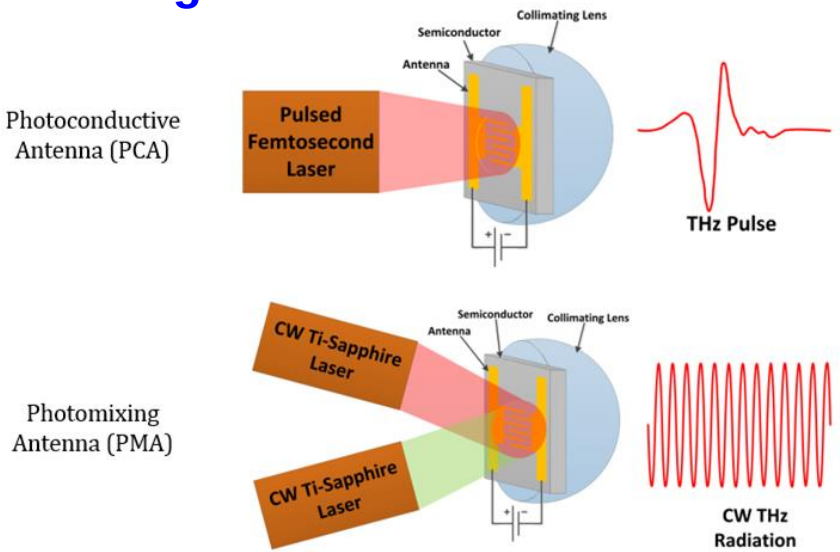
More details are available on
http://www.iitg.ernet.in/engfac/ratnajit/

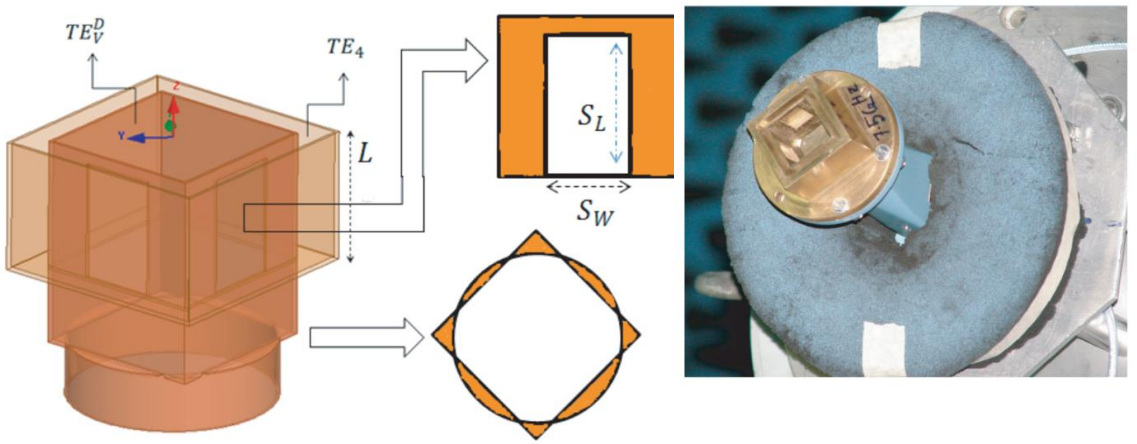
Research Areas

- Microwave Engineering
- Microstrip Antennas
- Electromagnetics
- Wireless Communication

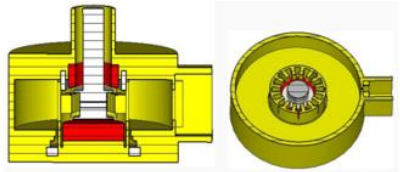
Modelling of Terahertz Generation

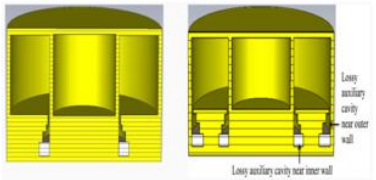


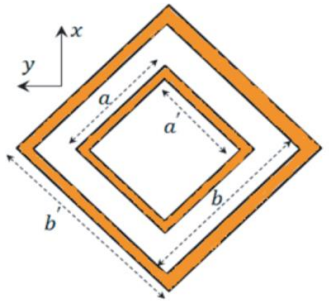
Wideband Matched Feed Design for Offset Reflector

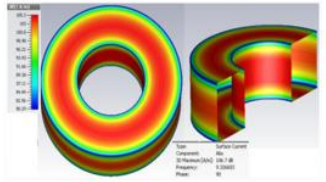


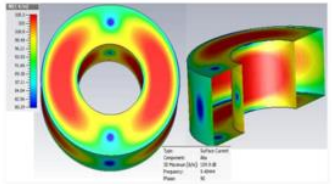
Design of High Power Coaxial Magnetron in X-Band

