Update on High-Impact Papers Presented at the IEEE Nuclear and Space Radiation Effects Conference: The View in 2013

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***Abstract*—This paper, an update of a paper published in 2003 (1), identifies a number of papers presented at the NSREC and published in the** IEEE TRANSACTIONS ON NUCLEAR SCIENCE **that have had measurable impact on radiation effects research and the radiation effects community. Criteria include papers selected for the Outstanding Paper Award at the NSREC or papers from the NSREC that have been highly cited by authors of other journal publications. Observations on the successes and failures of the methodology used for selecting high-impact papers are presented.**

***Index Terms*—*IEEE Nuclear and Space Radiation Effects Conference*, IEEE TRANSACTIONS ON NUCLEAR SCIENCE, radiation effects, radiation effects in microelectronics: radiation hardening.**

I. Introduction

THERE is no single definition of a high-impact paper. It may be a paper winning an Outstanding Paper Award or a paper frequently cited by authors of other papers or a paper that first identified a phenomenon or launched a new avenue of research. And, in fact, all of these could be considered to be of high impact.

2013 marks the fiftieth consecutive IEEE Nuclear and Space Radiation Effects Conference (1964–2013). This paper updates an earlier paper that compiled information on papers presented at the NSREC and published in the IEEE TRANSACTIONS ON NUCLEAR SCIENCE in the years 1964 through 2002 (1). It looks at papers identified in the earlier paper and makes another cut based on citations with the bar for inclusion set higher. Additionally, this paper looks at the citation data for papers published in the years 2003 through 2012 and attempts to identify for the reader a selection of papers that have had measurable impact on radiation effects research and the radiation effects community.

II. Papers Receiving an Outstanding Paper Award

The Outstanding Paper Award has been an important part of the IEEE Nuclear and Space Radiation Effects Conference since its inception. Selection of this paper (or papers) has always been a challenging task. A well established and documented process has evolved for the NSREC (1). A list of papers presented at the IEEE Nuclear and Space Radiation Effects Conference from 1964 through 2002 selected as the Conference Outstanding Paper was included in the earlier high-impact paper. Appendix I lists papers presented at the NSREC from 2003 through 2012 selected as the Conference Outstanding Paper. These papers competed with other papers at the conference and were judged by a number of technical specialists to be "outstanding." Thus, they are included here as high-impact papers at the Nuclear and Space Radiation Effects Conference.

III. Selecting High-Impact Papers on the Basis of Citation Count

The Web of Science[1] is an online academic citation index provided by Thomson Reuters which replaces the citation records of ISI (Institute for Scientific Information). Our earlier paper (1) compiled the list of all papers from the IEEE Nuclear and Space Radiation Effects Conference and published in the IEEE TRANSACTIONS ON NUCLEAR SCIENCE with 50 or more citations at that time. The number 50 was somewhat arbitrary and certainly could have been set higher, or lower.

Authors select a paper for citation for a variety of reasons including: the cited paper provides useful background information; it describes methods of measurement, analysis techniques, or models relevant to the authors' paper; the work cited represents previous work on the same or similar topics; or, in the best of cases, the work cited is fundamental to their own work.[2]

It is also interesting to note the effect on citations of research teams and the numbers of authors on any given paper. Over the past fifty years, team size for scientific papers has at least doubled (2), and teams are most likely to produce the highly cited work (2, 3, 4).

Table I illustrates this point with papers from the NSREC in the IEEE TRANSACTIONS ON NUCLEAR SCIENCE giving for each decade the average number of authors per paper and the number of papers with having at least 30 citations.

It is also interesting to note that through mid-December 2012, there are a total of 4657 NSREC papers (there is some error in this number due to papers that for one reason or another did not end up in the conference special issue). Of this total, only 372 have $\geq$ 30 total citations and 2313 papers have $\leq$ 5 citations. For the papers with 5 or fewer citations, the mode or the value that occurs most often is 0 citations.

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[1]http://thomsonreuters.com/products_services/science/science_products/a-z/web_of_science/

[2]For citation counts in this paper, self-citations have not been eliminated.

