

Dr Christopher Frost

Publications, Reports and Media Output

Papers Relating to Neutron Irradiation since 2007

2023

1. *The MIGDAL experiment: Measuring a rare atomic process to aid the search for dark matter*
Araújo, HM; Balashov, SN; Borg, JE; Brunbauer, FM; Cazzaniga, C; Frost, CD; Garcia, F; Kaboth, AC; Kastriotou, M; Katsioulas, I et al; *Astroparticle Physics*, 151, 102853, 2023
2. *An analysis of the significance of the $^{14}\text{N}(n, p)^{14}\text{C}$ reaction for single-event upsets induced by thermal neutrons in SRAMs*
Coronetti, Andrea; Alía, Rubén García; Lucsanyi, David; Letiche, Manon; Kastriotou, Maria; Cazzaniga, Carlo; Frost, Christopher D; Saigné, Frédéric; *IEEE TRANSACTIONS ON NUCLEAR SCIENCE*, VOL. 70, NO. 8, AUGUST 2023
3. *Fast neutron response characterization of an EJ-276 plastic scintillator for use as a neutron monitor*
Ngo, Khai D; Cazzaniga, Carlo; Paoletti, Michela; Rigamonti, Davide; Kastriotou, Maria; Frost, Christopher; Tardocchi, Marco; Sykora, Jeff; Mann, Sarah; Lutz, Benjamin; *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 1051, 168216, 2023
4. *Towards the use of SDD as an absolute detector for high-energy neutron measurements*
Cippo, E Perelli; Cazzaniga, C; Paoletti, M; Colombi, S; Caruggi, F; Petruzzo, M; Rigamonti, D; Frost, C; Rebai, M; *Journal of Instrumentation*, 18, 5, C05019, 2023
5. *Impact of Temperature on Neutron Irradiation Failure-in-Time of Silicon and Silicon Carbide Power MOSFETs*
Principato, Fabio; Cazzaniga, Carlo; Kastriotou, Maria; Frost, Christopher; Abbene, Leonardo; Pintacuda, Francesco; *Radiation*, 3, 2, 110-122, 2023
6. *Characterization Measurements of Compact Neutron Generators of the New NILE Facility*
Cazzaniga, Carlo; Dapica, Paula Luna; Ngo, Khai; Paoletti, Michela; Smith, Veronica; Brown, Craig; Tardocchi, Marco; Cippo, Enrico Perelli; Rigamonti, Davide; Colombi, Stefano; *IEEE Transactions on Nuclear Science*, vol. 70, no. 8, pp. 1616-1624, Aug. 2023

2022

7. *Experimental findings on the sources of detected unrecoverable errors in GPUs*
dos Santos, Fernando Fernandes; Malde, Sujit; Cazzaniga, Carlo; Frost, Christopher; Carro, Luigi; Rech, Paolo;
IEEE Transactions on Nuclear Science, 69, 3, 436-443, 2022
8. *Neutron irradiated perovskite films and solar cells on PET substrates*
De Rossi, F; Taheri, B; Bonomo, M; Gupta, Vishal; Renno, G; Nia, N Yaghoobi; Rech, P; Frost, C; Cazzaniga, C; Quagliotto, P; *Nano Energy*, 93, 106879, 2022
9. *High energy and thermal neutron sensitivity of google tensor processing units*

Junior, Rubens Luiz Rech; Malde, Sujit; Cazzaniga, Carlo; Kastriotou, Maria; Letiche, Manon; Frost, Christopher; Rech, Paolo; IEEE Transactions on Nuclear Science, 69, 3, 567-575, 2022

10. *Perovskite films and solar cells on PET substrates for space applications: stability study under neutron irradiation*
Brunetti, Francesca; De Rossi, Francesca; Bonomo, Matteo; Taheri, Babak; Renno, Giacomo; Gupta, Vishal; Yaghoobi Nia, Narghes; Rech, Paolo; Frost, Chris; Cazzaniga, Carlo; Proceedings of International Conference on Hybrid and Organic Photovoltaics (HOPV22), 2022
11. *Comparison between a proton, laser, and neutron test on Automotive MOSFETS for space application*
Pesce, A; Muschitiello, M; Principato, F; Ravituso, M; Cazzaniga, C; Frost, C; Rizzo, M; Pintacuda, F; 9TH EUROPEAN CONFERENCE FOR AERONAUTICS AND SPACE SCIENCES (EUCASS); DOI: 10.13009/EUCASS2022-7242

