

## CURRICULUM VITAE FOR ARTHUR FRANK WITULSKI

### CONTACT INFORMATION

**Office:** Institute for Space and Defense Electronics,  
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### EMPLOYMENT HISTORY

- 1/06-present      Research Associate Professor of Electrical Engineering, School of Engineering, Vanderbilt University. Responsible for writing proposals, winning and directing sponsored research projects, supervising graduate students and engineers, managing research teams, publishing research results, teaching courses in electrical engineering and computer science, and administration of research grants.
- 1/04-12/11      Senior Research Engineer, Institute for Space and Defense Electronics (ISDE), Vanderbilt University. Modeling, analysis, and design of integrated circuits and power converters for space and defense environments. Technology Computer Aided Design (TCAD) single-event simulation of CMOS and power MOSFET structures and evaluation of Radiation Hardening by Design techniques.
- 8/00-6/03      Pursued Master of Divinity Degree at Regent College in Vancouver, British Columbia.
- 5/96-6/00      Associate Professor Electrical and Computer Engineering, University of Arizona (tenured). Direction of sponsored research in the area of resonant power conversion, modeling of power electronic circuits, measurement of electromagnetic interference in power converters, and distributed (modular) power supplies. Teaching in analog and digital integrated circuits, power electronics. Advising of graduate and undergraduate students.
- 8/89-5/96      Assistant Professor, Electrical and Computer Engineering, University of Arizona: Sponsored Research, Teaching in electronics, Advising of graduate and undergraduate students.
- 6/94-8/94      Summer Research Fellow, American Society for Engineering Education (ASEE) Summer Exchange Program, at the Naval Surface Warfare Center, Carderock Division, Annapolis Detachment (formerly the David Taylor Research Laboratory). Conducted research on modeling and predicting the stability of electrical power systems on surface ships and submarines.
- 1/89-7/89      Research Associate, Electrical and Computer Engineering, University of Colorado; Research in the area of quasi-resonant converter modeling.
- 6/84-12/88      Research Assistant, Electrical and Computer Engineering, University of Colorado; Research in the area of power electronics and resonant power conversion. Responsibilities included: Analysis and design of dc to dc converters, experimental measurement, computer programming, report writing, presentations to research sponsors, conference and journal papers.
- 8/83-5/84      Teaching Assistant, Electrical and Computer Engineering, University of Colorado; Responsibilities included: supervision of students, preparation of laboratory equipment,

grading of laboratory reports. Fall semester: Junior level electronics lab; Spring semester: Senior level communications lab.

8/81-7/83 Design Engineer for Storage Technology Corporation, 2270 S. 88th St., Louisville, CO 80027 (official title: Graduate Engineer). Designed power supplies and associated circuitry for magnetic tape subsystems. Responsibilities included: circuit design, worst-case analysis, supervision of lab technicians, design documentation, manufacturing and test specifications, vendor qualification, safety agency and FCC requirements. Also provided engineering support to the manufacturing line for existing products. (Official title: "Graduate Engineer").

6/80-8/80 Electrical Design Intern, Tri-State Generation and Transmission, 12076 Grant St., Thornton, CO 80241. Automation of a high voltage disconnect switch for remote control. Economic study of the use of Aluminum Conductor Steel Reinforced (ACSR) cables.

#### CHRONOLOGY OF EDUCATION

- 12/88 Ph.D. in Electrical Engineering, University of Colorado, Boulder.  
Ph.D. Dissertation: "Small Signal Equivalent Circuit Modeling of Resonant Power Converters,"
- 5/86 M. S. in Electrical Engineering, University of Colorado, Boulder.  
Master of Science Thesis: "Steady State Analysis and Design of the Series Resonant Converter,"
- 5/81 B. S. in Electrical Engineering, University of Colorado, Boulder.

#### SOFTWARE SKILLS

Operating systems: Mac OS X, Linux, Windows  
TCAD: Synopsys Sentaurus Suite, semiconductor device simulation and visualization  
IC Design: Cadence Virtuoso IC6, schematic, simulation, layout,  
Mentor Calibre: Design rule checking, layout-versus-schematic checking  
LTSpice: analog circuit simulation, other SPICE platforms  
Mathematica  
Microsoft Office and equivalents

#### PUBLICATIONS

##### Overall Citation Indices

h-index=30, i10 index=59, Source: Google Scholar, referenced 01/08/16.

##### Ten Selected Journal Articles-Total of 65-See Appendix for Complete Chronological List

N. E. Ives, J. Chen, A. F. Witulski, R. D. Schrimpf, D. M. Fleetwood, R. W. Bruce, M. W. McCurdy, E. X. Zhang, and L.W. Massengill, "Effects of Proton-Induced Displacement Damage on Gallium Nitride HEMTs in RF Power Amplifier Applications," Nuclear Science, IEEE Transactions on, Volume: 62, Issue: 6, Pages: 2417 - 2422, DOI: 10.1109/TNS.2015.2499160, Dec. 2015.

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. A. Alles, A. F. Witulski, "Bayesian Inference Modeling of Total Ionizing Dose Effects on System Performance," Nuclear Science, IEEE Transactions on, Volume: 62, Issue: 6 Pages: 2517 - 2524, DOI: 10.1109/TNS.2015.2493882, Dec. 2015.

Diggins, Z.J.; Mahadevan, N.; Pitt, E.B.; Herbison, D.; Karsai, G.; Sierawski, B.D.; Barth, E.J.; Reed, R.A.; Schrimpf, R.D.; Weller, R.A.; Alles, M.L.; Witulski, A.F., "System Health Awareness in Total-Ionizing Dose Environments," Nuclear Science, IEEE Transactions on, Year: 2015, Volume: 62, Issue: 4, DOI: 10.1109/TNS.2015.2440993, Pages: 1674 – 1681.

Gaspard, N. J. ; Witulski, A. F. ; Atkinson, N. M. ; Ahlbin, J. R. ; Holman, W. T. ; Bhuva, B. L. ; Loveless, T. D. ; Massengill, L. W. ; "Impact of Well Structure on Single-Event Well Potential Modulation in Bulk CMOS," *IEEE Trans. Nucl. Sci.*, Nov. 2011.

