Electroscience Group graduate students and faculty in the Nondestructive Evaluation Laboratory.

contacts

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NONDESTRUCTIVE EVALUATION LAB
http://www.egr.msu.edu/ndel/

ELECTROMAGNETICS
http://www.egr.msu.edu/ece/research/electromagnetics

ELECTRONIC MATERIALS & DEVICES
http://www.egr.msu.edu/ece/research/electronic-materials-devices

PLASMA THEORY & SIMULATION
http://ptsg.egr.msu.edu/#Workshops

FRAUNHOFER CENTER FOR COATINGS & LASER APPLICATIONS– CCL COATINGS TECHNOLOGY DIVISION
http://www.ccl-coatings.fraunhofer.org/

electro sciences group

MICHIGAN STATE UNIVERSITY | COLLEGE OF **ENGINEERING**

msu electrosciences group

— a tightly integrated and collaborative group of 16 faculty members together with their graduate students —


John Albrecht


Rebecca Anthony


Jes Asmussen


Shanker Balasubramaniam


Prem Chahal


Andrew Christlieb


Tim Grotjohn


Lee Harle


Tim Hogan


Leo Kempel


Ed Rothwell

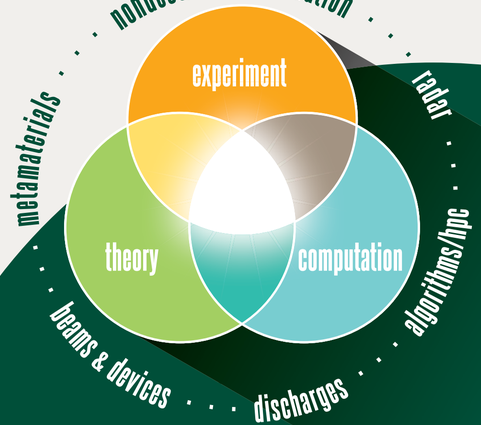

Nelson Sepúlveda


Antonello Tamburrino


Lalita Udpa


Satish Udpa


John Verboncoeur



— with research spanning multiple disciplines in applied physics ranging from nondestructive evaluation to plasma to classical electromagnetics. Our unique strength lies in building around a comprehensive core — including theory, experiment, and computation — offering decades of collaborative expertise for engineering a better tomorrow.

msu electrosciences group

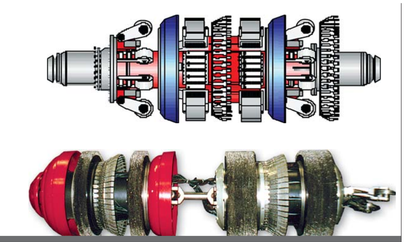
concept ▸ computation ▸ application

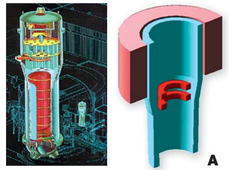
nondestructive evaluation

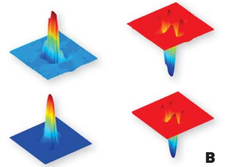
Theoretical development for flaw/field interaction

Numerical analysis of the underlying phenomena (both electromagnetic and acoustic)

Design and development of sensors and systems for nondestructive evaluation of metal and composite airframe structures, heat exchange tubes

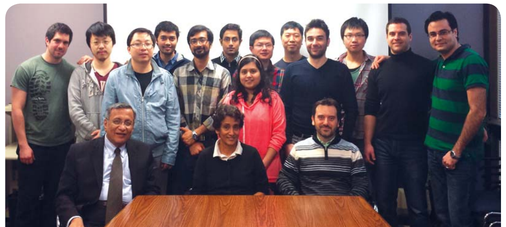






ABOVE: In-line pipeline inspection tool.

RIGHT: Steam generator tube simulation GUI: (A) FE model mesh, (B) validation of simulation (*top:* experiment, *bottom:* simulation).



electro-magnetics

Algorithms and software for large-scale time and frequency domain electromagnetic analysis

Higher-order integral and differential equation solvers

Light-matter interaction, coupled device electromagnetic models

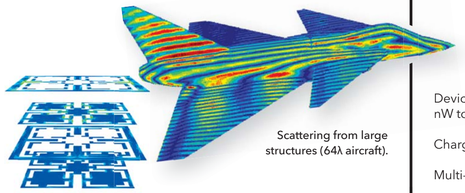
Theoretical and experimental design of meta-surfaces, meta-material-inspired devices (antennas; THz imagers, sensors, and infrared detectors), optimization of metamaterial structures

Reconfigurable and self-structuring antennas for air and land vehicles

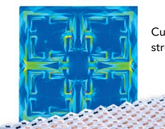
Antenna miniaturization, reconfigurable scatterers, cavities, microwave circuits, and wearable devices

