

# Accelerated tests - Irradiation testing

SPACE WEATHER – FLIGHT CONDITIONS – FUNCTIONALITY  
Radiation Hardness Assurance RHA - RADIATION EFFECTS

Low E-IONS  
& NEUTRONS

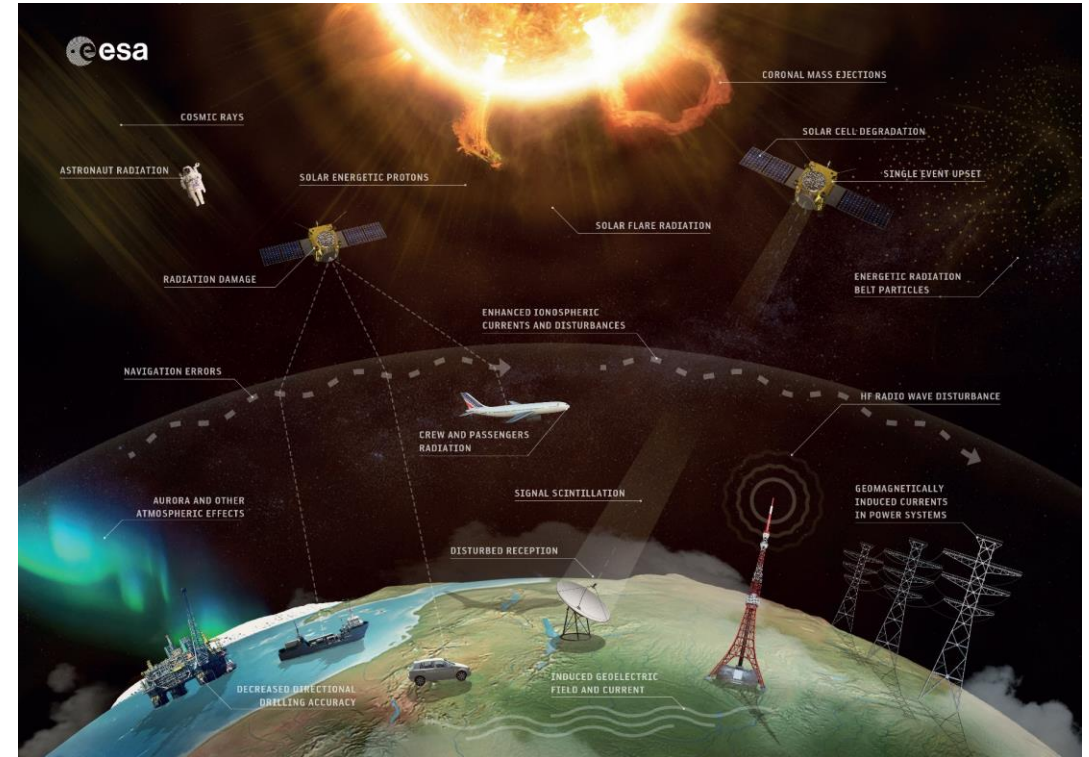
Gamma PHOTONS

Thermal  
cycling

Irradiation capabilities at the CNA

Cobalt-60 Gamma RadLab      PHOENIX

IIL – Tandem 3 MV      EBL – 18/9 Cyclotron

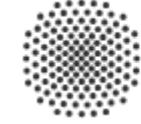


**Total Ionizing Dose (TID) – ESCC BS 22900**  
**Displacement Damage Dose (DDD) – ESCC BS 22500**  
**Single Event Effects (SEE) – ESCC BS 25100**

# LEP Space Applications; Space, Radiation monitors



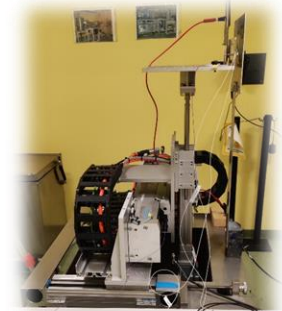
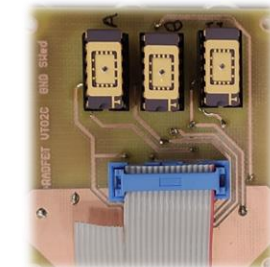
## Proton Irradiation Test on Solar Cells, cables and shielding materials



