AGATA Simulation Code Status
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Generalities and recent developments

On behalf of the

AGATA Simulation Working Group

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Science & Technology Facilities Council
Nuclear Physics Group

Outline

- **Generalities on the AGATA code**
- **On-going developments**
- **Near-future developments**

Generalities

Latest version of the distributed AC is on gitlab:

- https://*gitlab*.com/*malabi-agata*/agata
- compatible with Geant4.10.7 *and prior versions*
- Should be soon compatible with Geant4 11.

Generalities

Recent additions to the distributed code

(more details in the next 2 talks by S. Chen and I. Xanon/D. Brugnara)

- S. Chen implemented a ROOT interface to the code so that ROOT files generated from external generator (MOCADI) can be used as input file to the simulation and also simulation outputs can be saved into a ROOT file.
- D. Brugnara added a new fork to the repository, which contains new:
  - Ancillary detectors: OSCAR, GALTRACE, MUGAST, S1, large LaBr crystals and the CTADIR cryogenic target
  - Event generators with the possibility to have different angular distributions for different excited states
  - This will be merge later to the master version.
  - Coming soon is some improvement to the simulation of PRISMA Dipole simulation.

Generalities

A new AGATA Simulation workshop is being discussed.

- Some funding is available for this (Emmanuel?).
- Questions: when, where, what, how ?
  - Need support of a local team
  - Need support to run the workshop (lecture+tutorial)
  - What level basic or advanced simulation?
  - Do we couple this with a school on data analysis?
  - If so, then Simulations will need to provide ADF files.
- For me, probably not this year but next year Feb-March should be possible

On-going developments with FairRoot

Implementation of AGATA into FairRoot has started

- As a deliverable of the UK AGATA grant.
- FairRoot is an object orientated simulation, reconstruction and data analysis framework developed and maintained GSI for FAIR experiment.
- It is used by CBM, PANDA, R3B collaborations.
- Functionalities based on ROOT

On-going developments with FairRoot

FairRoot main features:

- **No Executable:**

  Root is the executable, steering macros are called from within root, thus the same macros runs on PC, batch farm or even on the grid!

- **VMC and VGM for simulation:**
  - Running different transport MC's from the same application
  - Geometry is described once and then one can choose between different MC's and different navigations: e.g:
    - G3 Native geometry and navigation
    - G4 Native geometry and navigation
    - G4 Native geometry and Root navigation
    - G4 Root geometry and navigation

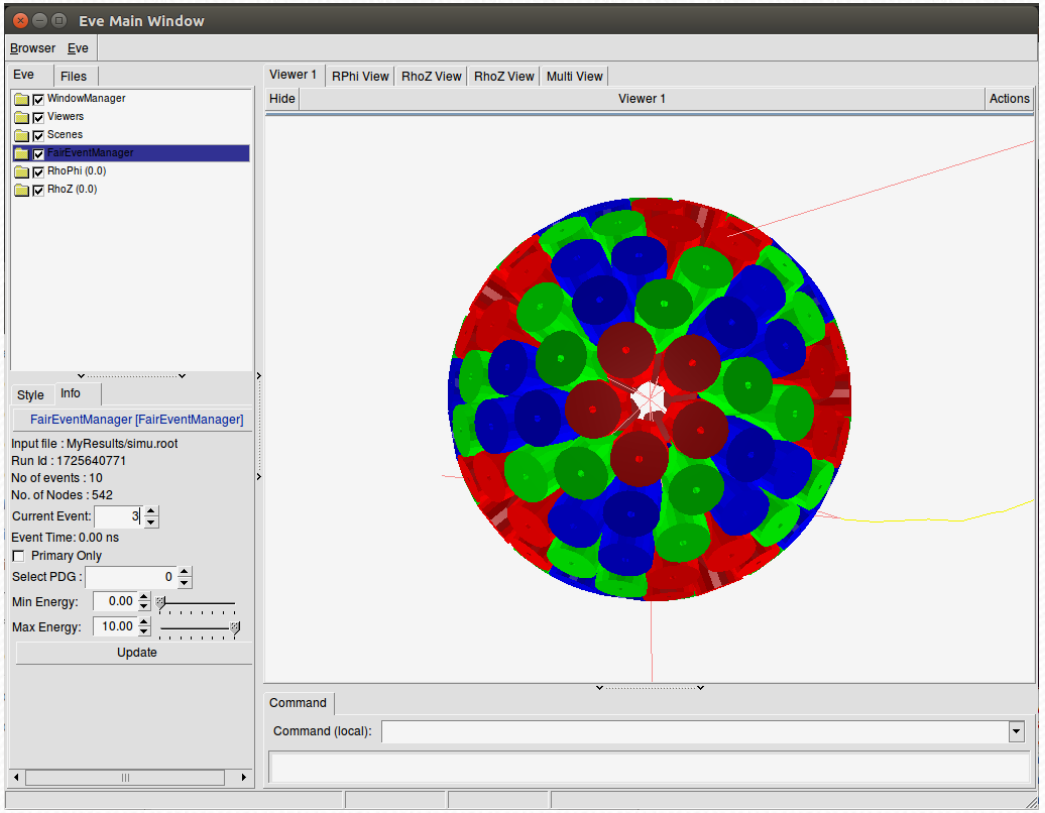
More features can be found here: https://fairroot.gsi.de/index.html

