

# EnsarRoot: The framework for simulation and data analysis for ENSAR

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IGFAE 



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# Outline

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- 1 Introduction: the ENSAR Project and FairRoot
- 2 EnsarRoot Description
- 3 Present Developments
- 4 Other users cases

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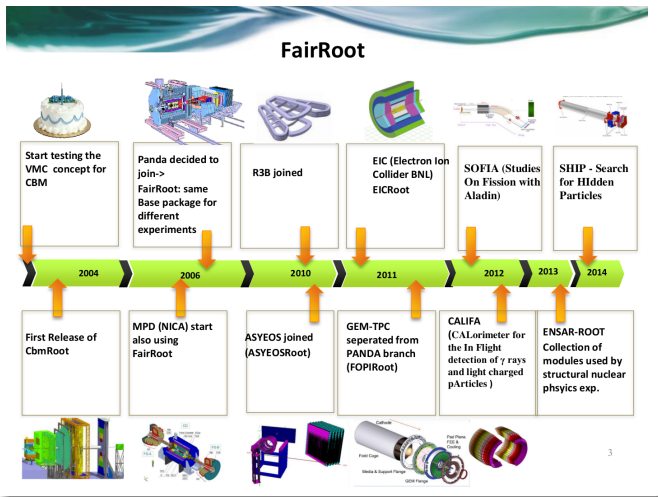
# The ENSAR Project

## European Nuclear Science and Applications Research



- ENSAR2: second phase of the project  
<http://www.ensarfp7.eu/>
- JRA in ENSAR: SiNuRSE / SATNuRSE (2nd phase)  
<http://igfae.usc.es/satnurse>
  - Simulations and Analysis Tools for Nuclear Reactions and Structure in Europe
  - EnsarRoot is started in SiNuRSE, and continues in SATNuRSE

# FairRoot *community* time line



# What is a framework like FairRoot?

- The purpose of a framework is to improve the efficiency of creating new software
- Reuses code that has been pre-built and pre-tested increasing the reliability of a new application and reduce the programming effort
- In short: simple, adaptive, flexible

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## EnsarRoot: Definition

Simulation and data analysis framework adopted for small/medium scale nuclear and particle physics experiments

Delivers base classes which enable the users to construct their detectors and analysis tasks in a simple way

Serves as the core where all developments can be implemented



# EnsarRoot: General layout

Code is on its central git repository:

**<https://github.com/EnsarRootGroup/EnsarRoot>**

Uses the FairRoot base libraries

All required external software is in FairSoft with automatic installation on multiple platforms/compilers

# EnsarRoot: General layout

## ROOT Based

- No executables - ROOT steering macros with dynamic libraries
- Input/Output in TFile, TTree, TClonesArray... structures in root files
- TGeo root file format for geometry and navigation
- TEve based event viewer

VMC interface: TGeant3, TGeant4 transport engines

# What the user will find in EnsarRoot?

- A complete set of scripts (macros) and instructions to start simulations and analyse data
- Templates (modules) of different detectors and setups; geometries and digitization
- Fancy event display
- Event generators for different physical cases, e.g.:

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# Some implemented Event Generators

- Standard Ion Generator with Fairlon class interface
- Proton Induced Gamma Emission (PIGE) Generator
- Giant and Pygmy Dipole Resonance Generator
- CRY Generator Interface (Cosmic Ray Air Showers Generator)

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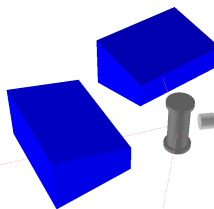
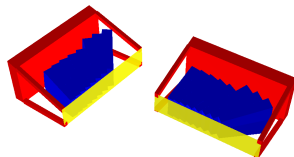
## CsI(Tl) and HPGe detectors implementation



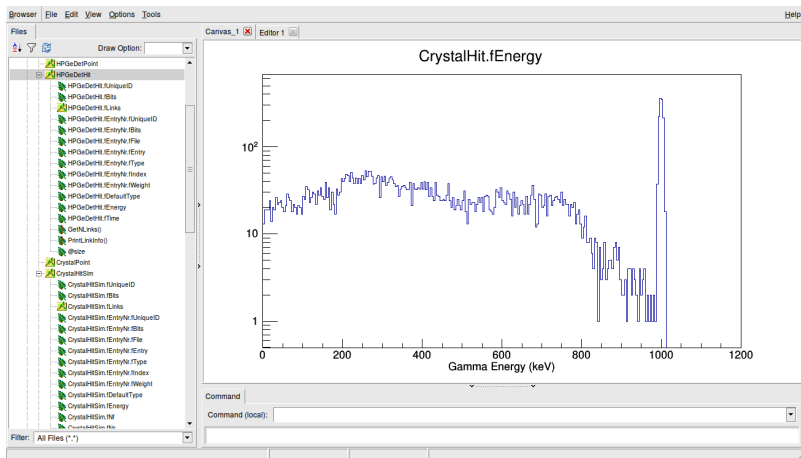
Recent experiment at CTN/IST  
Tandem accelerator in Lisbon,  
Portugal