DasGupta, S.; Witulski, A.F.; Bhuva, B.L.; Alles, M.L.; Reed, R.A.; Amusan, O.A.; Ahlbin, J.R.; Schrimpf, R.D.; Massengill, L.W.; Effect of Well and Substrate Potential Modulation on Single Event Pulse Shape in Deep Submicron CMOS, Nuclear Science, IEEE Transactions on, Volume 54, Issue 6, Part 1, Dec. 2007 Page(s):2407 - 2412

Amusan, O. A.; Witulski, A. F.; Massengill, L. W.; Bhuva, B. L.; Fleming, P. R.; Alles, M. L.; Sternberg, A. L.; Black, J. D.; Schrimpf, R. D.; Charge Collection and Charge Sharing in a 130 nm CMOS Technology Nuclear Science, IEEE Transactions on Volume 53, Issue 6, Part 1, Dec. 2006 Page(s):3253 - 3258

M. Florez-Lizaraga, A. F. Witulski, "Input Filter Design for Multiple-Module DC Power Systems," *IEEE Transactions on Power Electronics*, May 1996, Vol. 11, No. 3, pp. 472-479. Winner, IEEE PELS Transaction prize paper, 1996.

J. S. Glaser, A. F. Witulski, "Application of a Constant-Output-Power Converter in Multiple-Module Converter Systems," *IEEE Transactions on Power Electronics*, January 1994, Vol. 9, No. 1, pp. 43-50.

A. F. Witulski, R.W. Erickson, "Extension of State-Space Averaging to Resonant Switches-and Beyond," *IEEE Transactions on Power Electronics*, January, 1990, Vol. 5, No. 1, pp. 98-109.

A. F. Witulski, R. W. Erickson, "Steady State Analysis of the Series Resonant Converter," *IEEE Transactions on Aerospace and Electronic Systems*, Vol. AES-21, No. 6, November 1985, pp. 701-799. Reprinted in "Recent Developments in Resonant Power Conversion," Edited by K. Kit Sum, Intertec Communications Press, 1988, pp. 525-532.

#### **Ten Selected Conference Papers-Total of 72-See Appendix for Complete Chronological List**

A. F. Witulski, A. Sternberg, J. Rowe, R. D. Schrimpf, J. Zydel, J. Schaf, "Ionizing Dose-Tolerant Enhancement-Mode Cascode for High-Voltage Power Devices," *IEEE Nuclear and Space Radiation Effects Conference (NSREC)*, Portland, OR, U.S. A, July 11-15, 2016.

A. F. Witulski, R. Austin, R. Reed, G. Karsai, N. Mahadevan, B. Sierawski, J. Evans, K. LaBel, "Goal Structured Notation in a Radiation Hardening Safety Case for COTS-Based Spacecraft," *Proceedings of the Government Microcircuit and Critical Applications Technology Conference (GOMACTech-16)*, 2016, Orlando, Florida.

Arthur F. Witulski, Eric Barth, Gabor Karsai, Zachary Diggins, Nagabushan Mahedevan, E. Bryn Pitt, Daniel Herbison, Ronald Schrimpf, Robert Reed, Robert Weller, Brian Sierawski, "A Comprehensive Program for Investigation of Radiation Effects in Robots Used in Mitigation of Nuclear Disasters," *Proceedings of the Government Microcircuit and Critical Applications Technology Conference (GOMACTech-14)*, 2014, Charleston, South Carolina, USA, April 1 - 3, 2014, pp. 513-516. Winner, Best Poster Paper Award.

Z. J. Diggins, N. Mahadevan, D. Herbison, G. Karsai, E. Barth, R. A. Reed, R. Schrimpf, R. A. Weller, M. Alles, A. Witulski, "Total Ionizing Dose Induced Timing Window Violations in CMOS Microcontrollers," *IEEE Nuclear and Space Radiation Effects Conference (NSREC)*, Paris, France, July 14-18, 2014.

D. Herbison, A. Witulski, M. McCurdy, L. Massengill, R. Owen, M. Butkovich, P. Rutt, "MIL-STD 883 Worst-Case Testing of a DC/DC Converter for Dose-Rate Latchup," *Hardened Electronics and Radiation Technology Conference (HEART)*, April, 2010.

- A. Kelly, P.C. Adell, A. F. Witulski, W. T. Holman, R.D. Schrimpf, "Total Dose and Single Event Transients in Linear Voltage Regulators," Oral paper F-5, Eighth European conference on Radiation and Its Effects on Components and Systems (RADECS), Cap d'Agde, France, September 19-23, 2005.
- J. H. Cheng, A. F. Witulski, J. L. Vollin, "Dynamic Analysis of the Class-D Converter at Fixed Frequency Using Amplitude and Phase Modulation," Proceedings of the IEEE Power Electronics Specialist's Conference, pp. 380-386, Fukuoka, Japan, May 17-22, 1998.
- Y.L. Lin, A. F. Witulski, "A Unified Treatment of a Family of ZVS and ZCS Resonant Inverters," Proceedings of the IEEE Power Electronics Specialist's Conference, pp. 14-20, St. Louis MO, June 1997.
- M. Belkhat, R. Cooley, A. Witulski, "Large Signal Stability Criteria for Distributed Systems with Constant Power Loads," Proceedings of the IEEE Power Electronics Specialist's Conference, 1995 Record, pp. 1333-1338, Atlanta, Georgia.
- S. D. Johnson, A. F. Witulski, R. W. Erickson, "A Comparison of Resonant Topologies in High Voltage Applications", IEEE Applied Power Electronics Conference, 1987 Proceedings, pp. 145-156

#### **Conference Papers Accepted:**

- R. Austin, N. Mahadevan, G. Karsai, A. Witulski, "A CubeSat-Payload Radiation-Reliability Assurance Case using Goal Structuring Notation, IEEE Reliability and Maintainability Symposium, Orlando, FL, Jan. 23-26, 2017.

#### **Recent Workshops and Presentations**

- R. D. Schrimpf, A. F. Witulski, Z. J. Diggins, R. Austin, N. Mahadevan, G. Karsai, B. D. Sierawski, R. A. Reed, and E. J. Barth, "Projecting System Reliability Based on Component Measurements Using Bayesian Methods and Goal Structuring Notation," Workshop for NASA Commercial Electronics in Reliable Spacecraft (CERS), NASA Jet Propulsion Laboratory, Pasadena, CA June 22-23, 2016.
- A. Witulski, R. Austin, N. Mahadevan, G. Karsai, B. Sierawski, R. Schrimpf, R. Reed, "Radiation-Reliability Assurance Case Using Goal Structuring Notation For COTS Spacecraft, NASA Electronic Parts and Packaging Electronic Technology Workshop (ETW), GSFC, Maryland, June 13-16, 2016. (Invited)
- R. D. Schrimpf, A. F. Witulski, Z. J. Diggins, R. Austin, N. Mahadevan, G. Karsai, B. D. Sierawski, R. A. Reed, and E. J. Barth, "Projecting System Reliability Based on Component Measurements Using Bayesian Methods," Microelectronics Reliability and Qualification Workshop, Aerospace Corporation, Los Angeles, CA, February 9,10, 2016.

