Paper #	ORAL PRESENTATIONS
A-1	**Effects of Layer-to-Layer Coupling on the Total-Ionizing Dose Response of 3D-Sequentially Integrated FDSOI MOSFETs** S. Toguchi[1], E. Zhang[2], M. Rony[3], X. Luo[2], D. Fleetwood[2], R. Schrimpf[2], M. Alles[2], S. Moreau[4], S. Cheramy[4], P. Batude[4], L. Brunet[4], F. Andrieu[4] [1]Vanderbuilt University, USA [2]Vanderbilt University, USA [3]Vnaderbilt University, USA [4]CEA-LETI, France *3D-sequentially integrated transistors show strong layer-to-layer coupling of total-ionizing-dose re- sponses due to radiation-induced trapped charges in the intermediate dielectric region between upper and lower device layers.*
A-2	**TID Degradation and Low Frequency Noise in 16 nm Bulk FinFETs Irradiated to Ultra-High Doses** S. Bonaldo[1], T. Ma[1], S. Mattiazzo[2], A. Baschirotto[3], C. Enz[4], D. Fleetwood[5], A. Paccagnella[1], S. Gerardin[1] [1]University of Padova, Italy [2]University of Bergamo, Italy [3]University of Milano, Italy [4]EPFL, Switzerland [5]Vanderbilt University, USA *DC and low frequency noise measurements on 16 nm Si bulk FinFETs irradiated to 1 Grad(SiO2) show charge buildup in STI. The TID sensitivity depends on channel length, and fin and finger number.*
A-3	**Proton Irradiation Effects on Spin Orbit-Torque and Spin Transfer-Torque Magnetic Tunnel Junctions** O. Coi[1], G. Di pendina[2], O. Garello[2], D. Dangla[3], R. Ecoffet[3], L. Torres[4] [1]CEA-CNES-CNRS, France [2]CEA, France [3]CNES, France [4]University of Montpellier, LIRMM, CNRS, France *This paper aims to investigate proton irradiation effects on a new class of emerging devices: Perpendicular- Magnetic Anysotropy (PMA) Spin Orbit (SOT) Torque Magnetic Tunnel Junctions (MTJ).*

Paper #	POSTERS

PA-1	**Plasma effects in silicon detectors and the Two Photon Absorption Transient Current Technique** F. Palomo_pinto[1], M. Moll[2], M. Fernández garcía[3], R. Montero santos[4], I. Vila Álvarez[3] [1]Universidad de Sevilla, Spain [2]CERN, Switzerland [3]Instituto de Física de Cantabria, Spain [4]SGIker Laser Facility, Spain *We analyze plasma effects due to the use of Two Photon Absorption-Transient Current Technique in silicon particle detectors. The Tobe-Seibt model gives a good agreement with the experimental observations.*
PA-2	**Ion Irradiation Effects on Films and Temperature Sensors for Nuclear Facilities** M. Mitkova[1], A. Simon[1], Y. Sakaguchi[2] [1]Boise State University, USA [2]CROSS, Japan *Employing GexSe100-x glasses to monitor temperature using the phase change effect is reported. Materials selection, device structure and a prototype of temperature sensor performance are analysed. Heavy ion irradiation by Xe ions has been studied.*
PA-3	**Simplified Calculations of Radiation Dose-Rate Sensitivity of Bipolar Transistors** H. Hjalmarson[1], S. Witczak[2], R. Samuel[3], H. Barnaby[3], T. Buchheit[4], R. Van ginhoven[5] [1]Sandia Natl Labs, USA [2]Northrup Grumman Corporation, USA [3]Arizona State University, USA [4]Sandia National Laboratories, USA [5]Air Force Research Laboratory, USA *A simplified approach to estimating radiation-induced Si-SiO2 interface trap densities, based on steady-state populations of relevant mobile species, is presented. Calculations are consistent with known trends in dose, dose rate, hydrogen content and temperature.*

Paper #	ORAL PRESENTATIONS
B-1	**Hours-long Transient Leakage Current in MOS Structures after Ultra-High Total-Ionizing-Doses** H. Dewitte[1], P. Paillet[2], S. Rizzolo[3], C. Marcandella[2], V. Goiffon[1] [1]ISAE-SUPAERO, France [2]CEA, France [3]Airbus Defense and Space S.A.S, France *The abstract investigates the apparition after irradiation and the fast ambient temperature annealing of a leakage current in p-MOS structures. In particular, it discusses the origin of the current, the effect of the bias, and the dose rate.*
B-2	**Enhancement of Sample-to-Sample Variability Induced by Total Ionizing Dose in 16 nm Bulk nFinFETs** T. Ma[1], S. Bonaldo[1], S. Mattiazzo[2], A. Baschilotto[3], C. Enz[4], A. Paccagnella[5], S. Gerardin[6] [1]University of Padova, Italy [2]INFN and University of Bergamo, Italy [3]INFN and University of Milano Bicocca, Israel [4]Institute of Microengineering, EPFL, Switzerland [5]INFN and University of Padova, Italy [6]DEI - Padova University, Italy *TID-induced sample-to-sample variability is investigated in 16 nm bulk nFinFETs. The sample-to-sample variability increases significantly at ultra-high doses, due to the impact of random dopant fluctuations.*

Paper #	POSTERS
PB-1	**X-Ray Impact on Advanced High Voltage BCD Technology Platform** M. Basso[1], A. Danesi[1], S. Bertaiola[1], A. Veggetti[1], A. Andreini[1], P. Galbiati[1] [1]STMicroelectronics, Italy *xray effects on BCD platform are studied.Strong dependence of the BVdss vs.radiation dose is found.The impact is correlated with the doping:a typical behavior of ReSurF devices and is equivalent to additional charge inside the drain.*
PB-2	**Characterization of the Effects of Neutron-Induced Displacement Damage on the SiGe:C Heterojunction Bipolar Transistors** D. Sotskov[1], A. Kuznetsov[1], V. Elesin[1], I. Selishchev[1], V. Kotov[1], A. Nikiforov[1] [1]National Research Nuclear University MEPhI (Moscow Engineering Physics Institute), Russian Federation

	This paper explores effects of neutron-induced displacement damage on static and high frequency parameters of three types SiGe:C npn-heterostructure bipolar transistors from the SGB25V BiCMOS technology.

Paper #	ORAL PRESENTATIONS
C-1	**Highly Pulsed Electron Beam induced SEU Effects in a SRAM memory** V. Wyrwoll[1], K. Roed[1], R. Garciaalia[2], B. Delfs[3], A. Coronetti[4], W. Farabolini[2], A. Gilardi[2], R. Corsini[2] [1]University of Oslo, Norway [2]European Organization for Nuclear Research (CERN), Switzerland [3]University Clinic for Medical Radiation PhysicsMedical Campus Pius Hospital, Carl von Ossietzky University, Germany [4]CERN, Switzerland *Single Event Effects (SEEs) induced by high energy pulsed electrons in a ESA SEU monitor are discussed. Measurements with high energy electrons have been performed at VESPER (CERN) focusing on instantaneous fluxes and dose rates.*
C-2	**SE Performance of D-FF Designs with Different VT Options at Near-Threshold Supply Voltages in a 7-nm Bulk FinFET Technology** A. Feeley[1], Y. Xiong[1], N. Pieper[1], D. Ball[1], B. Bhuva[1] [1]Vanderbilt University, USA *SE rates for a 7-nm bulk FinFET node are investigated at NTV supply voltage for different VT options. Results show minimal differences at close-to-nominal voltages, and that LVT had lowest SEU cross- section at NTV*
C-3	**Heavy-Ion Induced Latent Damage in SiC Power MOSFETs** C. Martinella[1], P. Natzke[2], R. Garciaalia[3], Y. Kadi[3], U. Grossner[2], A. Javanainen[4] [1]University of Jyväskylä, CERN, APS - ETH Zurich, Finland [2]APS - ETH Zurich, Switzerland [3]CERN, Switzerland [4]University of Jyväskylä, Finland *Heavy-ions induce latent damage in SiC power MOSFETs, involving the gate oxide and the SiC crystal lattice. The failure site was investigated using plasma SEM-FIB analysis. An overview of the heavy-ion SEEs is given.*

