

## Brian D. Sierawski, Ph.D.

### Address

Institute for Space and Defense Electronics  
Vanderbilt University  
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## EDUCATION

*Doctor of Philosophy*, Electrical Engineering Dec. 2011  
Vanderbilt University, Nashville, TN  
Dissertation: The Role of Singly-Charged Particles in Microelectronics Reliability  
Advisor: Ronald D. Schrimpf

*Master of Science and Engineering*, Computer Science and Engineering Apr. 2004  
University of Michigan, Ann Arbor, MI

*Bachelor of Science and Engineering*, Computer Engineering Apr. 2002  
University of Michigan, Ann Arbor, MI

## RESEARCH INTERESTS

- Improving the reliability and robustness of small spacecraft hardware and software systems operating in the space radiation environment
- Evaluating ion and proton beam test methods for experimental characterization of single event effects in microelectronics
- Developing computational models and simulation to evaluate transient radiation effects in microelectronics at the device, circuit, gate, and register transfer levels

## PROFESSIONAL EXPERIENCE

### *Institute for Space and Defense Electronics*

Research Engineer Jul. 2012 – Jul. 2016

- Published first experimental observations of muon-induced errors in commercial memories through investigations of low-energy proton and muon single event upsets in highly-scaled static random access memories (SRAMs)
- Performed proton, ion, and muon beam accelerated single event tests at research facilities including Indiana University Cyclotron Facility, Lawrence Berkeley National Laboratory, Vanderbilt Pelletron, NASA Space Radiation Laboratory at Brookhaven, Texas A&M University Cyclotron Institute, TRIUMF, and Rutherford Appleton Laboratory
- Authored and administered NASA's CRÈME website and CRÈME-MC Monte Carlo tools for single event rate predictions on-orbit
- Led science and software development for the Radiation Effects Testbed CubeSat payload encompassing experiment controller, proton single event upset experiment, and single event latchup experiment

Staff Engineer Jan. 2005 – Jul. 2012

- Modeled CMOS transistors and performed three-dimensional Synopsys Sentaurus TCAD device simulations for aerospace, government, and commercial contracts
- Deployed a single event fault injection library for commercial Verilog RTL simulators

### *Intel Corporation*

Desktop Platforms Group RTL/Logic DA May 2001 – Aug. 2001

- Developed scan chain verification tools: created Prescott (Pentium IV) tools to run at megablock (cell based design) and EBB (embedded block) level for Prescott formal verification flows
- Designed interface between switch level simulator and schematic viewer. Enhanced debugging features by back-annotating values from simulator

## SPONSORED RESEARCH

### Principal Investigator (Total: \$555K)

NASA 422-421-3511, Evaluation of FINFET Technology for Extreme Environments, 2/1/2016 – 1/31/2019, \$499,998 Average Historical Effort: 10%

NASA 422-421-3535, Administering and Maintaining CRÈME Tools Suite Via an Open Access Website, \$25,000 04/2015 – 03/2016, Average Historical Effort: 18%

NASA 422-421-3545, Cosmic Ray Effects on Micro-electronics (CRÈME) Tools Maintenance (Server Replacement), 09/2015 – 11/2015, \$29,984 Average Historical Effort: 20%

### Co-Investigator (Total: \$51K)

NASA 422-420-3521, Reliability Paradigms for Space: Phase I: Goal Structuring Notation for Aerospace Reliability Applications, 09/2015 – 01/2016, \$50,996 Average Historical Effort: 4%

### Senior Investigator (Total: \$17M)

AECOM/URS DOD 422-420-4163, AECOM/URS Navy SP27 Model Development and Verification Support, 09/2015 – 09/2016, \$264,997 Average Historical Effort: 10%

Aero Thermo / Navy 422-421-4153, SSP D5LE Program Support, 01/2013 – 12/2015, \$1,310,190 Average Historical Effort: 7%

AECOM/URS DOD 422-421-4173, AECOM/URS Ground Based Strategic (GBSD) Program Support, 9/2015 – 9/2016, \$576,580 Average Historical Effort: 12%

AEDC 422-423-4223, IDIQ ISDE/Cubesat Effort, 11/2014 – 12/2015, \$75,000 Average Historical Effort: 16%

