

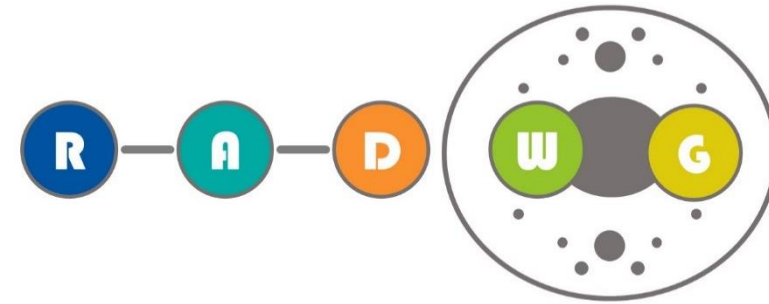
# RADWG Meeting November 2018

Salvatore Danzeca EN/SMM/RME on behalf of the RADWG

# AGENDA

- **Activities Overview** by *Salvatore Danzeca*
- **QPS developments status and CHARM test results** by *Jens Steckert and Surbhi Mundra*
- **BE/CO : CHARM Radiation test results of the Cu-Cu repeater** by *Julien Palluel*
- **CHARM tests on the pressure sensors** by *Beatrice Mandelli*

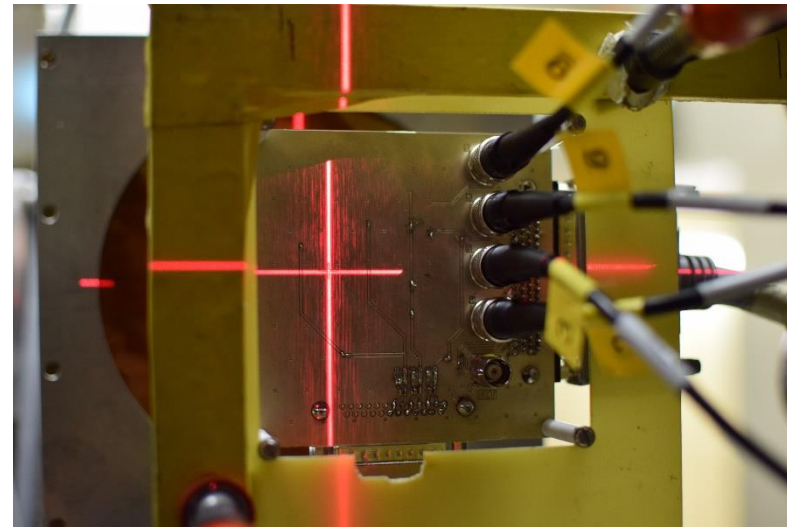
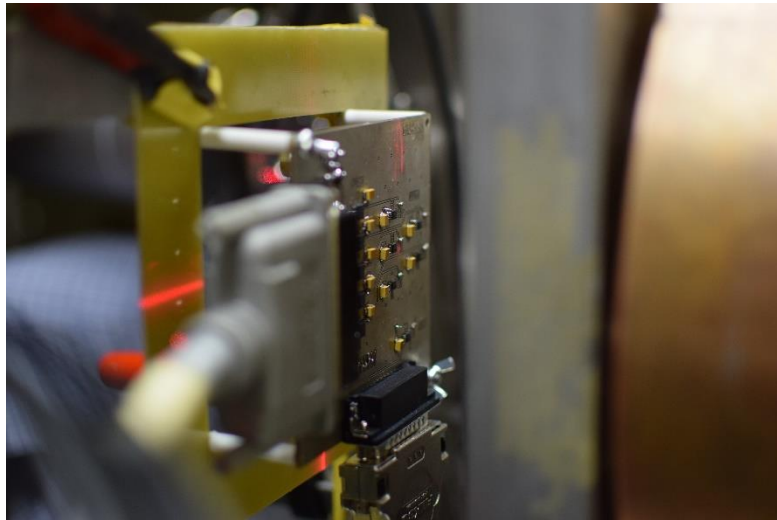
# RADWG Mandate