TABLE I
AVERAGE NUMBER OF AUTHORS PER PAPER AND NUMBER OF PAPERS WITH EQUAL TO OR GREATER THAN 30 CITATIONS PER DECADE

Decade	Ave. No. Authors	No. papers with $\geq$ 30 citations
64-73	1.9	21
74-83	2.6	86
84-93	4.1	124
94-03	5.5	112
04-present	7.5	29

In this "update," we have decided to use different criteria to try to take some account of the time that a paper has been in print. Obviously, a paper published in 1985 has the opportunity to accumulate more citations than a paper published in 2000.

With that in mind, we have selected the following criteria for inclusion:

Papers published in TNS 1964–1980 $\geq$ 100 citations.

Papers published in TNS 1981- present an $\geq$ average of 5 citations/year over the time interval.[3]

These criteria aim to identify those publications which are highly cited and consistently cited over time.

Appendix II lists the papers presented at the IEEE Nuclear and Space Radiation Effects Conference from 1964 through 2012 cited in other published archival papers using the criteria described above. These papers have attracted the attention of authors who believe, for whatever reason, that there was valued added in citing them as relevant literature for their own publication. Thus, they are included here as high-impact papers at the Nuclear and Space Radiation Effects Conference.

IV. THE PAPERS WITH THE HIGHEST NUMBER OF CITATIONS AND THE HIGHEST RATE OF CITATION

This section identifies the top five papers from the IEEE Nuclear and Space Radiation Effects Conference appearing in the IEEE TRANSACTIONS ON NUCLEAR SCIENCE ranked by number of citations as of mid-December 2012.

1. 376 Citations (278 citations and first place in 2003)

F. B. McLean, "A Framework for Understanding Radiation-Induced Interface States in SiO_2 MOS Structures," IEEE Trans. Nuclear Science 27, No. 6, pp. 1651–1657, 1980.

2. 263 Citations (163 citations and third place in 2003)

P. S. Winokur, J. R. Schwank, P. J. McWhorter, P. V. Dressendorfer, and D. C. Turpin, "Correlating the Radiation Response of MOS Capacitors and Transistors," IEEE Trans. Nuclear Science 31, No. 6, pp. 1453–1460, 1984.

3. 250 Citations (less than 50 citations in 2003)

T. Calin, M. Nicolaidis, and R. Velazco, "Upset Hardened Memory Design for Submicron CMOS Technology," IEEE Trans. Nuclear Science 43, No. 6, pp. 2874–2878, 1996.

4. 244 Citations (less than 50 citations in 2003)

G. P. Summers, E. A. Burke, P. Shapiro, S. R. Messenger, and R. J. Walters, "Damage Correlations in Semiconductors Exposed to Gamma-Radiation, Electron-Radiation, and Proton-Radiation," IEEE Trans. Nuclear Science 40, No. 6, pp. 1371–1379, 1993.

5. 234 Citations (194 citations and second place in 2003)

J. R. Schwank, P. S. Winokur, P. J. McWhorter, F. W. Sexton, P. V. Dressendorfer, and D. C. Turpin, "Physical Mechanisms Contributing to Device 'Rebound'," IEEE Trans. Nuclear Science 31, No. 6, pp. 1434–1438, 1984.

Two of the top five papers in 2003 are not in the top five in 2013. Both are included in the list of Appendix II. In 2003, the fourth most cited paper from the NSREC was F. J. Grunthaner *et al.* (1982) with 158 citations. It now has 175 citations and is in sixth place overall. The fifth most cited paper in 2003 was R. J. Powell and G. F. Derbenwick (1971). This paper is now in fourteenth place overall as its citation count increased from 136 citations to 144.

If we consider the rate of citation criteria applied for papers in the Transactions on Nuclear Science published from 1981 to December 2012, nine papers have an average rate of more than 10/year. From Appendix II they are: Summers *et al.* (1993), Calin *et al.* (1996), Normand (1993), Anelli *et al.* (1999), Hazucha *et al.* (2000), Dodd *et al.* (2004), Faccio and Cervelli (2005), Amusan *et al.* (2006), and Barnaby (2006).

V. OBSERVATIONS AND OPINIONS

The two criteria used to select papers in Sections II (Conference Outstanding Paper) and III (highly cited) are clearly defined, but they certainly do not encompass the universe of high-impact NSREC papers. Over the life of the conference, the core technical topics, the technologies, the research raison d'ětre, the interests of the researchers and attendees, and the publication practices of the radiation effects community have changed. In the 2003 paper (1), a Section entitled "First Reports, Overlooked Papers, and Other Outliers" was included. It attempted to identify other work that has had an important impact, but that might not meet the criteria of Sections II and III. For example, the first NSREC papers to report SEUs (single-event-upsets) and ELDRS (enhanced low dose rate sensitivity) are identified with other firsts and interesting technical achievements. We recommend this section of the 2003 paper to the reader.