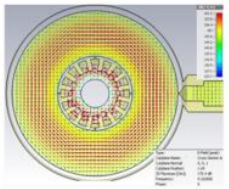

Simulation Design

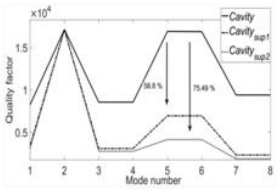

Auxiliary cavity for mode suppression




Surface current density for TE_{011}

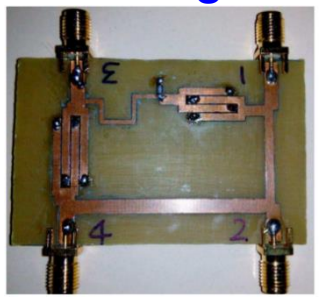

Surface current density for TE_{121}

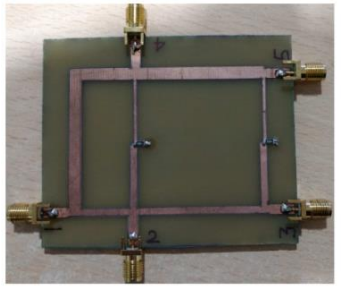

Electric Field distribution

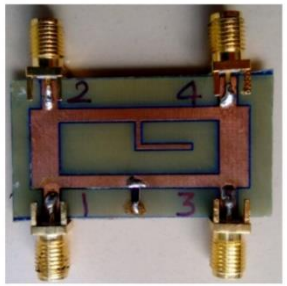


Suppression of Q factor

Design and Analysis of Power Dividers







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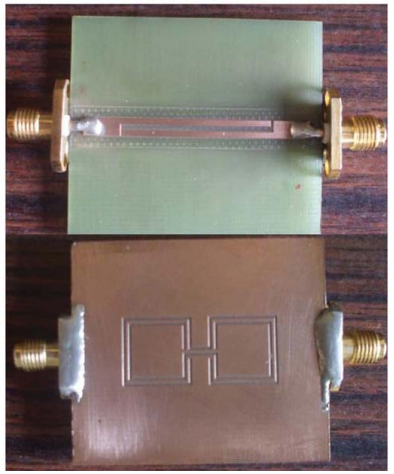
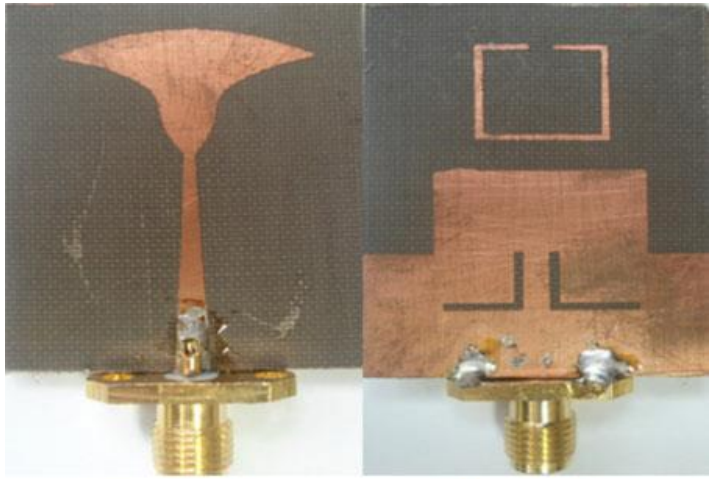
More details are available on
http://www.iitg.ac.in/engfac/krs/public_html/index.html