- It provides **support** to the accelerator sector equipment groups for the assessment of radiation tolerance of electronic equipment to be installed in radiation exposed areas.
- It is as a **forum** for electronic engineers to discuss
  - design practices
  - radiation tests
  - radiation induced failures in the accelerators.
- It **coordinates radiation test campaigns** inside and outside CERN
- The RADWG **assists the R2E Project** leader for the evaluation of the technical aspects of the proposed mitigation actions with the representatives of the equipment groups

# Radiation Tests

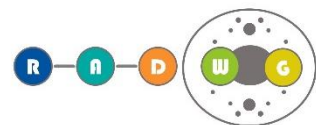
- **71 components tested** under irradiation in the 2018 requested by TE/VSC, TE/EPC, BE/BI, TE/MPE
- **8 PSI-PIF proton** test campaigns
- **5 years collaboration** with PSI to ensure continuity of the radiation tests also during the LS2
- **Radiation test database** available online: <https://radwg-table.web.cern.ch/public/>



# Radiation test campaigns

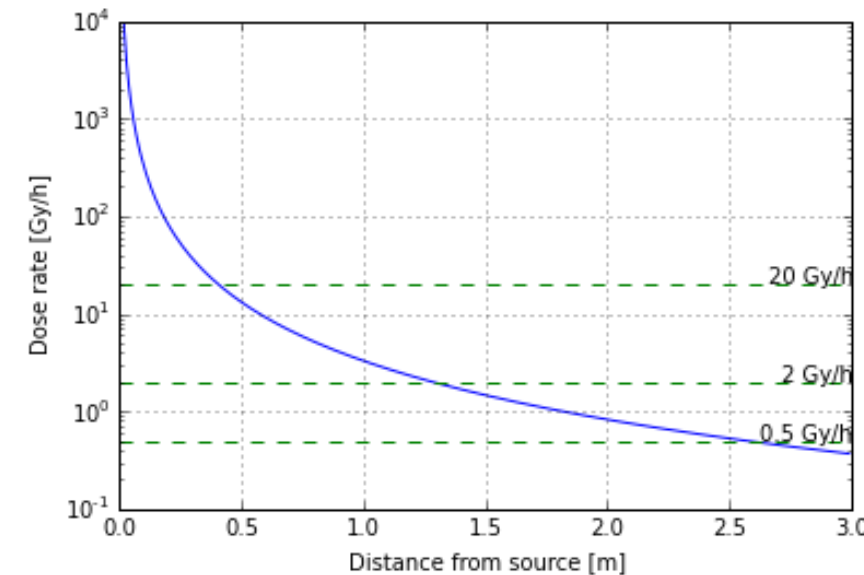
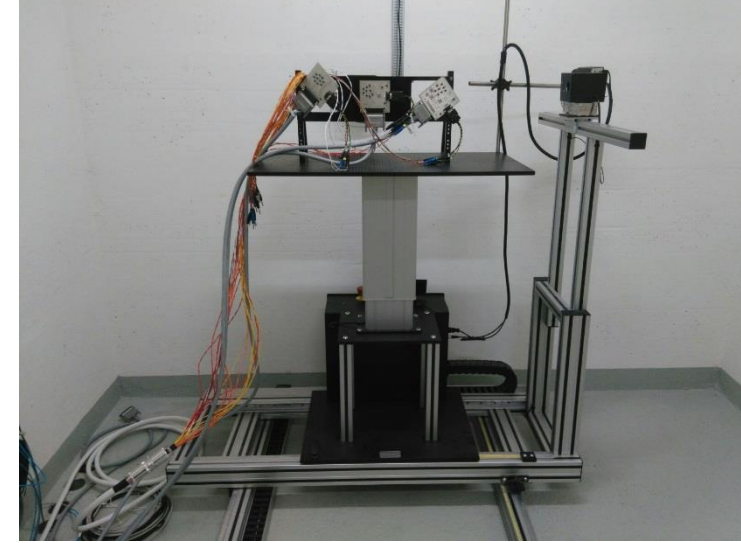
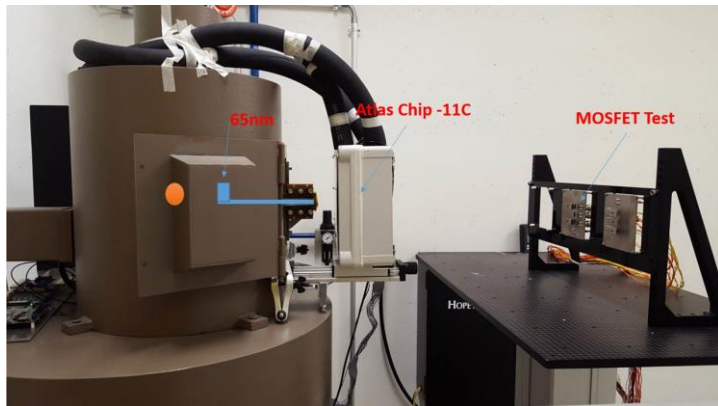
- PSI Facility Updates
  - 2019 Requests open