On-going developments with FairRoot

Similarly to CBMRoot, PANDARoot, R3BRoot, a new application called AGATARoot is being developed.

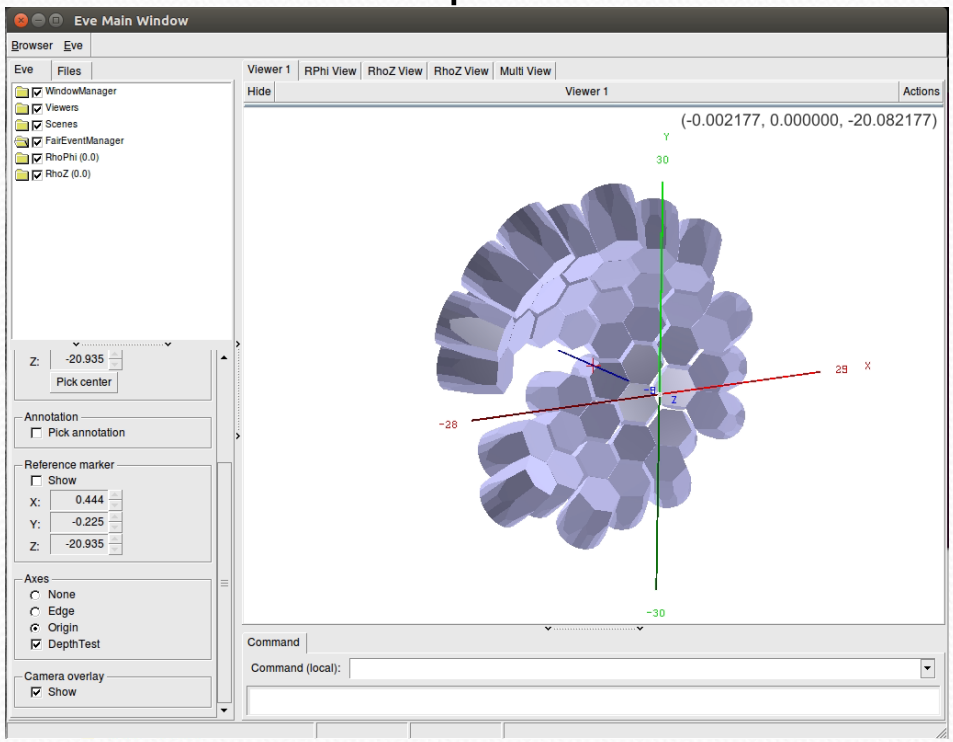
The full 4pi AGATA geometry Define in GDML format in has been imported into that new framework

Other configurations can be easily be produced:
Single crystal, single ATC, LNL configuration, etc



On-going developments with FairRoot

Once the FairRoot framework is installed and the AGATARoot is downloaded you can run basic simulations with a couple of command lines:



