

## Invited Talks/Lectures (29)

- (11) *INVITED* “Tutorial: FPGA SEE Test Beam Planning and Ensuring Test Validity,” by **T. D. Loveless**, *2025 Single-Event Effects Symposium/Military & Aerospace Programmable Logic Devices (SEE/MAPLD) Combined Workshop*, La Jolla, CA, May 2025.
- (12) *INVITED* “REACH-A Private Sector Model for Trusted 1200 Microelectronic Workforce Development,” by S. Weeden-Wright, M. A. Thompson, J. Kauppila, J. Buckley, L. Massengill, and **D. Loveless**, *2025 HEART*, Apr. 2025.
- (13) *INVITED* “SCALE Microelectronics Workforce Development Panel,” *First Tuesday, Purdue @ Westgate*, Westgate, Crane, IN, Oct. 2024.
- (14) *INVITED* “Ground Testing of Electronics for SEE Part 1: General Principles,” *Academy for Radiation Effects and Survivability (A4RES)*, Baltimore, MD, June 2024.
- (15) *INVITED* “Single Event Effects: Mechanisms and Test Structure Design,” *IEEE VLSI Test Symposium*, SS-1, Tempe, AZ, Apr. 2024.
- (16) *INVITED* “Advancing Secure and Resilient Microelectronics: Indiana University's Strategic Investment in Radiation Effects Mitigation,” *University of Notre Dame, Electrical Engineering Seminar*, Indiana, Jan. 2024.
- (17) *INVITED* “Strategic Investment for Innovation: IU's Contribution to Microelectronics,” *First Tuesday, Purdue@WestGate Academy*, Westgate, IN, Dec. 2023.
- (18) *INVITED* “The IU Center for Reliable and Trusted Electronics (CREATE),” *IU/NSWC Crane Strategic Partnership, Captain Boonyobhas and President Whitten*, NSWC Crane, Sept. 7, 2023.
- (19) *INVITED* “Radiation Hardening for Analog and Mixed Signal Circuits,” *Putting the Rad in Radiation Effects, DARPA ERI 2.0 Summit*, Seattle, WA, Aug. 2023.
- (110) *INVITED* “Panel: Challenges for Radiation Effects Modeling in 3DHI,” *panelist at the Putting the Rad in Radiation Effects, DARPA ERI 2.0 Summit*, Seattle, WA, Aug. 2023.
- (111) *INVITED* “Panel: Modeling and Simulation-based Approaches to Radiation-Hardened Electronics Qualification” *panelist at the 2023 Government Microcircuits and Critical Applications Conference (GOMACTech)*, San Diego, CA, Mar. 2023.
- (112) *INVITED* “Hardening-By-Design Techniques for Analog and Mixed-Signal ASICs,” by **T. D. Loveless**, presented at the 18th International School on the Effects of Radiation on Embedded Systems for Space Applications (SERESSA), CERN, Geneva, Switzerland, Dec. 2022.
- (113) *INVITED* “Basic SEE & Test Execution Definitions: Radiation in Materials and Active Devices,” by **T. D. Loveless**, presented at the Single-Event Effects (SEE) Testing Bootcamp at the NASA Space Radiation Laboratory (NSRL), Sept. 2021.
- (114) *INVITED* “Space Radiation Effects in Microelectronic Systems,” by **T. D. Loveless**, presented at the Tennessee Technological University, Cookeville, TN, Sept. 2021.

- (I15) *INVITED* “Hardening Techniques for Analog and Mixed-Signal Circuits,” by **T. D. Loveless**, presented at the 2021 IEEE Nuclear Space and Radiation Effects Short Course, Virtual, July 2021.
- (I16) *INVITED* “Space Radiation and Its Effects on Microelectronic Systems,” by **T. D. Loveless**, presented at the Macalester College, St. Paul, MN, Sept. 2019.
- (I17) *INVITED* “Hardening-By-Design Techniques for Analog and Mixed-Signal ASICs,” by **T. D. Loveless**, presented at the 12th International School on the Effects of Radiation on Embedded Systems for Space Applications (SERESSA), Munich, Germany, Oct. 2017.
- (I18) *INVITED* “Hardening-By-Design Techniques for Analog and Mixed-Signal ASICs,” by **T. D. Loveless**, presented at the 12th International School on the Effects of Radiation on Embedded Systems for Space Applications (SERESSA), Montreal, Quebec, Canada, Nov. 2016.
- (I19) *INVITED* “Radiation Effects and Basic Mitigation Techniques for Mixed-Signal Electronics,” by **T. D. Loveless**, presented at the 2016 Hardened Electronics and Radiation Technology (HEART) Conference, Monterey, CA, Apr. 2016.
- (I20) *INVITED* “Embedded Systems and Small Satellites for Smart Cities,” by **T. D. Loveless**, presented at the US Ignite Technical Interchange, UTC, Chattanooga, TN, Mar. 2016.
- (I21) *INVITED* “Hardening-By-Design Techniques for Analog and Mixed-Signal ASICs,” by **T. D. Loveless**, presented at the 11th International School on the Effects of Radiation on Embedded Systems for Space Applications (SERESSA), Puebla, Mexico, Dec. 2015.
- (I22) *INVITED*, “RHBD Body-Driven Circuits for Low-Voltage AMS Systems”, by **T. D. Loveless**, presented at the DTRA Radiation Effects Review, NRO Nanoscale Rad-Hard Review, General RHBD Technical Interchange Meeting Vanderbilt University, Nashville, TN, May 12-13, 2015.
- (I23) *INVITED*, “Single-Event Mitigation Techniques for Analog and Mixed-Signal ASICs,” by **Daniel Loveless**, presented at the 7th International School on the Effects of Radiation on Embedded Systems for Space Applications (SERESSA), Toulouse, France, Dec. 2011.
- (I24) *INVITED* “Neutron-Induced Soft-Error Rate Measurements in 40 nm Bulk CMOS,” by Daniel Loveless, presented at JEDEC G12 RHA Users Subcommittee Meeting, Tempe, AZ, Feb. 2011.
- (I25) *INVITED*, “Single-Event Mitigation Techniques for Analog and Mixed-Signal ASICs,” by **Daniel Loveless**, presented at the 6th International School on the Effects of Radiation on Embedded Systems for Space Applications (SERESSA), São José Dos Campos, Brazil, Dec. 2010.
- (I26) *INVITED*, “Basic Radiation Effects Analysis, Modeling, and Hardening-by-Design,” by **Daniel Loveless**, presented at the 6th International School on the Effects of Radiation on Embedded Systems for Space Applications (SERESSA), São José Dos Campos, Brazil, Dec. 2010.
- (I27) *INVITED* “Mitigation Techniques for Analog and Mixed-Signal ASICs,” by Daniel Loveless, presented at the Workshop on Mitigation Techniques Against Radiation on

