

Radiation tests as a service, database and know-how

Salvatore Danzeca EN/SMM-RME



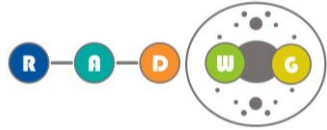
ENGINEERING
DEPARTMENT



Radiation test as a service

- Radiation testing requires:
 - Knowledge of radiation effects on electronic
 - Tests setup
 - Instrumentation
 - Facilities
 - Result comprehension and reporting
- Mandate:
 - reduce and help the equipment group to lower the burden of the radiation test by giving the support as a service in the Radiation Tolerant and Measurement Electronics (RME) section
 - still keep high the knowledge sharing and the collaborations

Radiation test service

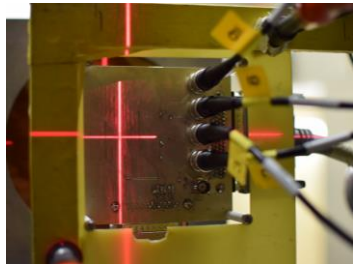


Database and Publication

The results are collected, stored and in EDMS and published in the RADWG database to allow an easy research of the best candidates for the new radiation tolerant designs

Result analysis

The results are analyzed during and after the tests for each components considering the end application and the possible operational issues



Request collection

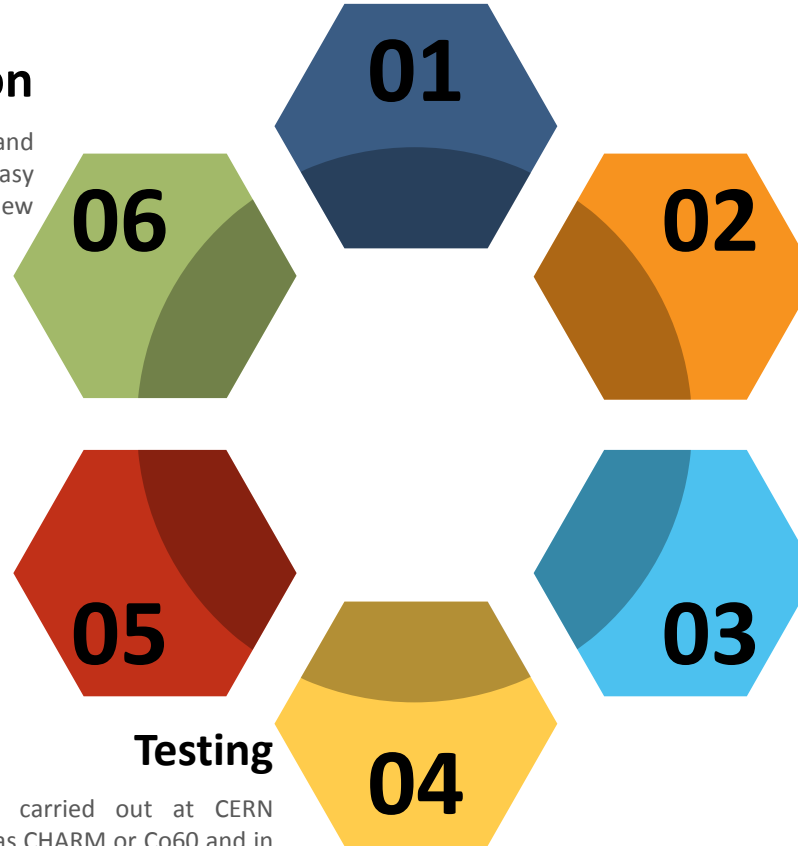
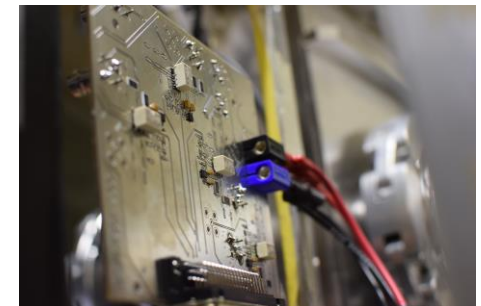
The request for radiation testing are collected and processed selecting the most suitable methodology and facilities