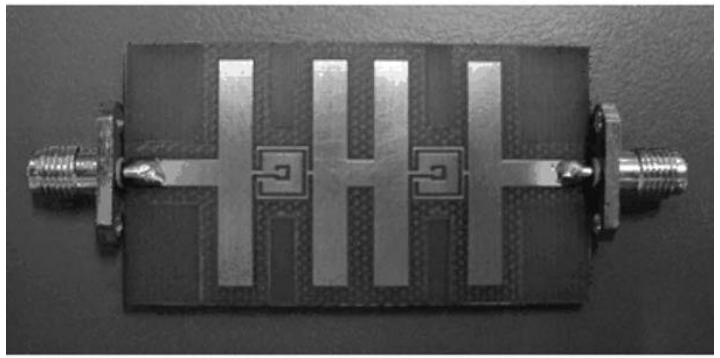


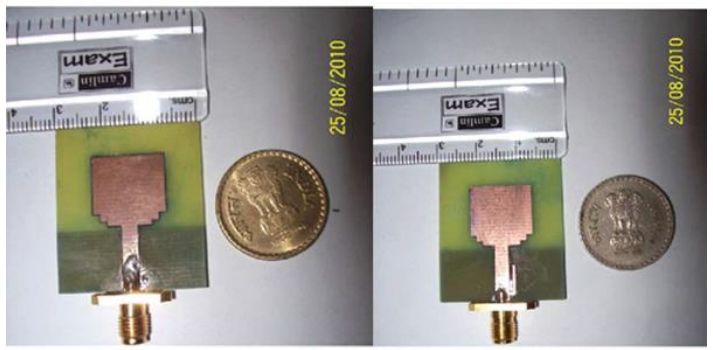


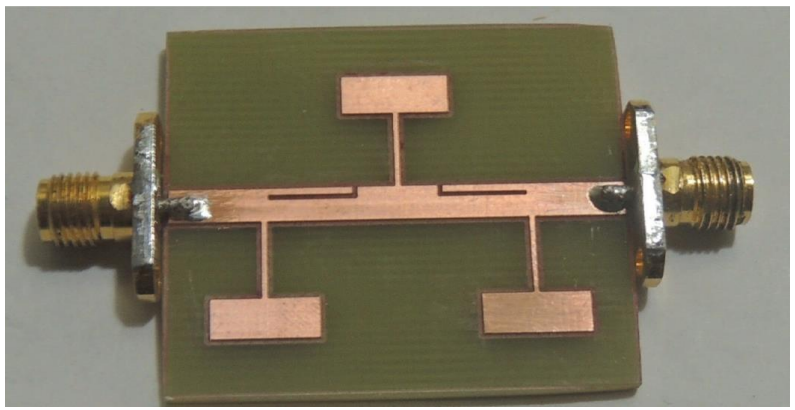
Front view Back view

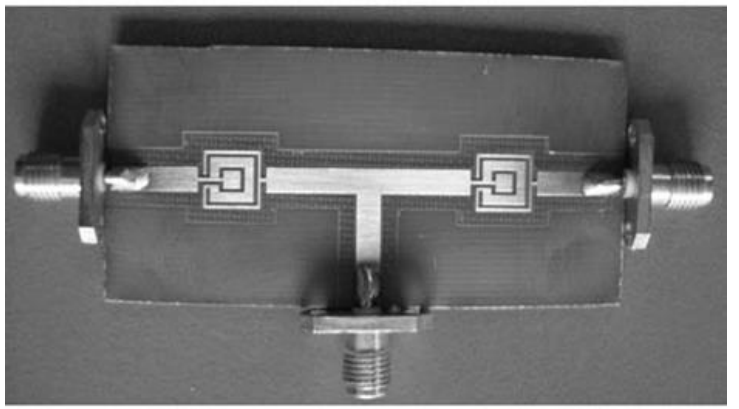
Research Areas

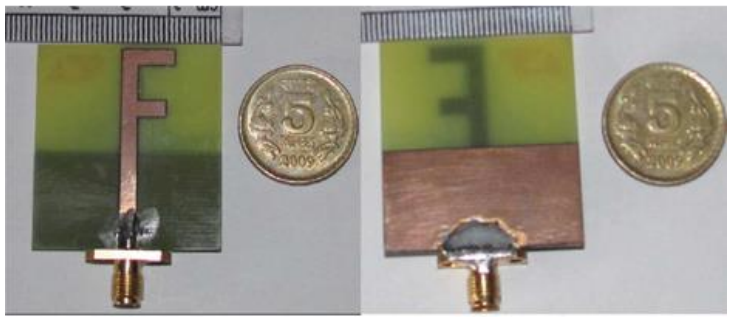
- Synthesis and design of passive microstrip circuits/devices
- Analysis and design of printed antennas/arrays
- Spatial modulation based MIMO/Optical wireless communications











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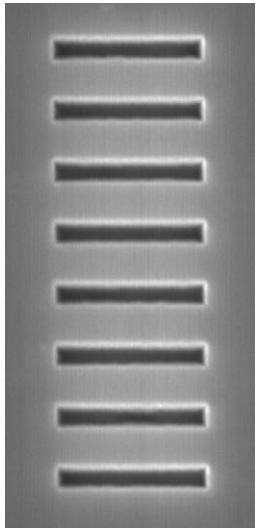
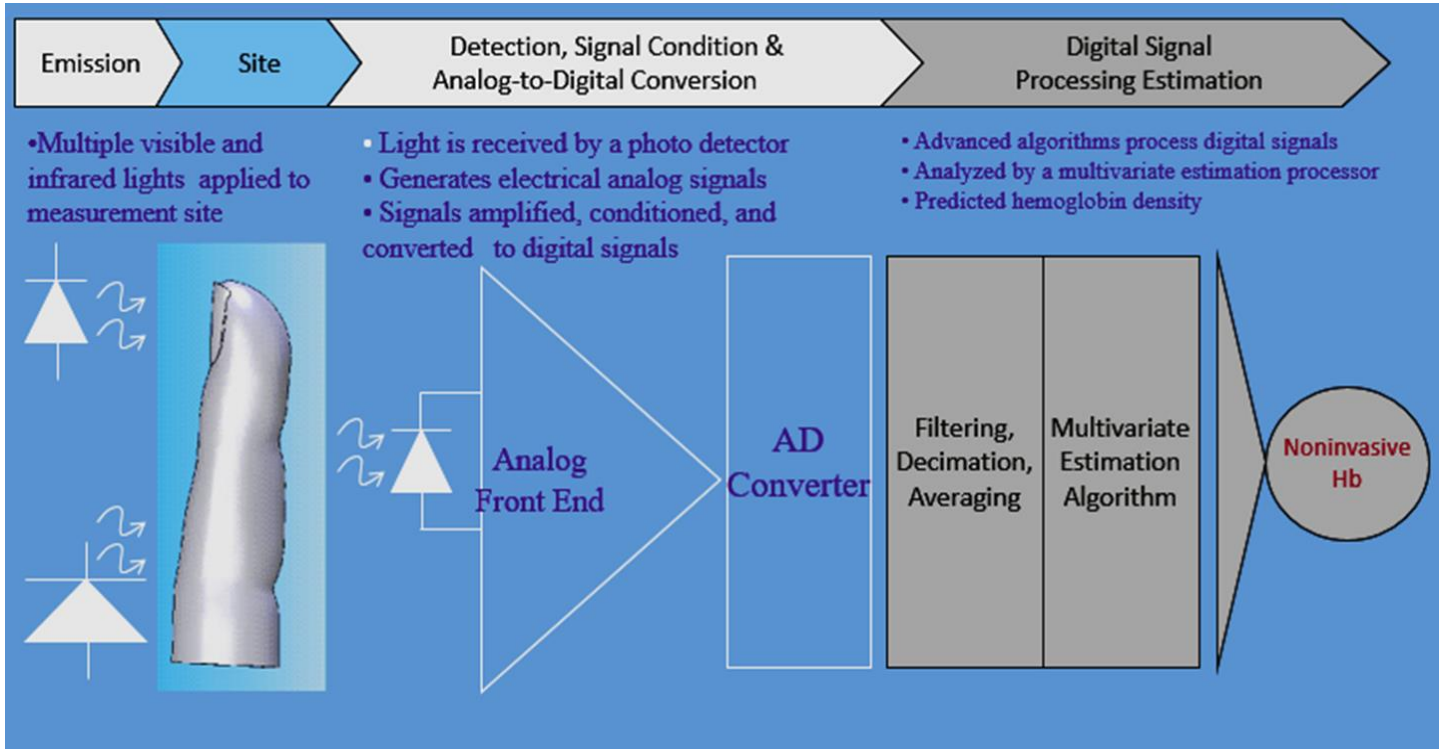
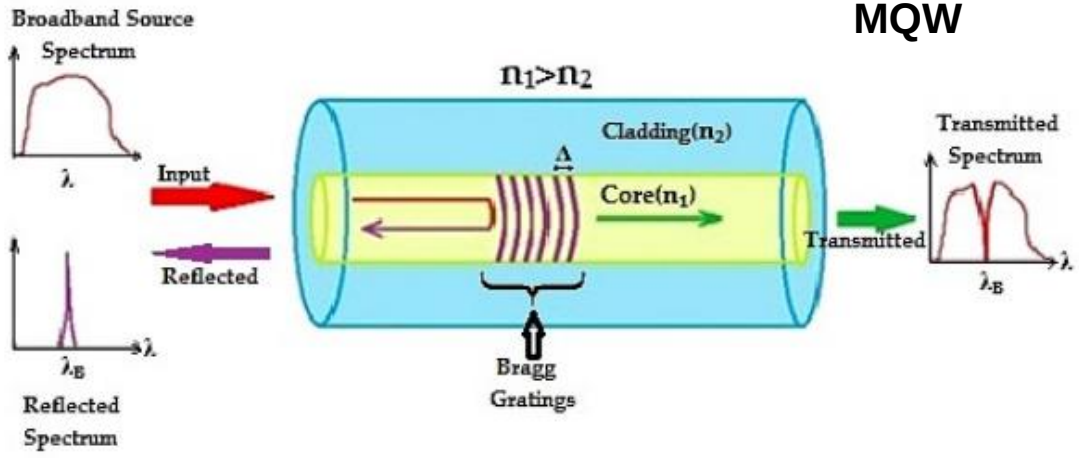


