



AIDA²⁰²⁰

Advanced European Infrastructures
for Detectors at Accelerators

AIDA-2020 - WP12

Detector Characterization Facilities

WP12 Summary

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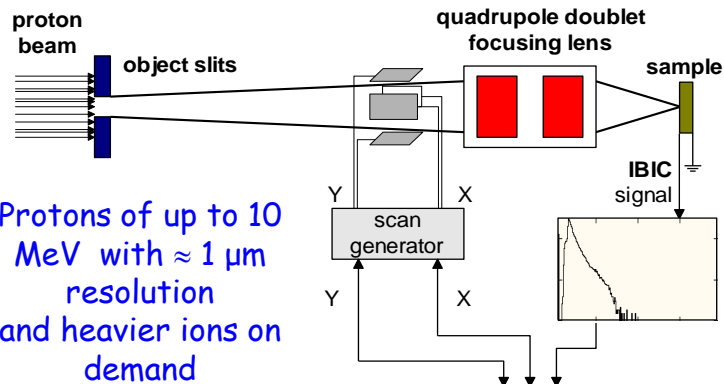


- 1. INTRODUCTION
- 2. TA RBI ACTIVITY
- 3. TA EMC ACTIVITY
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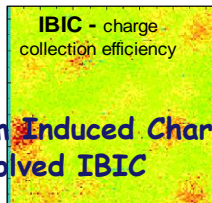


1. Introduction

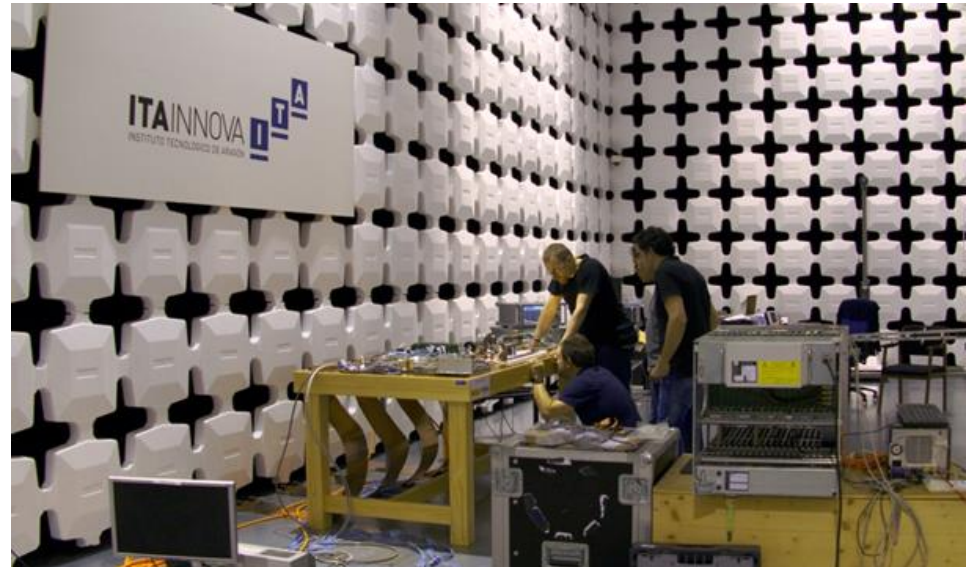
- The WP12 Transnational Access is focused on special detector and system characterization
- It covers two different types of characterization.
 - The multi-MeV ion micro-beam at Rudjer Boskovic Institute (**RBI**) in Croatia for detector **radiation characterization (sensors and ASICs)**
 - Electromagnetic Compatibility Laboratory of Instituto Tecnológico de Aragon (**ITAINNOVA**) in Spain for **EM noise characterization.**



Ion microprobe:



IBIC = Ion Beam Induced Charge images
TRIBIC = Time Resolved IBIC





- At RBI Facility users have performed different radiation tests on sensors and ASICs
 - Studies in vacuum and in-air IBIC imaging of charge collection properties using protons (1 μm resolution) and heavier ions
 - Time resolved IBIC (TRIBIC - lateral and frontal)
 - Performed real-time controlled damaging of detectors/detector-materials using protons or heavier ions using a microprobe
- 4 experiments per year have been planned under the project.
- 640 AU have been estimated

