

# RF & Microwave Systems Group



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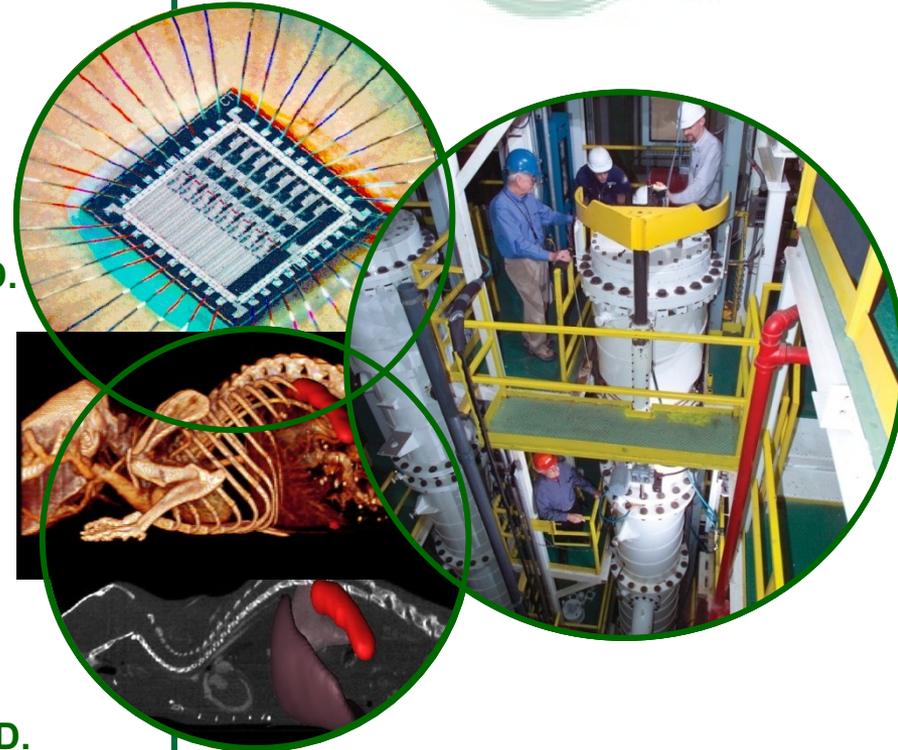
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*Energy and Engineering Science  
Directorate*



# RF & Microwave Systems Group

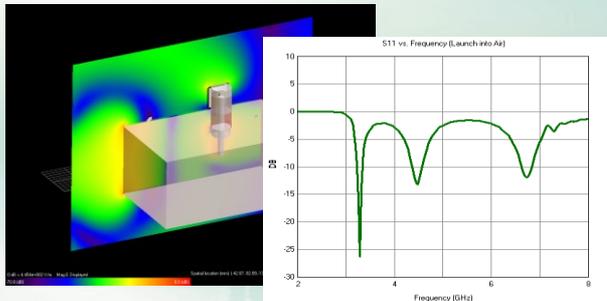
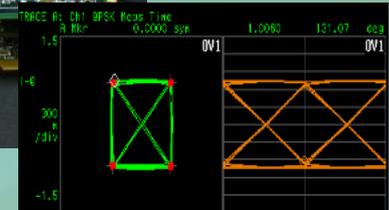
... Pioneering Solutions to Challenging Problems

## Core R&D

- Robust Communications in Extreme Environments
- Tagging, Tracking, and Locating Systems
- RF & Microwave Measurement Systems



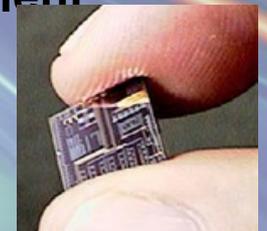
Software-Defined Radio Development Platform



Simulation of Teflon-Filled Coax to Waveguide Adapter

## Capabilities

- Custom RF & Microwave Electronics / Systems
- Software-Defined / Cognitive Radio Platforms
- Model-Based Waveform Development
- System Architecture Design
- Advanced Coding Techniques
- Novel Antenna Design
- Hardware-in-the-Loop Simulations
- Radiolocation Tracking and Locating Techniques
- RF- & Microwave-Based Sensors / Diagnostics
- Electromagnetic Characterizations

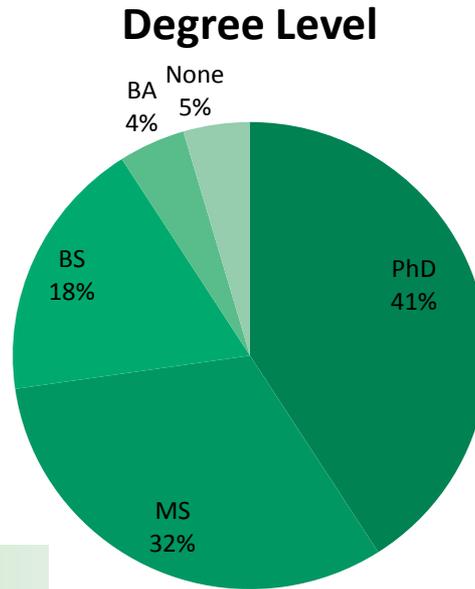
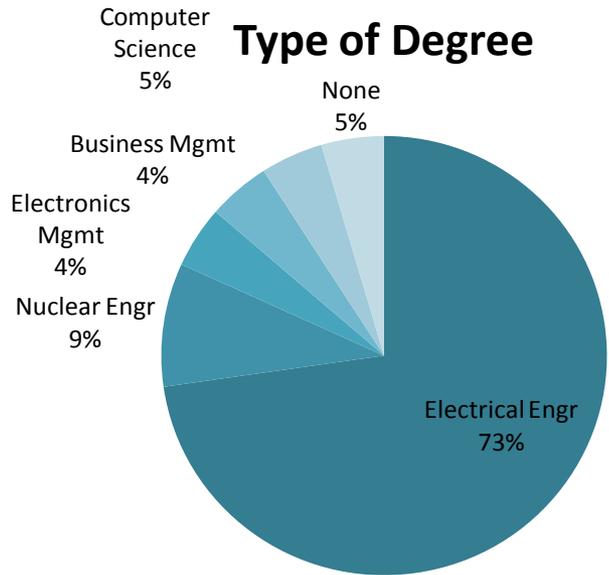