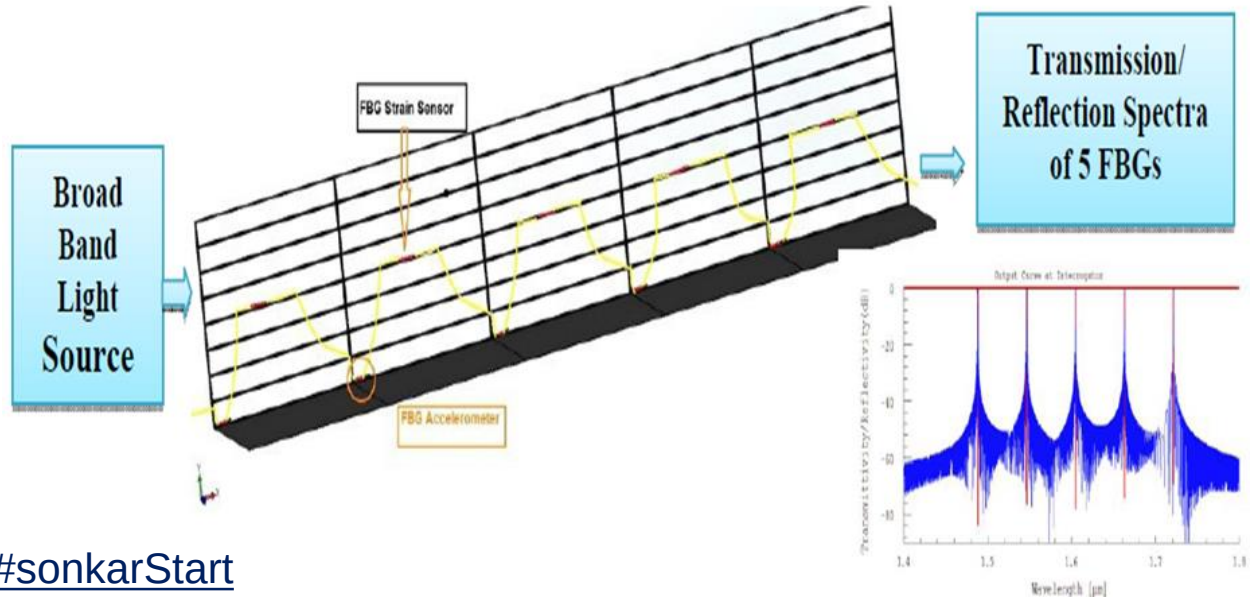
Waveguide Grating using InGaAsP/InP MQW



Research Areas

- Optoelectronics Devices
- III-V Compound Semiconductors
- Photonics Integrated Circuits
- Integrated Optics, Sensors
- Fiber Optics Communication
- Silicon Photonics