2021

12. *Measurements of ultra-high energy lead ions using silicon and diamond detectors*
Cazzaniga, Carlo; Kastriotou, Maria; Alia, Ruben Garcia; Fernandez-Martinez, Pablo; Wyrwoll, Vanessa; Minniti, Triestino; Frost, Christopher D; Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 985, 164671, 2021
13. *Thermal neutrons: a possible threat for supercomputer reliability*
Oliveira, Daniel; Blanchard, Sean; DeBardeleben, Nathan; Fernandes dos Santos, Fernando; Piscocya Dávila, Gabriel; Navaux, Philippe; Favalli, Andrea; Schappert, Opale; Wender, Stephen; Cazzaniga, Carlo; The Journal of Supercomputing, 77, 1612-1634, 2021
14. *Dosimetry of thermal neutron beamlines at a pulsed spallation source for application to the irradiation of microelectronics*
Cazzaniga, Carlo; Raspino, Davide; Sykora, G Jeff; Frost, Christopher D; IEEE Transactions on Nuclear Science, 68, 5, 921-927, 2021
15. *Evaluating and mitigating neutrons effects on COTS EdgeAI accelerators*
Blower, Sebastian; Rech, Paolo; Cazzaniga, Carlo; Kastriotou, Maria; Frost, Christopher D; IEEE Transactions on Nuclear Science, 68, 8, 1719-1726, 2021
16. *Neutron activation analysis of archeological artifacts using the ISIS pulsed neutron source*
Cazzaniga, Carlo; Scherillo, Antonella; Fedrigo, Anna; Raspino, Davide; Grazi, Francesco; Frost, Christopher D; AIP Advances, 11, 7, 2021
17. *Ultralow power system-on-chip SRAM characterization by alpha and neutron irradiation*
Haran, Avner; Yitzhak, Nir M; Mazal-Tov, Eran; Keren, Eitan; David, David; Refaeli, Nati; Preziosi, Enrico; Senesi, Roberto; Cazzaniga, Carlo; Frost, Christopher D; IEEE Transactions on Nuclear Science, 68, 11, 2598-2608, 2021
18. *On the evaluation of FPGA radiation benchmarks*
Bricas, Gaetan; Tsiliannidis, Georgios; Touboul, Antoine; Boch, Jérôme; Kastriotou, Maria; Cazzaniga, Carlo; Frost, CD; Dilillo, Luigi; Luza, L Matana; Microelectronics Reliability, 126, 114276, 2021
19. *Measurements of neutron fields in a wide energy range using multi-foil activation analysis*
Chiesa, D; Cazzaniga, C; Nastasi, M; Rebai, M; Frost, CD; Gorini, G; Lilley, S; Pozzi, S; Previtali, E; IEEE Transactions on Nuclear Science, 69, 7, 1659-1666, 2021
20. *Measurements of low-energy protons using a silicon detector for application to SEE testing*

Cazzaniga, Carlo; Alía, Rubén García; Coronetti, Andrea; Bilko, Kacper; Morilla, Yolanda; Martin-Holgado, Pedro; Kastriotou, Maria; Frost, Christopher D; IEEE Transactions on Nuclear Science, 69, 3, 485-490, 2021

21. *Experimental Findings on the Sources of Detected Unrecoverable Errors in GPUs*

Santos, Fernando Fernandes dos; Malde, Sujit; Cazzaniga, Carlo; Frost, Christopher; Carro, Luigi; Rech, Paolo; IEEE Transactions on Nuclear Science, vol. 69, no. 3, pp. 436-443, March 2022, doi: 10.1109/TNS.2022.3141341.