#### **Book Chapter**

- Balaji Narasimham, Bharat L. Bhuvan, Ronald D. Schrimpf, Lloyd W. Massengill, William Timothy Holman and Arthur F. Witulski, Vanderbilt U, Autonomous detection and characterization of radiation-induced transients in semiconductor integrated circuits, Chapter 13, Radiation Effects in Semiconductors: Devices, Circuits, and Systems, Edited By Kris Iniewski, Taylor and Francis.

#### **Patent**

- Arthur F. Witulski and Bruce Schwickrath, Inventors, "A Fault Protection System for Power Supplies That Use Ferro-Resonant Transformers," U.S. Patent No. 4466041, Aug. 14, 1984, Assignee: Storage Technology Corporation.

## GRANTS AND CONTRACTS WON

### **Vanderbilt University:**

Title: System-Level Impacts of Total Ionizing Dose in Analog Electronics: A Summer Student Research Experience

Principal Investigator: Witulski

Sponsor: Cal Tech/NASA Jet Propulsion Laboratory

Dates: Phase I: 05/25/2016-08/31/2016 Total Budget: \$11,000

Title: Integration of Goal Structuring Notation with Model-Based Engineering and Bayesian Networks

Principal Investigator: Witulski

Co-PIs: G. Karsai, B. Sierawski

Sponsor: NASA Goddard and NASA HQ OSMA

Dates: Phase I: 08/15/2016-12/31/2016 Total Budget: \$50,000

Phase II: 01/01/2017-09/30/2017 Total Budget: \$75,000

Title: Analysis of Radiation –Induced Changes in Robotic Materials, Components, and Subsystems: Option-Year 4

Principal Investigator: Witulski

Co-PIs: Eric Barth, Robert Reed, Robert Weller, Gabor Karsai R. Schrimpf

Sponsor: U.S. Defense Threat Reduction Agency (DTRA)

Dates: Awarded, start date in May 2016 Period of Performance 1 year, Budget: \$349,999

Title: Characterization and Mitigation of Radiation and High Temperature Effects in SiC Power Electronics

Principal Investigator: Witulski

Co-PIs: R. Schrimpf

Sponsor: CFDR Corporation-NASA Phase I SBIR

Dates: Awarded, start date in May 2016 Period of Performance 6 mo., Budget: \$32,353

Title: Reliability Paradigms for Space: Goal Structuring Notation for Aerospace Reliability Applications

Principal Investigator: Witulski

Co-PIs: G. Karsai, B. Sierawski

Sponsor: NASA Goddard and NASA HQ OSMA

Dates: Phase I: 09/01/2015-01/31/2016 Total Budget: \$51,000

Phase II: 02/01/2016-05/31/2016 Total Budget: \$25,000

Title: Radiation Tolerant Power Switches for Moog Switching Inverter Applications

Principal Investigator: Witulski

Co-PIs: R. Schrimpf, L. Massengill, K. Galloway, D. Fleetwood, R. Reed, B. Templeton

Sponsor: Moog Corporation

Dates: 06/1/2015-12/31/2015 Total Budget: \$141,000

Title: High-efficiency, Radiation-hardened GaN HEMT Technology for L-band Space Power Amplifier

Principal Investigator: Witulski

Co-PIs: R. Schrimpf

Sponsor: CFDR Corporation-U.S. Air Force Phase I SBIR

Dates: 06/24/2014-02/24/2015 Total Budget: \$35,000

Title: Radiation Hardening of Point of Load Converters

Principal Investigator: Witulski

Co-PIs: L. Massengill

Sponsor: Scientic Corporation, Texas Instruments-MDA Phase II SBIR

Dates: 03/10/2013-03/10/2015 Total Budget: \$249,979

Title: Analysis of Radiation –Induced Changes in Robotic Materials, Components, and Subsystems

Principal Investigator: Witulski

Co-PIs: Eric Barth, Robert Reed, Robert Weller, Gabor Karsai

Sponsor: Defense Threat Reduction Agency (DTRA)

Dates: 12/17/2012-12/17/2015 Total Budget: \$1,049,622

Title: Radiation-Hardened Point-of-Load (POL) Converter for Space Applications

Principal Investigator: Witulski

Co-PIs: Alles, Massengill

Sponsor: Scientic Corporation/MDA

Dates: 7/11-10/11 Total Budget: \$31,935

Bridge Funding to Phase II:

Dates: 6/12-9/12 Total Budget: \$15,986

Title: Worse Case Exposure Report & Written RLAT Test

Principal Investigator: Witulski

Co-PIs:

Sponsor: SEAKR Corporation

Dates: 7/10-10/10 Total Budget: \$71,284

Title: The Characterization of Single-Event Effects in Ultra Deep Submicron (<90nm) Microelectronics

Principal Investigator: Witulski

Co-PIs:

Sponsor: Robust Chip/DTRA

Dates: ~2/15/07-7/31/07 Total Budget: \$46,000

Title: Investigation of Macro- and Micro-Models for Prediction of SET-Induced Instability in Linear Regulators

Principal Investigator: Witulski

Co-PIs: Massengill, Schrimpf

Sponsor: ALCATEL

Dates: 9/05-2/06 Total Budget: \$24,863

Title: Radiation Hardened by Design and Integration Production of 8-16 Mega-Bit SRAM

Principal Investigator: Witulski

Co-PIs:

Sponsor: Structured Materials Inc.

Dates: 1/01/05-11/30/05 Total Budget: \$70,000

**University of Arizona:**

"Development of a Design Procedure for High Frequency Transformers using the Physically Based Transformer Model"

Principal Investigator: A. F. Witulski

Sponsor: Hughes Electron Devices, Torrance CA

July 23, 1998-May 31,1999, Amount: \$24,100

Continuation of "Modeling and Design of High Voltage Transformers for Switching Converters"

Principal Investigator: Arthur F. Witulski

Sponsor: Hughes Electron Devices, Torrance CA

January 10-Dec. 31, 1997, Amount: \$50,000.