CFDRC / Air Force 422-420-3933, High-efficiency, Radiation-hardened GaN HEMT Technology for L-band Space Power Amplifiers, 06/2014 – 02/2015, \$34,395 Average Historical Effort: 20%

Silicon Valley Community Foundation 4-22-420-6342, Establishing the Framework for Monte Carlo Calculations of the Muon Flux in the Earths Atmosphere, 12/14 – 4/15, \$20,000 Average Historical Effort: 5%

NASA 422-421-3525 / 422-421-3515, Administering and Maintaining the Cosmic Ray Effects on Micro-Electronics (CRÈME) Tools Suite via an Open Access Website , 7/1/2014 – 3/31/2015, \$69,663 Average Historical Effort: 26%

Cisco Systems, et al. 4-22-422-7614, 20 nm Testing, 8/12 – 3/16, \$899,992 Average Historical Effort: 5%

TSMC North America 422-422-7684, Soft Error Characterization of 16 nm Technology Platform, 3/14 – 2/28/17, \$1,298,595 Average Historical Effort: 5%

Boeing Aerospace, Inc. 4-22-423-4813, Boeing/DTRA Rad Hard by Design (RHBD) Phase 3 Task Single Event Simulations in 45-nm SOI CMOS Technology, 8/12 – 12/13, \$671,190 Average Historical Effort: 17%

5th Gait / MDA 422-425-3913, MDA SSE Environments, 3/14 – 6/14, \$31,931 Average Historical Effort: 20%

NASA 422-453-3571, RadFxSat - A University Based Satellite Program to Study Radiation Effects on Advanced Nanoelectronics (EPSCOR), 9/11 – 8/14, \$749,952 Average Historical Effort: 12%

CFDRC/DTRA 4-22-420-3893, Radiation Effects in Small Volume SOI Devices, 11/11 – 10/13, \$150,000 Average Historical Effort: 4%

DTRA 4-22-420-4203, Investigations of Physical Mechanisms for Radiation-Induced Effects in Non-Silicon Channel CMOS Devices, 6/12 – 5/15, \$1,048,823 Average Historical Effort: 12%

Silicon Valley Community Foundation 4-22-420-6322, Soft Error Response of 3D IC Technologies, 12/11 – 7/13, \$40,000 Average Historical Effort: 5%

Honeywell, Inc. 4-22-421-4063, Honeywell HX5000 Analysis, 7/12 – 5/13, \$174,450 Average Historical Effort: 18%

Honeywell, Inc. 422-421-4073, Task to Evaluate the Efficacy of PAXM and Identify Improvements, 10/13 – 11/13, \$42,028 Average Historical Effort: 7%

DTRA 4-22-421-4133, Analysis of Radiation-Induced Changes in Robotic Materials Components and Subsystems, 12/12 – 12/15, \$1,049,623 Average Historical Effort: 14%

AEDC 422-421-4233, Development of a Test Article Cubesat Payload for the support of High Energy Radiation Effects Test Simulations on the Space Threat Assessment Testbed, 5/13 – 4/16, \$49,759 Average Historical Effort: 9%

Aero Thermo / Air Force 422-422-3923, Minuteman, 1/13 – 11/14, \$1,072,201 Average Historical Effort: 26%

DTRA 4-22-424-4783, Studies of the Impact of Complex Material Systems, 5/08 – 7/12, \$1,248,788 Average Historical Effort: 20%

Silicon Valley Community Foundation 4-22-420-6302, Logic Designs for In-Field Repair and Failure Mitigation, 12/11 – 12/12, \$70,000 Average Historical Effort: 7%

NASA Marshall 4-22-421-3621, Tool for Predicting the Radiation-Induced Single Event Effect Response of Semiconductor Devices and Circuits, 6/07 – 06/13, \$1,579,523 Average Historical Effort: 25%

Scientific/MDA 422-420-3765, Radiation Hardened Point of Load DC/DC Converter for Space Applications, 7/11 – 12/12, \$47,921 Average Historical Effort: 15%

Cisco, et al. 4-22-422-7514, Soft Error Analysis of Designs at 28 nm Platform, 8/10 – 8/13, \$525,000 Average Historical Effort: 13%

