

WP2: Reliability (with and w/o radiation) & Testing

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RADSAGA Final Conference and Industrial event

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RADiation and Reliability Challenges for Electronics used in Space, Aviation, Ground and Accelerators (RADSAGA) is a project funded by the European Commission under the Horizon2020 Framework Program under the Grant Agreement 721624.

RADSAGA began in Mars 2017 and will run for 5 years.

❑ Objectives

- The different topics address the study of radiation effects on new emerging technologies for space, avionics, ground and accelerators.
- The results obtained on elementary devices are used to assess the relevance of a test at system level performed in WP3.

6 ESRs involved in this WP



- ❑ ESR6 : Arijit Karmakar (KU Leuven)
 - ❑ Supervisor : Paul Leroux (KU Leuven)
 - ❑ Co-supervisor : Valentijn De Smedt (KU Leuven)

« Integrated Time-based Signal Processing Circuits for Harsh Radiation Environments »

- Defining new sensor readout architectures based on time-domain signal processing for critical reliability application in harsh radiation environment
- The research output with proposed sensor interfaces and measurement results will be presented.

- ❑ ESR7 : Kimmo Niskanen (Université de Montpellier)

- ❑ Supervisor : Antoine Touboul (Université de Montpellier)
- ❑ Co-supervisor : Arto Javanainen (University of Jyväskylä)

« Coupled aging and radiation effects on wide bandgap power devices »

- In this work, the short and long term-reliability of Wide Bandgap power devices in radiation environment have been evaluated through experimental analysis and modeling.
- Research studies have been focused on
 - 1) the degradation of the device
 - 2) the effect of device aging on its radiation sensitivity
 - 3) effect of radiation on the long term reliability of the device/system.

- ❑ ESR8 : Mohamed Mounir Mahmoud (KU Leuven)
 - ❑ Supervisor : Paul Leroux (KU Leuven)
 - ❑ Co-supervisor : Jeffrey Prinzie (KU Leuven)
Vincent Pouget (Université de Montpellier)

« Impact of aging degradation mechanisms on the radiation susceptibility of advanced technology nodes »

- A test vehicle (ProArray) of programmable arrays of transistors and shift-register chains was specially designed to investigate the impact of aging degradation mechanisms on the radiation susceptibility of 28 nm FD-SOI technology
- The results and analysis of several TID and SEU irradiation tests will be presented

- ❑ ESR9 : Ygor Quadros de Aguiar (Université de Montpellier)
 - ❑ Supervisor : Frédéric Wrobel (Université de Montpellier)
 - ❑ Co-supervisors : Jean-Luc Autran (Aix-Marseille Université)
Paul Leroux (KU Leuven)

« Radiation hardening digital circuits against SET using design techniques. »

- Single-Event Transient (SET) effect is increasing in importance in advanced technologies due to the reduction in the inherent masking effect of logical circuits.
- Thus, in order to improve the reliability of electronics systems operating in a harsh environment, different radiation hardening techniques at design level have been studied and presented in this work.



- ❑ ESR10 : Salvatore Guagliardo (Université de Montpellier)
 - ❑ Supervisor : Frédéric Wrobel (Université de Montpellier)
 - ❑ Co-supervisors : Jean-Luc Autran (Aix-Marseille Université)
Paul Leroux (KU Leuven)

« Predictive tools and "Radiation Hardening By Design" (RHBD) - SEL and Temperature Effects »

- Effects of different parameters on Single Event Latchup (SEL) sensitivity using TCAD tools have been analyzed.
- Investigations have been performed to evaluate how to predict SEL by means of TCAD simulations.



- ❑ ESR11 : Rico Jossel M. Maestro (KU Leuven)
 - ❑ Supervisor : Paul Leroux (KU Leuven)
 - ❑ Co-supervisor : Jerome Boch (Université de Montpellier)

« Layout Effects in CMOS Photosensitive Devices in Radiation Environment »

- Increase of dark current is one of the main problems of CMOS image sensors when exposed to ionizing radiation. This is very process and layout dependent.
- A test chip is designed that has arrays of pixels. Multiple photosensitive devices and layout configurations were included to reduce the dark current without affecting the optical sensitivity of the pixel
- Results are discussed and analyzed



- ❑ Articles in journal : 15
- ❑ Conference Proceedings : 8
- ❑ Deliverable reports : 4
- ❑ Milestone report: 1
- ❑ PhD manuscripts : 3 done