2020

22. *SE Response of Guard-Gate FF in 16-and 7-nm Bulk FinFET Technologies*

Cao, Jingchen; Xu, Lyuan; Bhuvu, Bharat L; Fung, Rita; Wen, Shi-Jie; Cazzaniga, Carlo; Frost, C; IEEE Transactions on Nuclear Science, 67, 7, 1436-1442, 2020

23. *SEU characterization of commercial and custom-designed SRAMs based on 90 nm technology and below*

Coronetti, Andrea; Cecchetto, Matteo; Wang, Jialei; Tali, Maris; Martinez, Pablo Fernandez; Kastriotou, Maria; Papadopoulou, Athina; Bilko, Kacper; Castellani, Florent; Sacristan, Mario; 2020 IEEE Radiation Effects Data Workshop (in conjunction with 2020 NSREC), 45139, 2020

24. *Fast neutron measurements with solid state detectors at pulsed spallation sources*

Cazzaniga, C; Rebai, M; García Alía, R; Fernandez-Martinez, P; Cecchetto, M; Kastriotou, M; Tardocchi, M; Frost, CD; Journal of Neutron Research, 22, 44987, 345-352, 2020

25. *An Overview of the Risk Posed by Thermal Neutrons to the Reliability of Computing Devices*

Oliveira, Daniel; Blanchard, Sean; DeBardeleben, Nathan; dos Santos, Fernando F; Davila, Gabriel Piscocya; Navaux, Philippe; Wender, Stephen; Cazzaniga, Carlo; Frost, Christopher; Baumann, Robert; 2020 50th Annual IEEE-IFIP International Conference on Dependable Systems and Networks-Supplemental Volume (DSN-S), 92-97, 2020

26. *Thermal neutron induced soft errors in 7-nm bulk FinFET node*

Xu, Lyuan; Cao, Jingchen; Brockman, John; Cazzaniga, Carlo; Frost, Christopher; Wen, S-J; Fung, Rita; Bhuvu, Bharat L; 2020 IEEE International Reliability Physics Symposium (IRPS), 45047, 2020

27. *Thermal neutrons: a possible threat for supercomputers and safety critical applications*

Oliveira, Daniel; Blanchard, Sean; Debardeleben, Nathan; Dos Santos, Fernando F; Dávila, Gabriel Piscocya; Navaux, Philippe; Cazzaniga, Carlo; Frost, Christopher; Baumann, Robert C; Rech, Paolo; 2020 IEEE European Test Symposium (ETS), 45078, 2020

28. *High-energy versus thermal neutron contribution to processor and memory error rates*

Oliveira, Daniel; dos Santos, Fernando F; Dávila, Gabriel Piscocya; Cazzaniga, Carlo; Frost, Christopher; Baumann, Robert C; Rech, Paolo; IEEE Transactions on Nuclear Science, 67, 6, 1161-1168, 2020

29. *Neutron radiation shielding with sintered lunar regolith*

Meurisse, Alexandre; Cazzaniga, C; Frost, C; Barnes, Andrew; Makaya, A; Sperl, Matthias; Radiation Measurements, 132, 106247, 2020

30. *SEU characterization of commercial and custom-designed SRAMs based on 90 nm technology and below*

Coronetti, Andrea; Gilardi, Antonio; Martin-Holgado, Pedro; van Goethem, Marc-Jan; van der Graaf, Emil; Bazzano, Giulia; Morilla, Yolanda; Frost, Christopher; Jaatinen, Jukka; Kiewiet, Harry; IEEE Radiation Effects Data Workshop (in conjunction with 2020 NSREC), Santa Fe, NM, USA, 2020, pp. 1-8, doi: 10.1109/REDW51883.2020.9325822.