Paper #	POSTERS
PC-1	**A Neural Network Approach for Single-Event Latchup Prediction Based on TCAD Simulations in CMOS Technology** D. Truyen[1], E. Leduc[2], L. Montagner[2], M. Briet[2], A. Collange[3] [1]MICROCHIP, France [2]Microchip technology, France

	[3]Microchip Technology, France *This work presents a new approach of a predictive SEL modeling by neural networks, covering the CMOS technology nodes from 500nm up to 22nm. The SEL Model is validated by experimental results.*
PC-2	**Heavy-Ion-Induced Avalanche Multiplication in Low-Voltage Power VDMOSFET** S. Alberton[1], N. Medina[1], N. Added[1], V. Aguiar[1], M. Guazzelli[2], R. Baginski[2] [1]Universidade de Sao Paulo, Instituto de Fisica, Brazil [2]Centro Universitário FEI, Brazil *The Lackners' theory for avalanche multiplication provides physical interpretation for the model parameters, although obtaining them through experimental methods is necessary. Comparing computational simulations and experimental measurements, the Lackners' impact ionization coefficients were estimated.*
PC-3	**Heavy-ion Induced Gate Oxide Rupture in SiC MOSFETs** X. Zhou[1], Y. Jia[1], D. Hu[1], Y. Wu[1], Y. Zhao[1] [1]Beijing University of Technology, China *This paper presents the experimental characterization of SiC MOSFETs exposed to the heavy-ion irradiation. Different leakage paths related to the drain bias used during the tests are observed, suggesting different damage sites in the devices, which can be further verified through the post-irradiation measurements. TCAD simulations are utilized to explore the failure mechanisms. It is shown that the gate oxide rupture firstly occurs in the middle of the JFET region, while gradually spreads to the channel region with the increase of biased drain voltage, and terminates at the source region eventually. The findings in this paper demonstrate that more attentions should be paid on the heavy-ion induced gate oxide damage before SiC MOSFETs could act as a drop-in replacement of Si-based counterparts in avionic applications.*
PC-4	**Micro-Latchup Location and Temperature Characterization in a 7-nm Bulk FinFET Technology** N. Pieper[1], Y. Xiong[1], A. Feeley[1], G. Walker[1], B. Bhuva[1], R. Fung[2], S. Wen[2] [1]Vanderbilt University, USA [2]cisco, USA *Location and temperature characteristics of micro-latchups at the 7-nm bulk FinFET technology is investigated. Thermal images show that micro-latchup locations are spatially clustered and are removed serially when supply voltage is reduced.*

Paper #	ORAL PRESENTATIONS
D-1	**Impact of the Data Retention Threshold Voltage on the Cell-to-Cell SEU Sensitivity of COTS SRAMs** M. Rezaei[1], A. Arinero panduro[2], F. Franco[2], J. Fabero[3], H. Mecha[4], M. Letiche[5], H. Puchner[6], J. Clemente[7] [1]Universidad Complutense de Madrid / Departamento de Arquitectura de Computadores y Automática / Facultad de Informática, Spain [2]Universidad Complutense de Madrid, Spain [3]Complutense University of Madrid, Spain [4]UCM, Spain [5]Institut Laue Langevin, France [6]Infineon Technologies, USA [7]Universidad Complutense Madrid, Spain *An experimental study on the cell-to-cell sensitivity of 65-nm, 90-nm and 130-nm volatile bulk COTS SRAMs to thermal neutron irradiation is presented. Results show a dependency between VDR and the number of bitflips after irradiation.*
D-2	**Assessment of Machine Learning Models in Computing System under Neutron Radiation** M. Trindade[1], J. Brum[1], L. Maldaner[1], R. Garibotti[2], L. Ost[3], R. Possamai bastos[1] [1]Laboratoire TIMA, France [2]School of Technology, Pontifical Catholic University of Rio Grande do Sul, Brazil [3]Loughborough University, United Kingdom *This paper compares the effectiveness of three machine learning models running on a low-processor processor under neutron radiation. Results suggest that our implementations retain a certain level of effectiveness even without mitigation techniques.*
D-3	**Neutron-induced Faults on CNN for Aerial Image Classification on SRAM-based FPGA Using Softcore GPU and HLS** F. Benevenuti[1], M. Gonçalves[1], E. Pereira jr[2], R. Galhardo vaz[2], O. Gonçalez[2], J. Azambuja[1], F. Lima kastensmidt[1] [1]Universidade Federal do Rio Grande do Sul, Brazil [2]Departamento de Ciência e Tecnologia Aeroespacial, Brazil *This work evaluates neutron-induced SEUs in image classification all-convolutional neural networks implemented on SRAM-based FPGA: one running in softcore GPU and one in HLS design. Reliability, area, execution time and power are discussed.*

Paper #	POSTERS

PD-1	**Single-Event Transient (SET) sensitivity into the Clock Networks of FPGAs** N. Guibbaud[1], F. Miller[1], T. Colladant[2] [1]NUCLETUDES, France [2]DGA, France *In this paper we propose to measure Single-Event Transient (SET) cross section on the clock tree resources of FPGA towards radiations.*
PD-2	**Characterization of the Total Charge for SET Voltage Pulses in a Commercial 65 nm CMOS Technology** Z. Li[1], L. Berti[2], B. Vignon[2], P. Leroux[3] [1]IMEC/ KU LEUVEN, Belgium [2]IMEC, Belgium [3]Leuven University, Belgium *This paper SET charge measurement circuits and results for a commercial 65 nm CMOS technology. The chip has been tested under the heavy-ion beam with an effective LET from 20.4 to 88.35 MeVcm2/mg.*
PD-3	**Assessment of Attitude Estimation Processing System under Neutron Radiation Effects** T. Kraemer sarzi sartori[1], H. Fourati[2], M. Garay trindade[3], R. Possamai bastos[3] [1]UGA/TIMA/GIPSA-Lab, France [2]UGA/GIPSA-Lab, France [3]UGA/TIMA, France *This paper assesses the effectiveness of an Attitude Estimation (AE) processing system in tolerating neutron radiation-induced soft errors. Radiation tests have been conducted on an advanced AE algorithm running on a processing system neutron radiation.*
PD-4	**Reliability evaluation of low-power GPU-accelerated System-on-Chip under proton radiation** J. Badia[1], G. Leon[1], J. Belloch[2], A. Lindoso[2], M. Garcia-valderas[2], L. Entrena[2] [1]Universitat Jaume I de Castellón, Spain [2]Universidad Carlos III de Madrid, Spain *In this paper we evaluate the influence of the parallelization strategy on the proton radiation reliability of LU decomposition on a GPU-accelerated System-on-Chip. More intensive utilization of GPU resources produce larger cross-sections.*
PD-5	**Experimental Test Approach for SEFI Categorization in Microprocessors** S. Houssany[1], N. Guibbaud[1], F. Miller[1], T. Cheviron[1], T. Colladant[2] [1]Nuclétudes, France

