

## **Advanced Microsystems Radiation Effects R&D at Sandia National Laboratories**

Dr. Nathan Nowlin

Sandia National Laboratories

**1:30 PM, Thursday, June 27, 2019**  
**Seng-Liang Wang Hall Room 1004**

Sandia National Laboratories (SNL) develops advanced technologies to ensure global peace. We are called upon by our Nation to conduct leading-edge national-security research in the physics, modeling, hardening, and hardness assurance, and development of advanced microsystems, microelectronics, photonics, optoelectronics, micro-electrical-mechanical, and heterogeneously integrated circuits in Silicon CMOS, compound semiconductors and other materials and devices in harsh radiation environments. Dr. Nowlin, from the Advanced Microsystems Radiation Effects department, will describe recent research his team has reported on the development of radiation hardened technologies manufactured at SNL, as well as new work in the radiation hardness assurance of advanced integrated circuits from leading commercial manufacturers.

Dr. Nathan Nowlin has 25 years experience in advanced microelectronics and radiation effects research. In his early career, he co-discovered the Enhanced Low Dose Rate Sensitivity (ELDRS) effect in bipolar transistors. He then spent several years in the semiconductor industry developing high voltage Lateral Drain MOS (LDMOS) process technology and leading yield engineering for a high-speed BiCMOS technology. In the early 2000's, he went to work for Mission Research Corporation, where he led the development of a 90nm Radiation Hardened By Design (RHBD) library and SRAM compiler for spacecraft Application Specific Integrated Circuit (ASIC) designs. In his 10 years at Sandia, Dr. Nowlin has led research and development efforts for radiation hardening by design, advanced circuit modeling of radiation effects, and product engineering for high reliability, high consequence systems. Dr. Nowlin was a product realization team lead for 10 ASIC products, developing requirements, demonstrating prototypes, and initiating production for all aspects from wafer manufacturing, packaging, test, reliability, and radiation performance. His efforts enabled Sandia to successfully begin its largest ASIC production mission in its history. Dr. Nowlin now leads the Advanced Microsystems Radiation Effects department where he is responsible for trust and radiation hardness assurance of microsystems for national security applications. Dr. Nowlin is a Senior Member of the IEEE Nuclear and Plasma Sciences Society (NPSS), has authored or co-authored 21 papers, and serves on the organizing committees for the Nuclear and Space Radiation Effects Conference (NSREC) and the Hardened Electronics And Radiation Technologies (HEART) technical interchange meeting.