More details are available on http://www.iitg.ac.in/eee/sonkar.html#sonkarStart

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Postdoc, Imperial College London
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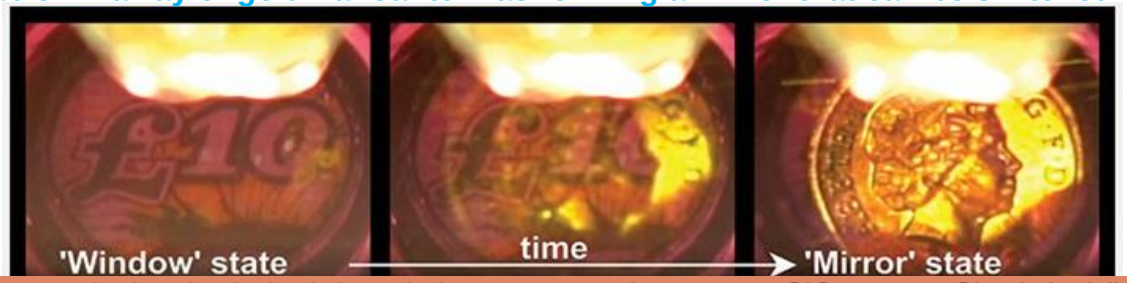
Metamaterial device reversibly changes its optical properties in response to voltage changes

Tuneable 2D array of gold nanoantennas forming a mirror that can be switched ON and OFF

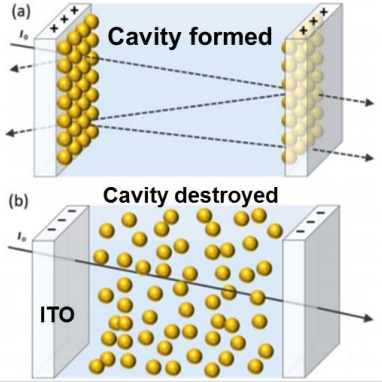


Depending on whether the device is in a window state or a mirror state, a £10 note or a £1 coin is visible, respectively.

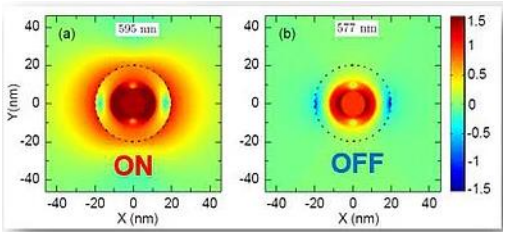
Research Areas

- Plasmonics and Metamaterials
- Optical and THz metadevices
- Light-matter interaction at nanoscale
- Tunable nano-optical Devices
- Nanoantennas, Switches, Filters, Sensors
- Dynamic tuning in plasmonic metadevices
- Alternative Plasmonic Materials
- CMOS-compatible Plasmonics

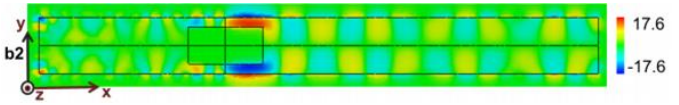
Electrotuneable nanoplasmonic Fabry–Perot Cavity



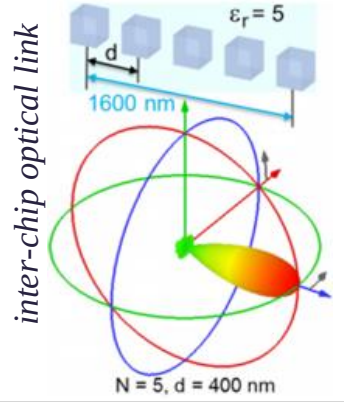
Light driven plasmonic nano-switch



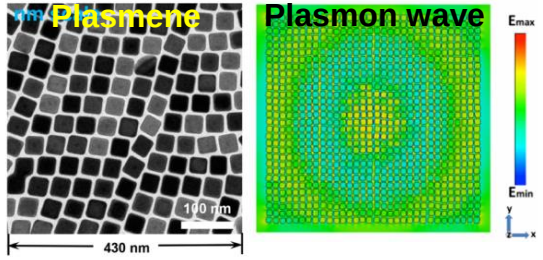
Controlled plasmonic waveguiding



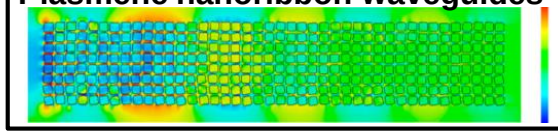
Loss-less directional nano-antenna



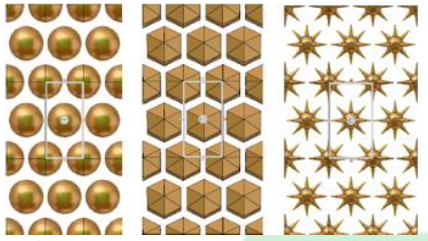
Plasmene: 2D plasmonic 'graphene-type' metamaterial

