

# CNES-ESA Final Presentation Days. Space Environment and Radiation Effects on EEE Components. Introduction to Radiation Hardness Assurance & Component Analysis Section (TEC- QEC) Presentations

Ali Zadeh, 08-03-2017

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# CNES – ESA Final Presentation Days an Important Collaborative Event



- Participation of CNES at the Final Presentation Days is greatly appreciated and important
- The CNES – ESA 2017 FPD welcomes the Space Environment and Effects Section.
- Bringing together all elements of Radiation Hardness Assurance
- The CNES – ESA FPD's provide an excellent venue to share experiences and strengthen ties.
- Highly desirable to increase our collaborative efforts to more efficiently utilise our resources. In particular important considering stringent financial envelopes.
- The role of the CTB RWG in harmonising and defining R&D activities should also be strengthened.



# TEC-QEC R&D activities and support



Our R&D activities cover RHA related issues, component testing, radiation facilities and in-flight experiments. In particular we carry out:

- RHA related PA support to programmes such as GSP, TRP, GSTP, ARTES, PRODEX,
- EEE Component Radiation screening, evaluation and qualification
- Support to radiation Hardening of active EEE components against TID, DD and SEE.
- Radiation Standardisation, ESCC (development of radiation evaluation and qualification methods) and ECSS (development of RHA standard)
- Collaboration with ESA supported external European irradiation test facilities including expert dosimetry services and implementation of common irradiation test facility interfaces. Managing and distributing ESA requested irradiation beam time at these facilities.
- Development and data mining/analysis of in-flight RHA verification and EEE component radiation performance demonstration experiments.
- Running and maintaining the ESA 60Co and CASE facilities.



# TEC-QEC R&D activities and Harmonisation Roadmap



- Radiation Characterisation of Novel technologies.
  - Increasingly, novel EEE component technologies are applied to improve European competitiveness in the space sector. Unfortunately, the radiation behaviour of these technologies are not always known or evident.
- Radiation Hardness Assurance standards.
  - These standards are living documents and need to be improved in line with the development of new technologies and identification of new failure modes.
- In-flight Radiation Hardness Assurance verification experiments.
  - Important for improvement of RHA standards and methods
- Irradiation test facilities.
  - Continuous improvement of irradiation test facilities to cater for irradiation characterisation of new EEE component technologies is of outmost importance.
- COTS devices
  - In some cases necessary to comply with stringent performance requirements. Novel screening methods required.



- **The R&D strategic plan is based on the harmonisation roadmap and present-day issues of concern.**
  - We observe an increase use of COTS for certain type of missions.
  - Current RHA requirements (ECSS-Q-ST60-15C) is applicable for COTS. However, for low-cost and Cubesat missions some times impractical to apply.
  - Plan to initiate activities to develop RHA best practices and guidelines for low-cost and Cubesat missions (employing COTS devices). Also discussed in the RWG.
  - Radiation screening / characterisation of COTS devices.
  - Development of Radiation Performance demonstration and RHA verification payloads.
  - Strategy to maintain a number of frame-contracts to enable easy and quick access to irradiation characterisation of EEE Components of interest to ESA.
  - Strategy to maintain and improve ESA supported irradiation test facilities.
  - Development of Radiation Performance demonstration and RHA verification payloads. Preferably having quick access to space (e.g. Cubesats).
  - Analysis and lessons learned from in-flight data.

# Wednesday afternoon presentations



14:00	<b>Introduction</b> <i>Ali ZADEH</i> <i>Newton2, ESA/ESTEC</i> 14:00 - 14:10
	<b>Displacement Damage test guideline</b> <i>Mr. Thierry NUNS</i> <i>Newton2, ESA/ESTEC</i> 14:10 - 14:30
	<b>Validation of NIEL for high energy (&gt; 1MeV) electrons in Silicon</b> <i>Mr. Thierry NUNS</i> <i>Newton2, ESA/ESTEC</i> 14:30 - 14:50
15:00	<b>Verification of Co-60 TID testing representativeness for EEE components flown in the Jupiter environment</b> <i>Dr. Patrícia GONÇALVES</i>
	<b>Part to part and lot to lot variability study of TID effects in bipolar linear devices</b> <i>Mr. Nicolas SUKHASEUM</i>
	<b>Coffee Break</b> <i>Newton2, ESA/ESTEC</i> 15:30 - 15:50
16:00	<b>Radiation characterization of European EEE components for space applications</b> <i>Dr. Pierre GARCIA</i> <i>Newton2, ESA/ESTEC</i> 15:50 - 16:20
	<b>Test methods for SEE evaluations of ADCs and DACs</b> <i>Mr. François-Xavier GUERRE</i> <i>Newton2, ESA/ESTEC</i> 16:20 - 16:40
	<b>TID testing of state of the art NAND flash memories</b> <i>Dr. Bendy TANIOS</i> <i>Newton2, ESA/ESTEC</i> 16:40 - 17:10
17:00	<b>Heavy-Ion Micro Beam and Simulation Study of a Flash-Based FPGA Microcontroller Implementation</b> <i>Mr. Carlos URBINA ORTEGA</i>



# Thursday morning presentations



09:00	<b>Irradiation characterisation of 2D imaging devices, memories and FPGAs for future ESA missions</b>	<i>Mr. ENOAL LE GOULVEN</i>
	<b>Radiation Evaluation of Digital Isolators</b>	<i>Dr. Michael WIND</i>
	<i>Newton2, ESA/ESTEC</i>	09:20 - 09:40
	<b>Survey of total ionising dose tolerance of power bipolar transistors and Silicon Carbide devices for JUICE</b>	<i>Dr. Michael STEFFENS</i>
10:00	<b>Total Ionizing Dose influence on the single event effect sensitivity of active EEE components</b>	<i>Mr. Lionel SALVY</i>
	<b>ESA supported Radiation Facility</b>	<i>Dr. Heikki KETTUNEN et al.</i>
	<i>Newton2, ESA/ESTEC</i>	10:20 - 10:50
	<b>Coffee Break</b>	
11:00	<i>Newton2, ESA/ESTEC</i>	10:50 - 11:10
	<b>Risk assessment of SEE events due to high energy electrons during the JUICE mission</b>	<i>Mr. Nicolas SUKHASEUM</i>
	<b>Single Event Burnout testing of high power schottky diodes</b>	<i>Dr. Pierre GARCIA</i>
	<i>Newton2, ESA/ESTEC</i>	11:30 - 12:00
12:00	<b>Re-issue Radiation Characterisation of GaAs power devices in support of European Radiation Hardness</b>	<i>Mr. Jeffrey CHUAN</i>
	<b>Laser Study of SETs in 65nm Bulk Technology</b>	<i>Mr. Adrian EVANS</i>
	<i>Newton2, ESA/ESTEC</i>	12:20 - 12:40
	<b>Comprehensive SEE Component Qualification</b>	<i>Mr. Adrian EVANS</i>
	<i>Newton2, ESA/ESTEC</i>	12:40 - 13:00
13:00		

