

The Ohio State University ElectroScience Laboratory (ESL) is seeking outstanding electrical and computer engineering graduate students interested in RF and optical systems, metamaterials for RF/optical applications, ultra wideband/miniaturized antennas, computational electromagnetics, remote sensing, software radio/radars, RFID systems, GPS, millimeter waves, and RF measurements.

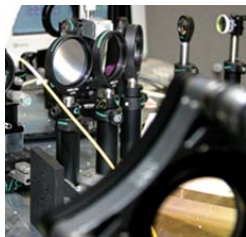


## ElectroScience Laboratory

Established in 1942, ESL is one of the largest university centers in the United States providing graduate studies in RF engineering, optics, and electromagnetics. Part of the Electrical and Computer Engineering Department, ESL is comprised of 14 faculty members, 10 research scientists, and 70 graduate and undergraduate students. ESL personnel carry out research in all aspects of RF/Optical systems, antennas, metamaterials for RF and optical applications, computational electromagnetics, remote sensing, software radio/radars, RFID systems, GPS, millimeter waves, and RF measurements (example current research activities detailed on reverse). ESL occupies a 20,000 sq. ft. facility, and construction of a new building addition is planned for 2008.

### Highlights:

- 14 IEEE Fellows
- 3 AMTA Distinguished Achievement Award Winners
- More than \$6M sponsored research
- 3 Multi-disciplinary University Research Initiatives (MURIs)
- Anechoic chamber (40 x 60 x 20 ft) housing 0.8 – 100 GHz compact range for antenna/scattering measurements
- Low temperature co-fired ceramic processing facility
- RF measurements laboratory
- RF integrated circuits and wireless systems laboratory
- Optics laboratory
- Balanced training in analysis, design, fabrication, hardware and measurements.
- Almost all graduate students are financially supported.



## Sponsored Fellowships

ESL offers more than ten externally funded fellowships for incoming graduate students in addition to fellowships provided by the Ohio State University graduate school. The ESL fellowships described below require U.S. citizenship or permanent residency, and are awarded based on undergraduate performance and research potential. All eligible ESL applicants are considered for these awards.

### AFRL Fellowships

In 2007, the Air Force Research Laboratory (AFRL) Sensors Directorate established a collaborative research program to train U.S. students in sensor technologies including software defined radar/ radar-on-a-chip, mixed signal design, next generation navigation systems, imaging techniques, and signal processing. Up to eight fellowships are available under this program.



### Northrop Grumman Fellowships

The Electronic Systems Sector of the Northrop Grumman Corporation (NGC) has established an ESL fellowship program to train U.S. students in the areas of airborne radar systems, ultra wideband antennas, computational electromagnetics, RF Measurements, and optics. NGC has a satellite research location at ESL, and provides 3 to 4 graduate student fellowships per year.



### NSF Connection One Center

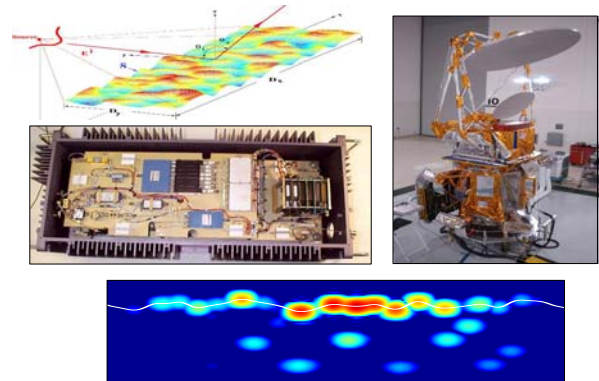
Established in 2005, this National Science Foundation (NSF) Center carries out inter-disciplinary research on next generation wireless tele-Communication systems by integrating expertise in antennas, electromagnetics, optics, devices, integrated systems, communication systems and signal processing. The center is supported by NSF and a group of industrial and government organizations who sponsor individual research projects. Five to seven graduate students are recruited for these projects.



For more information, please see our website at [www.electroscience.osu.edu](http://www.electroscience.osu.edu) or contact Prof. John L. Volakis, Director, ESL at [volakis@ece.osu.edu](mailto:volakis@ece.osu.edu)

## • RF and Optical Systems

- RFID, RF integrated circuits, and mixed signals
- Optical true time delays
- Ground and building penetration radars
- Instrumentation radars
- Radiometry systems for remote sensing
- GPS antenna electronics and receivers
- Imaging, geolocation, and signal processing
- Software defined radios and radars



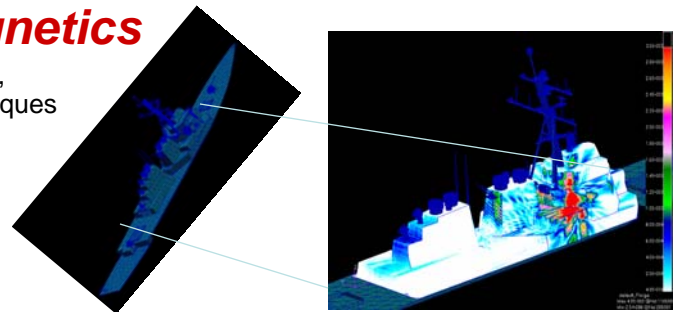
## • Novel Antennas

- Miniature antennas using metamaterials and artificial transmission-lines
- Conformal antennas on flexible substrates and ferrite ground planes
- Ultra-wide bandwidth antennas for sensors, communications, radar, and antenna ranges
- Compact GPS antennas
- Body-worn antennas
- Broadband arrays
- Antennas for RFID tags and readers



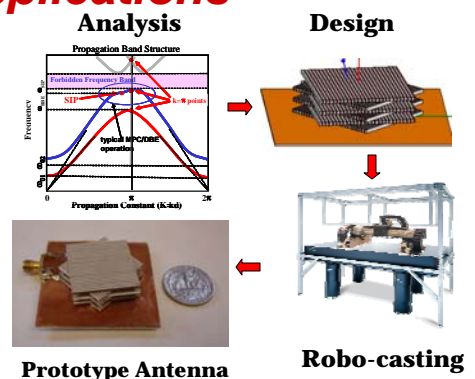
## • Computational Electromagnetics

- Frequency domain methods: finite elements, boundary integral and high frequency techniques
- Time domain methods: FETD, FDTD, and DGTD
- Domain decomposition methods
- Hybrid and multiphysics techniques



## • Metamaterials for RF and Optical Applications

- Dispersion engineering: field behavior control in metamaterials
- Engineered low-loss ferromagnetic RF crystals
- Slow wave structures
- Printed metamaterial components
- Material design and manufacturing
- Robo-casting and inkjet printing of low-loss ceramic composites
- Nonlinear optoelectronics systems with metamaterials



Prototype Antenna

Robo-casting