<u>To run the simulation:</u>

root – l

> .L run_sim_gdml.C

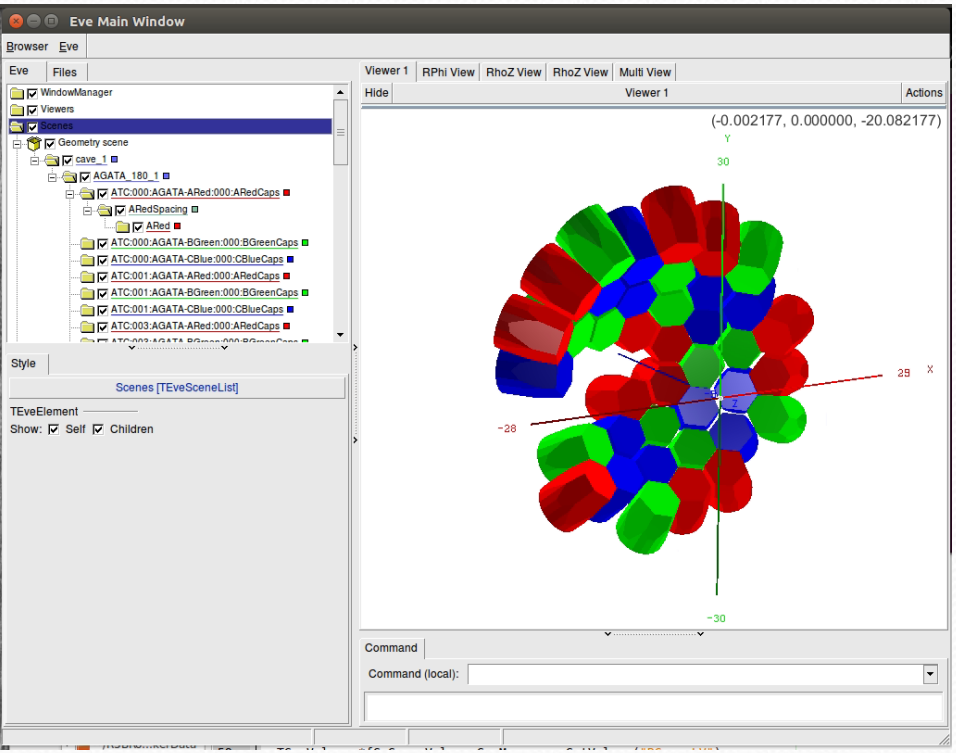
> run_sim_gdml(“simu”,“MyResults”)

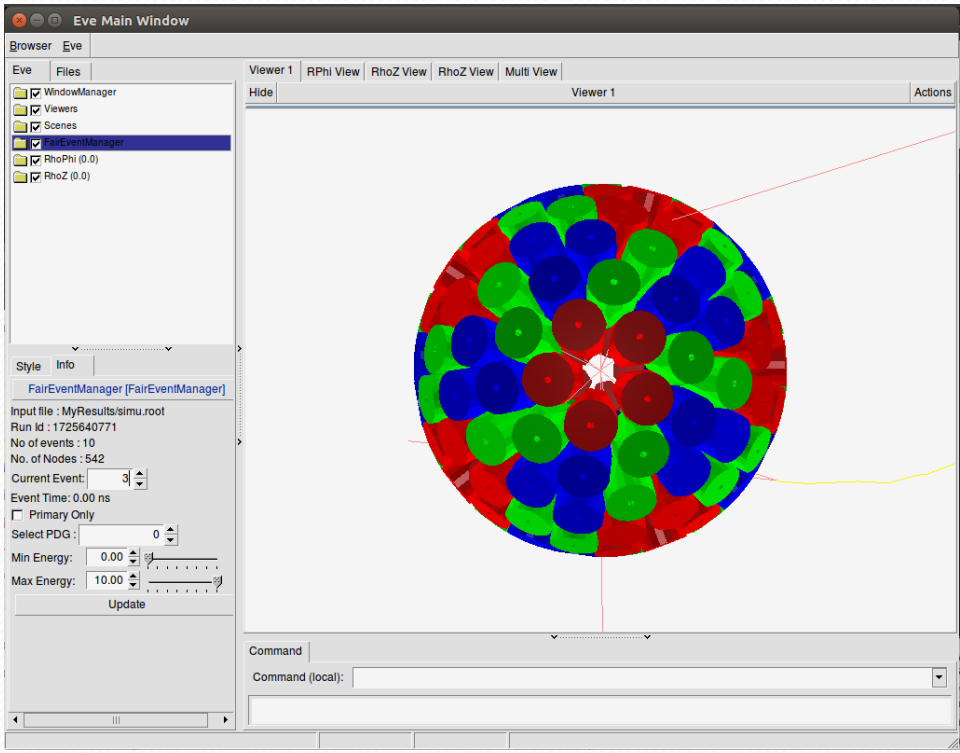
<u>To visualise the geometry and tracks:</u>

