SOFIARoot: Simulation of the SOFIA/ANDES Setup

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SOFIA/ANDES is an innovative experimental programme on nuclear fission developed at GSI-FAIR. These experiments provide for the first time complete isotopic yields (nuclear charge and mass) for both fragments over a broad range of fissioning nuclei from ^{238}Np down to ^{183}Hg. Moreover ANDES experiment provides the light charged particles and neutron multiplicities.

SOFIARoot is the simulation tool for the SOFIA / ANDES setups [1, 2] within the FAIRRoot [3] framework, a Root-based software for the simulation and data analysis developed at GSI for the analysis of the future FAIR experiments.

Part of this framework was also inherited from R3BRoot [4] that delivers base classes which allowed to implement detectors and derive simulation and analysis tasks in a simple way. It also supplies some general functionality like track visualization, database support and event structure as well as the full mathematical, histogramming and advance analysis machinery contained in the ROOT classes.

As a data-analysis tool, SOFIARoot allows an event-by-event based analysis, from the unpacking and basic calibration to the final processing of the combined physics observables, following a set of succesive tasks, ruled by user-friendly macros. As a simulation tool (Fig. 1), SOFIARoot supports Geant3 and Geant4 transport engines, interfacing with their geometry constructors. Furthermore the ALADIN magnet field map is included as an interpolation based on field-map measurements. The simulation also provides a constant magnetic field which is described in the macros. The user can switch between the two fields by a simple setup selection in the configuration macros which allow to do a selection without blending or overlapping fields. The detectors (TPC, MUSIC, Twin MUSIC[5], MWPCs and ToF Walls [6]) used in the experiments were also included while LAND detector was exported from R3BRoot.

Calibration and digitization parameters, geometry elements of detectors and other parameters are stored in a run-time database supporting different input/output methods, including ASCII, ROOT binary format and several available databases using SQL lenguage.

The most important of SOFIARoot is that allows the realization of the analysis and simulation under the same platform. The benefits of this approach include the evaluation of the geometrical efficiencies and other systematical uncertainties under the same platform which have already been used for the analysis of [7, 8].

References

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[7] J.L. Rodríguez-Sánchez et al., "Total Fission Cross Sections for Proton-Induced Fission of ^{208}Pb" in this annual report.

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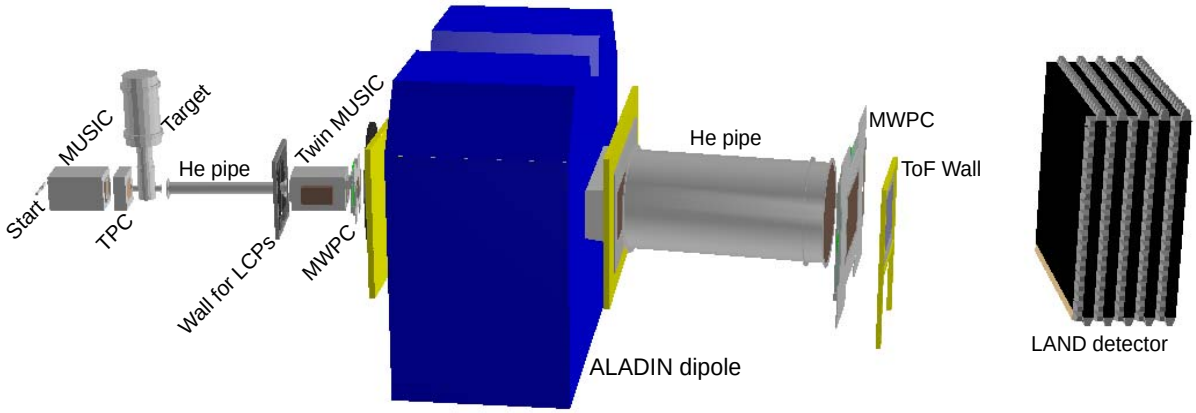

Figure 1: ANDES setup implemented in simulation.