We find it somewhat more difficult to identify "First Reports, Overlooked Papers, and Other Outliers" for the ten year period 2003–2012 than for the longer period covered in the 2003 paper (1). Subjectively, in this past decade, we would identify the following as "hot topics:" single event transients (SETs); the impact of nuclear events on single event effects (SEE); the advent of high-K dielectrics and trench isolated MOS devices; continued aggressive CMOS scaling; and transistors based on organic semiconductors, carbon nanotubes, and graphene. However, this list probably reveals a personal bias.

A number of NSREC papers on SETs in the past ten years meet the criteria as being "Highly Cited" as described in Section III and appear in Appendix II; e.g., P.E. Dodd *et al.* (2004), M. J. Gadlage *et al.* (2004), Eaton *et al.* (2004), Benedetto *et al.* (2006), V. Ferlet-Cavrois *et al.* (2007), and Narasimham *et al.* (2007).

There is only one paper on the "Highly Cited" list that treats the impact of nuclear events on SEE; e.g., Warren *et al.* (2005).

[3]The algorithm as supplied by Thomson Reuters was followed for the calculation of citations per year. See http://images.webofknowledge.com/WOKRS58B4/help/WOS/hp_citation_report.html for details. Regardless of the time of year of article publication, years are counted as a whole. For instance, when reviewing Web of Science data in December of 2012 for an article published in December 2009, the algorithm divides the total citations by four in order to create a figure for "average citations per year."

On this topic, we recommend the 2009 NSREC paper by Weller *et al.* (5), but it has not yet accumulated sufficient citations to make the "Highly Cited" list. We also recommend the 2010 RADECS paper by Weller *et al.* (6) on this topic that appeared in the IEEE TRANSACTIONS ON NUCLEAR SCIENCE.

The advent of high-K dielectrics, trench isolated MOS devices and FinFETs have continued the march in CMOS scaling. But papers on these topics at NSREC are yet to make the "Highly Cited" list. The first NSREC paper that treats radiation and high-K dielectrics (since very early work on Al_2O_3) is L.W. Massengill *et al.* (7). To quote . . . "We present experimental results on single-event-induced breakdown in sub-5-nm plasma-enhanced SiO_2, nitrided SiO_2, Al_2O_3, HfO_2, and $Zr_{0.4}Si_{1.6}O_4$ dielectrics typical of current and future-generation commercial gate oxides. These advanced oxides are found to be quite resistant to ion-induced breakdown." This paper is probably a good candidate for a first report (and perhaps a neglected paper) at NSREC. It currently has 35 citations.

Papers have appeared at the NSREC based on radiation effects on transistors fabricated using organic semiconductors, carbon nanotubes, and graphene. None are as yet "Highly Cited" and it seems premature to identify any of the work on these thus far as impactful even though it is interesting.

VI. SUMMARY

In this paper, we have tried to provide an update of a 2003 paper on "impact" (1) and some additional analysis of papers published in the IEEE TRANSACTIONS ON NUCLEAR SCIENCE from the IEEE NSREC. This paper identifies papers from the IEEE NSREC that have received distinction by either 1) selection by a committee of peers as the Conference Outstanding Paper Award or 2) selected by the authors of other journal publications for citation in their own work. It is, of course, impossible to provide a precise definition for high-impact; but these criteria provide reasonable rationale for inclusion. And, of course, there are biases associated with the almost any criteria that you select. We hope that you will find these selections interesting and controversial.

APPENDIX I
OUTSTANDING PAPER AWARD

Papers presented at the IEEE Nuclear and Space Radiation Effects Conference selected as the Conference Outstanding Paper (2003–2012).

2003 Dale McMorrow, William T. Lotshaw, Joseph S. Melinger, Stephen Buchner, Younes Boulghassoul, Lloyd W. Massengill, and Ronald L. Pease, "Three-Dimensional Mapping of Single Event Effects Using Two Photon Absorption," IEEE Trans. Nuclear Science 50, No. 6, pp. 2199–2207, 2003.