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31. *Study of the deposited energy spectra in silicon by high-energy neutron and mixed fields*
Cazzaniga, Carlo; Alía, Rubén García; Kastriotou, Maria; Cecchetto, Matteo; Fernandez-Martinez, Pablo; Frost, Christopher D; IEEE Transactions on Nuclear Science, 67, 1, 175-180, 2019
32. *Degradation measurement of Kinect sensor under fast neutron beamline*
Khanam, Zeba; Saha, Sangeet; Aslam, Bilal; Zhai, Xiaojun; Ehsan, Shoaib; Cazzaniga, Carlo; Frost, Christopher; Stolkin, Rustam; McDonald-Maier, Klaus; 2019 IEEE Radiation Effects Data Workshop, 45047, 2019
33. *SEE flux and spectral hardness calibration of neutron spallation and mixed-field facilities*
Cecchetto, Matteo; Fernández-Martínez, Pablo; Alía, Rubén García; Ferraro, Rudy; Danzeca, Salvatore; Wrobel, Frédéric; Cazzaniga, Carlo; Frost, Christopher D; IEEE Transactions on Nuclear Science, 66, 7, 1532-1540, 2019
34. *A heavy-ion detector based on 3-D NAND flash memories*
Bagatin, Marta; Gerardin, Simone; Paccagnella, Alessandro; Beltrami, Silvia; Costantino, Alessandra; Poivey, Christian; Santin, Giovanni; Ferlet-Cavrois, Véronique; Cazzaniga, Carlo; Frost, Chris; IEEE Transactions on Nuclear Science, 67, 1, 154-160, 2019
35. *Single Event Effects by atmospheric neutrons in commercial (COTS) normally-off GaN HEMT*
Wölk, Dorothea; Höffgen, Stefan K; Paschkowski, Eike; Steffens, Michael; Cazzaniga, Carlo; Frost, Christopher; 2019 19th European Conference on Radiation and Its Effects on Components and Systems (RADECS), 45017, 2019

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36. *A fast neutron monitor based on single event effects in SRAMs using commercial off-the-shelf components*
Obermueller, L; Cazzaniga, C; Kulmiya, S; Frost, CD; 2018 18th European Conference on Radiation and Its Effects on Components and Systems (RADECS), 45047, 2018
37. *Selective hardening for neural networks in FPGAs*
Libano, Fabiano; Wilson, Brittany; Anderson, J; Wirthlin, Michael J; Cazzaniga, Carlo; Frost, Christopher; Rech, Paolo; IEEE Transactions on Nuclear Science, 66, 1, 216-222, 2018
38. *Response of a telescope proton recoil spectrometer based on a YAP: Ce scintillator to 5–80 MeV protons for applications to measurements of the fast neutron spectrum at the ChiPr irradiation facility*
Feng, S; Cazzaniga, C; Minniti, T; Nocente, M; Frost, C; Gorini, G; Muraro, A; Romano, S; Tardocchi, M; Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 912, 36-38, 2018
39. *Atmospheric neutron soft errors in 3-D NAND flash memories*
Bagatin, M; Gerardin, S; Paccagnella, A; Beltrami, S; Cazzaniga, C; Frost, CD; IEEE Transactions on Nuclear Science, 66, 7, 1361-1367, 2018
40. *Progress of the scientific commissioning of a fast neutron beamline for chip irradiation*
Cazzaniga, Carlo; Frost, Christopher D; Journal of Physics: Conference Series, 1021, 12037, 2018
41. *Measurement of the neutron flux at spallation sources using multi-foil activation*
Chiesa, Davide; Nastasi, Massimiliano; Cazzaniga, Carlo; Rebai, Marica; Arcidiacono, Laura; Previtali, Ezio; Gorini, Giuseppe; Frost, Christopher D; Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 902, 14-24, 2018

42. *First tests of a new facility for device-level, board-level and system-level neutron irradiation of microelectronics*
Cazzaniga, Carlo; Bagatin, Marta; Gerardin, Simone; Costantino, Alessandra; Frost, Christopher D; IEEE Transactions on Emerging Topics in Computing, 9, 1, 104-108, 2018
43. *Atmospheric-like neutron attenuation during accelerated neutron testing with multiple printed circuit boards*
Cazzaniga, Carlo; Bhuvana, Bharat; Bagatin, Marta; Gerardin, Simone; Marchese, Nicolò; Frost, Christopher D; IEEE Transactions on Nuclear Science, 65, 8, 1830-1834, 2018
44. *Fast neutron irradiation tests of flash memories used in space environment at the ISIS spallation neutron source*
Andreani, C; Senesi, R; Paccagnella, A; Bagatin, M; Gerardin, S; Cazzaniga, C; Frost, CD; Picozza, P; Gorini, G; Mancini, R; AIP Advances, 8, 2, 2018
45. *Single Event Effect cross section calibration and application to quasi-monoenergetic and spallation facilities*
Alía, Rubén García; Bonaldo, Stefano; Brugger, Markus; Danzeca, Salvatore; Ferrari, Alfredo; Frost, Christopher; Infantino, Angelo; Iwamoto, Yosuke; Mekki, Julien; Theis, Cris; EPJ Nuclear Sciences & Technologies, 4, 1, 2018