University of Stuttgart  
Institute for Photovoltaics



SPASOLAB

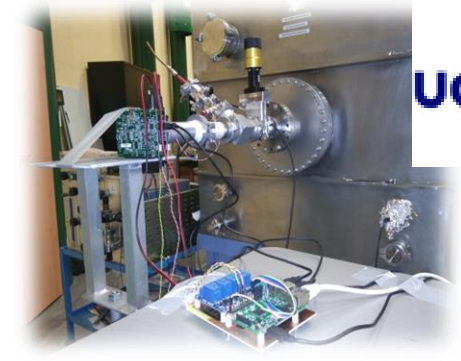


## Fault injection campaigns on FPGA – 28 nm

## Single Event Effects (SEE) cross sections on <65nm SRAM

## DDD experiments CMOS Image Sensors, optocouplers

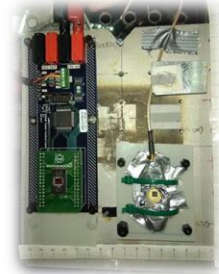
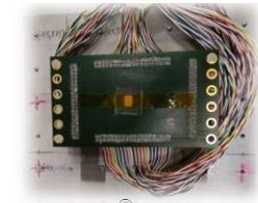
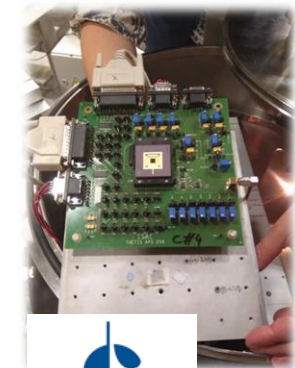
## Dosimeter experiments Diodes, RadFET, optical fibers



uc3m



Universitat d'Alacant  
Universidad de Alicante



ALTER

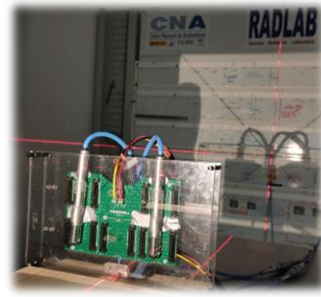


# RadLab Gamma irradiation tests with Co-60



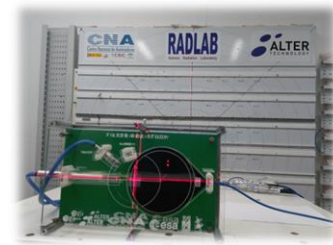
**Calibration and certification** by **SSDL PTW-Freiburg**.  
compliance with TRS-398 and TRS-469 IAEA protocols.

**Alter Technology agreement**  
**ESCC 22900 and MIL-STD-883/750 test methods 1019**  
**(ISO17025; DLA Lab suitability)**



## Dosimetry Intercomparison exercises

- Based on ionization chamber; ESA/ESTEC, CNA-ALTER/RadLab and UCL/CRC
- Based on the study of the filterbox with european, american and russian institutions
- Based on allanine dosimetry with ESA/ESTEC; SL & TRAD



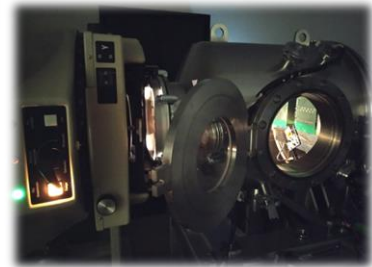
## Article: A Machine Learning Approach to Predict Radiation Effects in Microelectronic Components

Fernando Morilla <sup>1</sup>, Jesús Vega <sup>2</sup>, Sebastián Dormido-Canto <sup>1,\*</sup>, Amor Romero-Maestre <sup>3</sup>, José de-Martin-Hernández <sup>4</sup>, Yolanda Morilla <sup>3</sup>, Pedro Martín-Holgado <sup>3</sup> and Manuel Domínguez <sup>4</sup>



## RADIATION TESTS DATABASE

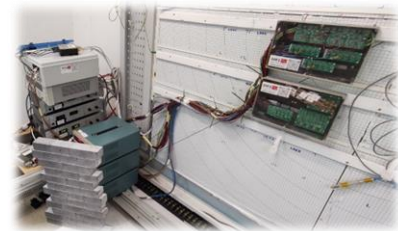
Restricted access through the Virtuallab platform:  
<https://virtuallab.altertechnology.com/>



