



AIDA²⁰²⁰

Advanced European Infrastructures
for Detectors at Accelerators

AIDA-2020 - WP12.2 : Detector Characterization Facilities EMC characterization

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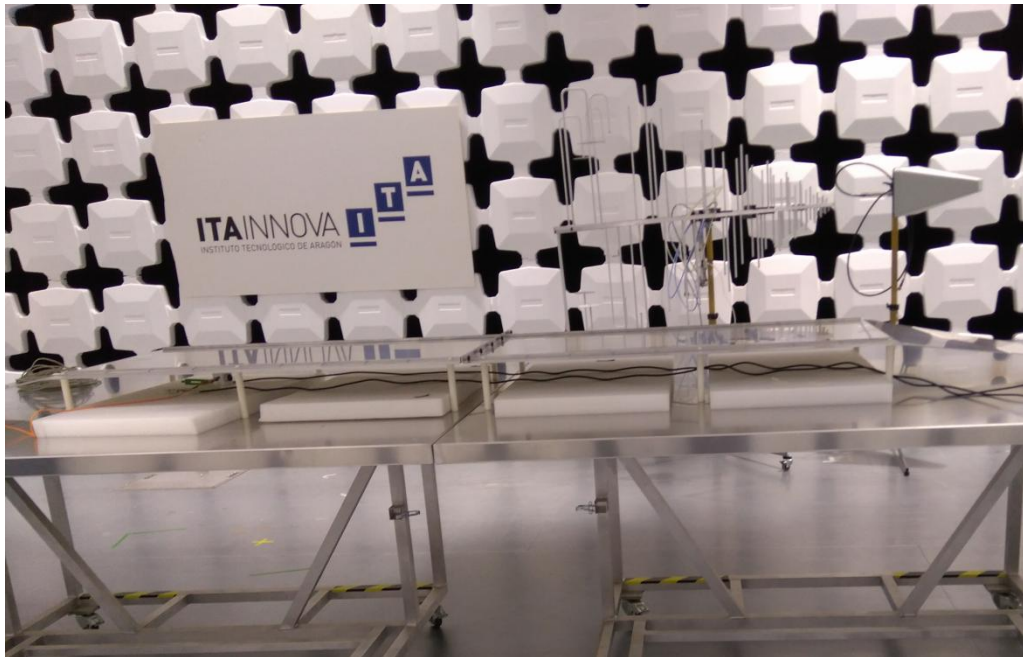
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- 1. INTRODUCTION
- 2. TA EMC ACTIVITY
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- 4. FUTURE ACTIVITIES
- 5. SUMMARY



- The WP12 Transnational Access is focused on special detector and system characterization (**NEW FACILITIES**)
- WP12.2.- EMC Laboratory of Instituto Tecnológico de Aragón (**ITAINNOVA**) in Spain for **EM noise characterization**.



- **EMC facilities allow to perform Electromagnetic Compatibility Test.**
 - Non-standard test (Specially focused on HEP)
 - Standard (According to European Directive 2004/108/EC)



- These tests may be used to define in any electronic device installed in HEP experiment:
 - 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



AIDA 2020

1. Introduction

- **AU are defined as manpower used during the access.**
 - Long access requires 2 persons support
 - Equipment will be handled only by ITAINNOVA staff
 - It has been estimated 10 working hours per day for long access
 - 2 weeks = 50 hours = 200 AU units
 - Standard access estimation has been based on 1 person support.
 - 1 week = 50 hours = 50 AU units
 - These numbers may be different – Each access is different
- **ITAINNOVA TA budget is based on actual cost (NOT access cost)**
 - Manpower used (AU / set-up preparation / test reports ..)
 - % Equipment maintenance
 - $AU \times ((10\% \text{ of annual maintenance budget} \times 4) / 1200)$
 - External trips (only for extended access / 1 person)