	[2]DGA, France *An experimental test approach to sort the different kinds of SEF) in microprocessors is presented. It relies on the configuration and use of the interrupt handler combined with an external watchdog.*
PD-6	**Investigation and Simulation of SEL Cross Sections at Different Temperatures** E. Mrozovskaya[1], P. Chubunov[1], S. Iakovlev[2], G. Zebrev[1] [1]National Research Nuclear University MEPhI, Russian Federation [2]JSC Institute of Space Device Engineering, Russian Federation *The Single Event Latchup cross sections as functions of LET in different CMOS circuits were experimentally investigated at different temperatures. A simplified simulation method for the SEL cross section temperature dependence is proposed and validated.*

Paper #	ORAL PRESENTATIONS
E-1	**Temperature Dependence of Radiation Induced Attenuation of Aluminosilicate Optical Fiber** C. Campanella[1], A. Morana[2], A. Guttilla[3], F. Mady[3], M. Benabdesselam[3], E. Marin[1], A. Boukenter[1], Y. Ouerdane[1], S. Girard[4] [1]Laboratoire Hubert Curien, France [2]Laboratory Hubert Curien, France [3]Université Côte d'Azur, Institut de Physique de Nice (INPHYNI), CNRS UMR 7010, France [4]Université de Saint Etienne, France *We investigated in situ the temperature influence on the Radiation-Induced Attenuation (RIA) of an Al-doped single-mode optical fiber in the Visible and Near-InfraRed spectral regions (400 nm – 2 µm, room temperature to 300°C).*
E-2	**Optimization of the Radiation Response of Backup Optical Fiber Amplifiers for Space Missions** M. Aubry[1], A. Morana[2], A. Laurent[3], L. Mescia[4], J. Mekki[5], N. Balcon[5], T. Robin[3], E. Marin[6], Y. Ouerdane[6], A. Boukenter[6], S. Girard[7] [1]CNES / iXblue / Laboratoire Hubert Curien / Politecnico di Bari, France [2]Laboratory Hubert Curien, France [3]iXblue Photonics, France [4]Politecnico di Bari, Italy [5]CNES, France [6]Laboratoire Hubert Curien, France [7]Université de Saint Etienne, France *We investigated how the photobleaching phenomenon could help in reducing the radiation impact on the performances of backup Erbium Doped Fiber Amplifiers (EDFAs) and Erbium-Ytterbium Doped Fiber Amplifiers (EYDFA) .*
E-3	**Impact of proton radiation on dark current of InAs/GaSb type-2 superlattice longwave infrared photodetector** R. Alchaar[1], C. Bataillon[1], J. Perez[1], O. Gilard[1], P. Christol[1] [1]Université de Montpellier, France *Electrical characterizations of T2SL IR photodetectors under 60 MeV proton fluence up to 8x1011 cm-2 were performed. Dark current increases with increasing the DDD independently of the cut-off wavelength and the number of T2SL periods.*
E-4	**Dark Current Random Telegraph Signal in visible and SWIR Direct Cu-Cu bonding InGaAs Image Sensor** V. Lalucaa[1], L. Calvinhac[1], C. Virmontois[1] [1]CNES, France

	Irradiation effects are studied on commercial InGaAs image sensors with hybrid direct Cu-Cu bonding. Performances, dark current and random telegraph signal are measured after 62MeV proton tests with different doses; and compared to existing models.
E-5	**Probing Dark-Current Random-Telegraph-Signal in a Small Pitch Vertically Pinned Photodiodes CMOS Image Sensor after Proton Irradiation** A. Antonsanti[1], C. Virmontois[2], J. Lauenstein[3], A. Le roch[1], V. Goiffon[1] [1]ISAE-SUPAERO, France [2]CNES, France [3]NASA GSFC, USA *Dark-Current Random Telegraph signal is studied after proton irradiation in new scale silicon micro-volumes using a commercial CMOS Image Sensor. Sate-of-the-art empirical trends and new scale effects are discussed.*

Paper #	POSTERS
PE-1	**Ionizing radiation effects in Silicon Photonics Modulators** M. Lalovic[1], C. Scarcella[1], A. Bulling[1], M. Court[1], S. Detraz[1], L. Marcon[1], L. Olantera[1], T. Prousalidi[1], U. Sandven[1], C. Sigaud[1], C. Soos[1], J. Troska[1] [1]CERN, Switzerland *Two popular types of Silicon Photonics modulators have been exposed to ionizing radiation up to 4 MGy. Ring Modulators are shown to be the most tolerant, showing no degradation in performance up to these levels.*
PE-2	**In-Situ Optical Characterization of Bulk Optical Glasses Under Proton Exposures** T. Allanche[1], A. Morana[1], P. Paillet[2], O. Duhamel[2], D. Lambert[2], C. Hoehr[3], C. Bélanger-champagne[3], M. Trinczek[3], C. Muller[1], Y. Ouerdane[1], A. Boukenter[1], S. Girard[4] [1]Laboratory Hubert Curien, France [2]CEA, France [3]TRIUMF, Canada [4]Université de Saint Etienne, France *We performed at TRIUMF in-situ radiation induced attenuation measurements caused by protons in bulk optical glasses and compared them with gamma-rays effect. We used GEANT4 calculations to compute the right deposited for each glass.*

Paper #	ORAL PRESENTATIONS
F-1	**A Soft-Error Hardened by Design Microprocessor Implemented on Bulk 12-nm FinFET CMOS** L. Clark[1], A. Duvnjak[2], M. Cannon[3], J. Brunhaver[2], S. Agarwal[3], J. Manuel[3], M. Marinella[3] [1]ASU, USA [2]Arizona State University, USA [3]Sandia National Laboratories, USA *A radiation hardened microprocessor design implemented on a 12-nm bulk finFET CMOS process is presented. The processor uses a combination of circuit redundancy and micro-architecture for hardening.*
F-2	**Analyzing Scaled Reduced Precision Redundancy for Error Mitigation under Proton Irradiation** L. Garcia-astudillo[1], A. Lindoso[2], L. Entrena[3], H. Martin[1], M. Garcia-valderas[1] [1]Universidad Carlos III de Madrid, Spain [2]University Carlos III Madrid, Spain [3]Universidad Carlos III, Spain *We propose a Scaled RPR approach for multi-stage circuits and analyze mitigation tradeoffs. FFT designs were tested with low-energy protons and fault injection. This approach achieves error mitigation with good precision, while reducing the overhead.*
F-3	**SEU Mitigation on SRAM-based FPGAs through Domains-based Isolation Design Flow** A. Portaluri[1], C. De sio[1], S. Azimi[1], L. Sterpone[1] [1]Politecnico di Torino, Italy *We developed a domain based isolation design flow for the mitigation of SEU effects on SRAM-based FPGAs. Fault injection experimental analysis on TMR circuits mapped on APSoC demonstrates an improvement of 44% versus traditional mitigation techniques.*
F-4	**Dual-Core Hybrid Multi-Threaded Lock-Step for Soft Error Mitigation** M. Peña fernández[1], A. Serrano-cases[2], A. Lindoso[3], S. Cuenca-asensi[2], L. Entrena[4], A. Martinez_alvarez[2] [1]Arquimea Ingeniería SLU, Spain [2]University of Alicante, Spain [3]University Carlos III Madrid, Spain [4]Universidad Carlos III, Spain *A new hybrid soft error mitigation technique for multi-core processors, validated with low energy proton irradiation, based on multi-threaded lockstep and a custom hardware interfacing the trace port, is presented.*