"Dynamic Modeling of Class D Converter by a Variable Capacitance Switch,"

Principal Investigator: Arthur F. Witulski  
Sponsor: Hughes Missile Systems, Tucson AZ  
January 10-Dec. 31, 1996 Amount: \$30,000

"Characterization of a Capacitor Ladder for High Voltage DC/DC Applications,"  
Principal Investigator: Arthur F. Witulski  
Sponsor: Hughes Missile Systems, Tucson AZ  
January 10-Dec. 31, 1996 Amount: \$50,000

"Modeling and Design of High Voltage Transformers for Switching Converters"  
Principal Investigator: Arthur F. Witulski  
Sponsor: Hughes Electron Devices, Torrance CA,  
January 10-Dec. 31, 1996 Amount: \$50,000

"Characterization of a High Voltage MOSFET Switch for Radar Applications,"  
Principal Investigator: Arthur F. Witulski  
Sponsor: Hughes Missile Systems, Tucson AZ  
January 10-Dec. 31, 1996 Amount: \$50,000

"Design of a high power, high frequency Class D converter for radar transmitter applications,"  
Principal Investigator: Arthur F. Witulski  
Sponsor: Hughes Research Laboratories, Malibu, CA  
January 10-Dec. 31, 1996 Amount: \$50,000

"Investigation of Losses and Development of a Design Procedure for Efficient Operation of a High-Voltage Class D DC/DC Converter, "  
Principal Investigator: Arthur F. Witulski  
Sponsor: Hughes Radar and Communications Systems, El Segundo, CA  
January 10-Dec. 31, 1996 Amount: \$50,000

Taken together, the projects above represented a coordinated one-year effort sponsored by four different divisions of Hughes to investigate high frequency, high voltage power converters for radar transmitters during 1996. Several Hughes companies were purchased by Raytheon in 1997.

"Investigation of Resonant Topologies for High Voltage Power Supplies,"  
Principal Investigator: Arthur F. Witulski  
Sponsor: Hughes Missile Systems Company, Tucson, AZ  
Dates: 5/95-8/95, Amount \$30,000.

"Input Filter Design for a Multiple Converter Power System,"  
Principal Investigator: Arthur F. Witulski  
Sponsor: Allied Signal Corporation  
Dates: 1/26/94-12/31/94, Amount \$15,000

"Investigation of Multi-Output DC-to-DC Converter Topologies: Small Signal Models,"  
Principal Investigator: Arthur F. Witulski  
Sponsor: Sandia National Laboratories  
Dates: 1/93-5/93 Amount: \$11,027

"Closed-Loop Regulation Properties of Multi-Output DC-to-DC Converters":  
Principal Investigator: Arthur F. Witulski,  
Sponsor: Sandia National Laboratories  
Dates 2/28/92-2/28/93, Amount: \$29,352

"Characterization of Power MOSFETs and Power Converters for use in Space-Radiation Environments"

Principal Investigator: K.F. Galloway

Co-P Is: A. F. Witulski and R. D. Schrimpf

Sponsor: Government Electronics Group, Motorola, Inc., Chandler, AZ.

Dates: 1/91-1/92 Amount: \$24,960.

"Investigation of Multi-Output DC-DC Converter Topologies and Control"

Principal Investigator: Arthur F. Witulski

Sponsor: Sandia National Laboratories

Dates: 10/90-12/91 Amount: \$25,000.

"Closed-Loop Operation of a Zero-Voltage-Switched, Coupled-Inductor Switching Converter for Low Output Noise and Ripple,"

Principal Investigator: A. F. Witulski, Co-Investigator: W. Kerwin,

Sponsor: IBM Corporation, Tucson AZ,

Dates: 1/92-1/93, Amount: \$54,781

"A Multiple-Output, Zero-Voltage-Switched Forward Converter With Low Output Ripple and Low Radiated Noise"

Principal Investigator: A. F. Witulski

Co-Principal Investigators: W. Kerwin

Sponsor: IBM Corporation, Tucson AZ

Dates: 1/91-1/92 Amount: \$54,020

"Investigation of Resonant Power Converters with Very Low Ripple and Noise Output Levels,"

Principal Investigator: W. Kerwin

Co-Principal Investigators: A. F. Witulski

Sponsor: IBM Corporation, Tucson AZ

Dates: 1/90-1/91 Amount: \$50,000

#### AWARDS

Best Poster Paper Award, Arthur F. Witulski, Eric Barth, Gabor Karsai, Zachary Diggins, Nagabushan Mahedevan, E. Bryn Pitt, Daniel Herbison, Ronald Schrimpf, Robert Reed, Robert Weller, Brian Sierawski, "A Comprehensive Program for Investigation of Radiation Effects in Robots Used in Mitigation of Nuclear Disasters," Proceedings of the Government Microcircuit and Critical Applications Technology Conference (GOMACTech-14), 2014, Charleston, South Carolina, USA, April 1 - 3, 2014, pp. 513-516.

IEEE Power Electronics Society 1996 Transactions Prize Paper Award, for "Input Filter Design for Multiple-Module DC Power Systems," with Martin Florez-Lizarraga, Published in the IEEE Transactions on Power Electronics, Vol. 11, No. 3, May 1996.

1993-94 University of Arizona Annual ECE Departmental Award for Innovative Teaching, for introduction of novel material on problem-solving skills into courses on electronic circuit design, ECE 351A and ECE 351B.

#### COURSES TAUGHT AT VANDERBILT UNIVERSITY

**EECS 285 VLSI Design and Layout:** First course in integrated circuit design and layout. Students use Cadence software and an open-source process design kit to fabricate integrated circuit designs on 0.5 micron MOSIS tiny-chips and test their chips when they return from the fab several months later.

**EECS 112 Circuits I.** First semester circuits course for EE majors and non-major engineering students. Basic circuit concepts up to and including first-order differential equations.

**EECS 307 Technology Computer Aided Design (TCAD) Modeling of Semiconductor Devices.** A graduate course on modeling MOSFETs with TCAD simulation. A review of basic semiconductor theory, introduction to Synopsys Sentaurus TCAD suite, introduction to solving partial differential equations, issues in modeling of highly scaled MOSFET device structures.

**EECE 292 Power Electronics and Alternative Energy (S 2012)** See description of U.A. ECE 561 above.



CS 151 **Computers and Ethics** Introductory course on, ethics, and social issues of technology, especially with regard to computing and the internet. Basic ethical theories applied to issues in the computing world, such as privacy, intellectual property, free speech, and cyber-security.

EECE 275 **Microelectronic Systems** (S 2015) Intended as a bridge course for computer engineers who don't have electronics as a requirement in the curriculum, to enable them to successfully do circuit-board-level electronic system design. The course is a semester overview of transistors, logic families, communication busses, analog/digital conversion, sensors, actuators, packaging, board layout, and micro-controller implementation.

#### COURSES TAUGHT AT UNIVERSITY OF ARIZONA

ECE 351 (later 351a) based "Microelectronic Circuits" by Sedra & Smith, **Analog Electronics I** Basic semiconductor physics, introduction to the diode as a nonlinear circuit element, op amps, intro to bipolar and MOS transistors, biasing, single-transistor amplifiers.