Integrated Circuits, the Space Research and Technology Centre of the European Space Agency (ESA/ESTEC), Noordwijk, The Netherlands, Sept. 2010.

- (I28) *INVITED* “Basics Part II: An Overview of Radiation Effects Analysis,” by **T. D. Loveless** and S. E. Armstrong, presented at the 5th International School on the Effects of Radiation on Embedded Systems for Space Applications (SERESSA), Takasaki, Japan, Dec. 2009.
- (I29) *INVITED* “Basics Part I: Devices and Circuits for Radiation Environments,” by S. E. Armstrong and **T. D. Loveless**, presented at the 5th International School on the Effects of Radiation on Embedded Systems for Space Applications (SERESSA), Takasaki, Japan, Dec. 2009.

**Other (92):**

- (P1) “Dynamic Time Warping for ASET Cluster Analysis,” by J. L. Carpenter, T. Peyton, J. M. Hales, A. Ildefonso, D. McMorro, S. Westfall, J. Lazenby, and **T. D. Loveless**, *2025 Single-Event Effects Symposium/Military & Aerospace Programmable Logic Devices (SEE/MAPLD) Combined Workshop*, La Jolla, CA, May 2025.
- (P2) “Impact of Single-Event Upsets on Deep Neural Networks,” by T. Peyton, A. Hubbard, J. L. Carpenter, A. Ildefonso, and **T. D. Loveless**, *2025 Single-Event Effects Symposium/Military & Aerospace Programmable Logic Devices (SEE/MAPLD) Combined Workshop*, La Jolla, CA, May 2025.
- (P3) “A Radiation-Hardened-by-Design Wide-Band Operational Amplifier Fabricated in the SkyWater S90LN 90 nm Process,” by J. L. Carpenter, **T. D. Loveless**, J. Kim, J. Pew, R. Young, M. Nour, P. Manos, M. Chambers, H. J. Barnaby, and J. Neuendank, *2025 HEART*, Monterey, CA, Apr. 2025.
- (P4) “Built-In Self-Test Measurement of Radiation Effects in the SkyWater S90LN 90 nm Process,” by S. Westfall, **T. D. Loveless**, J. L. Carpenter, T. Peyton, J. Kim, H. J. Barnaby, J. Neuendank, M. Nour, P. Manos, and M. Chambers, *2025 HEART*, Monterey, CA, Apr. 2025.
- (P5) “Artificial Intelligence & Machine Learning (AI/ML) for Radiation Hardened Electronics,” by Karthikeyan Lingasubramanian, *2024 Radiation Hardened Electronic Technologies Conference (RHET)*, Huntsville, AL, Nov. 2024.
- (P6) “Academy for Radiation Effects and Survivability,” by Michael McKenna, *2024 Radiation Hardened Electronic Technologies Conference (RHET)*, Huntsville, AL, Nov. 2024.
- (P7) “SCMC Technical Projects and Infrastructure Investments of Interest to RHET Community,” by Brett Hamilton, *2024 Radiation Hardened Electronic Technologies Conference (RHET)*, Huntsville, AL, Nov. 2024.
- (P8) “Heavy-Ion SET Response of a Wide-Band Operational Amplifier Fabricated in the SkyWater S90LN 90 nm Process,” by J. Carpenter, **T. D. Loveless**, J. Kim, J. Pew, R. Young, M. Nour, P. Manos, M. Chambers, H. J. Barnaby, and J. Neuendank, *2024 Single Event Effects Symposium*, La Jolla, CA, May 2024.