Intel, Corporation 422-422-7535, Physical Soft-Error Rate Prediction Capability Development, 12/10 – 12/12, \$297,190 Average Historical Effort: 11%

DTRA 4-22-424-4993, Fundamental Aspects of Radiation Event Generation, 5/2008 – 7/2012, \$999,146 Average Historical Effort: 14%

NASA Goddard 422-422-3611, Radiation Effects in Advanced Microelectronic Devices and Circuits, 10/10 – 9/11, \$265,000 Average Historical Effort: 3%

DTRA 422-422-4083, Characterization and Mitigation of Nanoscale CMOS, 8/13 – 7/16, \$2,500,175 Average Historical Effort: 9%

## TEACHING

Research Assistant Professor, Vanderbilt University

Fall 2016 – present

Adjunct Assistant Professor, Vanderbilt University

Fall 2013 – Spring 2015

- ES 1401: Introduction to Engineering, Electrical Engineering Module
- EECE 3892: Special Topics: Spacecraft Systems
- EECE 4377/5377: FPGA Design

Invited Lecturer, Vanderbilt University

Spring 2008 – present

- EECE 6304: Radiation Effects and Reliability - Device Simulation

Adjunct Instructor, Austin Peay State University

Fall 2004

- CSCI 1000: Introduction to Computer Science
- CSCI 1015: Introduction to Computer Programming

## SKILLS

Semiconductor device simulation (Synopsys Sentaurus, CFDRC nanoTCAD, RobustChip Accuro)

Radiation transport/effects tools (SRIM, Geant4, MRED, CREME96, Spenvis)

Logic simulation, register transfer, gate, and switch level (Synopsys VCS)

Logic synthesis, Verilog, VHDL, and FPGA programming (Synopsys Design Compiler)

Formal verification, binary decision diagrams, satisfiability solvers, and model checkers

Automatic Test Pattern Generation (ATPG) and statistical fault injection

Automated testing and test equipment control (Tektronix, TestEquity)

Software Development (C/C++, Python, assembly, FreeRTOS, Microchip and AVR microcontrollers)

Linux, GNU toolchain, L<sup>A</sup>T<sub>E</sub>X, CVS and Subversion document control systems

## HONORS

Outstanding Conference Paper Award, Nuclear and Space Radiation Effects Conference, 2015

Outstanding Conference Paper Award, Nuclear and Space Radiation Effects Conference, 2013

Best Student Paper, International Reliability Physics Symposium, 2011

Best Paper Nominee, Nuclear and Space Radiation Effects Conference, 2009, 2010

Graduate Fellow, Semiconductor Research Corporation, 2003 – 2004

Undergraduate Research Assistant, Semiconductor Research Corporation, 2000 – 2002

Young Student Support Award, SIGDA Design Automation Conference, 2000 – 2002

Student Achievement Award, academic excellence combined with personal commitment, 2002

Andrew Kucher Nominee, outstanding contributions to engineering research, 2002

## PROFESSIONAL ACTIVITIES

### Activities

- *Finance Chair*, IEEE Nuclear and Space Radiation Effects Conference 2016
- *Session Chair*, Hardness Assurance Methods, SEE Symposium 2014
- *Participant*, Revision Task Group for JEDEC Standard “JESD89B: Measurement and Reporting of Alpha Particle and Terrestrial Cosmic Ray-Induced Soft Errors in Semiconductor Devices”
- *Reviewer*, Nuclear and Space Radiation Effects Conference
- *Reviewer*, HEART Conference
- *Reviewer*, IEEE Transactions on Nuclear Science
- *Reviewer*, Elsevier Nuclear Instruments and Methods in Physics Research A
- *Reviewer*, Elsevier Nuclear Instruments and Methods in Physics Research B
- *Reviewer*, Elsevier Computer Physics Communications
- *Reviewer*, Elsevier Microelectronics Reliability

### Memberships

- *Senior Member*, Institute of Electrical and Electronics Engineers
- *Member*, Nuclear and Plasma Sciences Society

## PRESENTATIONS

“CubeSats and Crowd-Sourced Monitoring for Single Event Effects Hardness Assurance,” Nuclear and Space Radiation Effects Conference, Portland, OR, Jul., 2016.