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46. *Charge collection uniformity and irradiation effects of synthetic diamond detectors studied with a proton micro-beam*
Cazzaniga, C; Rebai, M; Lopez, J Garcia; Jimenez-Ramos, MC; Girolami, M; Trucchi, DM; Bellucci, A; Frost, CD; Garcia-Munoz, M; Nocente, M; Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms, 405, 45200, 2017
47. *Neutron radiation tolerance of two benchmark thiophene-based conjugated polymers: the importance of crystallinity for organic avionics*
Paternò, GM; Robbiano, V; Fraser, KJ; Frost, C; García Sakai, V; Cacialli, F; Scientific reports, 7, 1, 41013, 2017

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48. *Time-stability of a Single-crystal Diamond Detector for fast neutron beam diagnostic under alpha and neutron irradiation*
Rebai, M; Fazzi, Alberto; Cazzaniga, C; Croci, G; Tardocchi, M; Cippo, E Perelli; Frost, CD; Zaccagnino, D; Varoli, Vincenzo; Gorini, G; Diamond and Related Materials, 61, 45078, 2016
49. *Methodologies for the statistical analysis of memory response to radiation*
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50. *Characterization of the high-energy neutron beam of the PRISMA beamline using a diamond detector*
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51. *Muon-induced soft errors in 16-nm NAND flash memories*
Bagatin, M; Gerardin, S; Paccagnella, A; Visconti, A; Beltrami, S; Bertuccio, M; Ishida, K; Frost, CD; Hillier, A; Ferlet-Cavrois, V; 2016 IEEE International Reliability Physics Symposium (IRPS), 5C-1-1-5C-1-5, 2016

52. *Neutron-induced single event effect in mixed-signal flash-based FPGA*
Tambara, Lucas A; Lubaszewski, Marcelo S; Balen, Tiago R; Rech, Paolo; Kastensmidt, Fernanda L; Frost, Christopher; *FPGAs and Parallel Architectures for Aerospace Applications: Soft Errors and Fault-Tolerant Design*, 201-216, 2016

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53. *SEL hardness assurance in a mixed radiation field*
Alia, Ruben Garcia; Brugger, Markus; Danzeca, Salvatore; Ferlet-Cavrois, Veronique; Frost, Christopher; Gaillard, Rémi; Mekki, Julien; Saigné, Frédéric; Thornton, Adam; Uznanski, Slawosz; *IEEE Transactions on Nuclear Science*, 62, 6, 2555-2562, 2015
54. *A methodology for the analysis of memory response to radiation through bitmap superposition and slicing*
Bossler, A; Gupta, Viyas; Tsiligiannis, Georgios; Ferraro, Rudy; Frost, Christopher; Javanainen, A; Puchner, H; Rossi, M; Saigne, F; Virtanen, A; 2015 15th European Conference on Radiation and Its Effects on Components and Systems (RADECS), 45017, 2015
55. *Measuring failure probability of coarse and fine grain TMR schemes in SRAM-based FPGAs under neutron-induced effects*
Tambara, Lucas A; Almeida, Felipe; Rech, Paolo; Kastensmidt, Fernanda L; Bruni, Giovanni; Frost, Christopher; *Applied Reconfigurable Computing: 11th International Symposium, ARC 2015, Bochum, Germany, April 13-17, 2015, Proceedings 11*, 331-338, 2015
56. *A telescope proton recoil spectrometer for fast neutron beam-lines*
Cazzaniga, C; Rebai, M; Tardocchi, M; Croci, G; Nocente, M; Ansell, S; Frost, CD; Gorini, G; *Progress of Theoretical and Experimental Physics*, 2015, 7, 073H01, 2015
57. *The application of inelastic neutron scattering to investigate a hydrogen pre-treatment stage of an iron Fischer–Tropsch catalyst*
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58. *Measuring the impact of voltage scaling for soft errors in SRAM-based FPGAs from a designer perspective*
Tonfat, Jorge; Azambuja, José Rodrigo; Nazar, Gabriel; Rech, Paolo; Kastensmidt, Fernanda Lima; Carro, Luigi; Reis, Ricardo; Benfica, Juliano; Vargas, Fabian; Bezerra, Eduardo; 19th Annual International Mixed-Signals, Sensors, and Systems Test Workshop Proceedings, 45078, 2014
59. *Heavy-ion induced single event upsets in phase-change memories*
Gerardin, S; Bagatin, M; Paccagnella, A; Visconti, A; Bonanomi, M; Beltrami, S; Frost, C; Ferlet-Cavrois, V; 2014 IEEE International Reliability Physics Symposium, 2B. 3.1-2B. 3.6, 2014
60. *GPUs neutron sensitivity dependence on data type*
Rech, Paolo; Frost, Christopher; Carro, Luigi; *Journal of Electronic Testing*, 30, 307-316, 2014
61. *Dynamic test methods for COTS SRAMs*
Tsiligiannis, Georgios; Dilillo, Luigi; Gupta, Viyas; Bosio, Alberto; Girard, Patrick; Virazel, Arnaud; Puchner, Helmut; Bossler, Alexandre; Javanainen, Arto; Virtanen, Ari; *IEEE Transactions on Nuclear Science*, 61, 6, 3095-3102, 2014
62. *Decreasing FIT with diverse triple modular redundancy in SRAM-based FPGAs*