Test planning and structure

Each component/system is analyzed and all the possible radiation effects are taken into account for planning the test and structure it

Board and instrumentation preparation

For each component a dedicated set of test board is prepared and the associated instrumentation is chosen to face the complexity of the radiation test



Testing

The test are carried out at CERN facilities such as CHARM or Co60 and in external facilities. The transport, personnel and instrumentation are selected considering the peculiar aspect of each facility

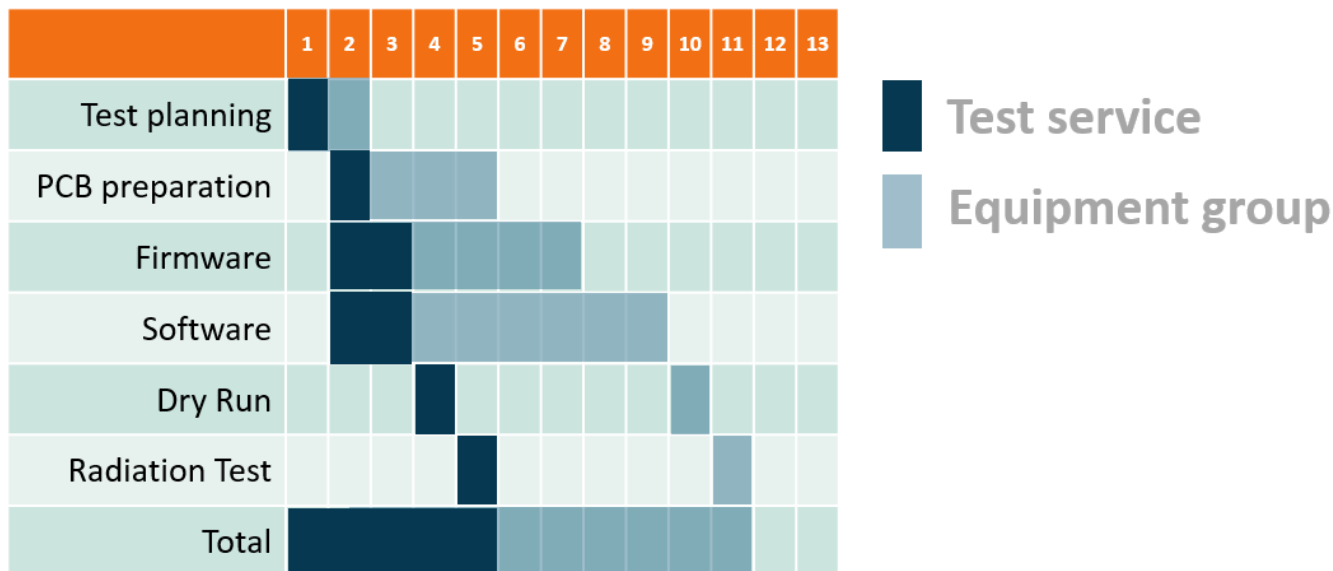


7/9/2018

Radiation tests as a service, database and know-how

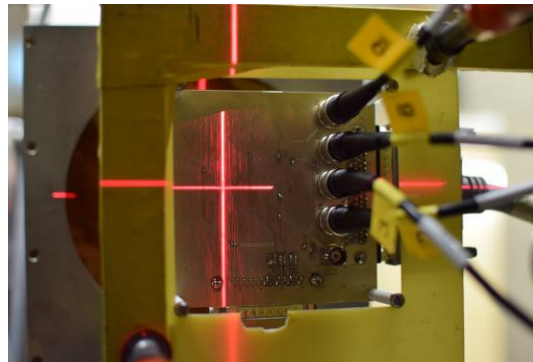
Time to results – T2R

- The equipment groups in parallel to their normal activities would take a non-affordable time to obtain radiation test data
- Radiation test service prepare and carry out the tests in less time and more effectively
 - The test service is able to face more than 10 radiation campaigns in a year
- Total time for the preparation could be 2-3 weeks if similar components have been already tested.



How?