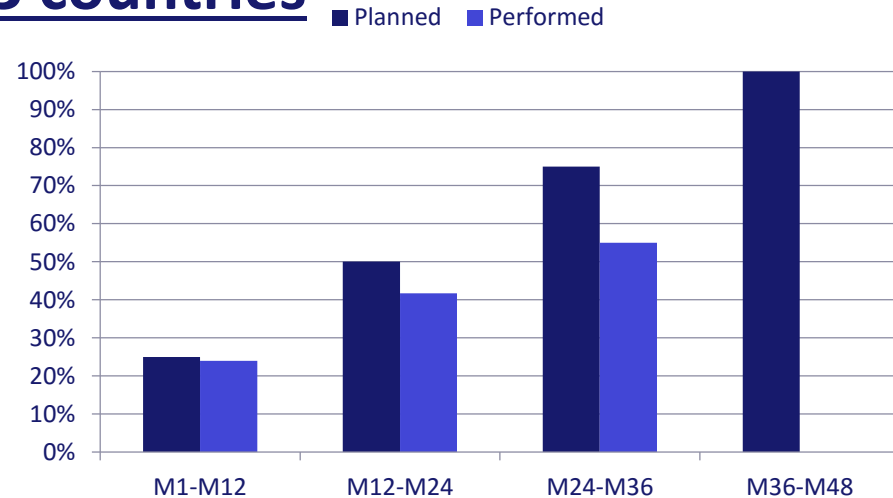


- 5 TA-WP12.2 accesses have been already approved
 - 4 extended accesses (4/4 - 100%) & 1 standard access (1/8 - 13%)
- 4 TA-WP12.2 accesses have been completed
 - AIDA-2020-EMC-2015-01-EMC Studies with the Belle II SVD Readout System , Austria (**240 AU**)
 - AIDA-2020-EMC-2015-02–DC-DC converters noise emissions for Belle II SVD System, Austria (R) - (**40 AU**)
 - AIDA-2020-EMC-2016-1-EMC characterization of Belle II Pixel System, Germany (**220 AU**)
 - AIDA-2020-EMC-2017-2-Electromagnetic compatibility characterization of the DOSFET, Italy (R) (**140 AU**)
- 1 proposal is still pending (Delayed to mid 2018)
 - AIDA-2020-EMC-2017-01 - Electromagnetic compatibility characterization of the new neutron spectrometer CYSP , Italy



- 4 TA-WP12.2 accesses have been completed
 - TA-ITAINNOVA – (54 % AU - Completed)
 - (Only 10% of the budget has been used for trips – around 6k€)
- Access has been requested from **3 countries**
 - Germany, Austria and Italy

ITAINNOVA	User Projects		Total users	TA units
	Submiss.	Selected		
M1-M36	5	5	10 (2)	640
M1-M48	12		12	1200



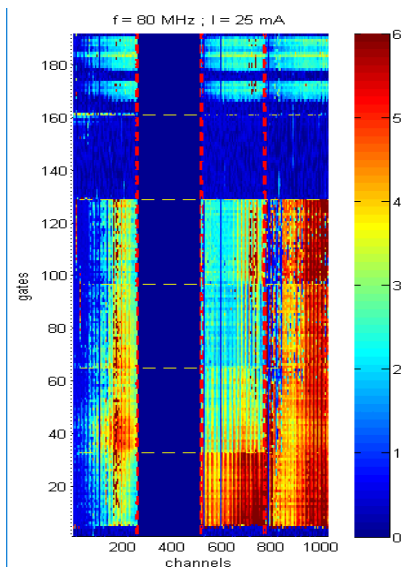
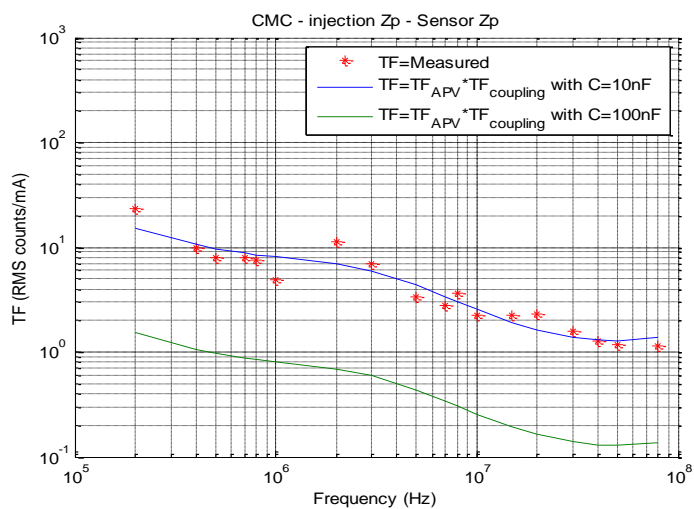
- The activity has slowed down during the last year
 - It is mainly motivated for a delay on prototypes development.
 - One of the test has been postponed to mid 2018