| Test date | Components   | Test group | Equipment owner                 |
|-----------|--|------------|---------------------------------|
| January   | Sensor calibration, Vacuum components, DCDC Converter from Atlas | EN/SMM     | TE/VSC – EN/SMM                 |
| April     | Voltage regulators, transistors, misc                            | EN/SMM     | TE/VSC , TE/MPE                 |
| May       | Timer, Logic   | EN/SMM     | BE/BI – TE/VSC – TE/MPE – BE/CO |
| June      | Zener Diodes, DAC, FLASH, misc                                   | EN/SMM     | BE/BI – TE/VSC – TE/MPE – BE/CO |
| July      | Logic, Diodes, I2C buffer from Atlas                             | EN/SMM     | BE/BI – TE/VSC – TE/MPE – BE/CO |
| August    | Voltage regulators, RFMos, OpAmp                                 | EN/SMM     | BE/BI – TE/VSC – TE/MPE – BE/CO |
| October   | Sensor calibration, Diodes, FPGA misc,                           | EN/SMM     | BE/BI – TE/VSC – TE/MPE – BE/CO |
| November  | Lot qualification, ADC, Vreg , MCU                               | EN/SMM     | BE/BI – TE/VSC –                |



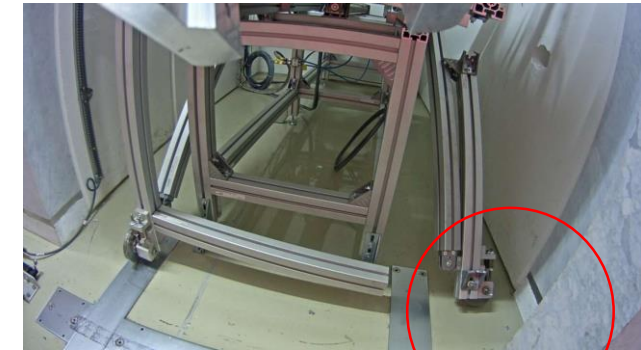
# $^{60}\text{Co}$ facility @ CERN

- Reminder: dose rates from 20Gy/h up to 0.36Gy/h
- Inside the irradiator setup: 300Gy/h to 100Gy/h on a small surface
- Past Users:
  - Kurtis Johnson (31 May to 16 Aug)
  - Rudy Ferraro (16 Aug to 10 Sept)
  - Joan Cesari (multiple tests)
  - Matteo Brucoli (15 June to 22 June)
  - Atlas FPGA TID testing
  - Dosimeter characterization
- Planned tests: DC/DC converter
- Call for tender for the new source of 100TBq completed.
- Installation next year
  - Modification of the irradiator might be necessary
- The new source can allow us to reach 1MGy in 20 days on 4x4 cm. Larger sample size will require more time.