2004 Paul E. Dodd, Marty R. Shaneyfelt, James A. Felix, and James R. Schwank, "Production and Propagation of Single-Event Transients in High-Speed Digital Logic ICs," IEEE Trans. Nuclear Science 51, No. 6, pp. 3278–3284, 2004.

2005 J. R. Schwank, M. R. Shaneyfelt, J. Baggio, P. E. Dodd, J. A. Felix, V. Ferlet-Cavrois, P. Paillet, D. Lambert, F. W. Sexton, G. L. Hash, and E. Blackmore, "Effects of Particle Energy on Proton-Induced Single-Event Latchup." IEEE Trans. Nuclear Science 52, No. 6, pp. 2622–2629, 2005.

2006 V. Ferlet-Cavrois, P. Paillet, M. Gaillardin, D. Lambert, J. Baggio, J. R. Schwank, G. Vizkelethy, M. R. Shaneyfelt, K. Hirose, E. W. Blackmore, O. Faynot, C. Jahan, and L. Tosti, "Statistical Analysis of the Charge Collected in SOI and Bulk Devices under Heavy Ion and Proton Irradiation—Implications for Digital SETs," IEEE Trans. Nuclear Science 53, No. 6, pp. 3242–3252, 2006.

2007 P. E. Dodd, J. R. Schwank, M. R. Shaneyfelt, J. A. Felix, P. Paillet, V. Ferlet-Cavrois, J. Baggio, R. A. Reed, K. M. Warren, R. A. Weller, R. D. Schrimpf, G. L. Hash, S. M. Dalton, H. Hirose, and H. Saito, "Impact of Heavy Ion Energy and Nuclear Interactions on Single-Event Upset and Latchup in Integrated Circuits," IEEE Trans. Nuclear Science 54, No. 6, pp. 2303–2311, 2007.

2008 Marty R. Shaneyfelt, James A. Felix, Paul E. Dodd, James R. Schwank, Scott M. Dalton, Jacques Baggio, Véronique Ferlet-Cavrois, Philippe Paillet, and Ewart W. Blackmore, "Enhanced Proton and Neutron Induced Degradation and Its Impact on Hardness Assurance Testing," IEEE Trans. Nuclear Science 55, No. 6, pp. 3096–3105, 2008.

2009 David F. Heidel, Paul W. Marshall, Jonathan A. Pellish, Kenneth P. Rodbell, Kenneth A. LaBel, James R. Schwank, Stewart E. Rauch, Mark Hakey, Melanie D. Berg, Carlos Castaneda, Paul E. Dodd, Mark R. Friendlich, Hak S. Kim, Anthony D. Phan, Christina M. Seidleck, Marty R. Shaneyfelt, and Michael A. Xapsos, "Single-Event Upsets and Multiple-Bit Upsets on a 45 nm SOI SRAM," IEEE Trans. Nuclear Science 56, No. 6, pp. 3499–3504, 2009.

2010 Cheryl J. Marshall, Paul W. Marshall, Raymond L. Ladbury, Augustyn Waczynski, Rajan Arora, Roger D. Foltz, John D. Cressler, Duncan M. Kahle, Dakai Chen, Gregory S. Delo, Nathaniel A. Dodds, Jonathan A. Pellish, Emily Kan, Nicholas Boehm, Robert A. Reed, and Kenneth A. LaBel, "Mechanisms and Temperature Dependence of Single Event Latchup Observed in a CMOS Readout Integrated Circuit from 16–300 K," IEEE Trans. Nuclear Science 57, No. 6, pp. 3078–3086, 2010.

2011 S. Buchner, N. Kanyogoro, C. Foster, P. O'Neill, and K. Nguyen, "Variable Depth Bragg Peak Method for Single Event Effects Testing," IEEE Trans. Nuclear Science 58, No. 6, pp. 2976–2982, 2011.

2012 V. Goiffon, M. Estribeau, O. Marcelot, P. Cervantes, P. Magnan, M. Gaillardin, C. Virmontois, P. Martin-Gonthier, R. Molina, F. Corbière, S. Girard, P. Paillet, and C. Marcandella, "Radiation Effects in Pinned Photodiode CMOS Image Sensors: Pixel Performance Degradation Due to Total Ionizing Dose," IEEE Trans. Nuclear Science 59, No. 6, pp. 2878–2887, 2012.