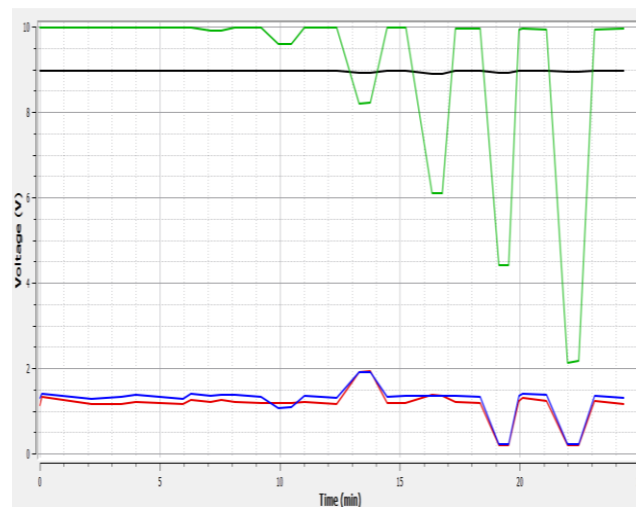
• Communities – Belle II and Electra synchrotron

- Pixel detectors
- Silicon μ -strips detectors
- Electronics dosimeters

Susceptibility curves of Silicon μ -strips detectors



Noise distribution of pixel detector



Channel degradation of an electronics dosimeter
(E-field 1.4 KV at 20 MHz)



- **PUBLICATION (6)**

- **2 papers have been published**

- ✓ **Journal of Instrumentation**, “*EMC Studies for the Vertex Detector of the Belle II Experiment*”, JINST 11 (2016) 01, C01044.

- ✓ **IEEE publication** “*Analysis and quantification of coupling mechanisms of external signal perturbations on silicon detectors for particle physics experiments*”, DOI: 10.1109/AeroEMC.2016.7504574

- **4 Contribution to Conferences (3 oral contributions & 1 poster)**

- ✓ **Topical Workshop on Electronics for Particle Physics**, TWEPP 2016 (Sep. 2015, Lisbon)

- ✓ **ESA Workshop on Aerospace EMC**, Valencia, May 2016

- ✓ **Linear Collider Vertex Detector Workshop 2017**, Ringberg , Germany, May 2017

- ✓ **The 26th International Workshop on Vertex Detectors**, Las Caldas (Asturias), Spain, Sep 2017

- **OnTrack**

- ✓ 2 contribution to On Track already done

- ✓ One will be presented soon based on the last test camping.



- It is plan to perform the EMC characterization of CYSP in the near future (Milano, Italy) - Planned 2018
- Future activity will be mainly focused on LHC upgrades
 - It has been planned to perform EMC tests on CMS and ATLAS upgrades.
 - ✓ SCC – RD53A Chips (ATLAS & CMS) – Planned 2018
 - ✓ Full serial powering chains for CMS and ATLAS are under discussions (2019)
 - Most of the future access will be extended access
- Extension of the project will be very useful for upgrades communities
 - Specially to perform EMC characterization on final prototypes.



- WP12.2 TA has slowed down during the last year
 - TA-WP12.2 – Actual status 54 % (640 /1200 TA units)
 - Some of access planned have been delayed
- Most of the requested accesses have been full EMC characterization
 - We have already covered the 100% of what we have planned
 - It will not generate any problem due to the low demand of standards access.
- TA activity has generated several publications, conference talks, posters as well as a Thesis (it is on going)
- It is expected to speed it up during second part of the year (and during 2019)
- Extension of the project will be very useful for upgrades communities