Paper #	POSTERS
PF-1	**Model-based Design Code Generator Effectson Codes Reliability** L. Tansini[1], P. Rech[2] [1]UFRGS, Brazil [2]UFRGS, Italy *We evaluate the impact of safety-critical Model-Based Design (MBD) code generation tools in programs reliabil-ity. We compare Manual, Simulink, and Scade implementations.In general MBD tools reduce the SDC rate but increase the DUE rate.*
PF-2	**Fail-Reason Capturing hardware module for a RISC-V based System on a Chip** S. Thomet[1], S. De-paoli[1], F. Ghaffari[2], J. Daveau[1], V. Bertin[1], F. Abouzeid[1], O. Romain[2], P. Roche[1] [1]STMicroelectronics, France [2]ETIS Lab - ENSEA, France *This paper presents a Fail-Reason Capturing Intellectual Property. Integrated in a System-on-a-chip, it provides diagnostic information about the origin of failures thanks to the combination of trace events buffering and error detection with triggering mechanisms.*
PF-3	**Machine learning as an alternative to thresholding for space radiation fault detection** A. Dorise[1], C. Alonso[1], A. Subias[1], L. Travé-massuyès[1], L. Baczkowski[2], F. Vacher[2] [1]LAAS-CNRS, France [2]CNES, France *This paper describes a new method to detect high current event caused by space radiation. Results of machine learning algorithms used on data sets created for this particular study are discussed.*

Paper #	ORAL PRESENTATIONS
G-1	**Analysis of TID testing of a statistically large quantity of parts** J. Voegtli[1], R. Sharp[1], L. Oswald[2], N. Hong[2], B. Archer[2] [1]Radtest Ltd, United Kingdom [2]University of Oxford, United Kingdom *1,000 LM239N quad comparators (two manufacturers, ten date codes) have undergone TID testing to improve the definition of the optimum sample size for such a test. This paper presents a statistical analysis of the results.*
G-2	**FPGA Benchmarking structures dedicated to TID parametric degradation evaluation** G. Bricas[1], G. Tsiligiannis[1], A. Touboul[1], J. Boch[2], T. Maraine[1], F. Saigné[1] [1]University of Montpellier, France [2]Universtity of Montpellier, France *This paper presents a simple, cost-effective and efficient methodology to evaluate and compare parametric degradation of FPGA performance induced by TID. X-ray radiation test results on three FPGA families are presented, compared and discussed.*
G-3	**Time-of-flight SEU Cross-section Measurements for 1-800 MeV neutrons and the Soft-error Rates at 18 MeV Proton Cyclotron-driven Neutron Source** H. Iwashita[1], Y. Hiroshima[1], Y. Okugawa[1], R. Kiuchi[2], H. Sato[2], T. Kamiyama[2], F. Michihiro[2], Y. Kiyanagi[3] [1]NIPPON TELEGRAPH AND TELEPHONE CORPORATION, Japan [2]Hokkaido University, Japan [3]Nagoya University, Japan *We measured the energy-dependent neutron-induced SEU cross-section for 1-800 MeV by the time-of-flight technique. Furthermore, we calculated the soft-error rates at a neutron field from an 18 MeV proton cyclotron-driven neutron source using this cross-section.*
G-4	**Impact of experimental conditions for the occurrence of stuck bits in commercial SDRAM** J. Guillermin[1], B. Vandevelde[1], N. Chatry[1], M. Poizat[2] [1]TRAD, France [2]ESA, Netherlands *Different commercial SDRAM were irradiated under protons in order to assess their sensitivity to stuck bits and determine the experimental conditions which are favorable to their occurrence.*

G-5	**Processor SER Estimation with ACE Bit Analysis** T. Hsu[1], D. Yang[1], W. Liao[2], M. Itoh[3], M. Hashimoto[4], J. Liou[1] [1]National Tsing Hua University, Taiwan [2]Kochi University of Technology, Japan [3]Tohoku University, Japan [4]Kyoto University, Japan *We proposed to estimate the SER by considering architecturally correct execution (ACE) bits of memory elements in a processor. In an irradiation experiment, the estimated SER has a good consistency with measured SER.*
G-6	**High-energy hadron testing and in-orbit single-event latchup predictions and boundaries** A. Coronetti[1], R. Garciaalia[1], A. Javanainen[2], F. Saigné[3] [1]CERN, Switzerland [2]University of Jyväskylä, Finland [3]University of Montpellier, France *Boundaries for the application of a volume equivalent LET approach to predict the SEL in-orbit rate based on the SEL cross-section retrieved from high-energy hadron testing are discussed along with upper bounds for zero events.*

Paper #	POSTERS
PG-1	**Lot-to-lot variability TID effects on COTS BJT** F. Krimmel[1], T. Borel[2], A. Costantino[1], M. Muschitiello[1], F. Tonicello[1], A. Pesce[1] [1]ESA, Netherlands [2]ESA - ESTEC, Netherlands *This work presents measurements and lot-to-lot variability analysis of the TID degradation of the gain on three COTS BJT part types (BC817, BC847 BC857)*
PG-2	**Testing and Validation Methodology for a Radiation Monitoring Systems for Electronics in Particle Accelerators** A. Zimmaro[1], R. Ferraro[2], J. Boch[3], S. Frederic[3], R. Garciaalia[4], A. Masi[4], S. Danzeca[4] [1]CERN, University of Montpellier, France [2]CERN, France [3]Univ Montpellier, France [4]CERN, Switzerland *In this work, a methodology for the design and validation of a novel wireless battery powered radiation tolerant monitoring system in particle accelerators is presented.*

PG-3	**Proton Cross-Sections from Heavy-Ion Data: A Review of the Models** D. Hansen[1], D. Czajkowski[1], B. Vermeire[1] [1]Space Micro, USA *This paper reports on the calculation of proton SEU cross-sections using heavy-ion data using a numb. Calculations are checked using data on proton and heavy-ion cross-sections from the published literature.*
PG-4	**PTA based availability analysis of the effects of blind scrubbing of UAV-UAV communication using SRAM based FPGAs** M. Abdelhamid[1], A. Attallah[1], M. Ammar[1], O. Ait mohamed[2] [1]Concordia University, Canada [2]Concordia, Canada *This paper computes the worst-case failure for serial UAV communication components using SRAM FPGAs. Furthermore, our framework implements priced timed automata models to execute the blind scrubbing technique and analyze UAV-UAV communication availability at different scrubbing intervals and durations.*
PG-5	**Methodical Approach for SEL Tolerance Confirmation of CMOS ICs at Low Temperatures** M. Novikova[1], A. Novikov[1], A. Pechenkin[1], V. Lukashin[1], E. Oblova[1], A. Gritsaenko[1], D. Protasov[1], A. Tararaksin[1] [1]Specialized Electronic Systems, Russian Federation *An approach for SEL sensitivity estimation using heavy ions at room temperature and laser facilities at both room and subzero temperatures is proposed. The results of comparison approach approbation are also presented.*