Tambara, Lucas A; Kastensmidt, Fernanda Lima; Rech, Paolo; Frost, Christopher; 2014 IEEE International Symposium on Defect and Fault Tolerance in VLSI and Nanotechnology Systems (DFT), 153-158, 2014

63. *Multiple cell upset classification in commercial SRAMs*
Tsiliogiannis, Georgios; Dilillo, Luigi; Bosio, Alberto; Girard, Patrick; Pravossoudovitch, Serge; Todri, Aida; Virazel, Arnaud; Puchner, Helmut; Frost, Christopher; Wrobel, Frédéric; IEEE Transactions on Nuclear Science, 61, 4, 1747-1754, 2014
64. *Measurements of gamma-ray background spectra at spallation neutron source beamlines*
Miceli, A; Festa, G; Senesi, R; Cippo, E Perelli; Giacomelli, L; Tardocchi, M; Scherillo, A; Schooneveld, E; Frost, C; Gorini, G; Journal of Analytical Atomic Spectrometry, 29, 10, 1897-1903, 2014
65. *Application of inelastic neutron scattering to investigate the "dry" reforming of methane over an alumina-supported nickel catalyst operating under conditions where filamentous carbon formation is prevalent*
Lennon, David; McFarlane, Andrew R; Silverwood, Ian P; Warringham, Robbie; Norris, Elizabeth L; Ormerod, R Mark; Frost, Christopher D; Parker, Stewart F; Abstracts of Papers of the American Chemical Society, 247, 2014
66. *Analysing the impact of aging and voltage scaling under neutron-induced soft error rate in SRAM-based FPGAs*
Kastensmidt, Fernanda Lima; Jorge, Tonfat; Both, Thiago; Rech, Paolo; Wirth, Gilson; da Luz Reis, Ricardo Augusto; Bruguier, Florent; Benoit, Pascal; Torres, Lionel; Frost, Christopher; ESREF: European Symposium on Reliability of Electron devices, Failure physics and analysis, 2014
67. *Software-based hardening strategies for neutron sensitive FFT algorithms on GPUs*
Pilla, Laercio L; Rech, Paolo; Silvestri, Francesco; Frost, Christopher; Navaux, Philippe Olivier Alexandre; Reorda, M Sonza; Carro, Luigi; IEEE Transactions on Nuclear Science, 61, 4, 1874-1880, 2014
68. *Neutron cross-section of N-modular redundancy technique in SRAM-based FPGAs*
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69. *GPUs reliability dependence on degree of parallelism*
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70. *Sensitivity of NOR flash memories to wide-energy spectrum neutrons during accelerated tests*
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71. *Neutron and alpha single event upsets in advanced NAND flash memories*
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72. *Aging and voltage scaling impacts under neutron-induced soft error rate in SRAM-based FPGAs*
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Kastensmidt, Fernanda Lima; Tonfat, Jorge; Both, T; Rech, Paolo; Wirth, Gilson; Reis, Ricardo; Bruguier, Florent; Benoit, Pascal; Torres, Lionel; Frost, Christopher; Microelectronics Reliability, 54, 45208, 2344-2348, 2014