Appendix II
Highly Cited Papers

Papers from the IEEE Nuclear and Space Radiation Effects Conference and published in the IEEE Transactions on Nuclear Science using the criteria described in Section III.

1968 D. C. Wunsch and R. R. Bell, "Determination of Threshold Failure Levels of Semiconductor Diodes and Transistors due to Pulse Voltages," IEEE Trans. Nuclear Science 15, No. 6, pp. 244–259, 1968. times cited: 122

1971 R. J. Powell and G. F. Derbenwick, "Vacuum Ultraviolet Radiation Effects in SiO_2," IEEE Trans. Nuclear Science 18, No. 6, pp. 99–105, 1971. times cited: 144

1973 G. W. Arnold, "Ion-Implantation Effects in Noncrystalline SiO_2," IEEE Trans. Nuclear Science 20, No. 6, pp. 220–223, 1973. times cited: 118

1975 G. F. Derbenwick and B. L. Gregory, Process Optimization of Radiation-Hardened CMOS Integrated Circuits, IEEE Trans. Nuclear Science 22, No. 6, pp. 2151–2156, 1975. times cited: 168
D. Binder, E. C. Smith, and A. B. Holman, "Satellite Anomalies from Galactic Cosmic Rays," IEEE Trans. Nuclear Science 22, No. 6, pp. 2675–2680, 1975. times cited: 146

1976 L. C. Kimerling, "New Developments in Defect Studies in Semiconductors," IEEE Trans. Nuclear Science 23, No. 6, pp. 1497–1505, 1976. times cited: 134
H. E. Boesch, Jr., and J. M. McGarrity, "Charge Yield and Dose Effects in MOS Capacitors at 80 K," IEEE Trans. Nuclear Science 23, No. 6, pp. 1520–1525, 1976. times cited: 108
C. T. Sah, "Origin of Interface States and Oxide Charges Generated by Ionizing Radiation," IEEE Trans. Nuclear Science 23, No. 6, pp. 1563–1568, 1976. times cited: 152
P. S. Winokur, J. M. McGarrity, and H. E. Boesch, Jr., "Dependence of Interface-State Buildup on Hole Generation and Transport in Irradiated MOS Capacitors," IEEE Trans. Nuclear Science 23, No. 6, pp. 1580–1585, 1976. times cited: 105

1977 P. S. Winokur, H. E. Boesch, Jr., J. M. McGarrity, and F. B. McLean, "Field- and Time-Dependent Radiation Effects at the SiO_2-Si Interface of Hardened MOS Capacitors," IEEE Trans. Nuclear Science 24, No. 6, pp. 2113–2118, 1977. times cited: 113

1980 F. B. McLean, "A Framework for Under-standing Radiation-Induced Interface States in SiO_2 MOS Structures," IEEE Trans. Nuclear Science 27, No. 6, pp. 1651–1657, 1980. times cited: 376, average rate: 11.39/year

1982 F. J. Grunthaner, P. J. Grunthaner, and J. Maserjian, "Radiation-Induced Defects in SiO_2 as Determined with XPS," IEEE Trans. Nuclear Science 29, No. 6, pp. 1462–1466, 1982. times cited: 175, average rate: 5.65/year
G. C. Messenger, "Collection of Charge on Junction Nodes from Ion Tracks," IEEE Trans. Nuclear Science 29, No. 6, pp. 2024–2031, 1982. times cited: 181, average rate: 5.84/year

1984 J. R. Schwank, P. S. Winokur, P. J. Mcwhorter, F. W. Sexton, P. V. Dressendorfer, and D. C. Turpin, "Physical Mechanisms Contributing to Device 'Rebound'," IEEE Trans. Nuclear Science 31, No. 6, pp. 1434–1438, 1984. times cited: 230, average rate: 7.93/year
P. S. Winokur, J. R. Schwank, P. J. McWhorter, P. V. Dressendorfer, and D. C. Turpin, "Correlating the Radiation Response of MOS Capacitors and Transistors," IEEE Trans. Nuclear Science 31, No. 6, pp. 1453–1460, 1984. times cited: 263, average rate: 9.07/year

1986 T. R. Oldham, A. J. Lelis, and F. B. McLean, "Spatial Dependence of Trapped Holes Determined from Tunneling Analysis and Measured Annealing," IEEE Trans. Nuclear Science 33, No. 6, pp. 1203–1209, 1986. times cited: 160, average rate: 5.91/year