“Application of CubeSats to Evaluate Radiation Effects on Advanced Electronics,” Single Event Effects Symposium, La Jolla, CA, May, 2016.

“Low Energy Single Event Upsets in SRAMs”, NASA Electronic Technology Workshop, Greenbelt, MD, Jun., 2012.

“Effects of Scaling on Muon-Induced Soft Errors”, International Reliability Physics Symposium, Monterey Bay, CA, Apr., 2011.

“Impact of Complex Material Systems on the Radiation Response of Advanced Semiconductors”, HEART, Orlando, FL, Mar., 2011.

“CRÈME-MC: A Physics-Based Single Event Effects Tool”, Nuclear Science Symposium, Knoxville, TN, Nov., 2010.

“CRÈME-MC: A Physics-Based Single Event Effects Tool”, Geant4 Space Users Working Group, Seattle, WA, Aug., 2010.

“Contribution of Low-Energy Neutrons to Upset Rate in a 65 nm SRAM”, International Reliability Physics Symposium, Anaheim, CA, Apr., 2010.

“Modeling and Simulation of Single Event Effects for Modern Radiation Hardened Microelectronics”, GO-MAC, Orlando, FL, Mar., 2009.

“Modeling Low-Energy Proton Induced Single Event Upsets,” Single Event Effects Symposium, La Jolla, CA, Apr., 2009.