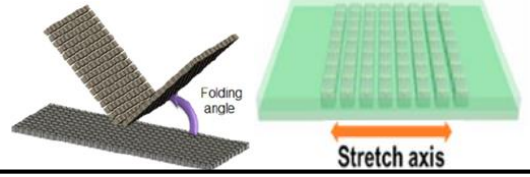


Plasmene nanoribbon waveguides

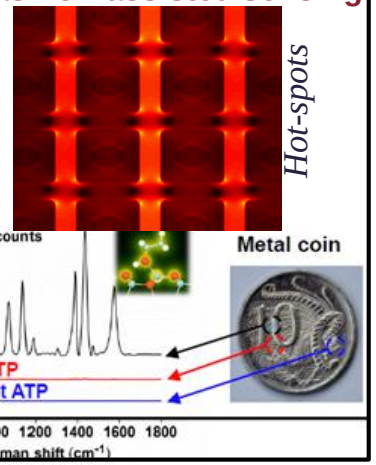


Stretchable/foldable plasmonic metadevices





Plasmon-assisted sensing



More details are available on

http://www.iitg.ac.in/eee/deb_sikdar.html

Dr. Rishikesh Dilip Kulkarni
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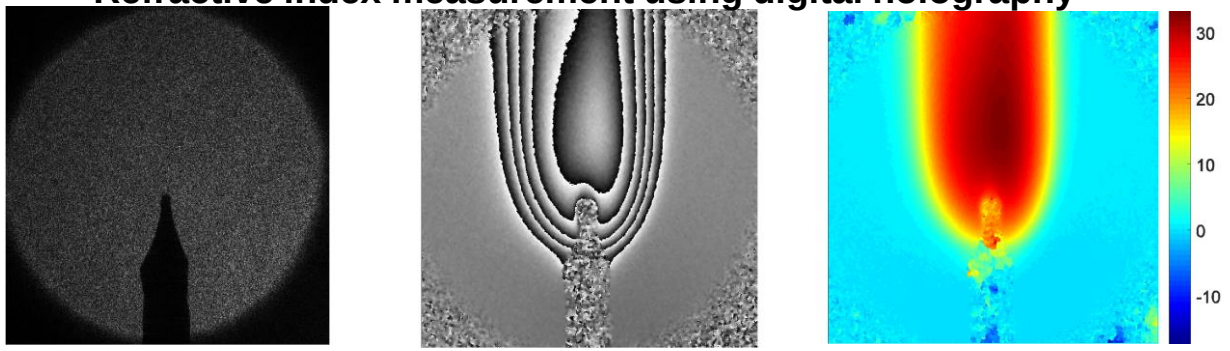
Refractive index measurement using digital holography



Research Interests

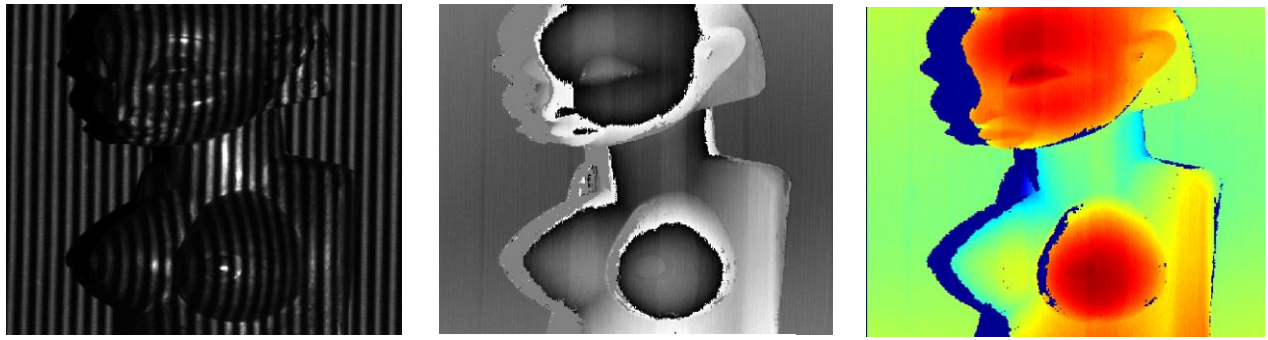
- **Optical Interferometric measurement techniques**
  - Digital Holography
  - Electronic Speckle Pattern Interferometry
  - Moiré interferometry
  - Shearography
  - Quantitative phase imaging

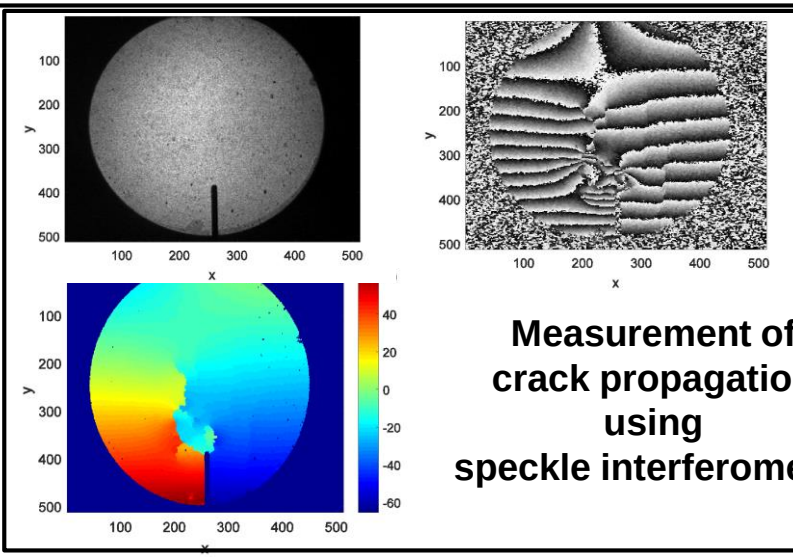
- **Optical Non-interferometric measurement techniques**
  - Digital Image Correlation
  - Transport of Intensity based phase measurement
  - Fringe Projection Profilometry for 3D shape measurement
- **Optical signal processing for the extraction of phase and its derivatives**