- (P9) "Built-in Self-Test Architecture for Characterization of Single Event Effects in Commercially Available Bulk 90nm Technology," by S. Westfall, **T. D. Loveless**, J. L. Carpenter, T. Peyton, J. Kim, J. Pew, R. Young, M. Nour, P. Manos, M. Chambers, H. J. Barnaby, and J. Neuendank, *2024 Single Event Effects Symposium*, La Jolla, CA, May 2024.
- (P10) "Harnessing Machine Learning: Parallel Testing and Real-Time Analysis for Accelerated Radiation Effects Dataset Generation," T. Peyton and **T. D. Loveless**, *2024 Single Event Effects Symposium*. La Jolla, CA, May 2024.
- (P11) "Comparison of Analytical and Machine-Learning Techniques for Radiation Effects Analysis," by T. Peyton, J. Carpenter, and **T. D. Loveless**, *2023 Single Event Effects Symposium*, La Jolla, CA, May 2023.
- (P12) "FSEE at Year 1: Correlative Results and Initial User Experiences," by J. Likar, S. Lidia, **T. D. Loveless**, J. Carpenter, J. Osheroff, M. Casey, J. Oarethu, and S. Katz, *2023 Single Event Effects Symposium*, La Jolla, CA, May 2023.
- (P13) "Detection of Single Event Transients in Arbitrary Waveforms using Statistical Window Analysis," by J. L. Carpenter, B. Dean, S. P. Lawrence, R. D. Young, D. R. Reising, and **T. D. Loveless**, *IEEE Nuclear and Space Radiation Effects Conference (NSREC)*, Provo, Utah, July, 2022.
- (P14) "RADFX Scheduling Tool," by J. Meyers, Emily Turner, and **T. D. Loveless** (2022). NASA Electronic Parts and Packaging (NEPP) Program 2022 Electronics Technology Workshop (ETW). Greenbelt, MD, June 2022.
- (P15) "The SCALE Radiation Effects Workforce Development Program," by **T. D. Loveless** (2022). 2022 Single Event Effects Symposium. La Jolla, CA, May 2022.
- (P16) "Supervised Learning and Classification of Single-Event Transient Anomalies," by T. Peyton, B. Dean, J. L. Carpenter, M. Fadul, D. R. Reising, and **T. D. Loveless** (2022). 2022 Single Event Effects Symposium. La Jolla, CA, May 2022.
- (P17) "Functional Redundancy for Mitigation of SEE in Heterogeneous Computing Systems," by S. Camp, J. Carpenter, T. Skjellum, D. Reising, and **T. D. Loveless** (2022). 2022 Single Event Effects Symposium. La Jolla, CA, May 2022.
- (P18) "Detection of Single Event Transients in Arbitrary Waveforms Using Statistical Window Analysis," by J. L. Carpenter and **T. D. Loveless** (2022). 2022 Single Event Effects Symposium. La Jolla, CA, May 2022.
- (P19) "Training the Next-Generation Radiation Effects Test Engineer," by **T. D. Loveless** (2021). 2021 Single Event Effects Symposium. La Jolla, CA (Virtual).
- (P20) "Towards AI-Based Mitigation of SEE," by **T. D. Loveless**, J. Carpenter, B. Dean, S. Lawrence, R. Young, and D. Reising (2021). 2021 Single Event Effects Symposium. La Jolla, CA (Virtual).
- (P21) "Electrical Measurement of Cell-to-Cell Variation of Critical Charge in SRAM and Sensitivity to Single-Event Upsets by Low-Energy Protons," by J. Cannon, R. Estrada, R. Boggs, B. Patel, G. Santos, **T. D. Loveless**, M. W. McCurdy, A. L. Sternberg, and T. Finzell (2020). 2020 Single Event Effects Symposium. La Jolla, CA (Virtual).