Packaging and high-frequency interconnects, 3D and heterogeneous integration

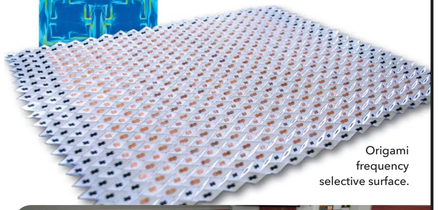
Measurement of constitutive properties in from the MHz–THz regimes



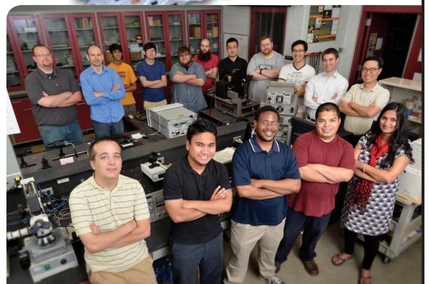
Scattering from large structures (64λ aircraft).



Current distributions in 3D fractal structures with 2D periodicity.



Origami frequency selective surface.



devices

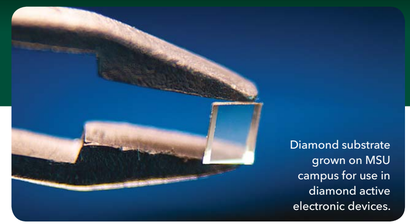
Devices from RF to THz frequencies, nW to GW powers

Charge and phonon transport

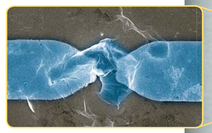
Multi-scale device modeling

Thermoelectric devices, transport measurement systems

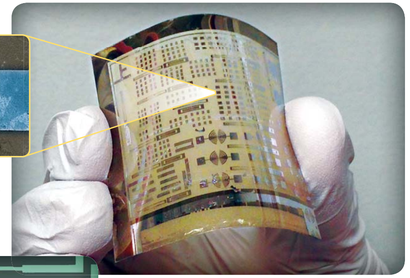
MEMS and optical devices based on phase-change materials

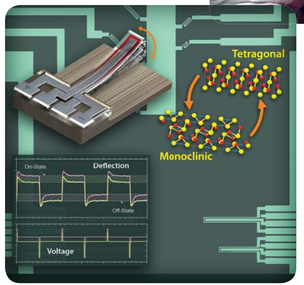


Diamond substrate grown on MSU campus for use in diamond active electronic devices.

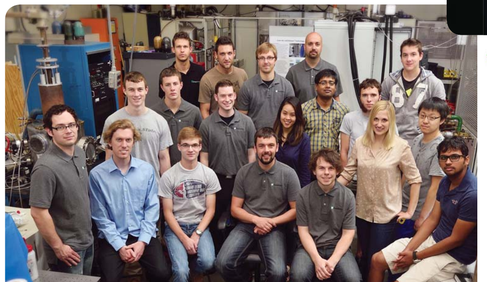


Graphene devices on flux substrate.





LEFT: Programmable MEMS: fully monolithically integrated MEMS memories have been developed in our group. The devices use the structural phase transition in VO_2 and hysteric behavior to allow for multiple state programmable micro actuators. The devices are operated completedly through electrical signals, but could also be acuated photo-thermally.



plasmas

Basic plasma physics, wave propagation, and instabilities

Low-temperature plasmas for materials, lighting, jets, and thrusters

Beams, accelerator, and microwave devices and components

Plasma chemistry for combustion, surface physics, and laser pumping

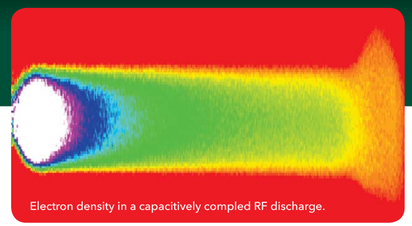
Algorithms and high-performance computing

Particle, fluid, and global models

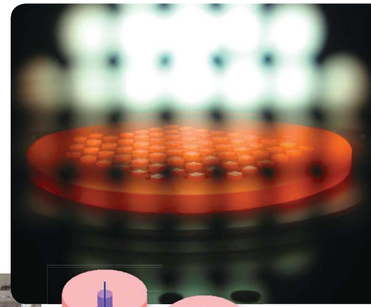
Microwave plasma source design including large area and microplasmas

Plasma diagnostics, plasma materials process including deposition, etching, and surface treatment of materials

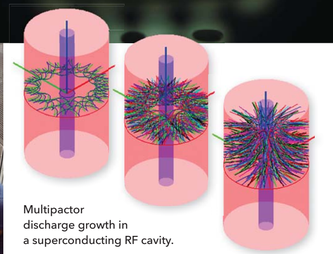
Plasma-assisted chemical vapor deposition of diamond and plasma etching of diamond



Electron density in a capacitively compled RF discharge.



Diamond materials fabrication in the Fraunhofer Center for Coatings & Laser Applications laboratory.



Multipactor discharge growth in a superconducting RF cavity.