ECE 351b Sedra & Smith **Analog Electronics II** Multi-transistor circuits, differential amplifiers, current sources, output stages, overall op amp design.

ECE 302 Second semester **Analog Design Laboratory** course, a project course where students built a discrete power op amp over the course of the semester and demonstrated its use in a project of their own choice.

ECE 455 **Digital integrated Circuit Design** at the transistor level. Comprehensive transistor-level design of logic gates, transient switching times in typical digital circuits, TTL, CMOS, other logic families.

ECE 453/553 Senior/First year graduate course on **Design-Oriented Analysis of Electronic Circuits**. This unique course is based on a body of work developed by Dr. R. D. Middlebrook at Cal Tech over many years. He observed that EE students often suffer from "analysis paralysis" when faced with real-world electronic design problems, and often give up on an analytical solution and resort to unguided, inconclusive simulations. He developed a philosophy of design and a set of circuit theorems and techniques to enable engineers to get to the heart of an analog design problem very quickly. Topics include: doing algebra on the Bode Plot, the Extra Element Theorem (for calculating the effect of a new circuit element on a circuit quantity like gain or impedance without redoing the original analysis), The Feedback Theorem, and others.

ECE 550 **Analog Integrated Circuits**: Design of analog bipolar and CMOS integrated circuits.

ECE 561 **Power Electronics**. This course covers the fundamentals of switching DC/DC converters: averaging of switching networks, characteristics of power semiconductor devices, magnetic device modeling and design, and feedback loop design and analysis. These principles can be easily extended to other power electronic applications such as DC/AC inverters for solar arrays or motor drivers, or AC/DC applications such as low-harmonic rectifiers or battery chargers.

ECE 650 **Advanced Analog IC Design** course: a/d and d/a data converter topologies and design.

ECE 599 **Seminar on Advanced Power electronics**: Current-mode modeling, control, resonant converters.

#### CONSULTING

Apex Microtechnology, Tucson AZ. Worst case analysis and control loop modeling and measurement for a multi-output dc/dc converter on a thick-film substrate.

National Semiconductor, Tucson, AZ. Control loop analysis of analog controller IC's and integrated dc/dc converters.

Raytheon Missile Systems Company, Tucson AZ. Modeling and analysis of resonant modulator switches for high voltage TWT radar systems.

## UNIVERSITY OF ARIZONA EXTERNAL PRESENTATIONS

- Invited Seminar, "Pulse-Width-Modulated Converters: Modeling and Measurement," presented to Power Supply Technical Advisory Group (PSTAG) Meeting of Honeywell Corporation, 8 hour presentation, September 30, 1991, in Minneapolis, Minnesota. Approx. 15-20 attendees.
- Invited Seminar, "Modeling and Design of Coupled Inductors and Transformers," presented to Power Supply Technical Advisory Group (PSTAG) Meeting of Honeywell Corporation, 4 hour presentation, October 26, 1992, in Phoenix, AZ. Approx. 25-30 attendees.
- Industrial Short Course: "Power Electronics: Devices and Applications," with Dr. R. Schrimpf of UA and Mr David Blackburn of the National Institute of Standards and Technology (NIST), presented through Engineering Professional Development, DoubleTree Hotel, Tucson, March 16-18, 1992. Three-day course, responsible for approx. 1 day of lectures. Thirteen attendees from industry, 8-9 UA grad. students. Also given at the Fiesta Inn, Phoenix, February 8-10, 1993, with fourteen attendees from industry.
- Invited Talk, "Topics in the Design and Analysis of Distributed Electronic Power Systems," at the Corporate Power Electronics Committee (CPEC) Meeting of Hughes Aircraft Corporation, Los Angeles, CA, April 27, 1994.
- Instructor for "Structured Analog Design," a 3 day industrial short course originated by Dr. R.D. Middlebrook at Caltech. Both courses were presented to audiences of engineers of the Jet Propulsion Laboratory in Pasadena California. The course consists of 8 hours of lecture each day, and covers 560 rather complicated view graphs. The first course was given June 28-30th, the second in December 12-14th of 1995, both offered through JPL's continuing education program.
- Seminar: "Equivalent Circuit Modeling of Small Signal Dynamics in Switching Power Converters," Presented for the U. of A. Applied Mathematics Seminar Series on Nov. 9, 1995
- Invited Talk: "An Introduction to Zero-Voltage and Zero-Current Switching Resonant Converters," Hughes Power Electronics Symposium, Los Angeles, CA, September 24, 1996.
- Tutorial: "PWM Converter Modeling and Measurement," *IEEE CIEP 96 (Congreso Internacional Electronica de Potencia)*, Cuernavaca, Mexico, October 1996.
- Seminar: "Topics in High Voltage DC Resonant Power Conversion for Radar Transmitters," Power Electronics Research Seminar, University of Colorado, Boulder CO, March 10, 1997.
- Seminar: "Small Signal Modeling of DC-DC Converters," *IEEE Applied Power Electronics Conference*, New Orleans, Louisiana, February 1999.

## SERVICE

- Reviewer, Energy Conversion, *IEEE Transactions on Aerospace and Electronic Systems*
- Reviewer, Static Power Converters, *IEEE Transactions on Industry Applications*
- Reviewer, Power Converters, *IEEE Transactions on Power Electronics*, Aug. 1990 to present.
- Member, Program Review Committee, IEEE Power Electronics Specialists Conference 1991-2000
- Session Chair, IEEE Power Electronics Specialist Conference, Resonant DC/DC Converters
- Member, Program Review Committee, IEEE Applied Power Electronics Conference (APEC)
- Treasurer, IEEE Power Electronic Society Administrative Committee, 1999-2000.
- Reviewer, Nuclear and Space Radiation Effects Conference, 2007-2011.
- Reviewer, HEART Conference, 2011
- Reviewer, IEEE Transactions on Power Electronics
- Reviewer, IEEE Transactions on Nuclear Science.

## INTRAMURAL SERVICE

### Departmental Committees, University of Arizona

- Microelectronics Sub-Committee: Curriculum Review, Aug. 1990-Jan. 1991.
- Microelectronics Sub-Committee: Restructuring ECE 351/352, Chair, Dec. 1990-Jan. 1991.
- Microelectronics Sub-Committee: Laboratory and Office Space, Aug. 1990-Jan. 1991.