- (P22) “Electrical Measurement of Cell-to-Cell Variation of Critical Charge in SRAM and Sensitivity to Single-Event Upsets by Low-Energy Protons,” by J. Cannon, R. Estrada, R. Boggs, B. Patel, G. Santos, **T. D. Loveless**, M. W. McCurdy, A. L. Sternberg, and T. Finzell (2020). 2020 Single Event Effects Symposium. La Jolla, CA (Virtual).
- (P23) “A CubeSat Reaction Wheel-Based Attitude Control System,” by B. Dean, D. Amaro, M. Bushra, M. E. Loveless, L. Elliott, and **T. D. Loveless**, presented at the 2020 Posters at the Capital, Nashville, TN, Feb. 2020.
- (P24) “Electrical-Based Screening of Radiation Failure Modes in Transistor-Based Memory for Space Application,” by J. Cannon, R. Estrada, R. Boggs, D. R. Reising, and **T. D. Loveless**, presented at the 2019 CUR REU Symposium, Alexandria, VA, Oct. 2019.
- (P25) “Ionizing Radiation Effects Spectroscopy (IRES) for Analysis of Total Ionizing Dose Degradation in Voltage-Controlled Oscillators,” by B. P. Patel, M. Joplin, R. Boggs, D. Reising, M. W. McCurdy, L. W. Massengill, and **T. D. Loveless**, presented at the IEEE Nuclear and Space Radiation Effects Conference (NSREC), Kona, HI, PA-3, July 2018.
- (P26) “TID-Induced Leakage and Drive Characteristics of Planar 22-nm Partially-Depleted Silicon-on-Insulator and 14-nm Bulk and Quasi-Silicon-on-Insulator FinFET Devices,” by M. P. King, M. P. King, J. G. Massey, A. Silva, E. H. Cannon, M. R. Shaneyfelt, **T. D. Loveless**, J. Ballast, M. Cabanas-Holmen, S. DiGregorio, W. C. Rice, B. L. Draper, P. Oldgies, and K. Rodbell, presented at the IEEE Nuclear and Space Radiation Effects Conference (NSREC), A-1, Kona, HI, July 2018.
- (P27) *BEST STUDENT POSTER AWARD (2<sup>nd</sup> Place)* “The Response of Fuzzy Electronics to Ionizing Radiation,” by S. Singh and **T. D. Loveless**, presented at the ASEE Southeastern Section Annual Conference, Daytona Beach, FL, Mar. 2018.
- (P28) *BEST STUDENT POSTER AWARD (2<sup>nd</sup> Place)* “Efficacy of Fuzzy Electronics in Space,” by S. Singh and **T. D. Loveless**, presented at the 52<sup>nd</sup> Annual Conference of the National Collegiate Honors Council (NCHC), Atlanta, GA, Nov. 2017.
- (P29) “Undergraduate Research Experience in the Space Sciences,” by **T. D. Loveless**, presented at the WCTL Instructional Excellence Conference, Chattanooga, TN, May 2017.
- (P30) “UTChattSat: Space Science and Engineering in the Classroom,” by **T. D. Loveless** and A. M. Patel, presented at the StartupCHA Week/Co.Lab Demo Night, Chattanooga, TN, Oct. 2016.
- (P31) “UTChattSat,” by **T. D. Loveless**, M. B. Joplin, A. M. Patel, and D. Johnson, presented at the GIGTank365 boutique accelerator pitch night, Chattanooga, TN, July 2016.
- (P32) “A Single-Event Transient Measurement Payload for a 1U CubeSat,” by M. B. Joplin, **T. D. Loveless**, J. S. Kauppila, and L. W. Massengill, presented at the 2016 Single-Event Effects Symposium, La Jolla, CA, May 2016.
- (P33) “Radiation and Reliability Resiliency of Advanced and Emerging Integrated Circuit Technologies,” by **T. D. Loveless**, M. B. Joplin, and A. M. Patel, presented at the 2016 University of Tennessee at Chattanooga Research Dialogues, Apr. 2016.

- (P34) "Rocket Scientist, Engineer, and Educator," by **T. D. Loveless**, presented at the 2016 University of Tennessee at Chattanooga Research Dialogues Faculty Elevator Speech Competition, Apr. 2016.
- (P35) "Frequency Trends Observed in 32 nm SOI Flip-Flops and Combinational Logic," by R. C. Quinn, J. S. Kauppila, **T. D. Loveless**, J. A. Maharrey, J. D. Rowe, M. W. McCurdy, M. L. Alles, B. L. Bhuvu, R. A. Reed, K. Lilja, and L. W. Massengill, presented at the 2015 Nuclear Space and Radiation Effects Conference (NSREC), Boston, MA, July 2015.
- (P36) "Layout based RHBD for Sequential and Combinatorial Logic," by K. Lilja, M. Bounasser, R.C. Quinn, J. S. Kauppila, **T. D. Loveless**, J.A. Maharrey, J.D. Rowe, M.W. McCurdy, M.L. Alles, B.L. Bhuvu, R.A. Reed, and L. W. Massengill, presented at the 2015 Single-Event Effects Symposium, La Jolla, CA, May 2015.
- (P37) "Power-Aware Mitigation of Combinational Logic Soft Errors," by N. N. Mahatme, N. J. Gaspard, T. Assis, **T. D. Loveless**, B.L. Bhuvu, W. H. Robinson, L. W. Massengill, S.-J. Wen, R. Wong, presented at the 2014 Nuclear Space and Radiation Effects Conference (NSREC), Paris, FR, July 2014.
- (P38) "Identification of a Pulse-Width Window of Vulnerability for Single-Event-Transient-Induced Harmonic Errors in Ring Oscillators," by Y. P. Chen, **T. D. Loveless**, P. Maillard, N. J. Gaspard, S. Jagannathan, A. F. Witulski, B. L. Bhuvu, W. T. Holman, L. W. Massengill, presented at the 23<sup>rd</sup> Annual Single Event Effects (SEE) Symposium, La Jolla, CA, May 2014.
- (P39) "Use of Alpha Particle and Ion Accelerators for Characterization of Soft-Error Reliability in Advanced ICs," by R. C. Quinn, **T. D. Loveless**, J. S. Kauppila, J. A. Maharrey, S. Jagannathan, E. X. Zhang, M. L. Alles, M. W. McCurdy, R. A. Reed, L. W. Massengill, presented at the 23<sup>rd</sup> International Conference on the Application of Accelerators in Research and Industry (CAARI), San Antonio, TX, May 2014.
- (P40) "Single-Event Transient (SET) Analysis of 40 nm Digital-Controlled Oscillator (DCO) Topologies," by Y. Chen, **T. D. Loveless**, P. Maillard, S. Jagannathan, N. Gaspard, N. M. Atkinson, and L. W. Massengill, presented at the 22<sup>nd</sup> Annual Single Event Effects (SEE) Symposium, La Jolla, CA, April 2013.
- (P41) "Single Event Investigations of a 40 nm Low Noise Amplifier," by K. Freeman, S. Jagannathan, **T. D. Loveless**, N. J. Gaspard, N. M. Atkinson, P. Maillard, J. S. Kauppila, and L. W. Massengill, presented at the 22<sup>nd</sup> Annual Single Event Effects (SEE) Symposium, La Jolla, CA, April 2013.
- (P42) "A New Error Correction Circuit for Delay Locked Loops," by P. Maillard, W. T. Holman, **T. D. Loveless**, and L. W. Massengill, presented at the 22<sup>nd</sup> Annual Single Event Effects (SEE) Symposium, La Jolla, CA, April 2013.
- (P43) "SET Pulse Width Trends in Highly Scaled SOI," by R. C. Quinn, J. A. Maharrey, **T. D. Loveless**, J. S. Kauppila, S. Jagannathan, N. M. Atkinson, N. J. Gaspard, E. Zhang, W. T. Holman, B. L. Bhuvu, and L. W. Massengill, presented at the 22<sup>nd</sup> Annual Single Event Effects (SEE) Symposium, La Jolla, CA, April 2013.
- (P44) "Effect of Negative Bias Temperature Instability on the Single Event Upset Response of 40 nm Flip-Flops," by A. V. Kauppila, B. L. Bhuvu, **T. D. Loveless**, S. Jagannathan, N. J. Gaspard, J.