Thousands of radiation test results

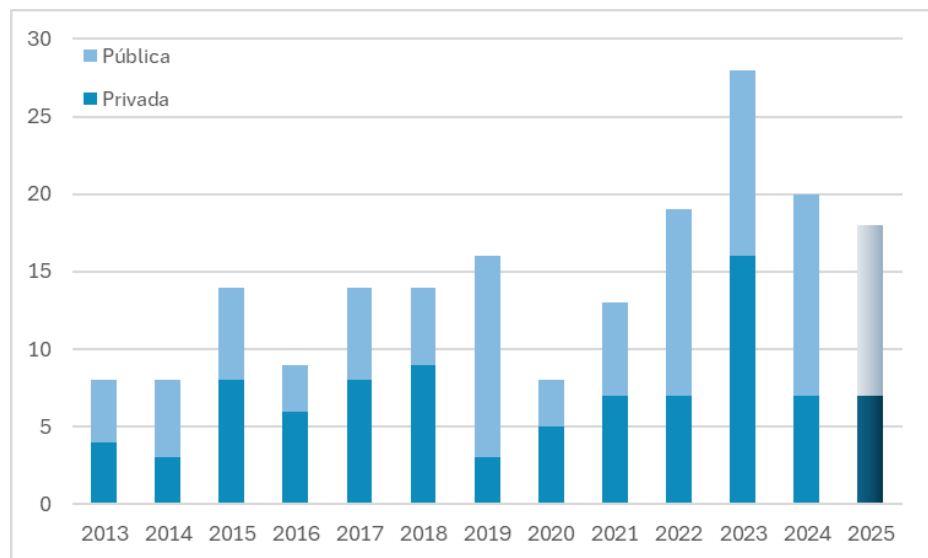
The largest parameterized database

Optocoupler Compendium

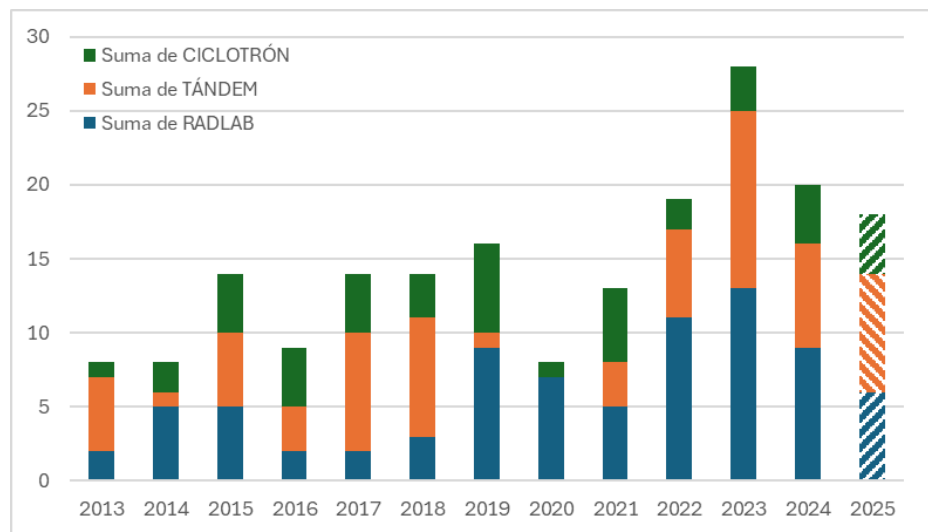


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**Abstract:** This paper presents an innovative technique, Advanced Predictor of Electrical Parameters, based on machine learning methods to predict the degradation of electronic components under the effects of radiation.  
<https://www.mdpi.com/1424-8220/24/13/4276/pdf>



CNA annual number of applications for irradiation testing



## RADECS

### RADIation Effects on Components & Systems

<https://www.radecs-association.net/>

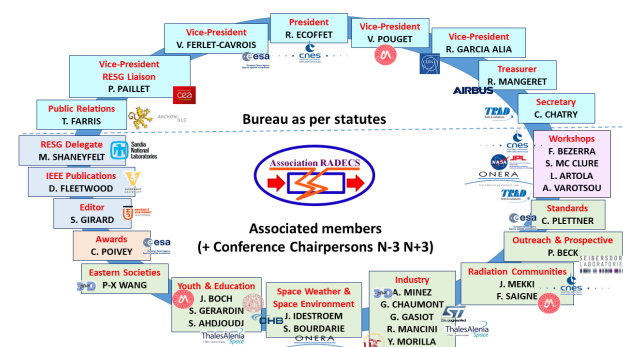


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101008126.

<https://irradiation-facilities.web.cern.ch/>



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<https://radnext.web.cern.ch/>