Microelectronics Sub-Committee: Recruiting Aug. 1990-Jan. 1991.  
 Microelectronics representative on Dept of ECE Curriculum Committee, and ad-hoc Sub-Committees on Circuits and Electronics Curriculum, August 1991-May 1992.  
 Member of committee for: Master's Thesis Defenses, Ph.D. Qualifying Examinations, Ph.D. Preliminary Examinations, Ph.D. Defenses.  
 Microelectronics group representative on the ECE Graduate Studies Committee.  
 Member of ad-hoc microelectronics search committee for a new faculty member.  
 Chairman of Undergraduate Curriculum committee, 1999-2000.

### **GRADUATE STUDENT ADVISING**

**Students for whom I supervised their Ph.D. thesis, Vanderbilt:**

Zachary Diggins, "System Health Awareness in Total-Ionizing Dose Environments," Scheduled for October 1, 2016.

**Students for whom I supervised their M.S. thesis, Vanderbilt:**

Sandeepan DasGupta, "Trends in Single Event Pulse Widths and Pulse Shapes in Deep Submicron CMOS, M.S. Thesis, Vanderbilt University, Dec., 2007.

Tania Roy, "Single Event Mechanisms in 90nm Triple Well CMOS Devices, M.S. Thesis, Vanderbilt University, Aug., 2008.

Patrick Voytek, "Gamma Total Ionizing Dose Impact On The Control Performance Of Integrated Point-Of-Load Converters," July 2014.

Students that I co-supervised with Dr. Tim Holman:

Nick Atkinson, "Single-event characterization of a 90-nm bulk CMOS digital cell library," Vanderbilt University, May 2010.

Nelson Gaspard, "Impact of well structure on SE response in 90-nm bulk CMOS," Vanderbilt University, May, 2011.

**Ph.D. Dissertations Supervised, University of Arizona:**

Matthew Goldman, "Topics in the Design and Analysis of Multi-Output Current-Mode Controlled DC/DC Converters," 1993.

Leng-nien Hsiu, "Low-Ripple and Noise DC/DC Converter with Quasi-resonant Switching and Integrated Magnetics, 1995.

John Glaser, "Topics in Large Signal Analysis of Switching Power Converters," 1996.

Yung-Lin Lin, "Resonant Converters and Their Application to Electronic Ballasts and High Voltage Power Conversion," 1997.

Jung-Hui Cheng, "Steady-State and Small-Signal Analysis of High-Order Resonant Converters," 1997.

**Students for whom I supervised their M.S. thesis, University of Arizona**

|                   |                   |
|-------------------|-------------------|
| John Glaser       | Martin Florez     |
| Lengnien Hsiu     | Judith Barleycorn |
| Reggie Kellum     | Lengnien Hsiu     |
| Judith Barleycorn | Doug Smith,       |
| Susan Theodore    | Fernand Anvia     |
| Bin Wu            | Jian Wang         |

## APPENDIX: COMPLETE LIST OF JOURNAL AND CONFERENCE PUBLICATIONS, CHRONOLOGICAL ORDER

### Reviewed Journal Papers

1. A. F. Witulski, R. W. Erickson, "Steady State Analysis of the Series Resonant Converter," IEEE Transactions on Aerospace and Electronic Systems, Vol. AES-21, No. 6, November 1985, pp. 701-799. Reprinted in "Recent Developments in Resonant Power Conversion," Edited by K. Kit Sum, Intertec Communications Press, 1988, pp. 525-532.
2. A. F. Witulski, R. W. Erickson, "Design of the Series Resonant Converter for Minimum Component Stress," IEEE Transactions on Aerospace and Electronic Systems, Volume AES-22, No. 4, July 1986, pp. 356-363.
3. S. D. Johnson, A. F. Witulski, R.W. Erickson, "A Comparison of Resonant Topologies in High Voltage Applications", IEEE Transactions on Aerospace and Electronic Systems, May 1988, Vol. 24, No. 3, pp. 263-274.
4. R. W. Erickson, A. F. Hernandez, A. F. Witulski, R. Xu, "A Nonlinear Resonant Switch," IEEE Transactions on Power Electronics, April, 1989, Vol. 4, No.2, pp. 242-252.
5. A. F. Witulski, R.W. Erickson, "Extension of State-Space Averaging to Resonant Switches-and Beyond," IEEE Transactions on Power Electronics, January, 1990, Vol. 5, No. 1, pp. 98-109.
6. A. F. Witulski, A. F. Hernandez, R. W. Erickson "Small Signal Equivalent Circuit Modeling of Resonant Converters," IEEE Transactions on Power Electronics, January, 1991, Vol. 6, No. 1, pp.11-27.
7. A. F. Witulski, "Buck Converter Small-Signal Models and Dynamics: Comparison of Quasi-Resonant and Pulse-Width-Modulated Switches" IEEE Transactions on Power Electronics, October, 1991, Vol. 6, No. 4, pp. 727-738.
8. J. S. Glaser, A. F. Witulski, R. G. Myers, "Steady-State-Analysis of the Constant Frequency Diode-Clamped Series Resonant Converter," IEEE Transactions on Aerospace and Electronics Systems, January 1994, vol. 30, No. 1, pp. 135-143.
9. J. S. Glaser, A. F. Witulski, "Application of a Constant-Output-Power Converter in Multiple-Module Converter Systems," IEEE Transactions on Power Electronics, January 1994, Vol. 9, No. 1, pp. 43-50.
10. L. Hsiu, M. Goldman, A. F. Witulski, W. Kerwin, R. Carlsten, "Characterization and Comparison of Noise Generation for Quasi-Resonant and Pulse-Width Modulated Converters," IEEE Transactions on Power Electronics, July, 1994, Vol. 9, No. 4, pp. 425-532.
11. D. Smith, M. Koen, A. F. Witulski, "Evolution of High-Speed Operational Amplifiers, Architectures, and Process Technologies," IEEE Journal of Solid-State Circuits, October, 1994, Vol. 29, No. 10, pp. 1166-1179.
12. M. Goldman, A. F. Witulski, "Predicting Regulation for a Multiple-Output Current-Mode Controlled DC-to-DC Converter," IEEE Transactions on Aerospace and Electronic Systems, April, 1995, Vol. 31, No. 2.
13. A. F. Witulski, "Introduction to Modeling and Design of Transformers and Coupled Inductors," IEEE Transactions on Power Electronics, May, 1995, Vol. 10, No. 3, pp. 349-357.
14. M. Florez-Lizaraga, A. F. Witulski, "Input Filter Design for Multiple-Module DC Power Systems," IEEE Transactions on Power Electronics, May 1996, Vol. 11, No. 3, pp. 472-479.