# CHARM Facility

- **Fully booked for the 2018**
- **Last day with protons 11/11/2018**
- More than **50 users** (2x 2017) from CERN and external institutes
  - Reports available online : <http://charm.web.cern.ch/content/radiation-test-report>
- Problem on the target solved in two weeks with the help of the EN-STI and Robotics intervention
  - All the users have been re-scheduled and no beam lost
- **Up to 8 users running in parallel** in different positions (last year was 6)
- **Online dosimetry** using the RadMon system
- **Second ion beam (Lead)** in CHARM during the 2018 started on the 12/11/2018 will end on the 3<sup>rd</sup> of December



# R2E RHA documents

- **RHAPS: Process Structure** → Pure RHA guideline which gives information about the process and guides the user through the design and qualification methodology
- **RHAPV: Project Validation** (new project) → report of the project information, radiation environment, radiation tests [linked to Engineering Change Request]
- **RHACD: Check document** (existing equipment) → report the cards changed and if they are conform with the RHAPS

## New Developments

- Have to follow a radiation assurance procedure RHA
- The criticality needs to be assessed
- The system has to be tested in a representative radiation environment

## System already installed

- Their fault rate should be assessed
- The relocation should be notified
- The integration document will have a field pointing at the RHA document
- Any system change should be notified



# RHAPV – Project Validation

- Example: GEFE BPM FE system

|   |  |                      |
|---|--|----------------------|
| CERN CH-1211 Geneva 23 00000000<br>EDMS NO. 0000000 REV. 0.0 VALIDITY DRAFT<br>REFERENCE XXXX<br>Engineering Department<br>To be sent to: <a href="mailto:scr.ENDEPT@cern.ch">scr.ENDEPT@cern.ch</a> Date: 201x-xx-xx   |  |                      |
| <b>Radiation Hardness Assurance Protocol Document</b><br><b>GBT-based Expandable Front-End (GEFE)</b><br>Brief description of the project(s):   |  |                      |
| EQUIPMENT CONCERNED:  | DRAWINGS CONCERNED:  | DOCUMENTS CONCERNED: |
|   |  |                      |
| PE IN CHARGE OF THE ITEM:<br><input type="text" value="Name"/>  | PROJECT LEADER:<br><input type="text" value="Name"/>   |                      |
| DECISION OF THE PROJECT ENGINEER:<br><input type="checkbox"/> Rejected.<br><input type="checkbox"/> Accepted by the Project Engineer,<br>no impact on other items.<br>Actions identified by the Project Engineer:<br><input type="checkbox"/> Accepted by the Project Engineer,<br>but impact on other items.<br>Comments from other Project Engineers required.<br>Final decision and actions by the Project Management. | DECISION OF THE PROJECT LEADER:<br><input type="checkbox"/> Rejected.<br><input type="checkbox"/> Accepted by the Project Leader |                      |
| DATE OF APPROVAL:   | DATE OF APPROVAL:  |                      |
| ACTIONS TO BE UNDERTAKEN:<br><input type="text" value="ACTIONS"/>   |  |                      |
| DATE OF IMPLEMENTATION: <input type="text" value="DATE"/>   |  |                      |

|  |   |
|--|---|
| <b>1. PROJECT DESCRIPTION</b><br>1.1.1 TECHNICAL REQUIREMENTS AND MAIN SPECIFICATIONS<br>1.1.2 ARCHITECTURE<br>1.2 CRITICALITY | <b>Equipment group</b>                          |
| <b>2. RADIATION ENVIRONMENT</b>  | <b>MCWG chair</b>                               |
| <b>3. RADIATION TESTING</b><br>3.1 COMPONENTS LIST AND CRITICALITY<br>3.2 RADIATION TEST AT COMPONENT LEVEL                    | <b>Radiation test service</b>                   |
| <b>4. RADIATION TEST AT SYSTEM LEVEL</b>   | <b>Equipment group + Radiation test service</b> |
| <b>5. FINAL SUMMARY</b><br><b>6. COMMENTS</b>  | <b>R2E project leader</b>                       |

Document template available on [EDMS \(2028777\)](#)