EnsarRoot: The framework for simulation and data analysis for ENSAR

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Outline

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The ENSAR Project

European Nuclear Science and Applications Research

- ENSAR2: second phase of the project
- JRA in ENSAR: SiNuRSE / SATNuRSE (2nd phase)
  [http://igfae.usc.es/satnurse](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

2004
- Start testing the VMC concept for CBM
- First Release of CbmRoot

2006
- MPD (NICA) start also using FairRoot

2010
- R3B joined
- ASYEOS joined (ASYEOSRoot)

2011
- EIC (Electron Ion Collider BNL) EICRoot
- CALIFA (CALorimeter for the In Flight detection of γ rays and light charged particles)

2012
- SOFIA (Studies On Fission with Aladin)

2013
- SHIP - Search for Hidden Particles

2014
- ENSAR-ROOT Collection of modules used by structural nuclear physics exp.
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 FairIon 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
CsI(Tl) and HPGe detectors implementation
Resistive Plate Chamber detector implementation

Cosmic Ray Air Showers telescope at Santiago de Compostela, Spain

Implemented for simulation only so far
Resistive Plate Chamber detector implementation
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![Graph of RPCHit.fCharge with data statistics: Entries 43, Mean 1.748e-06, Std Dev 2.864e-06]
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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 experiment 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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