15. J.H. Cheng, A. F. Witulski, "Steady-State and Large-Signal Design of Current-Programmed Converters," IEEE Transactions on Power Electronics, July, 1997, Vol. 12, No.4, pp. 349-357.
16. J.H. Cheng, A. F. Witulski, "Analytic Solutions for LLC Parallel Converter Simplify Use of Two- and Three-Element Converters," IEEE Transactions on Power Electronics, March 1998, Vol. 13, No. 2, pp. 235-243.
17. J.H. Cheng, A. F. Witulski, "LLC Parallel Resonant Converter Design by Scaling the LC Converter," IEEE Transactions on Aerospace and Electronic Systems, July 1998, Vol. 34, No. 3, pp. 924-933.
18. J. E. Pizano, T. H. Ma, J. O. Attia, R. D. Schrimpf, K. F. Galloway, and A. F. Witulski, "Total Dose Effects on Power-MOSFET Switching Converters," *Microelectronics Reliability*, 1998, Vol. 38, No. 12, pp. 1935-1939.
19. J-H Cheng, A.F. Witulski, J.L. Vollin, "A Small-Signal Model Utilizing Amplitude Modulation for the Class-D Converter at Fixed-Frequency," IEEE Transactions on Power Electronics, November 2000, Vol. 15, No. 6, pp. 1204-1211.
20. J-H Cheng, A.F. Witulski, J.L. Vollin, D.L. Shaw, "A Generalized DC Model and Low-Frequency Dynamic Analysis for the Class-D Converter at Fixed Frequency," IEEE Transactions on Power Electronics, November 2000, Vol. 15, No. 6, pp. 1212-1220.
21. Black, J.D.; Sternberg, A.L.; Alles, M.L.; Witulski, A.F.; Bhuvu, B.L.; Massengill, L.W.; Benedetto, J.M.; Baze, M.P.; Wert, J.L.; Hubert, M.G.; HBD layout isolation techniques for multiple node charge collection mitigation, Nuclear Science, IEEE Transactions on Volume 52, Issue 6, Part 1, Dec. 2005 Page(s):2536 – 2541
22. Casey, M. C.; Bhuvu, B. L.; Black, J. D.; Massengill, L. W.; Amusan, O. A.; Witulski, A. F.; Single-Event Tolerant Latch Using Cascode-Voltage Switch Logic Gates, Nuclear Science, IEEE Transactions on Volume 53, Issue 6, Part 1, Dec. 2006 Page(s):3386 – 3391
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25. Baze, M. P.; Wert, J.; Clement, J. W.; Hubert, M. G.; Witulski, A.; Amusan, O. A.; Massengill, L.; McMorrow, D.; Propagating SET Characterization Technique for Digital CMOS Libraries, Nuclear Science, IEEE Transactions on Volume 53, Issue 6, Part 1, Dec. 2006 Page(s):3472 – 3478
26. Adell, P. C.; Witulski, A. F.; Schrimpf, R. D.; Marec, R.; Pouget, V.; Calvel, P.; Bezerra, F.; Single Event-Induced Instability in Linear Voltage Regulators, Nuclear Science, IEEE Transactions on, Volume 53, Issue 6, Part 1, Dec. 2006 Page(s):3506 - 3511
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28. Loveless, T. D.; Massengill, L. W.; Bhuvu, B. L.; Holman, W. T.; Witulski, A. F.; Boulghassoul, Y.; A Hardened-by-Design Technique for RF Digital Phase-Locked Loops; Nuclear Science, IEEE Transactions on Volume 53, Issue 6, Part 1, Dec. 2006 Page(s):3432 - 3438

29. Ramachandran, V.; Narasimham, B.; Fleetwood, D. M.; Schrimpf, R. D.; Holman, W. T.; Witulski, A. F.; Pease, R. L.; Dunham, G. W.; Seiler, J. E.; Platteter, D. G.; Modeling Total-Dose Effects for a Low-Dropout Voltage Regulator; Nuclear Science, IEEE Transactions on, Volume 53, Issue 6, Part 1, Dec. 2006 Page(s):3223 – 3231
30. Narasimham, B.; Ramachandran, V.; Bhuvu, B. L.; Schrimpf, R. D.; Witulski, A. F.; Holman, W. T.; Massengill, L. W.; Black, J. D.; Robinson, W. H.; McMorrow, D.; On-Chip Characterization of Single-Event Transient Pulses; Device and Materials Reliability, IEEE Transactions on; Volume 6, Issue 4, Dec. 2006 Page(s):542 - 549
31. Olson, B.D.; Amusan, O.A.; Dasgupta, S.; Massengill, L.W.; Witulski, A.F.; Bhuvu, B.L.; Alles, M.L.; Warren, K.M.; Ball, D.R.; Analysis of Parasitic PNP Bipolar Transistor Mitigation Using Well Contacts in 130 nm and 90 nm CMOS Technology ; Nuclear Science, IEEE Transactions on; Volume 54, Issue 4, Part 2, Aug. 2007 Page(s):894 – 897
32. Bajura, M.A.; Boulghassoul, Y.; Naseer, R.; DasGupta, S.; Witulski, A.F.; Sondeen, J.; Stansberry, S.D.; Draper, J.; Massengill, L.W.; Damoulakis, J.N.; Models and Algorithmic Limits for an ECC-Based Approach to Hardening Sub-100-nm SRAMs; Nuclear Science, IEEE Transactions on; Volume 54, Issue 4, Part 2, Aug. 2007 Page(s):935 – 945
33. Kelly, A.T.; Adell, P.C.; Witulski, A.F.; Holman, W.T.; Schrimpf, R.D.; Pouget, V.; Total Dose and Single Event Transients in Linear Voltage Regulators; Nuclear Science, IEEE Transactions on, Volume 54, Issue 4, Part 3, Aug. 2007 Page(s):1327 – 1334
34. DasGupta, S.; Witulski, A.F.; Bhuvu, B.L.; Alles, M.L.; Reed, R.A.; Amusan, O.A.; Ahlbin, J.R.; Schrimpf, R.D.; Massengill, L.W.; Effect of Well and Substrate Potential Modulation on Single Event Pulse Shape in Deep Submicron CMOS, Nuclear Science, IEEE Transactions on, Volume 54, Issue 6, Part 1, Dec. 2007 Page(s):2407 - 2412
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37. Amusan, O. A.; Massengill, L. W.; Baze, M. P.; Sternberg, A. L.; Witulski, A. F.; Bhuvu, B. L.; Black, J. D.; Single Event Upsets in Deep-Submicrometer Technologies Due to Charge Sharing Device and Materials Reliability, IEEE Transactions on Volume 8, Issue 3, Sept. 2008 Page(s):582 – 589.
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39. Amusan, O. A.; Fleming, P. R.; Bhuvu, B. L.; Massengill, L. W.; Witulski, A. F.; Balasubramanian, A.; Casey, M. C.; McMorrow, D.; Nation, S. A.; Barsun, F.; Melinger, J. S.; Gadlage, M. J.; Loveless, T. D.; Laser Verification of On-Chip Charge-Collection Measurement Circuit, Nuclear Science, IEEE Transactions on, Volume 55, Issue 6, Part 1, Dec. 2008 Page(s):3309 – 3313