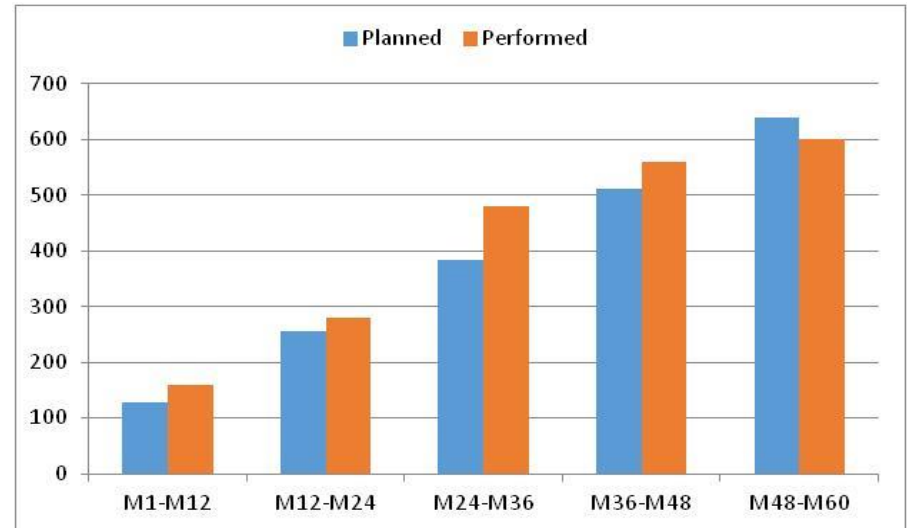
IBIC = Ion Beam Induced Charge
TRIBIC = Time Resolved IBIC



2. TA RBI activity

- 15/17 TA-WP12.1 accesses have been completed – 600 AU
 - TA-RBI – (94 % AU - Completed)

RBI	User Projects		Total users	TA units
	Submiss.	Selected		
M1-M48	18	17	30 (23)	600
M1-M48	16		24	640

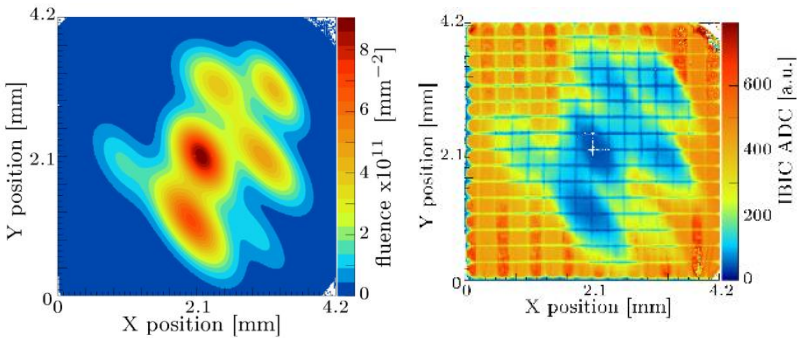


- 15 projects completed (two cancelled by the users and one could not be selected due to the coronavirus situation in Europe)
- Users from 9 countries benefited from TA experiments:
 - Austria, France, Germany, Greece, Italy, Serbia, Spain, Swiss, UK.



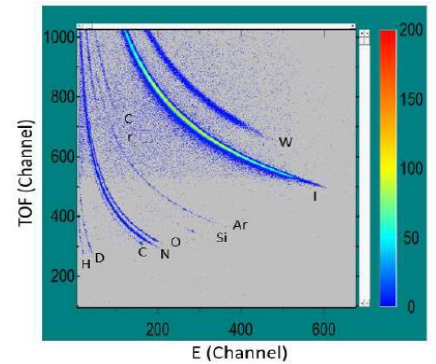
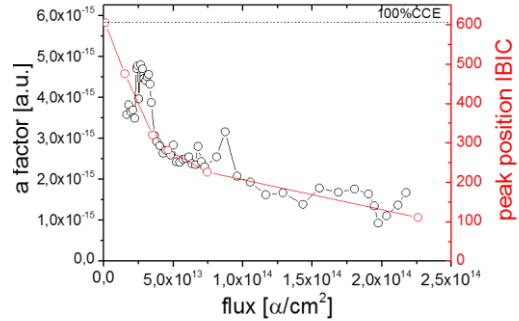
2. TA RBI activity