Paper #	ORAL PRESENTATIONS
H-1	**Radiation Field Study in ATLAS: Timepix measurements vs Geant4 simulations** T. Billoud[1], B. Bergmann[1], C. Leroy[2], S. Menke[3], S. Pospíšil[1] [1]Institute of Experimental and Applied Physics, Czech Republic [2]Université de Montréal, Canada [3]Max Planck Institute for Physics, Germany *New methods to characterize radiation in the ATLAS experiment have been developed using Timepix detectors. Measurements of total ionizing dose and charged particle fluences at different locations in the experiment are used to benchmark Geant4 simulations.*
H-2	**A Framework for Global Trapped Particle Radiation Modelling** C. Papadimitriou[1], I. Sandberg[1], S. Aminalragia-giamini[1], H. Evans[2], P. Jiggens[2] [1]SPARC, Greece [2]ESA, Netherlands *We present a unified framework, to consolidate both data and methodologies, perform comparisons under the same constraints, and produce trapped particle radiation models that can be tailored to any future user's use-case scenarios.*
H-3	**Infer electron space environment along EOR mission profile from LEO measurements: application to EUTELSAT 7C** D. Lazaro[1], A. Sicard[1], P. Caron[1], D. Falguère[1], R. Ecoffet[2], D. Standarovski[2], N. Balcon[2], J. Mekki[2], V. Thakur[3], P. Timmerman[3], R. Hernandez[3], G. Schneider[3], C. Keys[4], M. Baylocq[4] [1]ONERA, France [2]CNES, France [3]EUTELSAT, France [4]MAXAR, USA *Using correlation between LEO and equatorial electron measurements, a methodology is presented and validated, with the ICARE-NG detector measurements on board EUTELSAT 7C to infer flux encountered by the spacecraft during its EOR phase.*
H-4	**In-flight Measurements of Radiation Environment Observed by Eutelsat 7C (Electric Orbit Raising Satellite)** P. Caron[1], S. Bourdarie[1], D. Falguere[1], D. Lazaro[1], P. Bourdoux[2], N. Balcon[3], D. Standarovski[3], J. Mekki[3], R. Ecoffet[3], V. Thakur[4], P. Timmerman[4], R. Hernandez perez[4], G. Schneider[4], M. Baylocq[5], C. Keys[5] [1]ONERA, France [2]EREMS, France [3]CNES, France [4]EUTELSAT, France [5]MAXAR, USA

	Measurements of particle fluxes (protons and electrons) obtained with the ICARE_NG monitor on the Eutelsat 7C orbit (Electric Orbit Raising to geostationary orbit) are presented.
H-5	**Development of a Miniaturized Reference Dosimeter Payload for SmallSat Applications** C. Tscherne[1], M. Wind[1], L. Huber[1], M. Latocha[1], I. Slipukhin[2], S. Uznanski[2], R. Garciaalia[2], A. Hörmer[3], R. Zeif[3], O. Koudelka[3], H. Fragner[4], A. Dielacher[4], C. Pirat[5], F. Perez-lissi[5], G. Santin[5], P. Beck[1] [1]Seibersdorf Laboratories, Austria [2]CERN, Switzerland [3]Graz University of Technology, Institute of Communication Networks and Satellite Communications, Austria [4]RUAG Space GmbH, Austria [5]ESA, Netherlands *We present the TID Reference Dosimeter and SEU Assessment System, a miniaturized dosimetry payload for SmallSats. We provide information on the concept, performance, development, and preparations for its in-orbit demonstration onboard the Austrian CubeSat PRETTY.*
H-6	**First results from ESA Next Generation Radiation Monitor units on-board GEO EDRS-C and LEO Sentinel-6** I. Sandberg[1], S. Aminalragia-giamini[2], C. Papadimitriou[2], R. Van gijlswijk[3], D. Heynderickx[4], M. Heil[5], H. Evans[6] [1]Space Applications and Research Consultancy, Greece [2]Space Applications and Research Consultancy (SPARC), Greece [3]Solenix-DE, Germany [4]DH Consultancy, Belgium [5]ESA ESOC, Germany [6]ESA ESTEC, Netherlands *First results from ESA Next Generation Monitor on-board EDRS-C are presented. Special attention is given on the measurements of the unit during the GTO of the satellite. Evaluation and comparisons with other monitors are reported.*

Paper #	POSTERS
PH-1	**DESIGN OF A SPACE RADIATION MONITOR FOR A SOUNDING ROCKET AND RESULTS FROM THE FIRST TURKISH SOUNDING ROCKET FLIGHT** A. Albarodi[1], M. Demirköz[1], U. Kılıç[1], A. Can[1], E. Karadöller[1], D. Boztemur[1], M. Aktaş[2], T. Atasever[2] [1]Middle East Technical University, Turkey [2]ROKETSAN, Turkey

	A radiation monitor was produced and flown to an altitude of 136 km twice on top the SR0.1 rocket launched with measurement of the Pfotzer-Regener maximum and the effects of the CME at 28th October-2020
PH-2	**Upper envelop in GREEN model for energetic electrons** A. Sicard[1], V. Maget[1], D. Lazaro[1], N. Balcon[2], R. Ecoffet[2] [1]ONERA, France [2]CNES, France *The aim of this study is to develop a GREEN "Upper Envelop" model for electrons which takes into account the variation from one solar cycle to another.*
PH-3	**Investigation of Inner Belt Flux Anisotropies** F. Enengl[1], H. Evans[2], R. Horne[3] [1]University of Oslo, Norway [2]ESA, Netherlands [3]British Antarctic Survey, United Kingdom *We investigate pitch angle distributions in the inner radiation belt in equatorial regions. We use data from IREM (INTEGRAL mission) and PROTEL (CRRESmission). We find a dependency of flux anisotropies on the proton energy levels.*
PH-4	**Association of relativistic electron enhancements with VLF/ULF wave activity and seed electrons** A. Nasi[1], I. Daglis[1], C. Katsavrias[1], W. Li[2] [1]National and Kapodistrian University of Athens, Greece [2]Boston University, USA *This study addresses the association of solar wind conditions, geomagnetic parameters, wave activity, and seed electrons, and indicates that seed electron presence, plasmasphere erosion and wave activity are conditions leading to substantial relativistic electron enhancements.*
PH-5	**Flight data analysis of highly miniaturized TID monitor module onboard TRISAT** L. Gonzales[1], G. Kirbiš[1], D. Selčan[2], I. Kramberger[1] [1]Laboratory for Electronic and Information Systems, Faculty of Electrical Engineering and Computer Science, University of Maribor, Slovenia [2]SkyLabs d.o.o., Slovenia *This paper presents design, temperature and irradiation calibration, and in-flight data of PIN diode base TID monitor module, appropriate for use on nanosatellites missions. The module is highly miniaturized and uses COTS components.*

PH-6	**Space Environment & Effects Satellite (SE&ES) Mission Concept Feasibility Study** P. Jiggens[1], J. Vennekens[1], P. Lux[1], N. Lawton[1], S. Clucas[1], C. Poivey[1], D. Steenari[1], H. Evans[1], M. Millinger[1], V. Braun[1], S. Mutch[1], M. Khan[2], M. Verhoef[1], G. Salinas[1], C. Terhes[1], B. Sousa[2], K. Benamar[1], Y. Le deuff[1], M. Van pelt[1], M. Magazzu[1], T. Wablat[1], D. Lomanto[1], P. Nieminen[1], S. Rason[1], V. Ferlet_cavrois[1] [1]ESA, Netherlands [2]ESA, Germany *Initial conclusions of a feasibility study for a low-cost, short-duration mission to measure the space environment whilst simultaneously measuring effects on components, testing mitigation strategies and giving flight heritage to new detectors and components.*
PH-7	**Development of a plastic scintillator-based active shield for the ICARE-NG radiation monitor** M. Pinson[1], P. Caron[1], P. Laurent[2], I. Cojocari[2] [1]ONERA, France [2]CEA, France *An active shield using a scintillator and silicon photo-multipliers (SiPMs) has been developed to operate with the ICARE-NG instrument to reduce electron contamination through the sides of the detector, thus increasing energy resolution.*
PH-8	**Analysis of the photoneutron field near the THz dump of the CLEAR accelerator at CERN with SEU measurements and simulations** G. Lerner[1], A. Coronetti[1], J. Kempf[2], R. Garcia alia[1], F. Cerutti[1], A. Gilardi[3], W. Farabolini[4], R. Corsini[1] [1]CERN, Switzerland [2]ISAE-Supaero, France [3]CERN, University of Naples Federico II, INFN Naples, Switzerland [4]CERN, CEA-Saclay, Switzerland *We study the photoneutron field near the THz dump of the CLEAR electron accelerator at CERN using FLUKA simulations and SEU measurements with SRAM memories, characterising its properties and evaluating its suitability for radiation tests.*