root – l AGATADisplay.C

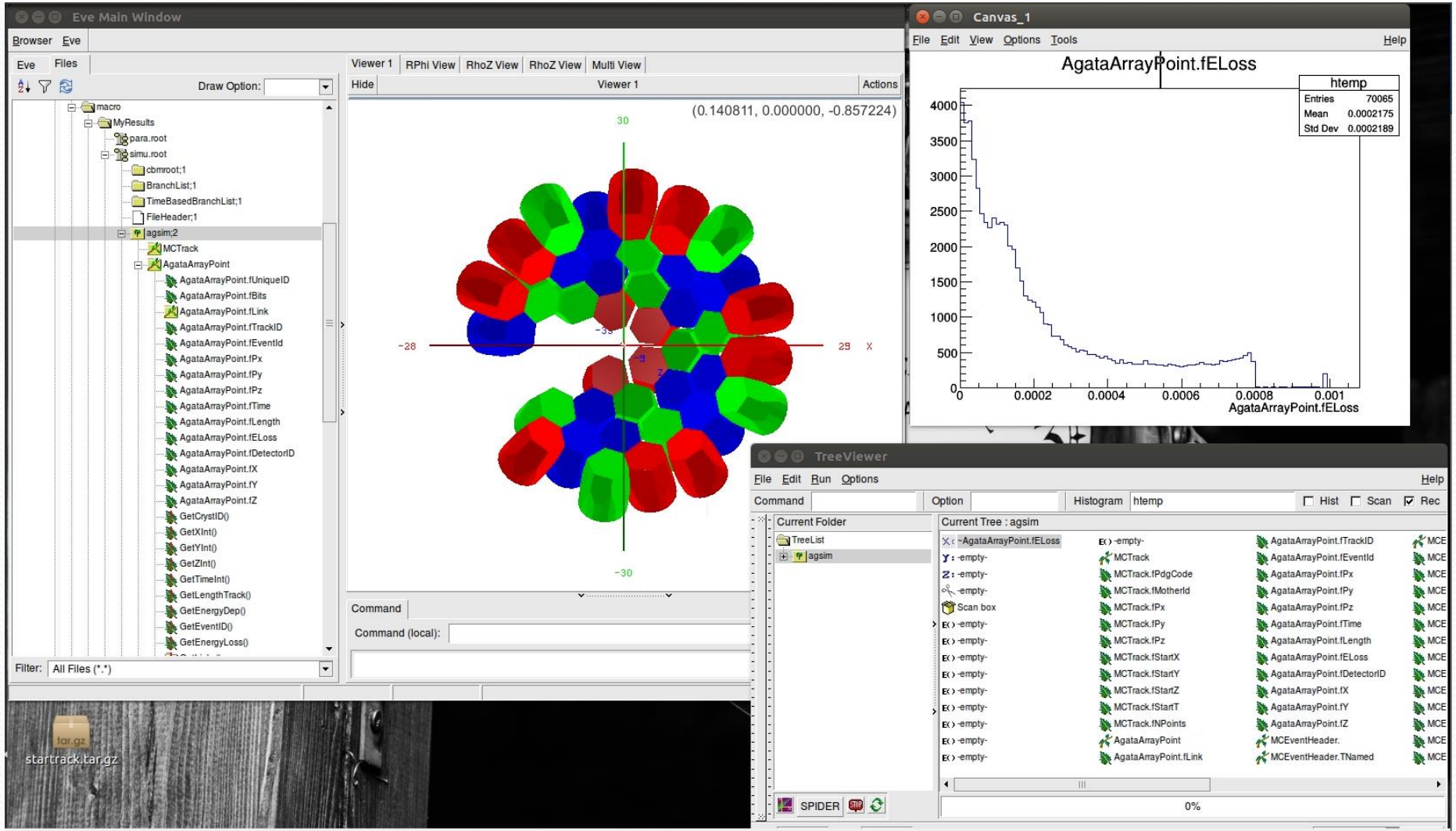
Users will be configure run_sim_gdml.C to point to the gdml file and either one of the existing predefined FairRoot event generators or a user-defined one.