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41. Amusan, O. A.; Massengill, L. W.; Baze, M. P.; Bhuvu, B. L.; Witulski, A. F.; Black, J. D.; Balasubramanian, A.; Casey, M. C.; Black, D. A.; Ahlbin, J. R.; Reed, R. A.; McCurdy, M. W., Mitigation Techniques for Single-Event-Induced Charge Sharing in a 90-nm Bulk CMOS Process, *Device and Materials Reliability*, IEEE Transactions on, Volume 9, Number 2, pp. 311-317 June 2009.
42. Narasimham, B.; Gadlage, M. J.; Bhuvu, B. L.; Schrimpf, R. D.; Massengill, L. W.; Holman, W.; Witulski, A. F.; Reed, R. A.; Weller, R. A.; Zhu, X., Characterization of Neutron- and Alpha-Particle-Induced Transients Leading to Soft Errors in 90-nm CMOS Technology, *Device and Materials Reliability*, IEEE Transactions on, Volume 9, Number 2, Page(s): 325-333, June 2009.
43. DasGupta, S.; Amusan, O.A.; Alles, M.L.; Witulski, A.F.; Massengill, L.W.; Bhuvu, B.L.; Schrimpf, R.D.; Reed, R.A.; "Use of a Contacted Buried Layer for Single Event Mitigation in 90 nm CMOS" *Nuclear Science*, IEEE Transactions on Volume 56, Issue 4, Part 2, Aug. 2009 Page(s):2008 – 2013.
44. Adell, P. C.; Witulski, A. F.; Schrimpf, R. D.; Baronti, F.; Holman, W. T.; Galloway, K. F.; Digital Control for Radiation-Hardened Switching Converters in Space Aerospace and Electronic Systems, *IEEE Transactions on Volume: 46* , Issue: 2 Publication Year: 2010 , Page(s): 761 – 770.
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47. N. M. Atkinson, A. F. Witulski, W. T. Holman, J. R. Ahlbin, B. L. Bhuvu, and L. W. Massengill, "Layout Technique for Single-Event Transient Mitigation via Pulse Quenching," *IEEE Trans. Nucl. Sci.*, Feb. 2011.
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- Transactions on. Volume: 60 , Issue: 6 , Part: 1. Digital Object Identifier: 10.1109/TNS.2013.2283457. Publication Year: 2013, Page(s): 4498 – 4504
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54. Zhang, E.X. ; Fleetwood, D.M. ; Pate, N.D. ; Reed, R.A. ; Witulski, A.F. ; Schrimpf, R.D., "Time-Domain Reflectometry Measurements of Total-Ionizing-Dose Degradation of n MOSFETs," Nuclear Science, IEEE Transactions on, Volume: 60 , Issue: 6 , Part: 1, Digital Object Identifier: 10.1109/TNS.2013.2285129, Publication Year: 2013 , Page(s): 4470 – 4475.
55. Gaspard, N.J. ; Jagannathan, S. ; Diggins, Z.J. ; King, M.P. ; Wen, S.-J. ; Wong, R. ; Loveless, T.D. ; Lilja, K. ; Bounasser, M. ; Reece, T. ; Witulski, A.F. ; Holman, W.T. ; Bhuva, B.L. ; Massengill, L.W., "Technology Scaling Comparison of Flip-Flop Heavy-Ion Single-Event Upset Cross Sections," Nuclear Science, IEEE Transactions on, Volume: 60 , Issue: 6 , Part: 1, Digital Object Identifier: 10.1109/TNS.2013.2289745, Publication Year: 2013 , Page(s): 4368 – 4373.
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57. Z. J. Diggins, N. Mahadevan, D. Herbison, G. Karsai, E. Barth, R. A. Reed, R. Schrimpf, R. A. Weller, M. Alles, A. Witulski, "Total Ionizing Dose Induced Timing Window Violations in CMOS Microcontrollers," Nuclear Science, IEEE Transactions on Volume: 61 , Issue: 6 , Part: 1 DOI: 10.1109/TNS.2014.2368125 Publication Year: 2014 , Page(s): 2979 – 2984.
58. Y. P. Chen, T. D. Loveless, P. Maillard, N. J. Gaspard, S. Jagannathan, A. L. Sternberg, E. X. Zhang, A. F. Witulski, B. L. Bhuva, T. W. Holman, and L. W. Massengill, "Single-Event Transient (SET) Induced Harmonic Errors in Digitally Controlled Ring Oscillators (DCROs), Nuclear Science, IEEE Transactions on, Volume: 61, Issue: 6 , Part: 1, DOI: 10.1109/TNS.2014.2364813, Publication Year: 2014 , Page(s): 3163 – 3170.
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60. Z. J. Diggins, N. Mahadevan, D. Herbison, G. Karsai, E. Barth, R. A. Reed, R. D. Schrimpf, R. A. Weller, M. L. Alles, and A. Witulski, "Range-Finding Sensor Degradation in Gamma Radiation Environments," IEEE Sensors Journal, Vol. 15, Issue 3, DOI: 10.1109/JSEN.2014.2368139, March 2015, pp. 1864 – 1871.
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64. N. E. Ives, J. Chen, A. F. Witulski, R D. Schrimpf, D. M. Fleetwood, R. W. Bruce, M. W. McCurdy, E. X. Zhang, and LW. Massengill, "Effects of Proton-Induced Displacement Damage on Gallium Nitride HEMTs in RF Power Amplifier Applications," Nuclear Science, IEEE Transactions on, Volume: 62, Issue: 6, Pages: 2417 - 2422, DOI: 10.1109/TNS.2015.2499160, Dec. 2015.
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#### Conference Proceedings

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2. A. F. Witulski, R. W. Erickson, "Small Signal AC Equivalent Circuit Modeling of the Series Resonant Converter," IEEE Power Electronics Specialists Conference, 1987 Record, pp. 693-704. Reprinted in "Recent Developments in Resonant Power Conversion," Edited by K. Kit Sum, Intertec Communications Press, 1988, pp. 69-80.
3. R. W. Erickson, A. F. Hernandez, A. F. Witulski, R. Xu, "A Nonlinear Resonant Switch," Proceedings of the IEEE Power Electronics Specialists Conference, 1989 Record, pp. 43-50.
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