S. Kauppila, L. W. Massengill, S-J. Wen, R. Wong, G. L. Vaughn, and W. T. Holman, presented at the 2012 Nuclear and Space Radiation Effects Conference (NSREC), Miami, FL, July 2012.

- (P45) "On-Chip Measurement of Single-Event Transients in a 45 nm Silicon-on-Insulator Technology," by **T. D. Loveless**, J. S. Kauppila, S. Jagannathan, D. R. Ball, J. D. Rowe, N. J. Gaspard, N. M. Atkinson, R. W. Blaine, T. R. Reece, J. R. Ahlbin, T. D. Haeffner, M. L. Alles, W. T. Holman, B. L. Bhuvu, L. W. Massengill, presented at the 2012 Nuclear and Space Radiation Effects Conference (NSREC), Miami, FL, July 2012.
- (P46) "Frequency Dependence of Alpha-Particle Induced Soft Error Rates of Flip-Flops in 40-nm CMOS Technology," by S. Jagannathan, **T. D. Loveless**, B. L. Bhuvu, N. J. Gaspard, N. Mahatme, T. Assis, S-J. Wen, R. Wong, and L. W. Massengill, presented at the 2012 Nuclear and Space Radiation Effects Conference (NSREC), Miami, FL, July 2012.
- (P47) "Differential Charge Cancellation (DCC) Layout as an RHBD Technique for Bulk CMOS Differential Circuit Design," by R. W. Blaine, N. M. Atkinson, J. S. Kauppila, S. E. Armstrong, N. C. Hooten, **T. D. Loveless**, J. H. Warner, W. T. Holman, L. W. Massengill, presented at the 2012 Nuclear and Space Radiation Effects Conference (NSREC), Miami, FL, July 2012.
- (P48) "Evaluation of Built-In-Self-Test Circuitry for Single-Event Transient Measurements in 45 nm SOI," by **T. D. Loveless**, J. S. Kauppila, D. R. Ball, S. Jagannathan, T. D. Haeffner, N. J. Gaspard, N. M. Atkinson, R. W. Blaine, T. R. Reece, M. L. Alles, W. T. Holman, B. L. Bhuvu, and L. W. Massengill, presented at the 21<sup>st</sup> Annual Single Event Effects (SEE) Symposium, La Jolla, CA, April 2012.
- (P49) "The Quad-Path Hardening Technique for Switched-Capacitor Circuits," by N. M. Atkinson, W. T. Holman, J. S. Kauppila, R. W. Blaine, **T. D. Loveless**, and L. W. Massengill, presented at the 21<sup>st</sup> Annual Single Event Effects (SEE) Symposium, La Jolla, CA, April 2012.
- (P50) "RHBD Techniques for CMOS Operational Amplifier Design," by R. W. Blaine, N. M. Atkinson, J. S. Kauppila, **T. D. Loveless**, S. E. Armstrong, W. T. Holman, and L. W. Massengill, presented at the 21<sup>st</sup> Annual Single Event Effects (SEE) Symposium, La Jolla, CA, April 2012.
- (P51) "Frequency Dependence of Alpha-Particle Induced Soft Error Rates of Flip-Flops in 40 nm CMOS Technology," by S. Jagannathan, **T. D. Loveless**, N. J. Gaspard, B. L. Bhuvu, T. Assis, Z. J. Diggins, S-J. Wen, R. Wong, and L. W. Massengill, presented at the 21<sup>st</sup> Annual Single Event Effects (SEE) Symposium, La Jolla, CA, April 2012.
- (P52) "SET Characterization of Two 90 nm Voltage Controlled Delay Line (VCDL) Topologies," by P. Maillard, L. W. Massengill, W. T. Holman, **T. D. Loveless**, Y. Chen, N. Roche, J. Warner, S. Buchner, and D. McMorrow, presented at the 21<sup>st</sup> Annual Single Event Effects (SEE) Symposium, La Jolla, CA, April 2012.
- (P53) "Analysis of Single-Event Transients in a 45 nm SOI Technology for Rad-Hard Applications," by **T. D. Loveless**, J. Kauppila, T. Haeffner, T. Holman, M. Alles, B. Bhuvu, L. Massengill, S. Jagannathan, N. Gaspard, N. Atkinson, R. Blaine, J. Ahlbin, presented at the 37th Annual Government Microcircuit Applications & Critical Technology Conference (GOMACTech), Las

Vegas, NV, March 2012.

