

SOFTWARE

ENGINEERING



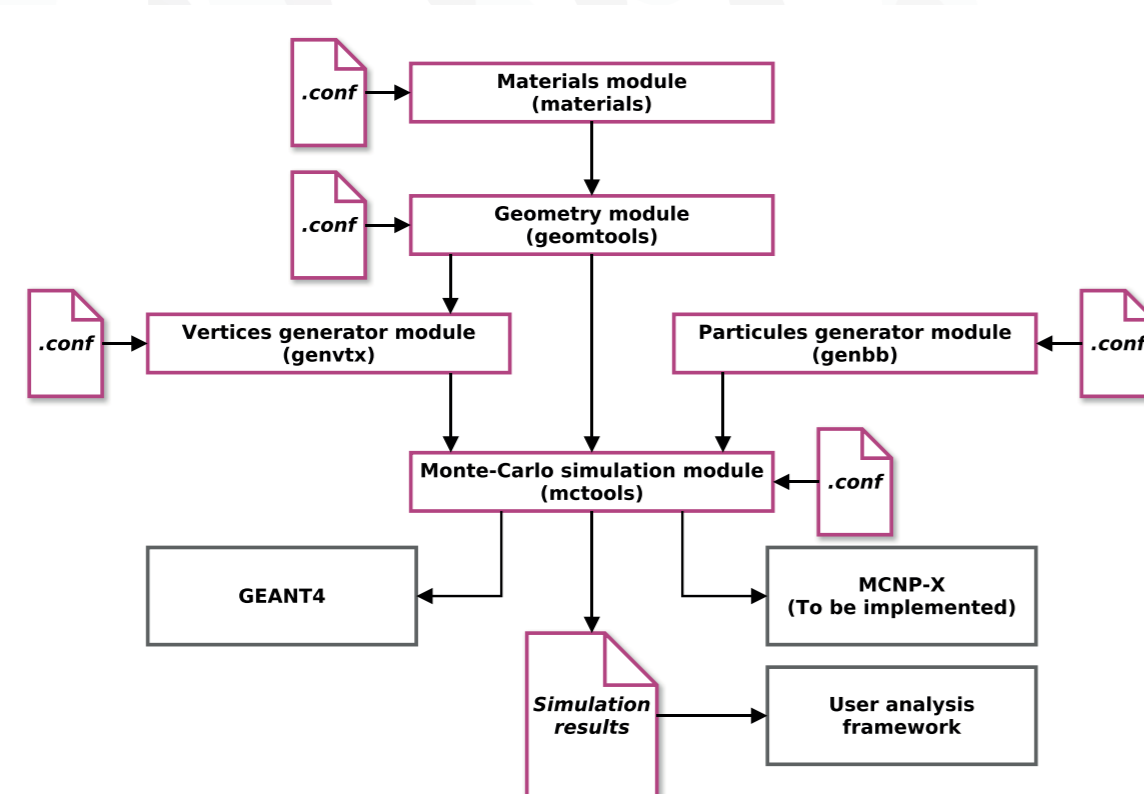
BAYEUX, A GEANT4 BASED SIMULATION TOOL FOR INDUSTRIAL APPLICATIONS

MONTE-CARLO SIMULATIONS FROM PARTICLES TO NUCLEAR PHYSICS

MODELISATION – ESTIMATION – DIMENSIONING

A MODULAR, MULTIFUNCTIONAL AND ACCESSIBLE SOFTWARE SUITE

The Bayeux suite is formed of several modules which have their own specific role : geometry definition, materials description, sources setting, choice of physical parameters, etc.



The simulation module is based on the GEANT4 library (CERN) and allows to spread particles and save their interactions along their path to extract useful microscopic or macroscopic information.

The benefits of Bayeux are many:

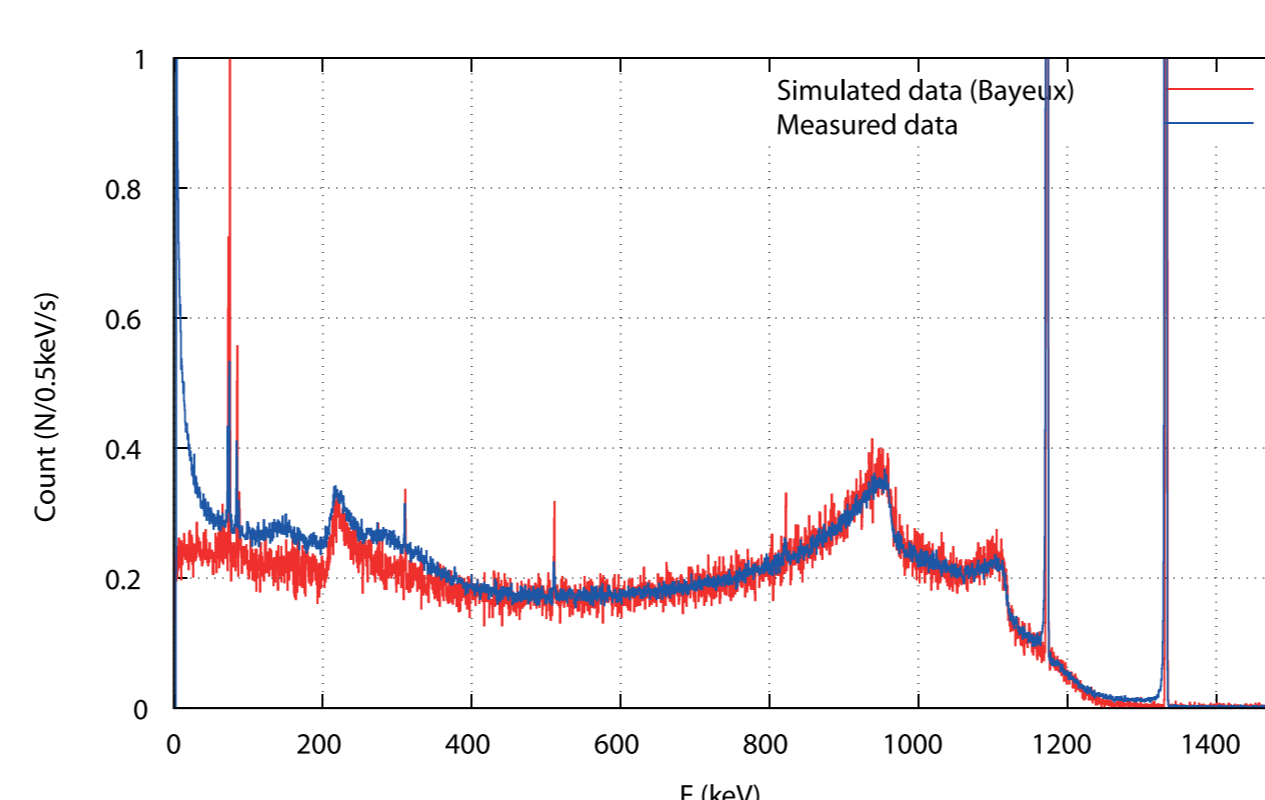
- use of portable and modular text files to configure the simulation
- use of modules to separate tasks : materials, geomtools, genvtx, genbb, emfield & mctools
- possibility to modify or create existing/customised modules in C++
- free software suite, under GPL3 licence, in continuous improvement