## PUBLICATIONS

- [1] Z. J. Diggins, N. Mahadevan, E. B. Pitt, D. Herbison, R. M. Hood, G. Karsai, B. D. Sierawski, E. J. Barth, R. A. Reed, R. D. Schrimpf, R. A. Weller, M. L. Alles, and A. F. Witulski, "Bayesian inference modeling of total ionizing dose effects on system performance," *IEEE Trans. Nucl. Sci.*, vol. 62, no. 6, pp. 2517–2524, Dec. 2015.
- [2] J. M. Trippe, R. A. Reed, R. A. Austin, B. D. Sierawski, R. A. Weller, E. D. Funkhouser, M. P. King, B. Narasimham, B. Bartz, R. Baumann, J. Labello, J. Nichols, R. D. Schrimpf, and S. L. Weeden-Wright, "Electron-induced single event upsets in 28nm and 45nm bulk SRAMs," *IEEE Trans. Nucl. Sci.*, vol. 62, no. 6, pp. 2709–2716, Dec. 2015.
- [3] N. A. Dodds, M. J. Martinez, P. E. Dodd, M. R. Shaneyfelt, F. W. Sexton, J. D. Black, D. S. Lee, S. E. Swanson, B. L. Bhuvu, K. M. Warren, R. A. Reed, J. Trippe, B. D. Sierawski, R. A. Weller, N. Mahatme, N. J. Gaspard, T. Assis, R. Austin, S. L. Weeden-Wright, L. W. Massengill, G. Swift, M. Wirthlin, M. Cannon, R. Liu, L. Chen, A. T. Kelly, P. W. Marshall, M. Trinczek, E. W. Blackmore, S. J. Wen, R. Wong, B. Narasimham, J. A. Pellish, and H. Puchner, "The contribution of low-energy protons to the total on-orbit SEU rate," *IEEE Trans. Nucl. Sci.*, vol. 62, no. 6, pp. 2440–2451, Dec. 2015, IEEE Nuclear and Space Radiation Effects Conference (NSREC) Outstanding Conference Paper Award.
- [4] S. L. Weeden-Wright, M. P. King, N. C. Hooten, W. G. Bennett, B. D. Sierawski, R. D. Schrimpf, R. A. Weller, R. A. Reed, M. H. Mendenhall, D. M. Fleetwood, M. L. Alles, and R. C. Baumann, "Effects of energy-deposition variability on soft error rate prediction," *IEEE Trans. Nucl. Sci.*, vol. 62, no. 5, pp. 2181–2186, Oct. 2015.
- [5] R. A. Reed, R. A. Weller, M. H. Mendenhall, D. M. Fleetwood, K. M. Warren, B. D. Sierawski, M. P. King, R. D. Schrimpf, and E. C. Auden, "Physical processes and applications of the monte carlo radiative energy deposition (MRED) code," *IEEE Trans. Nucl. Sci.*, vol. 62, no. 4, pp. 1441–1461, Aug. 2015.
- [6] Z. J. Diggins, N. Mahadevan, E. B. Pitt, D. Herbison, G. Karsai, B. D. Sierawski, E. J. Barth, R. A. Reed, R. D. Schrimpf, R. A. Weller, M. L. Alles, and A. Witulski, "System health awareness in total-ionizing dose environments," *IEEE Trans. Nucl. Sci.*, vol. 62, no. 4, pp. 1674–1681, Aug. 2015.
- [7] Z. J. Diggins, N. Mahadevan, D. Herbison, G. Karsai, B. D. Sierawski, E. J. Barth, E. B. Pitt, R. A. Reed, R. D. Schrimpf, R. A. Weller, M. L. Alles, and A. Witulski, "Total-ionizing-dose induced timing window violations in CMOS microcontrollers," *IEEE Trans. Nucl. Sci.*, vol. 61, no. 6, pp. 2979–2984, Dec. 2014.
- [8] J. H. Adams, R. A. Weller, R. A. Reed, B. D. Sierawski, and M. H. Mendenhall, "Model of radiation effects on electronics (MREE)," *NASA Tech Briefs Magazine: Software Supplement*, vol. 38, no. 9, p. 15, Sep. 2014.
- [9] B. D. Sierawski, B. Bhuvu, R. Reed, N. Tam, B. Narasimham, K. Ishida, A. Hillier, M. Trinczek, E. Blackmore, S.-J. Wen, and R. Wong, "Bias dependence of muon-induced single event upsets in 28 nm static random access memories," in *Proc. of the Int. Rel. Physics Symp.*, Jun. 2014, pp. 2B.2.1–2B.2.5.
- [10] M. P. King, R. A. Reed, R. A. Weller, M. H. Mendenhall, R. D. Schrimpf, B. D. Sierawski, A. L. Sternberg, B. Narasimham, J. K. Wang, E. Pitta, B. Bartz, D. Reed, C. Monzel, R. C. Baumann, X. Deng, J. A. Pellish, M. D. Berg, C. M. Seidleck, E. C. Auden, S. L. Weeden-Wright, N. J. Gaspard, C. Zhang, and D. M. Fleetwood, "Electron-induced single-event upsets in static random access memory," *IEEE Trans. Nucl. Sci.*, vol. 60, no. 6, pp. 4122–4129, Dec. 2013, IEEE Nuclear and Space Radiation Effects Conference (NSREC) Outstanding Conference Paper Award, Outstanding Student Paper Award.
- [11] J. H. Adams, A. F. Barghouty, M. H. Mendenhall, R. A. Reed, B. D. Sierawski, K. M. Warren, J. W. Watts, and R. A. Weller, "CRÈME: The 2011 revision of the cosmic ray effects on micro-electronics code," *IEEE Trans. Nucl. Sci.*, vol. 59, no. 6, pp. 3141–3147, 2012.
- [12] F. El-Mamouni, E. X. Zhang, D. R. Ball, B. D. Sierawski, M. P. King, R. D. Schrimpf, R. A. Reed, M. L. Alles, D. M. Fleetwood, D. Linten, E. Simoen, and G. Vizkelethy, "Heavy-ion-induced current transients in bulk and SOI FinFETs," *IEEE Trans. Nucl. Sci.*, vol. 59, no. 6, pp. 2674–2681, 2012.