On-going developments with FairRoot

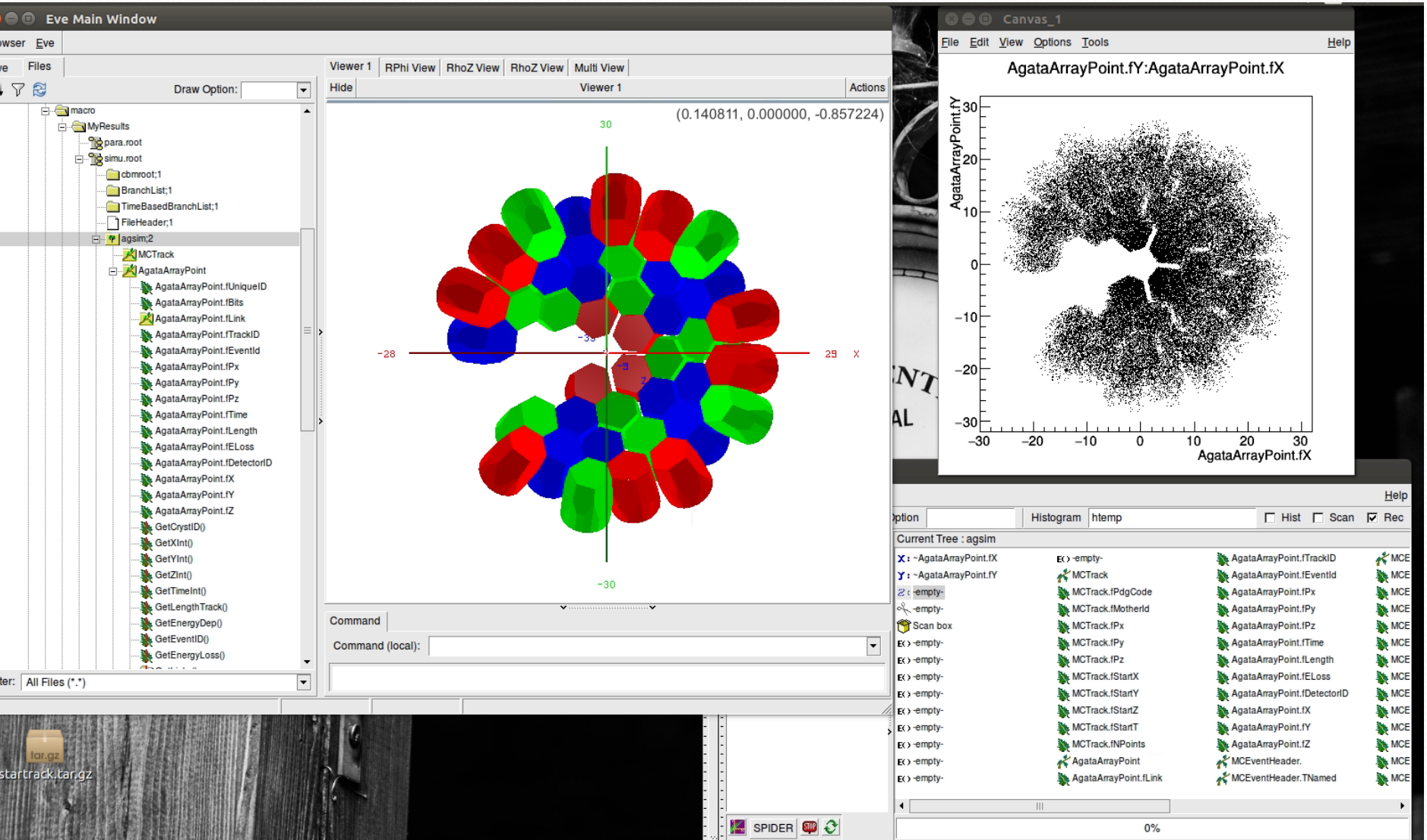




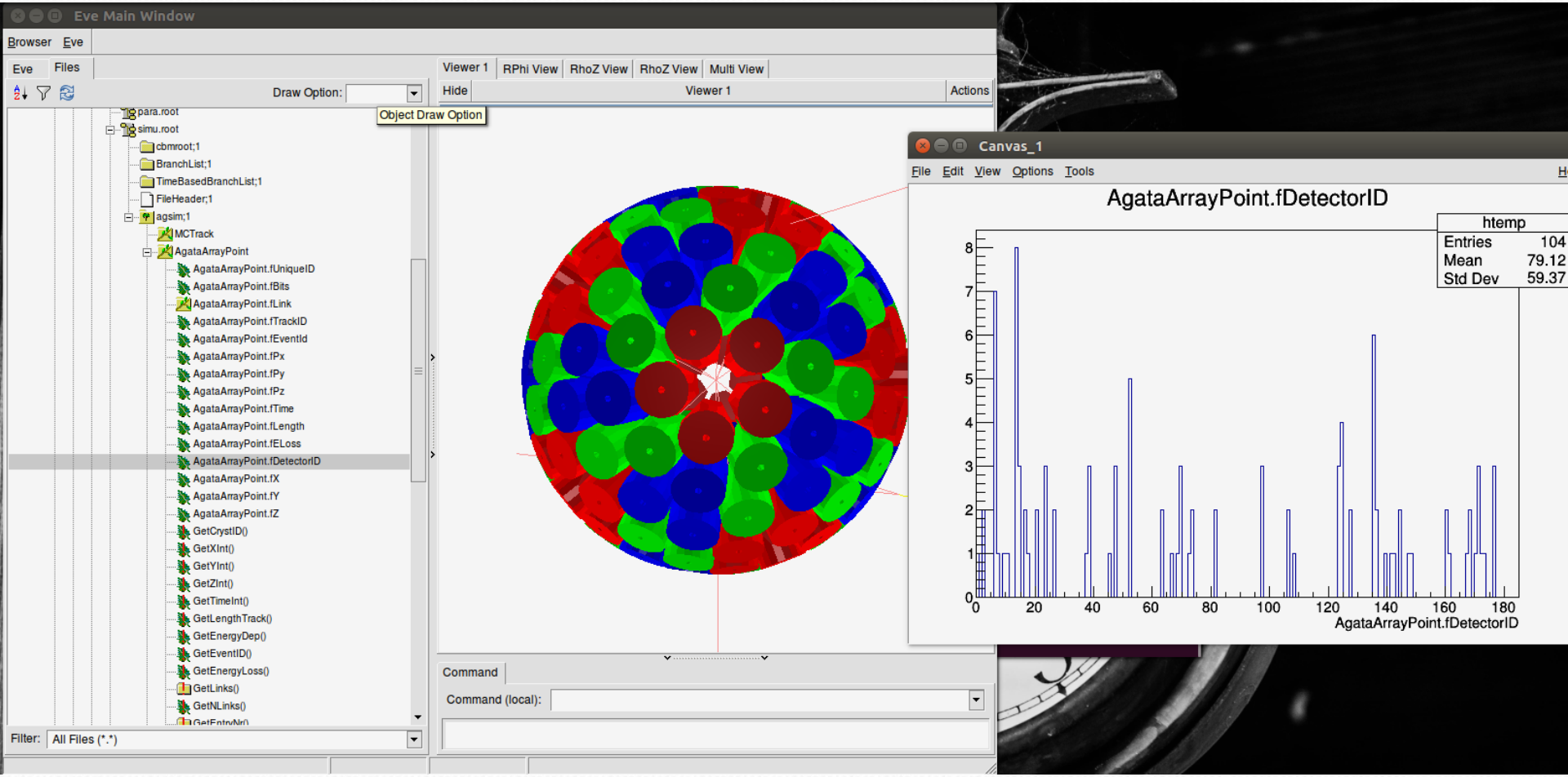
On-going developments with FairRoot



On-going developments with FairRoot



On-going developments with FairRoot



On-going developments with FairRoot

AGATARoot not yet distributed but that will come soon.

Currently, root output file contains almost all essential information the native geant4 simulation already provides before tracking:

- The crystal id.
- hit position (x,y,z) in laboratory frame,
- energy deposited at this position,
- plus the time information.

Only the segment id information remains to be added.

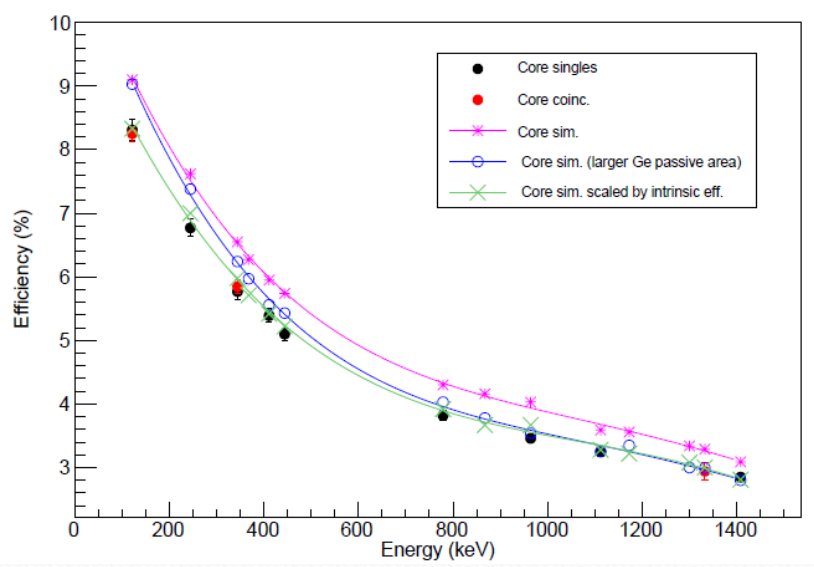
Other on-going developments

Simulated Efficiencies.