- (P54) “Design Choices for High Speed Radiation-Hardened Delay-Locked Loops,” by Pierre Maillard, **T. Daniel Loveless**, W. Timothy Holman, and Lloyd W. Massengill, presented at the 37th Annual Government Microcircuit Applications & Critical Technology Conference (GOMACTech), Las Vegas, NV, March 2012.
- (P55) “Single-Event Hardening Techniques for CMOS Operational Amplifier Design,” by R. W. Blaine, N. M. Atkinson, J. S. Kauppila, S. E. Armstrong, **T. Daniel Loveless**, W. Timothy Holman, and Lloyd W. Massengill, presented at the 37th Annual Government Microcircuit Applications & Critical Technology Conference (GOMACTech), Las Vegas, NV, March 2012.
- (P56) “Single-Event-Hardened CMOS Operational Amplifier Design,” by R. W. Blaine, S. E. Armstrong, N. M. Atkinson, J. S. Kauppila, **T. D. Loveless**, W. T. Holman, and L. W. Massengill, presented at the 12th European Conference on Radiation Effects on Components and Systems (RADECS), Seville, Spain, Sept. 2011.
- (P57) “Single-Event Tolerant Flip-Flop Design in 40 nm CMOS Technology,” by S. Jagannathan, **T. D. Loveless**, J. R. Ahlbin, B. L. Bhuva, S.-J. Wen, R. Wong, M. Sachdev, D. Rennie, and L. W. Massengill, presented at the 2011 Nuclear and Space Radiation Effects Conference (NSREC), Las Vegas, NV, July 2011.
- (P58) “Influence of N-Well Contact Area on the Pulse Width of Single-Event Transients,” by J. R. Ahlbin, N. M. Atkinson, M. J. Gadlage, N. J. Gaspard, B. L. Bhuva, **T. D. Loveless**, E. X. Zhang, L. Chen, and L. W. Massengill, presented at the 2011 Nuclear and Space Radiation Effects Conference (NSREC), Las Vegas, NV, July 2011.
- (P59) “Circuit-Level Layout-Aware Single-Event Sensitive-Area Analysis of 40 nm Bul CMOS Flip-Flops Using Compact Modeling,” by J. S. Kauppila, T. D. Haeffner, D. R. Ball, A. V. Kauppila, **T. D. Loveless**, S. Jagannathan, A. L. Sternberg, B. L. Bhuva, and L. W. Massengill, presented at the 2011 Nuclear and Space Radiation Effects Conference (NSREC), Las Vegas, NV, July 2011.
- (P60) “Comparison of Combinational and Sequential Error Rates for a Deep Submicron Process,” by N. N. Mahatme, S. Jagannathan, **T. D. Loveless**, L. W. Massengill, B. L. Bhuva, S.-J. Wen, R. Wong, presented at the 2011 Nuclear and Space Radiation Effects Conference (NSREC), Las Vegas, NV, July 2011.
- (P61) “Impact of Well Structure on Single-Event Well Potential Modulation in Bulk CMOS,” by N. J. Gaspard, A. F. Witulski, N. M. Atkinson, J. R. Ahlbin, W. T. Holman, B. L. Bhuva, **T. D. Loveless**, and L. W. Massengill, presented at the 2011 Nuclear and Space Radiation Effects Conference (NSREC), Las Vegas, NV, July 2011.
- (P62) “Single-Event Vulnerability of Mixed-Signal Circuit Interfaces in Communication Devices,” by S. E. Armstrong, **T. D. Loveless**, R. W. Blaine, N. M. Atkinson, W. T. Holman, and L. W. Massengill, presented at the 20th Annual Single Event Effects (SEE) Symposium, La Jolla, CA, April 2011.