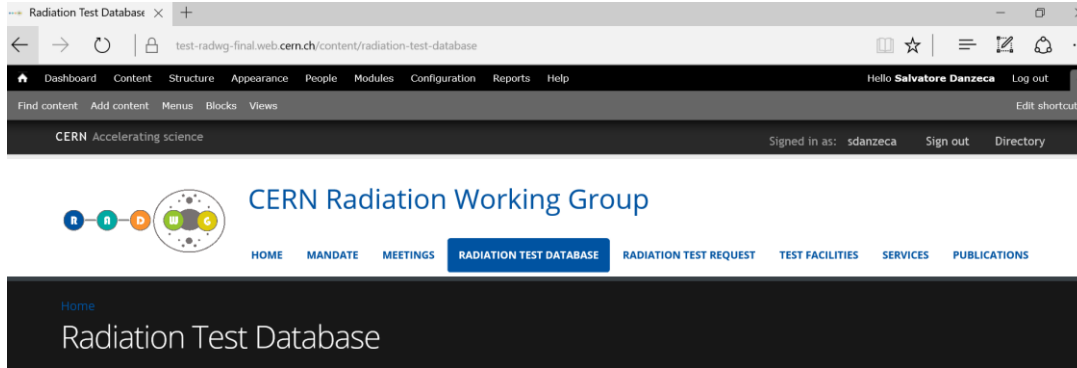
- Acquired know-how and development of standard test structures and instrumentation to be used allows a test every month on new devices
- Tests are not limited to the requested parameters monitoring but general parameters are measured to be as general as possible and allow other users to verify the suitability of the devices for their purposes.
- Key points:
 - Ability to produce test cards within a week
 - Ability to quickly develop firmware and software suited for the tests
 - Availability of high-end instrumentation to face the most difficult task (i.e fA measurements under irradiation, Single Event Transient)



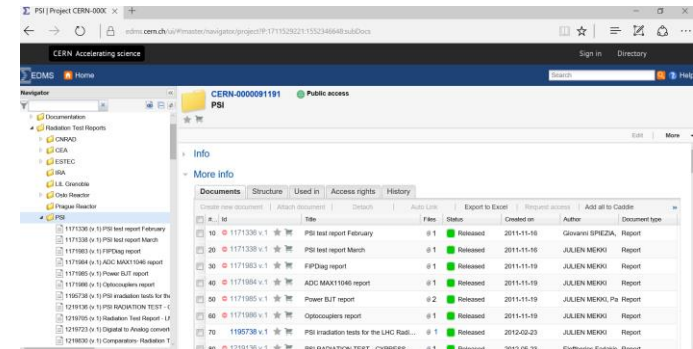
Test results and reporting

- The service produces reports in a common template for all the components tested
 - Test reports template ensure a coherent reporting
- The service maintains two databases accessible by all the equipment groups
- Radiation test results are reported also via the Radiation Working Group

<https://test-radwg-final.web.cern.ch/>



<https://edms.cern.ch/ui/#!master/navigator/project?P:1711529221:1382953417:subDoCS>



DC-DC converter tested in 2017

Name	V _{IN}	V _{OUT}	Absorbed Dose [Gy]	Output Power
TMH 0512D	6.54V	+12V , -12V	1400 (without failures)	2W
TMR 9-4822WI ₁	65V	+12V , -12V	280	9W
TMR 9-4822WI ₂	33V	+12V , -12V	170	9W
TMR 2422	33V	+12V , -12V	655	2W
THD 10-4822N	65V	+12V , -12V	310	10W
TEN 8-4822WI ₁	65V	+12V , -12V	570	4W
TEN 8-4822WI ₂	33V	+12V , -12V	120	4W
TMR 6-4822WI ₁	65V	+12V , -12V	190	3W
TMR 6-4822WI ₂	33V	+12V , -12V	280	3W
TMR 6-2422	33V	+12V , -12V	55	3W

Conclusions

- The radiation test service has the mandate to provide radiation test data to the equipment groups developing rad-tolerant design
- The radiation test service covers all the steps for a radiation campaign, from the test specification up to the reporting.
- Tests are carried out to be more general as possible in order to create the common building blocks that can be re-usable by many other equipment
- The two databases with the radiation test data are maintained to be the reference for all the CERN
- DC/DC modules and/or discrete components can be tested relatively quickly



ENGINEERING
DEPARTMENT

Thank you