1989 A. J. Lelis, T. R. Oldham, H. E. Boesch, Jr., and F. B. McLean, "The Nature of the Trapped Hole Annealing Process," IEEE Trans. Nuclear Science 36, No. 6, pp. 1808–1815, 1989. times cited: 146, average rate: 6.08/year
N. S. Saks and D. B. Brown, "Interface Trap Formation via the Two-Stage H+ Process," IEEE Trans. Nuclear Science 36, No. 6, pp. 1848–1857, 1989. times cited: 131, average rate: 5.46/year

1991 E. W. Enlow, R. L. Pease, W. Combs, R. D. Schrimpf, and R. N. Nowlin, "Response of Advanced Bipolar Processes to Ionizing-Radiation," IEEE Trans. Nuclear Science 38, No. 6, pp. 1342–1351, 1991. times cited: 142, average rate: 6.45/year

1993 G. P. Summers, E. A. Burke, P. Shapiro, S. R. Messenger, and R. J. Walters, "Damage Correlations in Semiconductors Exposed to Gamma-Radiation, Electron-Radiation, and Proton-Radiation," IEEE Trans. Nuclear Science 40, No. 6, pp. 1372–1379, 1991. times cited: 244, average rate: 12.20/year

1994 D. M. Fleetwood, S. L. Kosier, R. N. Nowlin, R. D. Schrimpf, R. A. Reber, Jr., M. DeLaus, P. S. Winokur, A. Wei, W. E. Combs, and R. L. Pease, "Physical Mechanisms Contributing to Enhanced Bipolar Gain Degradation at Low Dose Rates," IEEE Trans. Nuclear Science 41, No. 6, pp. 1871–1883, 1994. times cited: 131, average rate: 6.89/year
J. S. Melinger, S. Buchner, D. McMorrow, W. J. Stapor, T. R. Weatherford, and A. B. Campbell, "Critical-Evaluation of the Pulsed-Laser Method for Single Event Effects Testing and Fundamental-Studies," IEEE Trans. Nuclear Science 41, No. 6, pp. 2574–2584, 1994. times cited: 109, average rate: 5.74/year

1996 T. Calin, M. Nicolaidis, and R. Velazco, "Upset Hardened Memory Design for Submicron CMOS Technology," IEEE Trans. Nuclear Science 43, No. 6, pp. 2874–2878, 1996. times cited: 250, average rate: 14.71/year
E. Normand, "Single Event Upset at Ground Level," IEEE Trans. Nuclear Science 43, No. 6, pp. 2742–2750, 1996. times cited: 187, average rate: 11.00/year

1997 A. Scarpa, A. Paccagnella, F. Montera, G. Ghibaudo, G. Pananakakis, G. Ghidini, and P. G. Fuochi, "Ionizing Radiation Induced Leakage Current on Ultra-Thin Gate Oxides," IEEE Trans. Nuclear Science 44, No. 6, pp. 1818–1825, 1997. times cited: 97, average rate: 6.06/year
S. Buchner, M. Baze, D. Brown, D. McMorrow, and J. Melinger, "Comparison of Error Rates in Combinational and Sequential Logic," IEEE Trans. Nuclear Science 44, No. 6, pp. 2209–2216, 1997. times cited: 96, average rate: 6.00/year

1998 M. R. Shaneyfelt, P. E. Dodd, B. L. Draper, and R. S. Flores, "Challenges in Hardening Technologies Using Shallow-Trench Isolation," IEEE Trans. Nuclear Science 45, No. 6, pp. 2584–2592, 1998. times cited: 102, average rate: 6.80/year
M. Ceschia, A. Paccagnella, A. Cester, A. Scarpa, and G. Ghidini, "Ionizing Radiation Induced Leakage Current on Ultra-Thin Gate Oxides," IEEE Trans. Nuclear Science 45, No. 6, pp. 2375–2382, 1998. times cited: 94, average rate: 6.27/year

