AGATA Simulation Code (ASC)

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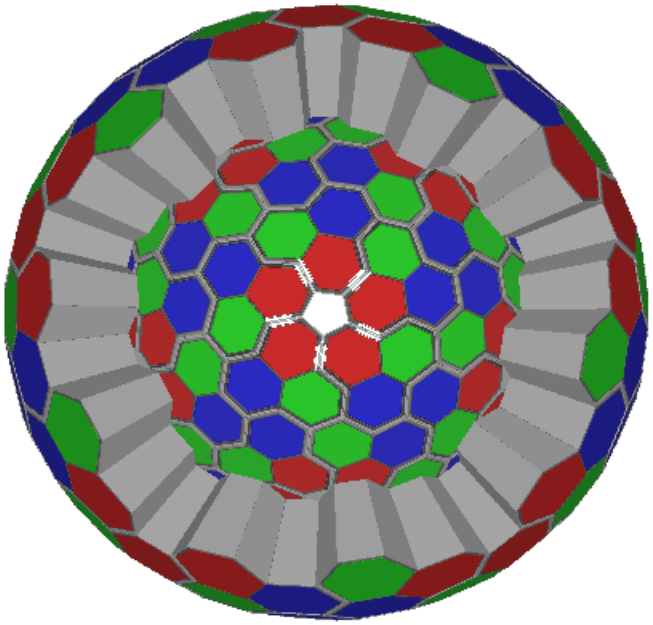


Outline:

- Some Generalities on ASC
- Recent Developments
  - New Evt generators
  - New Ancillary detectors
- Future Developments
  - ICC-SPIRAL2 meeting on Simulation (Orsay – Nov. 2014)

AGATA Simulation code

- Developed & Maintained by the AGATA collaboration
  - Written by Enrico Farnea (Padova – 1970-2013)
  - Core Team:
    - M. Labiche – Convener (DL),
    - J. Ljungvall (IPNO),
    - C. Domingo- Pardo (IFIC Valencia),
    - M. Palacz (Warsow),
    - G. Jaworski (Warsaw),
    - M. Ciemala (GANIL/Krakow)
    - A. Goasduff (Legnaro)
    - …
  - Plus contributions from many other advanced users …

- svn repository: http://npg.dl.ac.uk/agata/svn
  - Pure GEANT4 program - Not a Simulation/Analysis framework
  - ASC compiles with GEANT4.10.1 (but only fully tested with G4.9.6)

- Used mainly by AGATA users, HISPEC/DESPEC col. , and also GRETINA collaborators.

ASC Recent Developments

- First developed for AGATA design, and now used for exp. Campaigns (Legnaro, GSI, and now GANIL)
  - Increasing number of users.
  - ASC Workshop (Orsay 2013) – http://npg.dl.ac.uk/AGATA

- Evt Generators:
  - External generators available
    - for Transfer, elasctic/inelastic, Coulex, Fusion-evap.
    - Input files coupled to VAMOS Acceptance filter
  - Other built-in generators:
    - **Simulation of time-stamped data (J. Ljungvall)**

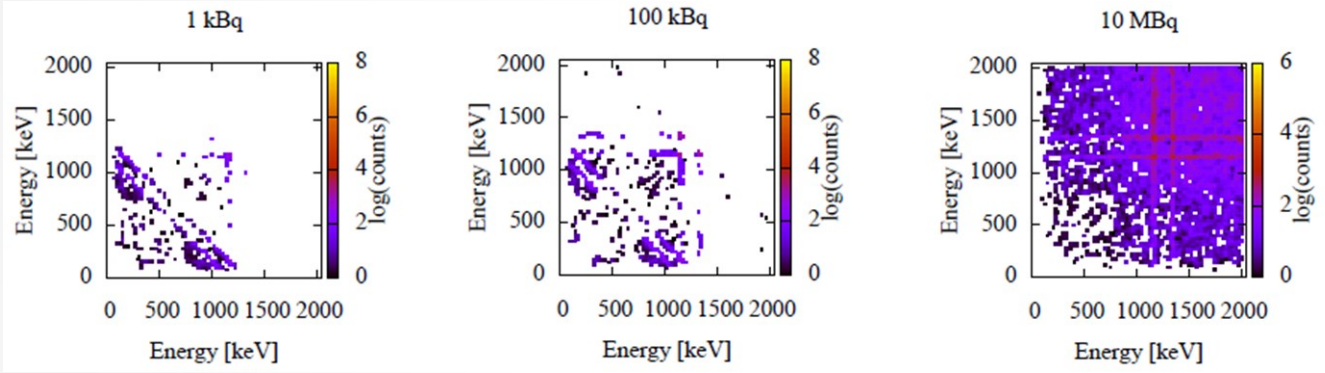
    → Simulation Output file in AGATA Data Format (ADF)

    → Same analysis code for real and simulated data.