- (P63) "A Radiation-Hardened Delay-Locked Loop Design Utilizing Differential Delay Line Topology," by P. Maillard, **T. D. Loveless**, W. T. Holman, and L. W. Massengill, presented at the 20th Annual Single Event Effects (SEE) Symposium, La Jolla, CA, April 2011.
- (P64) "Effect of Latchup Mitigation Techniques on Well Potential Modulation and Single-Event-Transient Pulse Widths," by N. J. Gaspard, A. F. Witulski, N. M. Atkinson, J. R. Ahlbin, W. T. Holman, **T. D. Loveless**, B. L. Bhuva, and L. W. Massengill, presented at the 20th Annual Single Event Effects (SEE) Symposium, La Jolla, CA, April 2011.
- (P65) "Neutron- and Proton-Induced SEU Error Rates for D- and DICE-Flip/Flop designs at a 40 nm Technology Node," by **T. Daniel Loveless**, S. Jagannathan, T. Reece, J. Chetia, B. L. Bhuva, L. W. Massengill, S-J. Wen, R. Wong, and D. Rennie, presented at the 11<sup>th</sup> European Conference on Radiation Effects on Components and Systems (RADECS), Sept. 2010.
- (P66) "Phase-Dependent Single-Event Sensitivity Analysis of High-Speed A/MS Circuits Extracted from Asynchronous Measurements," by Sarah Armstrong, **Daniel Loveless**, Jonathan Hicks, Dale McMorrow, and Lloyd W. Massengill, presented at the 11<sup>th</sup> European Conference on Radiation Effects on Components and Systems (RADECS), Sept. 2010.
- (P67) "Variables Affecting the Low LET SEU Cross Sections of a 45 nm CMOS SOI SRAM," by **T. D. Loveless**, M. L. Alles, D. R. Ball, K. M. Warren, and L. W. Massengill, presented at the 2010 Nuclear and Space Radiation Effects Conference (NSREC), Denver, CO, July 2010.
- (P68) "An RHBD Technique to Mitigate Missing Pulses in Delay Locked Loops," by Pierre Maillard, W. T. Holman, **T. D. Loveless**, B. L. Bhuva, and L. W. Massengill, presented at the 2010 Nuclear and Space Radiation Effects Conference (NSREC), Denver, CO, July 2010.
- (P69) "A Generalized Model for Single-Event Analysis and Hardening of Mixed-Signal Phase-Locked Loops," by **T. Daniel Loveless**, Lloyd W. Massengill, W. Timothy Holman, Bharat L. Bhuva, Dale McMorrow, and Jeff Warner, presented at the 19th Annual Single Event Effects (SEE) Symposium, San Diego, CA, April 2010.
- (P70) "Experimental Extraction of Phase-Dependent Single-Event Sensitivity," by S. E. Armstrong, **T. D. Loveless**, J. R. Hicks, D. McMorrow, and L. W. Massengill, presented at the 19th Annual Single Event Effects (SEE) Symposium, San Diego, CA, April 2010.
- (P71) "An RHBD Technique to Mitigate Missing Pulses in Delay Locked Loops," by Pierre Maillard, W. T. Holman, **T. D. Loveless**, B. L. Bhuva, and L. W. Massengill, presented at the 19th Annual Single Event Effects (SEE) Symposium, San Diego, CA, April 2010.
- (P72) "Single-Event Hardening of High-Speed Mixed-Signal Circuits," by **T. Daniel Loveless**, Lloyd W. Massengill, W. Timothy Holman, and Bharat L. Bhuva, presented at the 35th Annual Government Microcircuit Applications & Critical Technology Conference (GOMACTech), Reno, NV, March 2010.
- (P73) "Recent Advances in Radiation-Hardened-by-Design Analog and Mixed-Signal Circuits," by W. T. Holman, L. W. Massengill, B. L. Bhuva, A. W. Witulski, and **T. D. Loveless**, presented at the 35th Annual Government Microcircuit Applications & Critical Technology Conference (GOMACTech), Reno, NV, March 2010.

- (P74) "Analysis of Single-Event Transients in Integer-N Frequency Dividers and Impacts on Phase-Locked Loop Performance," by T. D. Loveless, B. L. Bhuva, W. T. Holman, B. D. Olson, and L. W. Massengill, presented at the 2009 Nuclear and Space Radiation Effects Conference (NSREC), Tucson, AZ, July 2009.
- (P75) "Single-Event-Transient Analysis of Delay-Locked Loops," by P. Maillard, T. D. Loveless, W. T. Holman, B. L. Bhuva, and L. W. Massengill, presented at the 2008 Nuclear and Space Radiation Effects Conference (NSREC), Tucson, AZ, July 2009.
- (P76) "Analysis and Testing of a Radiation Hardened by Design SerDes Transmitter Driver in 90nm CMOS," by S. E. Armstrong, B. D. Olson, J. Popp, J. Braatz, T. D. Loveless, W. T. Holman, D. McMorro, and L. W. Massengill, presented at the 2008 Nuclear and Space Radiation Effects Conference (NSREC), Tucson, AZ, July 2009.
- (P77) "Single-Event Effects in Microelectronics Induced by Through-Wafer Sub-Bandgap Two-Photon Absorption," by Dale McMorro, William T. Lotshaw, Joseph S. Melinger, Jeffrey Warner, Jonathan Pellish, T. Daniel Loveless, Sarah E. Armstrong, Robert Reed, and Lloyd W. Massengill, presented at the 2009 Nonlinear Optics: Materials, Fundamentals and Applications (NLO) Conference, Honolulu, HI, July 2009.
- (P78) "Analysis and Testing of a Radiation Hardened by Design SerDes Transmitter Driver in 90nm CMOS," by S. Armstrong, J. Popp, J. Braatz, B. D. Olson, T. D. Loveless, and L. W. Massengill, presented at the 2009 Single Event Effects (SEE) Symposium, San Diego, La Jolla, CA, April 2009.
- (P79) "Single-Event-Transient Analysis of Delay-Locked Loops," by P. Maillard, T. D. Loveless, W. T. Holman, B. L. Bhuva, and L. W. Massengill, presented at the 2009 Single Event Effects (SEE) Symposium, San Diego, La Jolla, CA, April 2009.
- (P80) "A Radiation-Hardened-by-Design Voltage-Controlled-Oscillator for Mixed-Signal Phase-Locked Loops" by T. D. Loveless, L.W. Massengill, B.L. Bhuva, and W.T. Holman, presented at the 2008 Nuclear and Space Radiation Effects Conference (NSREC), Tucson, AZ, July 2008.
- (P81) "Laser Verification of On-Chip Charge Collection Measurement Circuit" by O. A. Amusan, P. R. Fleming, B. L. Bhuva, L.W. Massengill, A. F. Witulski, A. Balasubramanian, M. C. Casey, D. Mcmorro, S. Nation, F. Barsun, J. S. Melinger, M. Gadlage, and T. D. Loveless, presented at the 2008 Nuclear and Space Radiation Effects Conference (NSREC), Tucson, AZ, July 2008.
- (P82) "A Built-In Self-Test (BIST) Technique for Hardness Assurance against SETs in Digital Circuits" by A. Balasubramanian, B. L. Bhuva, L. W. Massengill, B. Narasimham, R. L. Shuler, T. D. Loveless, and W. Timothy Holman, presented at the 2008 Nuclear and Space Radiation Effects Conference (NSREC), Tucson, AZ, July 2008.
- (P83) "Single-Event Effects on Combinational Logic Circuits Operating at Ultra-Low Power" by M. C. Casey, O. A. Amusan, S. A. Nation, T. D. Loveless, A. Balasubramanian, B. L. Bhuva, R. A. Reed, D. McMorro, R. A. Weller, M. L. Alles, L. W. Massengill, J. S. Melinger, and B. Narasimham, presented at the 2008 Nuclear and Space Radiation Effects Conference (NSREC), Tucson, AZ, July 2008.