- Many different characterization tests has been performed.
- They have provided **useful information.**

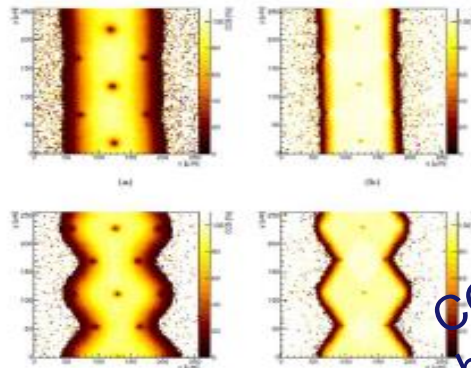
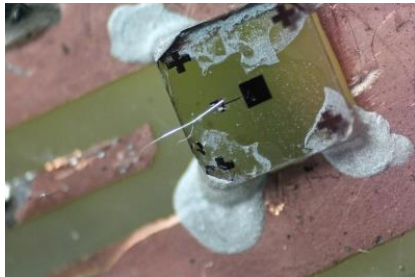
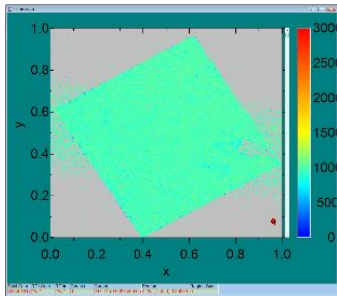


Radiation damage studies on scCVD diamond strip detector

Diamond Membranes for Radioisotope Batteries BATDiam



Time of Flight Elastic Recoil Detection Analysis (Thin film layers)



CCE maps for different biases and geometries

IBIC characterization of SC diamond based Schottky diodes for **microdosimetry applicator**



- The activity has produced several publications
 - 10 papers have been published
 - 13 Contributions to Conferences (13 oral)
 - 3 OnTrack
 - 13 PhD Thesis & 1 MsC Thesis
- Things that have worked very well
 - Preliminary discussions with users
 - Project extension has been very useful
 - Very positive collaborations established with users continuing even after the end of AIDA2020
- Things that have not worked very well
 - TA has been well organized but the issue of open access publications has not been solved in organized way.



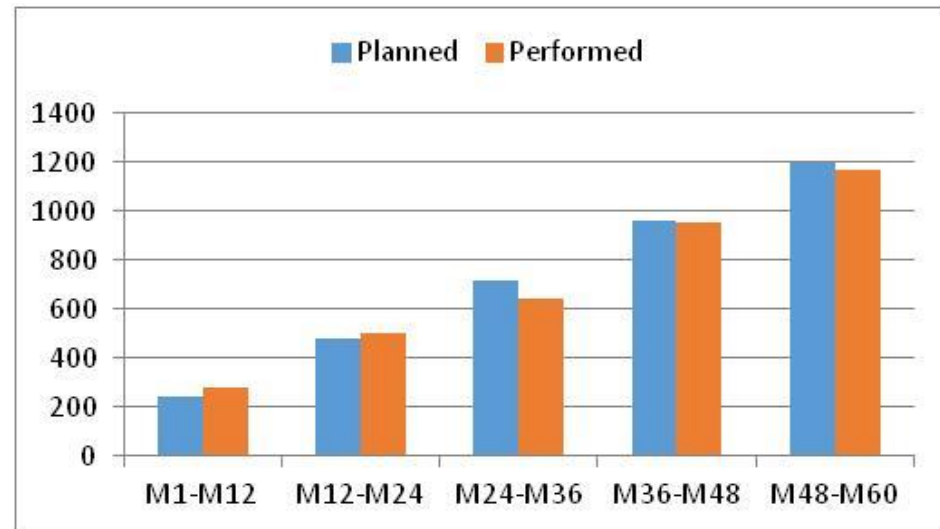
- These tests may be used to define in any electronic device installed in physics experiments:
 - EM noise emission and immunity levels
 - Filters designs & grounding configurations
- 2-3 Experiments expected per year have been planned under the project.
- 1200 AU have been estimated:
 - 8 standard accesses ~ 50 AU per access
 - 4 extended accesses ~ 200 AU units per access