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Nazar, Gabriel L; Rech, Paolo; Frost, Christopher; Carro, Luigi; IEEE Transactions on Nuclear Science, 60, 4, 2742-2749, 2013
77. *Novel n-type Mg₂B₁₄ on silicon diode: demonstration of a thermal solid state neutron detector*
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78. *Evaluating the effectiveness of a diversity TMR scheme under neutrons*
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79. *Neutron sensitivity of integer and floating point operations executed in GPUs*
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80. *An efficient and experimentally tuned software-based hardening strategy for matrix multiplication on GPUs*
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81. *Neutron sensitivity and hardening strategies for Fast Fourier Transform on GPUs*
Rech, P; Pilla, LL; Silvestri, Francesco; Frost, C; Navaux, POA; Reorda, M Sonza; Carro, L; 2013 14th European Conference on Radiation and Its Effects on Components and Systems (RADECS), 45047, 2013
82. *Temperature impact on the neutron SER of a commercial 90nm SRAM*
Tsiliogiannis, Georgios; Dilillo, Luigi; Bosio, Alberto; Girard, Patrick; Pravossoudovitch, Serge; Todri-Sanial, Aida; Virazel, Arnaud; Frost, Christopher; Wrobel, Frédéric; Saigné, Frédéric; NSREC: Nuclear and Space Radiation Effects Conference, 45017, 2013
83. *Pulsed neutron beam measurements with diamond detectors*
Giacomelli, L; Rebai, M; Fazzi, Alberto; Cippo, E Perelli; Tardocchi, M; Frost, CD; Pietropaolo, A; Rhodes, N; Schooneveld, E; Gorini, G; Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 720, 125-127, 2013
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113. A new hardware/software platform for the soft-error sensitivity evaluation of FPGA devices

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Media

Key Political Visits to ChipIr

114. Announcement by David Willetts, Minister for Universities and Science of £11 million funding for the ChipIr instrument and the start of the ISIS Second Target Station Phase 2 Project on 14 March 2011

<https://www.isis.stfc.ac.uk/Pages/Speech-by-David-Willetts,-Minister-for-Science,-at-ISIS.aspx>

115. The Deputy Prime Minister Nick Clegg visited ISIS today (Thursday 30 January 2014) where he saw the brand new 'ChipIr' facility; (Jan 2014)

<https://www.isis.stfc.ac.uk/Pages/Deputy-Prime-Minister-Nick-Clegg-visits-ISIS.aspx>

Public & Broadcast Media (Talks, Interviews, Podcast and Web)

116. Interview: BBC Radio 4 – Materials World (April 2012)

<https://www.bbc.co.uk/programmes/b01ghc4p>

Time - 24:08 Onwards

117. *Talk: STFC Talking Science Lecture: How alien invaders can change governments: The dangers of fast neutrons to advanced electronics (24 May 2012)*

118. *Interview: Naked Scientist Podcast (25 November 2012)*

Time – 36:19 Onwards

<https://www.thenakedscientists.com/podcasts/naked-scientists-podcast/investigating-isis-neutron-source>

119. *Talk: British Science Festival, Newcastle (11 Sept 2013) (available on request)*

120. *Featured In: BBC Radio 4 – In Our Time – the Neutron (April 2016)*

<https://www.bbc.co.uk/programmes/b076mnkr>

Time - 40:15 Onwards

121. *Talk: AAAS 2017 Meeting: Cloudy with a Chance of Solar Flares: Quantifying the Risk of Space Weather*

<https://aaas.confex.com/aaas/2017/webprogram/Session15276.html>

122. *Interview: BBC One Breakfast, BBC News 24, BBC Look East, BBC World Service (3-4 July 2021)*

<https://youtu.be/JZAhRido670> (pre-broad cast version sent to BBC by reporter)

123. *Interview: Morning Show -BBC Radio Oxford (17 July 2021) (available on request)*

124. *Interview (Web): Reuters - Can we stop solar flares derailing driverless cars? (28 October 2021)*