A VALIDATED SIMULATION TOOL

Bayeux was initially developed for the SuperNEMO fundamental physics experiment at the LCP Caen (UMR6534, CNRS/IN2P3).

This software is now used for several high precision fundamental physics experiments, it is then naturally validated for the particle and nuclear physics.

Furthermore, the spectrometry of a ^{60}Co source had been done with a high precision germanium detector. Then, the geometry and the characteristics of the experiment were implemented using Bayeux to compute the expected response of the spectrometer with the source.

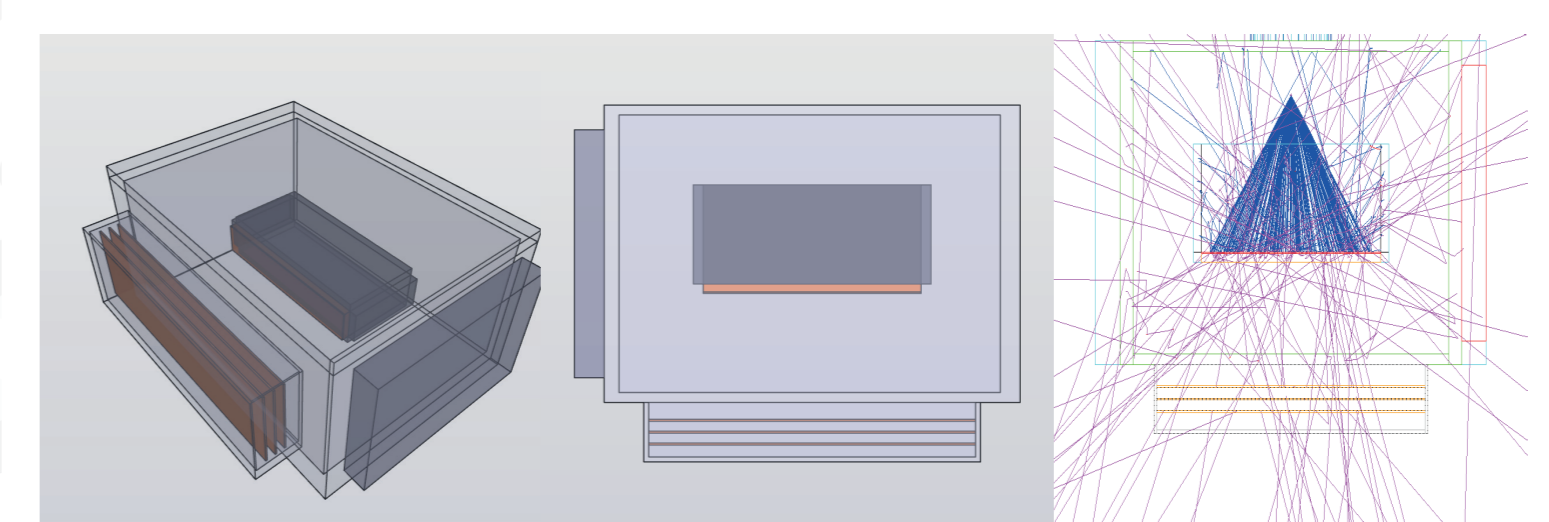


The measured spectrum (blue) and the simulated spectrum (red) are perfectly superimposed, except at low energies where no background noise was implemented.

INDUSTRIAL APPLICATIONS

ATRON is using an electrostatic electron accelerator. The beam had been modeled with Bayeux /GEANT4 for the simulation needs of the company.

In particular, the electron beam (blue) was simulated and stopped on the conversion target in the end of the beamline to compute the generated X-rays (purple). It allowed to develop a parallelepipedic ionisation chamber.



Using a 'variant system' which allows to modify the geometry and other parameters easily, it is possible to reuse this configuration for other simulations, both for ATRON and external companies or laboratories applications.



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