- **Application of interferometric signal processing techniques in non-optical measurement techniques**
  - Interferometric Synthetic Aperture Radar
  - Magnetic Resonance Imaging

More details are available on http://www.iitg.ac.in/eee/rishikesh.html

3D-shape measurement using fringe projection profilometry





Measurement of crack propagation using speckle interferometry

Dr. Mahima Arrawatia
Ph.D IIT Bombay
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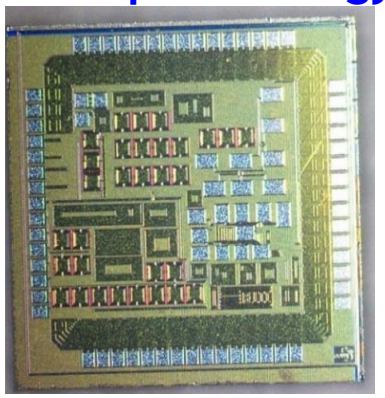
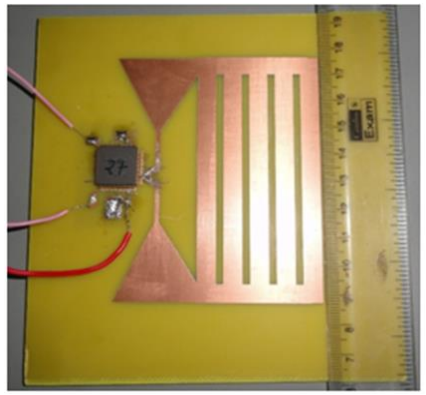
More details are available on
http://www.iitg.ac.in/eee/mahima.html

Research Areas

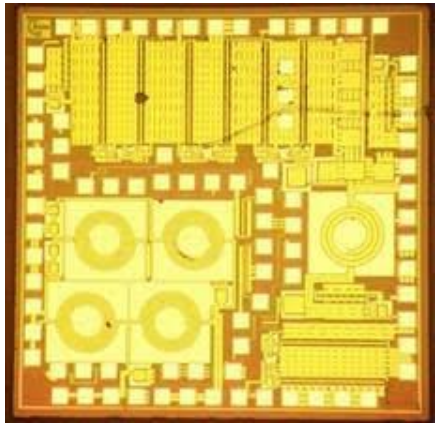
- Energy Harvesting
- Antennas
- RFIC Design
- MMIC Design
- Power Amplifier Design for 5G Applications
- Antenna and Beam forming networks for 5G
- Wake Receiver Design