Custom RF Chip

### What Sets Us Apart?

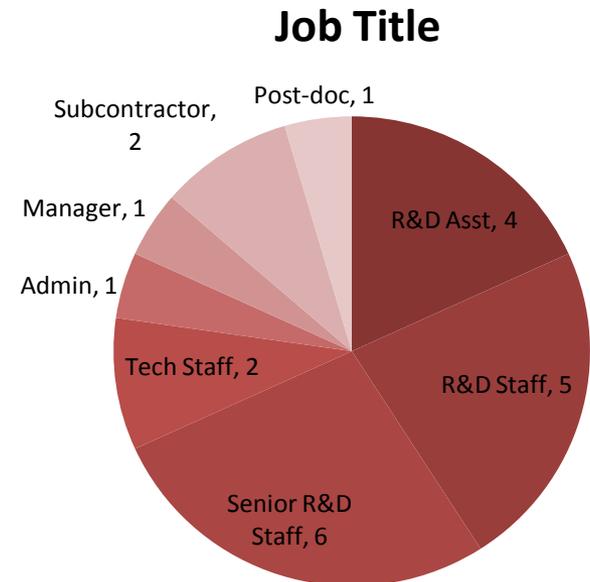
- Rapid Development and Prototyping
- Experience and Breadth of R&D Staff
- Cache of Intellectual Property

# Staff Structure



18 Exempt Staff  
 1 Non-Exempt Staff  
 2 Subcontractors  
1 Post-doc  
 22 TOTAL STAFF

Staff is Dominated by Mix of Ph.D.- and MS-Level Electrical Engineers



# Core R&D Area

## Robust Communications in Extreme Environments

### Focus

- Rugged Communications Systems for Harsh Environments
- Software-Defined Radio / Cognitive Radio Systems
- Biomimetics
- Wireless Network Security
- Emerging Developments in Advanced Communications



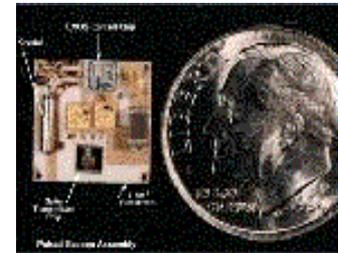
ORNL Robust Wireless Communications Technologies Team—Winner of 2004 Project of the Year Award from Federal Laboratory Consortium for Technology Transfer

### Sponsors

- DOE NA-22
- DOD - DARPA
- DOD - U.S. ARMY
- IC
- NRC



SDR/CR Platform



16 GHz Microtransmitter

# Core R&D Area

## Tagging, Tracking, and Locating

### Focus

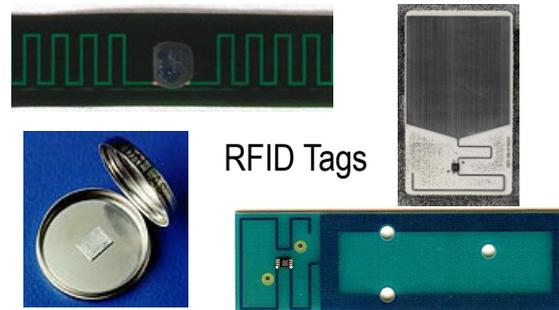
- Theater Positioning Systems (Radiolocation Techniques)
- Satellite-Based Global Asset Visibility
- Safeguarding Classified Assets
- Inertial Navigation Systems
- Radio-Frequency Identification (RFID) Middleware Development



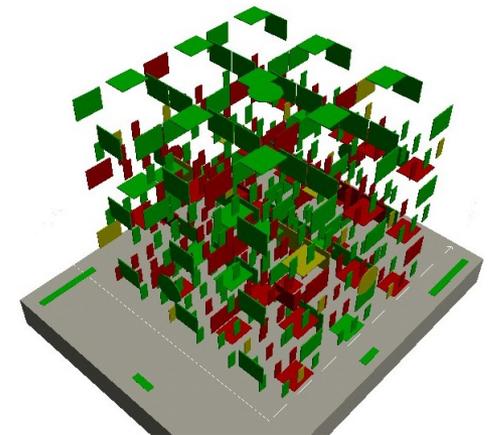
ORNL-developed tracking hardware installed on a shipping container in Charleston, SC

### Sponsors

- DOD - U.S. ARMY
- DOD - NRL
- DOD - NGA
- LDRD



RFID Tags



Pallet-Level RFID Tag Response

# Core R&D Area

## RF & Microwave Measurements

### Focus

- Radar Simulator Environment
- Magnetic Processing for Materials Development
- Microwave Plasma Diagnostics
- RF-Based Measurements
- Electronic Device Characterization



Microwave moisture measurement system for lumber drying

### Sponsors

- DOD – U.S. Army
- DOE – FED
- DOE – MSTD
- NRC
- CRADA Partners

Millimeter-wave radiometer for measuring plasma electron temperature