Paper #	ORAL PRESENTATIONS
I-1	**Secondary Particles Generated by Protons in 3D NAND Flash Memories** M. Bagatin[1], S. Gerardin[2], A. Paccagnella[1], A. Costantino[3], V. Ferlet_cavrois[3], G. Santin[3], M. Muschitiello[3], A. Pesce[3], S. Beltrami[4] [1]University of Padova, Italy [2]DEI - Padova University, Italy [3]ESA, Netherlands [4]Micron Technology - Process R&D, Italy *We studied proton-induced secondary byproducts inside 3D NAND Flash memories. The results provide interesting insight into the nuclear reactions occurring in electronics, in addition to showing the usefulness of these memories for monitoring proton beams.*
I-2	**Radiation monitor extension for CMOS imaging instruments in nanosatellites** J. Florczak[1], T. Neubert[1], E. Zimmermann[1], H. Rongen[1], M. Kaufmann[2], F. Olschewski[3], S. Van waasen[4] [1]Central Institute of Engineering, Electronics and Analytics - Electronic Systems (ZEA-2), Forschungszentrum Jülich, Germany [2]Institute of Energy and Climate Research (IEK-7), Forschungszentrum Jülich, Germany [3]Institute for Atmospheric and Environmental Research, University of Wuppertal, Germany [4]Faculty of Engineering, Communication Systems (NTS), University of Duisburg-Essen, Germany *This paper describes a low-cost extension for an imaging observation instrument as a radiation monitor. Adapted image processing methods enable discrimination between measured data and sensor / radiation-specific hazards and drives mitigation techniques to improve mission lifetime.*
I-3	**Heavy-Ion Charge Yield Measurement by Floating Gate Dosimeters - Brucoli** M. Brucoli[1], S. Danzeca[1], A. Waage[2], A. Masi[1], R. Garciaalia[1], B. Severa mas[3], A. Pineda[3], V. Ferlet_cavrois[4] [1]CERN, Switzerland [2]Norwegian University of Science and Technology, Norway [3]Sealicon Microsystems, Spain [4]ESA, Netherlands *In this study, charge yield measurement performed by using a floating gate dosimeter for heavy-ions with LETs from 0.24 to 44 MeV•cm2•mg-1 is presented.*
I-4	**X-Ray Radioluminescence in Diversely Doped Multimode Silica-based Optical Fibers** A. Meyer[1], A. Morana[1], H. El hamzaoui[2], B. Capoen[2], G. Bouwmans[2], M. Bouazaoui[2], S. Girard[1], E. Marin[1], Y. Ouerdane[1], A. Boukenter[1]

	[1]Université Jean Monnet Saint-Étienne, France [2]Université de Lille, France *We investigate the radioluminescence response of optical fibers doped with Ge, P, Al, F and Ce, under 100 keV X-rays with dose rates from 0.1 to 20 Gy(SiO2)/s, and discuss their suitability for dosimetry.*
I-5	**Measurements of neutron fields in a wide energy range using multi-foil activation analysis** D. Chiesa[1], C. Cazzaniga[2], M. Nastasi[1], M. Rebai[1], E. Previtali[1], G. Gorini[1], S. Lilley[2], C. Frost[2] [1]University and INFN of Milano - Bicocca, Italy [2]ISIS Facility, UKRI-STFC, Rutherford Appleton Laboratory, United Kingdom *Neutron activation analysis and unfolding has been used for measurements of atmospheric and moderated neutron fields for SEE testing at a spallation source. Multiple reactions are selected to cover from thermal to 800 MeV.*

Paper #	POSTERS
PI-1	**Benchmark between measured and simulated radiation level data at the Mixed-Field CHARM facility at CERN** D. Prelipcean[1], G. Lerner[1], R. García alía[1], K. Bilko[1], A. Infantino[1], D. Di francesca[1], D. Ricci[1], M. Brucoli[1], S. Danzeca[1] [1]CERN, Switzerland *A benchmark for radiation monitors employed at CERN for Radiation to Electronics applications is performed at the CHARM mixed field radiation facility. Their measured values during beam operation are compared to those simulated by FLUKA.*
PI-2	**Pulsed X-ray Source Dosimetry Based On Radioluminescent Nitrogen Optical Fiber** J. Vidalot[1], C. Campanella[2], C. Marcandella[3], O. Duhamel[3], A. Morana[4], A. Boukenter[2], Y. Ouerdane[2], S. Girard[5], P. Paillet[6] [1]CEA DAM / université Jean Monnet St Etienne, France [2]Laboratoire Hubert Curien - Université Jean Monnet St Etienne, France [3]CEA DAM, France [4]Laboratory Hubert Curien, France [5]Université de Saint Etienne, France [6]CEA, France *The potential of Nitrogen-doped optical fibers for the monitoring of a pulsed high dose rate X-ray source is investigated.*

PI-3	**Silicon solid-state detectors for monitoring high-energy accelerator mixed field radiation environments** K. Bilko[1], R. Garcia alia[1], M. Sacristan barbero[1], D. Prelipcean[1], C. Cazzaniga[2], A. Coronetti[1], G. Lerner[1], W. Hajdas[3] [1]CERN, Switzerland [2]STFC, United Kingdom [3]Pau Sherrer Institute, Switzerland *The use of silicon diodes for mixed-field radiation monitoring was studied. Measurements with high-energy hadrons and simulations are presented, focusing on accelerator applications. Compared to other devices, diodes show enhanced sensitivity and energy discrimination capabilities.*
PI-4	**An Enhanced Sensitivity Operation Mode for Floating Gate Dosimeters** M. Rizzo[1], M. Brucoli[1], S. Danzeca[1], A. Masi[1], A. Pineda[2], B. Servera mas[2] [1]CERN, Switzerland [2]Sealicon Microsystem, Spain *A new method for enhancing the sensitivity of the floating gate dosimeter (FGDOS) has been investigated. Results are presented providing the effectiveness of the enhancement and its effect on the sensitivity degradation rate.*
PI-5	**Design and expected performance of a new 60 MeV proton beam-line dedicated for R&D** P. Hofverberg[1], C. Armando[1], J. Bergerot[1], E. Bourrel[1], J. Dicarlo[1], G. Donadey[1], S. Dumas[1], A. Giusto[1], J. Grini[1], J. Hérault[1], Y. Payan[1], C. Salicis[1], R. Trimaud[1] [1]Centre Antoine Lacassagne, France *Centre Antoine Lacassagne is constructing a new 60 MeV proton beam-line for the MEDICYC cyclotron. This beam-line is dedicated for R&D activities, and will be available to external users from late 2021.*
PI-6	**Assessment of ICPO Proton Facility for the radiation assessment of electronic devices** S. El mimouni [1] [1]Nucletudes, France *Thanks to its upgrades, the Curie institute Proton facility in Orsay offers new perspectives to perform continuous proton irradiations usable for electronics sensitivity assessments. To this end, the facility was characterized with known electronic devices.*
PI-7	**Sirius electron accelerator** O. Cavani[1], R. Grasset[1], A. Courpron[1], A. Alessi[1]