3. TA EMC activity

- 7/8 TA-WP12.2 accesses have been completed – 1165 AU
 - TA-ITAINNOVA – (97 % AU - Completed)
 - Only 7 % of the budget has been used for user support
- Most of the access has been extended access (6/7)
 - Only one standard access

ITAINNOVA	User Projects		Total users	TA units
	Submiss.	Selected		
M1-M48	8	8	15 (3)	1165
M1-M48	12		12	1200

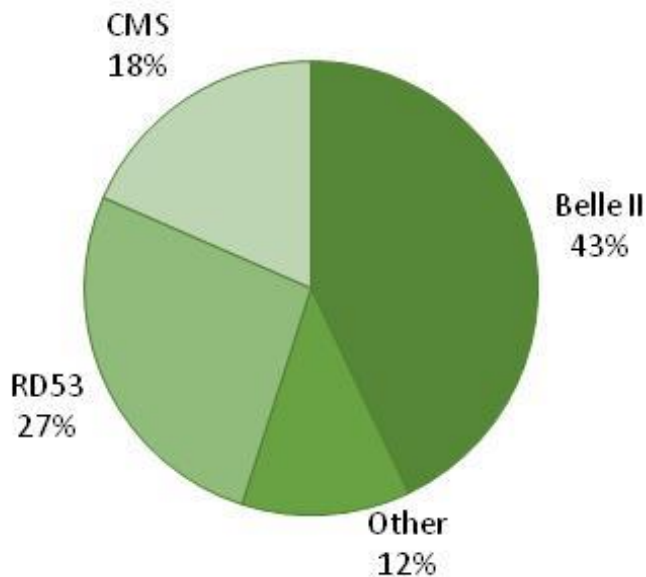


- One access has been cancelled by the users

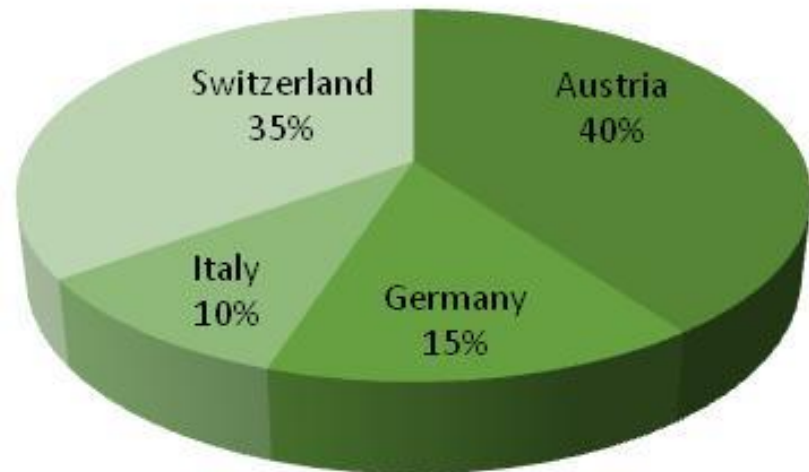


3. TA EMC activity

- TA-EMC has given support for different R&D activities
 - Experiments, ROCs & equipment (electronic RAD dosimeters)
 - Belle II, RD53 (CERN) and Elettra Synchrotron
- Users from 7 countries have benefited from TA-EMC



User distribution per country of home institute



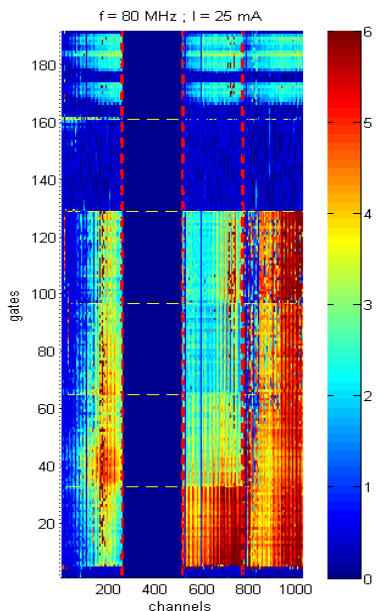
Access units distribution per project family