- (P84) "Pulsed Laser Single-Event Effects in Highly Scaled CMOS Technologies in the Presence of Dense Metal Coverage" by A. Balasubramanian, D. McMorrow, S. A. Nation, B. L. Bhuva, R. A. Reed, L. W. Massengill, **T. D. Loveless**, O. A. Amusan, J. D. Black, J. S. Melinger, M. P. Baze, V. Ferlet-Cavrois, M. Gaillardin, and J. R. Schwank, presented at the 2008 Nuclear and Space Radiation Effects Conference (NSREC), Tucson, AZ, July 2008.
- (P85) "A Radiation-Hardened-by-Design Voltage-Controlled-Oscillator for Mixed-Signal Phase-Locked Loops" by **T. D. Loveless**, L.W. Massengill, B.L. Bhuva, and W.T. Holman, presented at the 2008 Single Event Effects (SEE) Symposium, Long Beach, CA, April 2008.
- (P86) "Single-Event Effects Induced by Through-Wafer Sub-Bandgap Two-Photon Absorption," by D. McMorrow, W. T. Lotshaw, J. S. Melinger, P. Jenkins, P. Eaton, J. Benedetto, M. Gadlage, J. D. Davis, R. K. Lawrence, **T. D. Loveless**, and L. Massengill, presented at the 2007 Nonlinear Optics: Materials, Fundamentals and Applications (NLO) Conference, Kona, Hawaii, July 2007.
- (P87) "Mitigation and Modeling of Single-Event Transients in Voltage-Controlled Oscillators," by **T. D. Loveless**, L. W. Massengill, W. T. Holman, and B. L. Bhuva, presented at the 2007 Nuclear and Space Radiation Effects Conference (NSREC), Honolulu, HI, July 2007.
- (P88) "A Single-Event-Hardened Phase-Locked Loop Fabricated in 130nm CMOS," by **T. D. Loveless**, L. W. Massengill, B. L. Bhuva, W. T. Holman, R. A. Reed, D. McMorrow, and J. S. Melinger, presented at the 2007 Nuclear and Space Radiation Effects Conference (NSREC), Honolulu, HI, July 2007.
- (P89) "Effects of Technology Scaling on the Single-Event-Transient Response of Phase-Locked Loop Circuits," by **T. D. Loveless**, B. L. Bhuva, L. W. Massengill, and W. T. Holman, presented at the 2007 Single Event Effects (SEE) Symposium, Long Beach, CA, April 2007.
- (P90) "A Hardened-by-Design Technique for RF Digital Phase-Locked Loops," by **T. D. Loveless**, L. W. Massengill, B. L. Bhuva, W. T. Holman, A. F. Witulski and Y. Boulghassoul, presented at the 2006 Nuclear and Space Radiation Effects Conference (NSREC), Ponte Vedra, FL, July 2006.
- (P91) "Hardening Options for a RF Digital PLL," by **T. D. Loveless**, L. W. Massengill, B. L. Bhuva, W. T. Holman, A. F. Witulski, and Y. Boulghassoul, presented at the 2006 Single Event Effects (SEE) Symposium, Long Beach, CA, April 2006.
- (P92) "The Effect of Random Dopant Fluctuations (RDF) on the Radiation Hardness of CMOS Memory Cells," by A. Balasubramanian, A.L. Sternberg, P.R. Fleming, B.L. Bhuva, S. Kalemeris, and L.W. Massengill, presented by **T. D. Loveless** at the 2006 Single Event Effects (SEE) Symposium, Long Beach, CA, April 2006.