<https://www.reuters.com/video/watch/idOVF12VY3F>

125. *Interview (Web): How can we stop solar flares knocking out driverless cars, GPS systems and the internet itself? (3 November 2021)*

<https://www.euronews.com/video/2021/11/03/how-can-we-stop-solar-flares-knocking-out-driverless-cars-gps-systems-and-the-internet-its>

126. *Talk: RAL Lecture - When the Chips Are Down (27 April 2023) (available on request)*

127. *YouTube- STFC: ISIS Neutron and Muon source Impact Case Study, ChipIR instrument*

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128. *YouTube - STFC: 60 second science: ChipIR*

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Popular Science Print & Web Articles

129. *Newsweek: The Race to Protect Planes From Cosmic Rays (Jan 2014)*

<https://www.newsweek.com/2014/07/04/race-protect-planes-cosmic-rays-261570.html>

130. *Economist: How to predict and prepare for space weather (25 Feb 2017)*

<https://www.economist.com/science-and-technology/2017/02/25/how-to-predict-and-prepare-for-space-weather>

131. *BBC Futures Article: The computer errors from outer space (12th October 2022)*

<https://www.bbc.com/future/article/20221011-how-space-weather-causes-computer-errors>

132. *Physics World: Cosmic challenge: protecting supercomputers from an extraterrestrial threat (July 2021)*

<https://physicsworld.com/a/cosmic-challenge-protecting-supercomputers-from-an-extraterrestrial-threat/>

Reports

133. *Chiplr business case (phase 2); 2011*
<https://www.isis.stfc.ac.uk/Pages/chipir-briefing-document.pdf#search=Chipir%20briefing%20document>
134. *Lloyds and RAL Space: 360 Risk Insight report; Nov 2010*
<https://www.lloyds.com/news-and-risk-insight/risk-reports/library/natural-environment/space-weather>
135. *Royal Academy of Engineering: Extreme space weather: impacts on engineered systems and infrastructure; Feb 2013*
http://www.raeng.org.uk/news/publications/list/reports/Space_Weather_Full_Report_Final.PDF
136. *The UK's research and innovation infrastructure: opportunities to grow our capability (Chipir is a case study in this report, p145)*
<https://www.ukri.org/wp-content/uploads/2020/10/UKRI-201020-UKInfrastructure-opportunities-to-grow-our-capacity-FINAL.pdf>
137. *Irradiation Facilities - Opportunities on ISIS – II (available on request)*
- ISIS Web Articles on Chipir and NILE**
138. *First neutrons for the MIGDAL experiment at ISIS 24 Aug 2023*
<https://www.isis.stfc.ac.uk/Pages/First-neutrons-for-dark-matter-experiment-at-ISIS.aspx>
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140. *From mentoring to radiation testing - 30 Mar 2023*
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141. *100 publications for Chipir - 14 Mar 2023*
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142. *Triple celebrations for Chipir collaborators - 27 Sep 2022*
https://www.isis.stfc.ac.uk/Pages/News22_ChipirCelebrations.aspx
143. *NVIDIA uses Chipir to reduce errors in GPU systems - 01 Jul 2022*
<https://www.isis.stfc.ac.uk/Pages/NVIDIAsusesChipIrtoreduceerrorsinGPUsystems.aspx>
144. *Testing the resilience of electronics for the Internet of Things - 03 Mar 2022*
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145. *Transcontinental testing of electronic chips - 26 Jan 2022*
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146. *First neutrons for ISIS' second desktop neutron source - 06 Dec 2021*
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148. *Preparing robots to survive longer in extreme radiation environments – 2021*
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149. *New compact neutron sources at ISIS: from driverless cars to dark matter* - 21 Jul 2021
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150. *The 2020 ISIS Impact Award: Society* - 03 Aug 2020
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<https://www.isis.stfc.ac.uk/Pages/Cobham-use-ChiPlr-to-bring-product-to-market.aspx>
154. *Tales of the unexpected - making driverless cars safer from space invaders!* - 18 Oct 2018
<https://www.isis.stfc.ac.uk/Pages/Driving-into-the-future.aspx>
155. *Testing the robustness of space electronics against more than 100,000 years' worth of neutrons* - 26 Mar 2018
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