We know that simulations overestimate the measured efficiency by ~15%
(crystals have different intrinsic efficiency)

To reconcile simulation and measurement we were waiting to get final tomography of A005 from the scanning in Strasbourg

This scanning is now complete but crucially the first 2mm of the front face were missed.
(See G . Duchene's talk on Tuesday)



Nominal

How best we could implement this in the simulation remains to be determined?
Also, is this the same for all type of crystals?

Near future developments

- For AGATARoot:
  - Add the segmentation information to the FairRoot output file.
  - Make the application available to the community (gitlab)
  - Implement the OFT tracking for completeness and comparisons with the native G4 AGATA code.
- For more realistic simulated efficiencies:
  - Investigate the implementation of the tomography of A005 in the simulation geometry.

Thank you for your attention

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and please remember to:

Share your simulation development and results, either through:

- *gitlab merging requests*
  -
- *or the forum:*
  - *http://agata.in2p3.fr/forum/index.php*

Commissioning for the zero degree campaign

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Discussion

Do we need to plan one ?

-1- Do we need to plan one ?

Bear in mind that the new electronics should be available

-2- If yes, we need to think about one

What should be the focus ?

AGATA + NEDA/PARIS ?
AGATA phase-2 electronics ?
AGATA performance at high multiplicity ?
or else ?