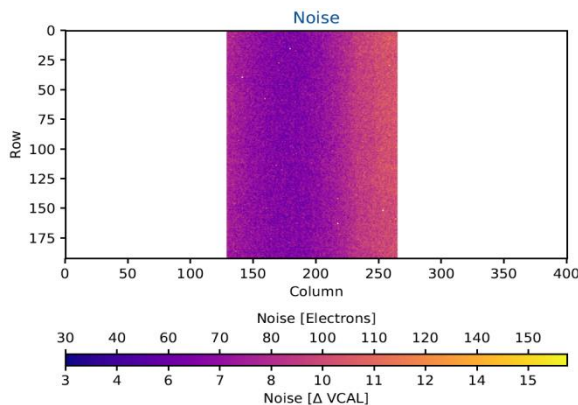
3. TA EMC activity

- Many different EMC characterization tests.
- They have provided useful information.

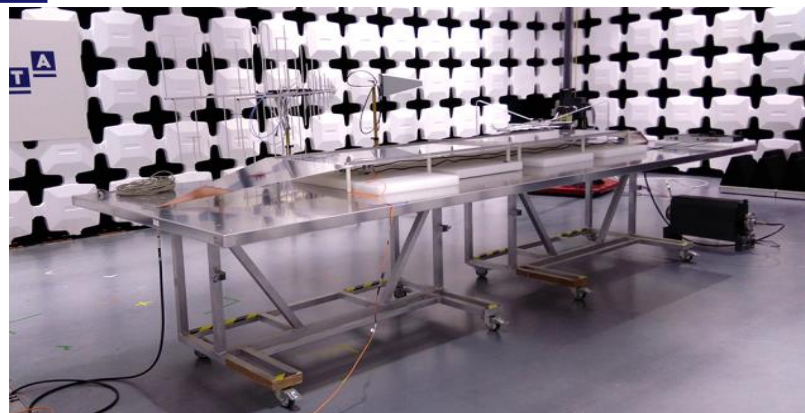
DOSFET-L02 test setup
(E-field 1.4 KV at 20 MHz)



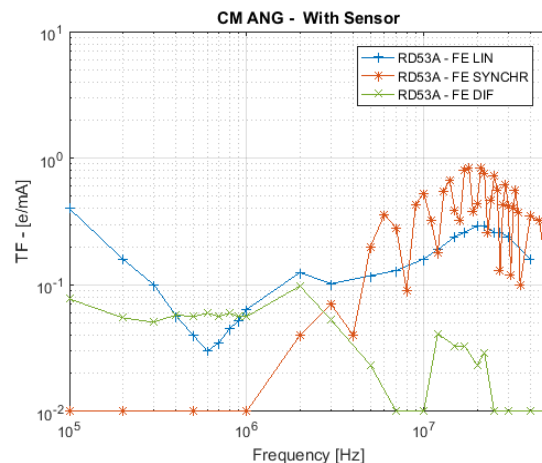
Noise distribution
Belle II
pixel detector
(Sensor mapping)



CMS-IT-HDI 2x2
Noise distribution



RD53A ROC
Susceptibility
curves





- The activity has produced several publications
 - 4 papers have been published on peer – reviewed publication
 - 5 Contributions to Conferences (4 oral & 1 poster)
 - 3 OnTrack
 - 1 PhD Thesis (Based on AIDA-2020-EMC-2016-1-EMC)
- Things that have worked very well
 - Preliminary meetings with users
 - We have given long support after test campaigns
 - Not covered within AIDA2020 but very useful
- Things that have not worked very well
 - Small EMC test - Short access not very well known.
 - EMC test depends a lot on electronics development (delays)
 - To book some AU for future access



- TA-WP12 access has been “completed” – 96%
 - TA-RBI – (94 % Completed) & TA-ITAINNOVA – (97 % - Completed)
- More than 22 projects have been selected and more than 45 users have benefited from TA support (11 different countries)
 - Several of them have been supported during the test camping
- WP12 - TA have shown to be a primary tool for R&D for future detector technologies
- TA-WP12 activities have produced several papers and conference contributions (>40)
- Although both TA-RBI & TA-ITAINNOVA are new , they have been a complementary tool to give support to detector development
 - Some R&D activities have benefited from different types of TA access