- [13] M. A. Clemens, B. D. Sierawski, K. M. Warren, M. H. Mendenhall, N. A. Dodds, R. A. Weller, R. A. Reed, P. E. Dodd, M. R. Shaneyfelt, J. R. Schwank, S. A. Wender, and R. C. Baumann, "The effects of neutron energy and high-z materials on single event upsets and multiple cell upsets," *IEEE Trans. Nucl. Sci.*, vol. 58, no. 6, pp. 2591–2598, 2011.
- [14] M. L. Alles, R. D. Schrimpf, R. A. Reed, L. W. Massengill, R. A. Weller, M. H. Mendenhall, D. R. Ball, K. M. Warren, T. D. Loveless, J. S. Kauppila, and B. D. Sierawski, "Radiation hardness of FDSOI and FinFET technologies," in *Proc. of the SOI Conf.*, 2011, pp. 1–2.
- [15] J. Chetia, B. D. Sierawski, A. L. Sternberg, A. A. Adeleke, B. L. Bhuya, and L. W. Massengill, "An efficient AVF estimation technique using circuit partitioning," in *Proc. of the Conf. on Rad. Effects. on Comp. and Sys.*, Sep. 2011, pp. 507–510.
- [16] R. Garcia, E. J. Daly, H. D. R. Evans, P. Nieminen, G. Santin, B. D. Sierawski, and M. H. Mendenhall, "Combined use of heavy ion and proton test data in the determination of a GaAs power MESFET critical charge and sensitive depth," in *Proc. of the Conf. on Rad. Effects. on Comp. and Sys.*, Sep. 2011, pp. 244–251.
- [17] —, "Calibration of the weighed sensitive volume model to heavy ion experimental data," in *Proc. of the Conf. on Rad. Effects. on Comp. and Sys.*, Sep. 2011, pp. 60–66.
- [18] K. Warren, R. Reed, R. Weller, M. Mendenhall, B. Sierawski, and R. Schrimpf, "Applications of monte carlo radiation transport simulation techniques for predicting single event effects in microelectronics," *AIP Conference Proceedings*, vol. 1336, no. 1, pp. 643–648, 2011.
- [19] B. D. Sierawski, R. A. Reed, M. H. Mendenhall, R. A. Weller, R. D. Schrimpf, S.-J. Wen, R. Wong, N. Tam, and R. C. Baumann, "Effects of scaling on muon-induced soft errors," in *Proc. of the Int. Rel. Physics Symp.*, Apr. 2011, pp. 3C.3.1 –3C.3.6, IEEE International Reliability Physics Symposium Best Student Talk Award.
- [20] B. D. Sierawski, M. H. Mendenhall, R. A. Reed, M. A. Clemens, R. A. Weller, R. D. Schrimpf, E. W. Blackmore, M. Trinczek, B. Hitti, J. A. Pellish, R. C. Baumann, S.-J. Wen, R. Wong, and N. Tam, "Muon-induced single event upsets in deep-submicron technology," *IEEE Trans. Nucl. Sci.*, vol. 57, no. 6, pp. 3273–3278, Dec. 2010, IEEE Nuclear and Space Radiation Effects Conference (NSREC) Outstanding Conference Paper Award Nominee.
- [21] B. Narasimham, J. K. Wang, M. Buer, R. Gorti, K. Chandrasekharan, K. M. Warren, B. D. Sierawski, R. D. Schrimpf, R. A. Reed, and R. A. Weller, "Contribution of control logic upsets and multi-node charge collection to flip-flop SEU cross-section in 40-nm CMOS," *IEEE Trans. Nucl. Sci.*, vol. 57, no. 6, pp. 3176–3182, Dec. 2010.
- [22] A. Dasgupta, D. M. Fleetwood, R. A. Reed, R. W. Weller, M. H. Mendenhall, and B. D. Sierawski, "Dose enhancement and reduction in SiO<sub>2</sub> and High-K MOS insulators," *IEEE Trans. Nucl. Sci.*, vol. 57, no. 6, pp. 3463–3469, Dec. 2010.
- [23] R. A. Weller, M. H. Mendenhall, R. A. Reed, R. D. Schrimpf, K. M. Warren, B. D. Sierawski, and L. W. Massengill, "Monte carlo simulation of single event effects," *IEEE Trans. Nucl. Sci.*, vol. 57, no. 4, pp. 1726–1746, Aug. 2010.
- [24] B. D. Sierawski, K. M. Warren, R. A. Reed, R. A. Weller, M. H. Mendenhall, R. D. Schrimpf, R. C. Baumann, and V. Zhu, "Contribution of low-energy ( $< 10$  mev) neutrons to upset rate in a 65 nm SRAM," in *Proc. of the Int. Rel. Physics Symp.*, May 2010, pp. 395–399.
- [25] V. B. Sheshadri, B. L. Bhuya, R. A. Reed, R. A. Weller, M. H. Mendenhall, R. D. Schrimpf, K. M. Warren, B. D. Sierawski, S.-J. Wen, and R. Wong, "Effects of multi-node charge collection in flip-flop designs at advanced technology nodes," in *Proc. of the Int. Rel. Physics Symp.*, May 2010, pp. 1026–1030.
- [26] J. A. Pellish, M. A. Xapsos, K. A. LaBel, P. W. Marshall, D. F. Heidel, K. P. Rodbell, M. C. Hakey, P. E. Dodd, M. R. Shaneyfelt, J. R. Schwank, R. C. Baumann, X. Deng, A. Marshall, B. D. Sierawski, J. D. Black, R. A. Reed, R. D. Schrimpf, H. S. Kim, M. D. Berg, M. J. Campola, M. R. Friendlich, C. E. Perez, A. M. Phan, and C. M. Seidleck, "Heavy ion testing with iron at 1 GeV/amu," *IEEE Trans. Nucl. Sci.*, vol. 57, no. 5, pp. 2948–2954, Oct. 2010, RADECS Meritorius Paper.