	[1]LSI, CEA/DRF/IRAMIS, CNRS, Ecole polytechnique, Institut Polytechnique de Paris, France *The capabilities of the electron accelerator named SIRIUS are reported. In this facility the main irradiation parameters like beam energy, fluence (dose), flux (dose rate), temperature and atmosphere can be adapted to specific irradiation aims.*
PI-8	**Conceptual design of a novel electron radiation and spacecraft charging test platform for CubeSat dimensioned devices based on laser-driven electron accelerator** I. Zymak[1], R. Antipenkov[1], L. Goncalves[1], G. Grittani[1], C. Lazzarini[1], S. Lorenz[2], M. Nevrkla[1], R. Versaci[1], P. Bakule[1], S. Bulanov[1] [1]ELI Beamlines, Czech Republic [2]ELI Beams, Czech Republic *Conceptual design of a radiation test environment has been developed using numerical SIMION and FLUKA models. Concept proof generation of the electron beam accelerated to energies above 1 MeV have been performed.*
PI-9	**SEREEL2 – a new laser single-event effects test system with benchmark results** R. Sharp[1], A. Crombie[1], C. Chong[1] [1]Radtest Ltd, United Kingdom *This work describes a new pulsed laser test system, SEREEL2, and demonstrates its capabilities by comparison of LM124 test data with similar obtained from other systems. SEREEL2 is a highly reliable, stable and precise instrument.*

Paper #	ORAL PRESENTATIONS
J-1	**System-level Uncertainty Quantification from Component-level Radiation Effects** G. Karsai[1], N. Mahadevan[1], A. Witulski[1], A. Sternberg[1], J. Kauppila[1], R. Schrimpf[1], P. Adell[2], H. Schrone[2], M. Meyers[2], A. Daniel[2] [1]Vanderbilt University, USA [2]NASA JPL, USA *Impacts of transistor-level total ionizing dose are simulated on system-level parameters of a CubeSat computing board. Temperature control loop uncertainty quantification shows TID-induced changes as probability distributions of key system parameters versus mission time.*
J-2	**How the Analysis of Archival Data Could Provide Helpful Information about TID Degradation** P. Martin_holgado[1], A. Romero-maestre[1], J. De-martín-hernández[2], J. González-luján[3], I. Illera-gómez[1], Y. Jiménez-de-luna[2], F. Morilla[4], M. Sacristan barbero[5], R. Garciaalia[5], M. Dominguez[3], Y. Morilla[6] [1]Centro Nacional de Aceleradores, Spain [2]Universidad de Sevilla, Spain [3]ALTER TECHNOLOGY, Spain [4]National Distance Education University, Spain [5]CERN, Switzerland [6]CNA, Spain *This work tries to evaluate if valuable information might be extracted from archival data to carry out the mission risk assessment despite the well-known and dramatic lot-to-lot, or even part-to-part, variation for some technologies.*
J-3	**Radiaton tolerant ATTM-WRTU wireless infrastructure for radiation harsh terrestrial applications** A. Bernhard[1], D. Selčan[1], T. Rotovnik[1], D. Gačnik[1], I. Kramberger[2], S. Danzeca[3], G. Furano[4] [1]Skylabs d.o.o., Slovenia [2]University of Maribor, Slovenia [3]CERN, Switzerland [4]ESA/ESTEC, Netherlands *This paper provides an overview of the challenges and solutions for wireless communications for terrestrial applications in radiation harsh environments, by utilising the proven designs used in space applications where radiation tolerance is a must.*
J-4	**Proposal of a Lightened Radiation Hardness Assurance Methodology for New Space** F. Bezerra[1], J. Mekki[1], G. Augustin[2], J. Guillermin[2], N. Chatry[2] [1]CNES, France

	[2]TRAD, France *In this paper, we present and discuss a lightened RHA methodology proposed to fulfill the harsh constraints in terms of cost and lead time applicable to New Space projects.*
J-5	**FPGA Qualification and Failure Rate estimation Methodology for LHC Environments Using Benchmarks Test Circuits** A. Scialdone[1], R. Ferraro[2], R. Garcia alia[3], L. Sterpone[4], S. Danzeca[1], A. Masi[1] [1]CERN, Italy [2]CERN, France [3]CERN, Switzerland [4]Politecnico di Torino, Italy *In this work, a novel approach for qualifying FPGAs to be used in the LHC radiation environment is proposed. The response of two different FPGAs is presented.*
J-6	**Laser-induced Transients in a GaN-on-Si Power HEMT using Si-SPA Optical Parameters** C. Ngom[1], V. Pouget[2], M. Zerarka[3], F. Coccetti[3], A. Touboul[4], M. Matmat[3], O. Crepel[5] [1]IRT Saint Exupery and IES-University of Montpellier, France [2]IES-CNRS, France [3]IRT Saint Exupery, France [4]IES - university of Montpellier, France [5]Airbus Toulouse, France *This paper investigates the response of a commercial GaN-on-Si HEMT technology to laser testing parameters commonly used for single-photon absorption testing of silicon devices. Transient currents mappings and the influence of bias conditions are presented and discussed.*

Paper #	POSTERS
PJ-1	**Estimation of Accelerated ELDRS Test Using Temperature-Switching Irradiation** X. Li[1] [1]Xinjiang Technical Institute of Physics and Chemistry, China *A temperature-switching irradiation (TSI) sequence based on first-principles understanding of interface-trap buildup and annealing is shown to be a conservative test for ELDRS at ultra-low dose rate in linear bipolar devices.*
PJ-2	**Searching The Damaged Area on IC Chip Using Ionization Response Mapping** D. Savchenkov[1], G. Davydov[1], A. Yanenko[1]

	[1]NRNU MEPhI / JSC SPELS, Russian Federation *A method is described for localizing damaged areas on IC chip using ionization response maps. The method can provide some essential information to IC designers to help them improve its resistance to failures.*
PJ-3	**General Purpose and Neural Network Approach For Benchmarking Microcontrollers Under Radiation** M. Giordano[1], S. Danzeca[2], R. Ferraro[2] [1]ETH Zurich, CERN, Switzerland [2]CERN, Switzerland *A testing methodology for microcontrollers under radiation is proposed. General purpose benchmarks are reviewed, a neural network benchmark for IoT-devices is introduced. The testing strategy is validated on ARM M0+/M4 microcontrollers under a 200MeV-proton beam*
PJ-4	**Accurate Cross Section Estimation Using High-Level Software Fault Injection on Arm CPUs** P. Bodmann[1], D. Oliveira[2], P. Rech[3] [1]UFRGS, Brazil [2]UFPR, Brazil [3]Politecnico di Torino, Italy *We compare cross-sections predicted with software fault-injection and measured with neutron beam experiments of eight codes on two Arm devices. We improve predictions accuracy using performance and hardware utilization metrics.*