1999 G. Anelli, M. Campbell, M. Delmastro, F. Faccio, S. Florian, A. Giraldo, E. Heijne, P. Jarron, K. Kloukinas, A. Marchioro, P. Moreira, and W. Snoeys, "Radiation Tolerant VLSI Circuits in Standard Deep Submicron CMOS Technologies for the LHC Experiments: Practical Design Aspects," IEEE Trans. Nuclear Science 46, No. 6, pp. 1690–1696, 1999. times cited: 143, average rate: 10.21/year
S. R. Messenger, E. A. Burke, G. P. Summers, M. A. Xapsos, R. J. Walters, E. M. Jackson, and B. D. Weaver, "Nonionizing Energy Loss (NIEL) for Heavy Ions," IEEE Trans. Nuclear Science 46, No. 6, pp. 1595–1602, 1999. times cited: 77, average rate: 5.50/year

2000 P. Hazucha and C. Svensson, "Impact of CMOS Technology Scaling on the Atmospheric Neutron Soft Error Rate," IEEE Trans. Nuclear Science 47, No. 6, pp. 2586–2594, 2000. times cited: 171, average rate: 13.15/year
S. T. Pantelides, S. N. Rashkeev, R. Buczko, D. M. Fleetwood, and R. D. Schrimpf, "Reactions of Hydrogen with Si-SiO_2 Interfaces," IEEE Trans. Nuclear Science 47, No. 6, pp. 2262–2268, 2000. times cited: 79, average rate: 6.08/year

2001 P. E. Dodd, M. R. Shaneyfelt, K. M. Horn, D. S. Walsh, G. L. Hash, T. A. Hill, B. L. Draper, J. R. Schwank, F. W. Sexton, and P. S. Winokur, "SEU-Sensitive Volumes in Bulk and SOI SRAMS from First-Principle Calculations and Experiments," IEEE Trans. Nuclear Science 48, No. 6, pp. 1893–1903, 2001. times cited: 96, average rate: 8.00/year

2002 S. N. Rashkeev, C. R. Cirba, D. M. Fleetwood, R. D. Schrimpf, S. C. Witczak, A. Michez, and S. T. Pantelides "Physical Model for Enhanced Interface-Trap Formation at Low Dose Rates," IEEE Trans. Nuclear Science 49, No. 6, pp. 2650–2655, 2002. times cited: 74, average rate: 6.73/year
D. M. Fleetwood, H. D. Xiong, Z. Y. Lu, C. J. Nicklaw, J. A. Felix, R. D. Schrimpf, and S. T. Pantelides "Unified Model of Hole Trapping, 1/f Noise, and Thermally Simulated Current in MOPS Devices," IEEE Trans. Nuclear Science 49, No. 6, pp. 2674–2683, 2002. times cited: 67, average rate: 6.09/year

2004 P. E. Dodd, M. R. Shaneyfelt, J. A. Felix, and J. R. Schwank, "Production and Propagation of Single-Event Transients in High-Speed Digital Logic ICs," IEEE Trans. Nuclear Science 51, No. 6, pp. 3278–3284, 2004. times cited: 111, average rate: 12.33/year
M. S. Gordon, R. Goldhagen, K. P. Rodbell, T. H. Zabel, H. H. K. Tang, J. M. Clem, and P. Bailey, "Measurement of the Flux and Energy Spectrum of Cosmic-Ray Induced Neutrons on the Ground," IEEE Trans. Nuclear Science 51, No. 6, pp. 3227–3434, 2004. times cited: 85, average rate: 9.44/year
M. J. Gadlage, R. D. Schrimpf, J. M. Benedetto, P. H. Eaton, D. G. Mavis, M. Sibley, K. Avery, and T. L. Turflinger, "Single Event Transient Pulsewidths in Digital Microcircuits," IEEE Trans. Nuclear Science 51, No. 6, pp. 3285–3290, 2004. times cited: 65, average rate: 7.22/year
P. H. Eaton, J. M. Benedetto, D. G. Mavis, K. Avery, M. Sibley, M. J. Gadlage, and T. L. Turflinger, "Single Event Transient Pulse-width Measurements Using a Variable Temporal Latch Technique," IEEE Trans. Nuclear Science 51, No. 6, pp. 3365–3368, 2004. times cited: 60, average rate: 6.67/year
J. M. Benedetto, P. H. Eaton, K. Avery, D. G. Mavis, M. J. Gadlage, T. L. Turflinger, P. E. Dodd, and G. Vizkelethyd, "Heavy Ion-Induced Digital Single-Event Transients in Deep Submicron Processes," IEEE Trans. Nucl. Sci. 51, No. 6, pp. 3480–3485, 2004. times cited: 52, average rate: 5.78/year
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