Implemented in the framework  
for both simulation and real data  
analysis

# CsI(Tl) and HPGe detectors implementation



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# Resistive Plate Chamber detector implementation

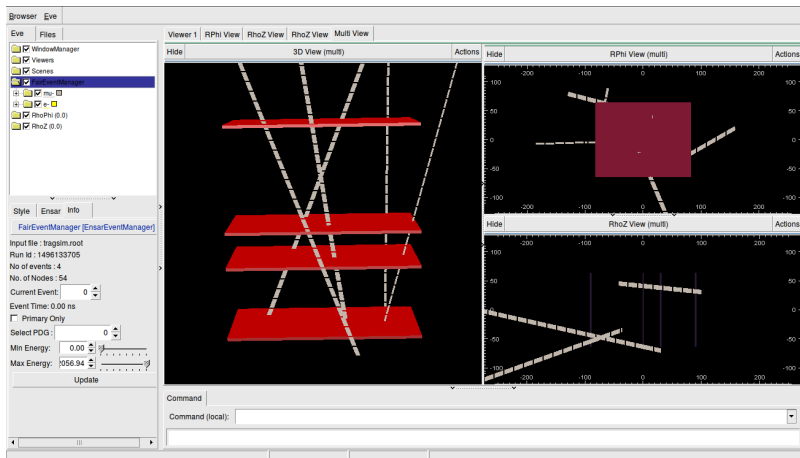


Cosmic Ray Air Showers  
telescope at Santiago de  
Compostela, Spain

Implemented for  
simulation only so far

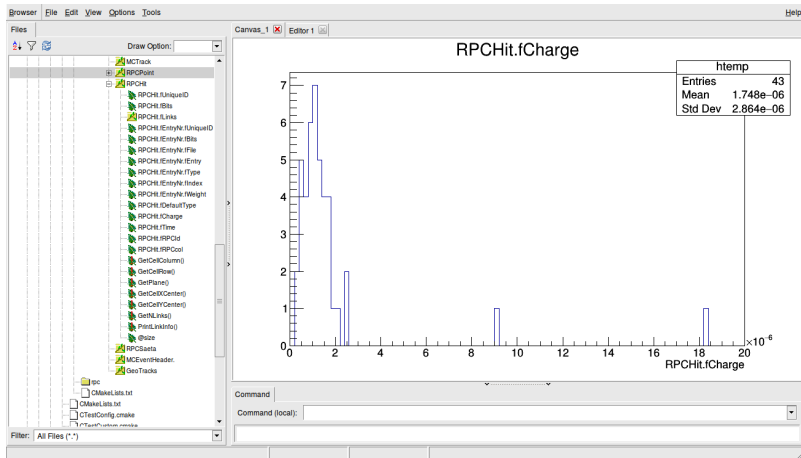


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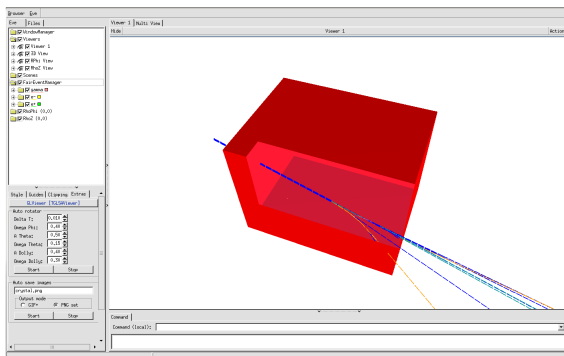


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# Other users implemented cases

## Gamma-ray simulations in nTOF-CERN

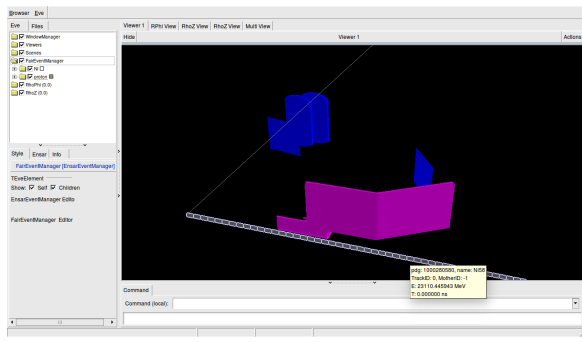
Simulation of gamma flash measurements with scintillator detectors in the nTOF line



# Other users implemented cases

## The E105 experimnt at ESR-GSI

Simulation of parts of the setup: DSSD and Si(Li) detectors  
Event generators: elastic scattering of  $^{56}\text{Ni}$  on  $p$  and  $\alpha$



Thank you for your attention!

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