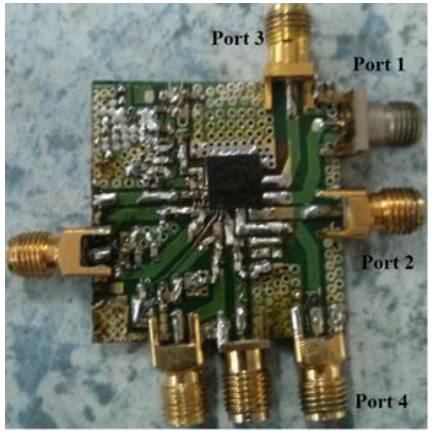
On-Chip RF Energy Harvesting System



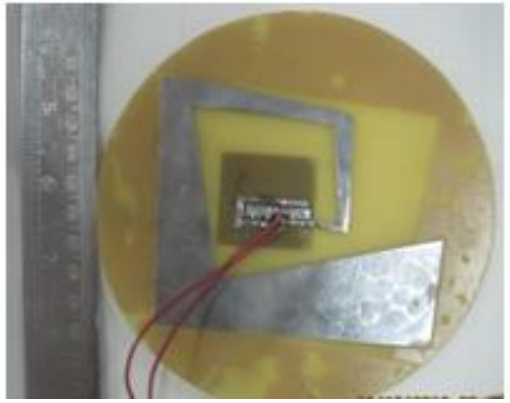


CMOS Power Amplifier Chip for 4G Applications

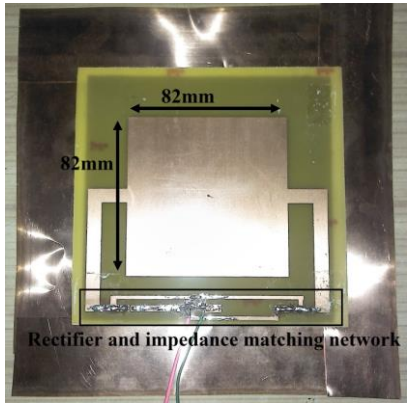


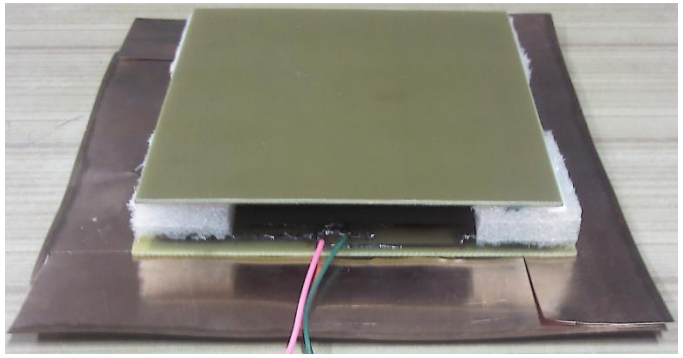


Wrap Around Antenna for RF Energy Harvesting



Differential Microstrip Antenna for RF Energy Harvesting





Course Structure: MTech

Semester I			
Code	**Course Name**	**L–T-P**	**Credits**
EE 540	Advance Electromagnetic Theory & Antennas	3-0-0	6
EE 541	RF Circuits and Systems	3-0-0	6
EE 542	Fiber Optic System	3-0-0	6
EE 543	Optical Systems Laboratory	0-0-3	3
EE/PH 6xx	Elective I	3-0-0	6
EE 6xx	Elective II	3-0-0	6
		15-0-3	33

Semester II			
Code	**Course Name**	**L–T-P**	**Credits**
EE 544	Photonics Devices and Circuits	3-0-0	6
EE 545	Computational Electromagnetics	3-0-0	6
EE 546	Optical Networks	3-0-0	6
EE 547	Antennas, RF and Microwave Laboratory	0-0-3	3
EE/PH 6xx	Elective III	3-0-0	6
EE 6xx	Elective IV	3-0-0	6
		15-0-3	33

Semester III			
Code	**Course Name**	**L–T-P**	**Credits**
EE 698	Project Phase-I	0-0-24	24

Semester IV			
Code	**Course Name**	**L–T-P**	**Credits**
EE 699	Project Phase-II	0-0-24	24

List of Departmental Electives can be found here : http://www.iitg.ac.in/eee/electives.html

Course Structure: MS + PhD

Course Structure

Semester - I At least Four Courses with a minimum aggregate of **24 credits** among EE 5xx / EE 6xx / XX 5xx / XX 6xx courses.					
Course No.	**Course Name/Type**	**L**	**T**	**P**	**C**
EE 5xx / EE 6xx	Elective - 1	3	0	0	6
EE 5xx / EE 6xx	Elective - 2	3	0	0	6
XX 5xx / XX 6xx	Elective - 3	3	0	0	6
XX 5xx / XX 6xx	Elective - 4	3	0	0	6
		12	**0**	**0**	**24**
Semester - II At least Four Courses with a minimum aggregate of **24 credits** among EE 5xx / EE 6xx / XX 5xx / XX 6xx courses.					
Course No.	**Course Name/Type**	**L**	**T**	**P**	**C**
EE 5xx / EE 6xx	Elective - 5	3	0	0	6
EE 5xx / EE 6xx	Elective - 6	3	0	0	6
XX 5xx / XX 6xx	Elective - 7	3	0	0	6
XX 5xx / XX 6xx	Elective - 8	3	0	0	6
		12	**0**	**0**	**24**
Semester - III At least Four Courses with a minimum aggregate of **24 credits** among EE 5xx / EE 6xx / XX 5xx / XX 6xx courses.					
Course No.	**Course Name/Type**	**L**	**T**	**P**	**C**
EE 5xx / EE 6xx	Elective - 5	3	0	0	6
EE 5xx / EE 6xx	Elective - 6	3	0	0	6
XX 5xx / XX 6xx	Elective - 7	3	0	0	6
XX 5xx / XX 6xx	Elective - 8	3	0	0	6
		12	**0**	**0**	**24**

	List of Courses: 1. All EE 5xx courses of the MTech program of the Dept of EEE. 2. All EE 6xx elective courses offered from the Dept of EEE. 3. All XX 5xx / XX 6xx courses offered from the other departments of the institute.

Course Structure: PhD

Course Structure

Semester - I At least Four Courses with a minimum aggregate of **24 credits** among EE 5xx / EE 6xx / XX 5xx / XX 6xx courses.					
Course No.	**Course Name/Type**	**L**	**T**	**P**	**C**
EE 5xx / EE 6xx	Elective - 1	3	0	0	6
EE 5xx / EE 6xx	Elective - 2	3	0	0	6
XX 5xx / XX 6xx	Elective - 3	3	0	0	6
XX 5xx / XX 6xx	Elective - 4	3	0	0	6
		12	**0**	**0**	**24**

Note: PhD students who have an MTech from IITs can be exempted from course work.

Who can apply for RF & Photonics programmes

- GATE qualified candidates (EC, EE, PH*)
- IIT Graduates with BTech Degree (ECE, EE, EP or equivalent) can apply without GATE score for MTech
- Graduates with BTech Degree (ECE, EE, EP or equivalent) from Centrally Funded Technical Institutes such as IITs, NITs, IIITs etc. can apply without GATE score for PhD
- QIP Candidates
- Defence Sponsored Candidates
- Part time Candidates

* Subjected to approval by the committee. Please check the website for latest updates.

How to Apply:

Instructions are available on the IIT Guwahati website.

http://www.iitg.ac.in/acad/

Career Options

- ❑ Academia
- ❑ R&D Jobs in Industries

Looking forward to welcoming you at IITG