

## Contact Us

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DEPARTMENT OF  
ELECTRICAL ENGINEERING  
AND COMPUTER SCIENCE

Institute for Space  
and  
Defense Electronics



 SCHOOL OF ENGINEERING  
VANDERBILT UNIVERSITY

# Our Objective

***The mission of ISDE is to contribute to the design and analysis of radiation-hardened electronics, the development of test methods and plans for assuring radiation hardness, and the development of solutions to system-specific problems related to radiation effects. ISDE was launched with initial support from the U.S. Navy SSPO and Draper Labs. In addition, ISDE currently supports the Defense Threat Reduction Agency, Arnold Engineering Development Center, NASA Goddard Space Flight Center, Mission Research Corporation, Boeing/DARPA and BAE Systems. ISDE engineers help to identify radiation-related issues at the device and circuit levels, propose design solutions and implement test plans. Expertise includes, but is not limited to, Intersil, Honeywell and IBM processes.***

## Background

The Radiation-Effects Group at Vanderbilt University was established in 1987 and is the largest program of its kind in the U.S. It is the only academic program actively involved in supporting the Department of Defense (DoD) in radiation effects for strategic applications and one of a very few programs involved in microelectronics research for space applications. In January 2003, the Radiation-Effects Group established the Institute for Space and Defense Electronics (ISDE) in order to extend its capabilities to serve government and commercial customers.

## Facilities

The ISDE facilities in Nashville, Tennessee, offer the best of both worlds from an independent contractor and academic environment perspective. The facility is located off of the Vanderbilt University campus and provides a professional office environment conducive to engineering and project management activities. However, the Institute has full access to the University's laboratories and meeting facilities located on campus just a short walk away. The ISDE office is a secure, limited access facility allowing only approved personnel to enter without an ISDE employee escort. We are a short 20-minute drive from the airport via interstate and have many hotels and restaurants within easy walking distance.

## Capabilities

The engineering staff of ISDE performs design, analysis and modeling work for a variety of space- and defense-oriented organizations. ISDE engineers help to identify radiation-related issues at the device and circuit levels, propose design solutions, and implement test plans. ISDE has an array of software tools for simulating radiation effects and designing integrated circuits, a high performance parallel computing cluster, several types of radiation sources, and extensive electrical characterization capability.

Specifically, ISDE has an extensive suite of test and characterization equipment for radiation-effects analysis, including an ARACOR 10-keV x-ray irradiator, two Cs-137 isotopic irradiators and a 2-MeV proton source. ISDE team members have extensive experience conducting single-event tests at facilities including Brookhaven National Laboratory, Michigan State University and Indiana University. An array of test equipment is available to facilitate the characterization of irradiated devices and ICs. Vanderbilt also has in place a Cooperative Research and Development Agreement (CRADA) with NAVSEA-Crane that provides access to a suite of radiation sources and fully equipped parts analysis laboratory. Vanderbilt's Advanced Computing Center for Research and Education (ACCRE) houses VAMPIRE, a 1200+ processor Beowulf cluster supercomputer used to execute Vanderbilt's Technology Computer Aided Design (TCAD) suite and the particle interaction simulator based on Geant4.

## Radiation-Effects Group Sponsors

- U.S. Navy Strategic Systems Program Office
- NAVSEA-Crane
- U.S. Air Force Office of Scientific Research
- Defense Threat Reduction Agency
- NASA—GSFC and JPL
- Sandia National Labs
- BAE Systems

## Major Programs

- Design and test of radiation-tolerant integrated circuits and semiconductor devices.
- Development and application of simulation tools for analyzing the effects of radiation on integrated circuits and semiconductor devices
- Test methods and plans for predicting the survival of electronics in radiation environments.
- Basic physical mechanisms of radiation damage in semiconductor devices and materials.