- [27] B. D. Sierawski, J. A. Pellish, R. A. Reed, R. D. Schrimpf, R. A. Weller, M. H. Mendenhall, J. D. Black, A. D. Tipton, M. A. Xapsos, R. C. Baumann, X. Deng, M. R. Friendlich, H. S. Kim, A. M. Phan, and C. M. Seidleck, "Impact of low-energy proton induced upsets on test methods and rate predictions," *IEEE Trans. Nucl. Sci.*, vol. 56, no. 6, pp. 3085–3092, Dec. 2009, IEEE Nuclear and Space Radiation Effects Conference (NSREC) Outstanding Conference Paper Award Nominee.
- [28] C. L. Howe, R. A. Weller, R. A. Reed, B. D. Sierawski, P. W. Marshall, C. J. Marshall, M. H. Mendenhall, R. D. Schrimpf, and J. E. Hubbs, "Effects of surrounding materials on proton-induced energy deposition in large silicon diode arrays," *IEEE Trans. Nucl. Sci.*, vol. 56, no. 4, pp. 2167–2170, Aug. 2009.
- [29] R. A. Weller, R. A. Reed, K. M. Warren, M. H. Mendenhall, B. D. Sierawski, R. D. Schrimpf, and L. W. Massengill, "General framework for single event effects rate prediction in microelectronics," *IEEE Trans. Nucl. Sci.*, vol. 56, no. 6, pp. 3098–3108, Dec. 2009.
- [30] J. A. Pellish, M. A. Xapsos, K. A. LaBel, P. W. Marshall, D. F. Heidel, K. P. Rodbell, M. C. Hakey, P. E. Dodd, M. R. Shaneyfelt, J. R. Schwank, R. C. Baumann, X. Deng, A. Marshall, B. D. Sierawski, J. D. Black, R. A. Reed, R. D. Schrimpf, H. S. Kim, M. D. Berg, M. J. Campola, M. R. Friendlich, C. E. Perez, A. M. Phan, and C. M. Seidleck, "Heavy ion testing at the galactic cosmic ray energy peak," in *Proc. of the Conf. on Rad. Effects. on Comp. and Sys.*, Sep. 2009, pp. 559–562.
- [31] M. E. Porter, J. E. Wilkinson, K. Walsh, B. D. Sierawski, K. M. Warren, R. A. Reed, and G. Vizkelethy, "Soft error reliability improvements for implantable medical devices," in *Proc. of the Int. Rel. Physics Symp.*, Apr. 2008, pp. 488–491.
- [32] K. M. Warren, J. D. Wilkinson, R. A. Weller, B. D. Sierawski, R. A. Reed, M. E. Porter, M. H. Mendenhall, R. D. Schrimpf, and L. W. Massengill, "Predicting neutron induced soft error rates: Evaluation of accelerated ground based test methods," in *Proc. of the Int. Rel. Physics Symp.*, Apr. 2008, pp. 473–477.
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