Paper #	POSTERS
DW-1	**A Fully Integrated 1 MHz – 2.5 GHz Radiation-Hardened All-digital Frequency Synthesizer** M. Strackx[1], B. Van bockel[2], A. Karmakar[2], S. Ali[1], B. Boons[1], R. Van dyck[1], H. Marien[1], Y. Cao[1], P. Leroux[2], J. Prinzie[2] [1]MAGICS Instruments, Belgium [2]KU Leuven, Belgium *A fully integrated radiation-hard all-digital frequency synthesizer is presented. Single-event monitoring of the phase-locked-loop is proposed by comparing the time-to-digital-converter output with an adjustable threshold. The validated radiation tolerance reaches 1kGy TID and 62.5MeV·cm2/mg SEL/SEU.*
DW-2	**SEE Radiation Analysis And Mitigation on SAM3X8ERT Microcontroller** R. Pilia[1], R. Espinasse[1], C. Poulet[1], F. Bezerra[2], L. Gillot[2], B. Treuillard[3], S. Dumortier[4] [1]EREMS, France [2]CNES, France [3]Michrochip Technology, France [4]Microchip Technology, France *This paper reports results and analysis of Single Event Effects (SEE) test campaign conducted by CNES and EREMS. The DUT used for the study was the SAM3X8ERT Microcontroller from Microchip.*
DW-3	**X-ray Irradiation Effects on DEPFET Pixel Sensors for the Belle II PiXel Detector** G. Giakoustidis[1] [1]University of Bonn, Germany *A Belle II PXD DEPFET module was irradiated using a 40 kV X-ray tube. Effects of FET threshold shifts and unexpectedly increasing bulk currents were observed and investigated to doses up to 165 kGy.*
DW-4	**SEE characterization for a Quad 12-bit 1.6 GSps ADC, Digitizing up to 6.4 GSps (April 2021)** O. Bonnet[1], R. Pilard[1], S. Pelé[1] [1]Teledyne e2v, France *The EV12AQ600, a quad channel 12-bit 1.6GSps ADC, was submitted to an heavy ions test, in order to evaluate its sensibility to Single Event Effect up to a LET of 67 MeV.cm²/mg.*
DW-5	**Total dose effects on large quantities of LM239N comparators from two manufacturers**

	R. Sharp[1], J. Voegtli[1], E. Bradley[2] [1]Radtest Ltd, United Kingdom [2]University of the West of England, United Kingdom *1,000 LM239N quad comparators (two manufacturers, ten date codes) have undergone TID testing to improve the definition of the optimum sample size for such a test. This paper presents the raw results of the work.*
DW-6	**Single Event Effects Characterization of 55-65nm NOR flash for Space Applications** B. Tanios[1], M. Kaddour[1], B. Forgerit[1], F. Guerre[1], C. Poivey[2] [1]Alter Technology TÜV Nord France, France [2]European Space Agency (ESA/ESTEC), Netherlands *This work presents a comparative study of Single Event Effects (SEE) radiation sensitivity of two COTS (commercial off-the-shelf) 55-65nm NOR flash memories for space applications.*
DW-7	**Single Event Effects Characterization of 24-36nm COTS NAND flash for Space Applications** B. Tanios[1], M. Rousselet[1], F. Lochon[1], B. Forgerit[1], F. Guerre[1], C. Poivey[2] [1]Alter Technology TÜV Nord France, France [2]European Space Agency (ESA/ESTEC), Netherlands *This work presents a comparative study of Single Event Effects (SEE) radiation sensitivity of two COTS (commercial off-the-shelf) 24-36nm NAND flash memories for space applications.*
DW-8	**Testing of COTS Multiplexer in the Framework of the ESA CORHA Study** M. Wind[1], C. Tscherne[1], M. Bagatin[2], S. Gerardin[2], L. Huber[1], M. Latocha[1], A. Paccagnella[2], M. Poizat[3], P. Beck[4] [1]Seibersdorf Labor GmbH, Austria [2]University of Padova, Italy [3]ESA, Netherlands [4]Seibersdorf Laboratories, Austria *We present TID radiation response test data of commercial multiplexers as part of the ESA CORHA study that investigates relevant COTS components and finally aims to formulate an test-data based ad-hoc RHA approach for COTS.*
DW-9	**SAMRH71F20C RHBD 32-bits Flash Microcontroller Single Event Effects & TID evaluation** G. Bourg cazan[1], J. Bernard[1], S. Furic[1], E. Leduc[2], A. Solere[3] [1]Microchip Technology Nantes, France [2]Microchip A & D, France [3]Microchip Technology Rousset, France

	This paper reports the results of Single Event Effects (SEE) and Total Ionizing Dose (TID) test campaigns conducted by Microchip on the ARM® Cortex® M7 SAMRH71F20C Microcontroller
DW-10	**Updated Radiation Performance of Intersil's Commercial Space Plastic Parts** W. Newman[1], N. Van vonno[1], S. Singer[2], P. Lawrence[2], E. Thomson[2] [1]Renesas Electronics America, USA [2]Renesas, USA *The ISL71xxxM/SLHM family of radiation-tolerant and radiation-hardened plastic-package ICs is designed to support the emerging constellations of small satellites that will provide high-speed internet connections to millions of users in communities, governments, and businesses worldwide.*
DW-11	**Non-Volatile Memory Destructive Failure in Standby Mode** P. Wang[1], P. Kohler[1], A. Bosser[1], L. Thibaut[2], G. Duran cardenas[2], L. Frederic[2] [1]3D PLUS, France [2]Alter Technology France, France *This paper presents the results of a 256Mb SPI/QSPI non-volatile memory (NVM) SEE characterization. Destructive failures were observed during SEE tests, and the DUT shows sensitivity especially in standby mode instead of Erase/Write/Read modes.*
DW-12	**TID Characterization of 24-45nm COTS NAND flash for Space Applications** B. Tanios[1], O. Perrotin[1], B. Forgerit[1], F. Tilhac[1], F. Guerre[1], C. Poivey[2] [1]Alter Technology TÜV Nord France, France [2]ESA, Netherlands *This work presents a comparative study of Total Ionizing Dose (TID) radiation sensitivity of five COTS (commercial off-the-shelf) 24-45nm NAND flash memories for space applications.*
DW-13	**VSC8541RT Single Port Gigabit Ethernet PHY Single Event Effects and Total Ionizing Dose performances** B. Treuillard[1], S. Furic[1], G. Bourg cazan[1], E. Leduc[2], P. Fournier[3] [1]Microchip Technology Nantes, France [2]Microchip A & D, France [3]Microchip Technology Rousset, France *This paper reports the results of Single Event Effects (SEE) and Total Ionizing Dose (TID) test campaigns conducted by Microchip on VSC8541RT Single Port Gigabit Ethernet PHY*
DW-14	**The SEE Test Results of the different analog devices** A. Kalashnikova[1], T. Maksimenko[2], A. Koziukov[3], P. Chubunov[2], M. Kuznetsov[2], R.

	Mangushev[2], A. Drokin[2], K. Bu-khasan[2], N. Bondarenko[2], M. Vyrostkov[2], A. Nilov[2], M. Maltseva[2], N. Il'yin[2], A. Kukharev[2] [1]Branch of Joint - Stock Company "United Rocket and Space Corporation"- "Institute of Space Device Engineering" (Branch of JSC URSC - ISDE), Russian Federation [2]Branch of Joint - Stock Company "United Rocket and Space Corporation"- "Institute of Space Device Engineering" (Branch of JSC URSC - ISDE), Russian Federation [3]Branch of JSC URSC - ISDE, Russian Federation *The article presents the results of singlt event effect (SEE) testing samples of various representatives of analog microcircuits: operational amplifiers (OpAmp), relays, voltage regulators and transistor.*
DW-15	**Heavy Ion Test Results for Microcircuits of the SNJ54 Series** A. Koziukov[1], P. Chubunov[1], S. Iakovlev[1], L. Arutunyan[1], M. Shekhovtsov[1], A. Riabtseva[1] [1]Branch of JSC "URSC" - "ISDE", Russian Federation *The article presents the test results of digital microcircuits of the SNJ54 series for resistance to heavy ions obtained on the test means to monitor resistance to heavy ion space.*