AGATA time stamped data

- Take into account source activity /beam intensity and time structure.
  - Simulated data with same format than real data after PSA

- Use same data analysis procedure than for real data to:
  - Buitd simulated γ–γ or γ–γ–γ matrices and apply gates
  - Study coincidences between the different ancillaries

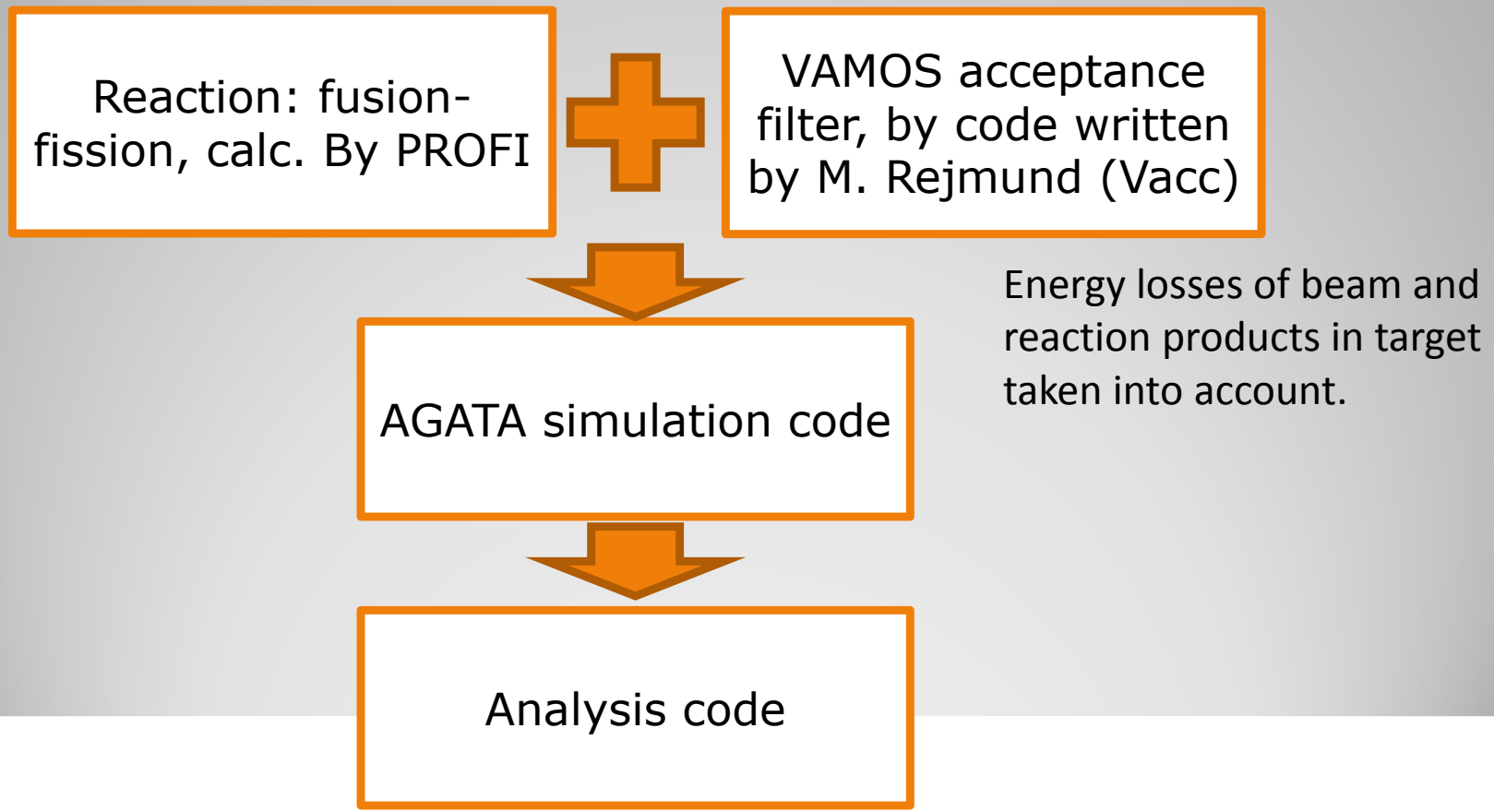


γ–γ matrices for ^{60}Co sources of different activity

- Thus, more complete and realistic simulations.

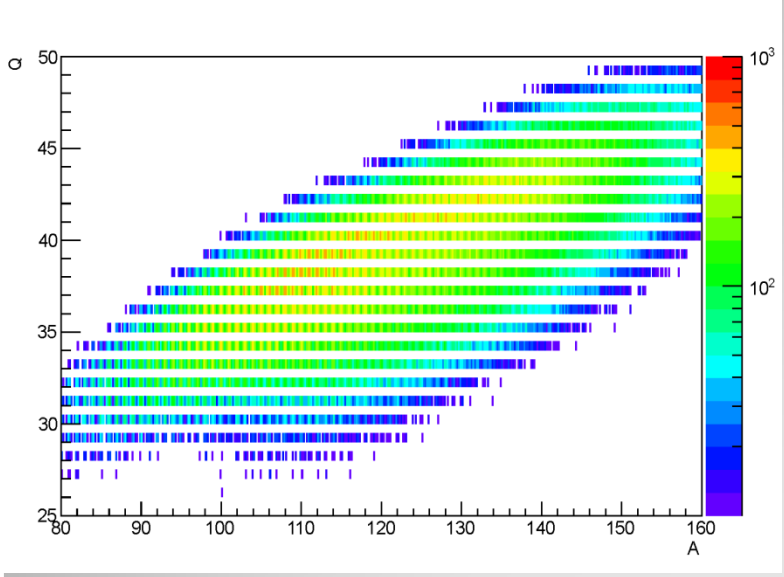
Simulations example fusion-fission case

Reaction used to test code:
6.2 MeV/A ^{238}U beam on a ^{9}Be 10 µm target

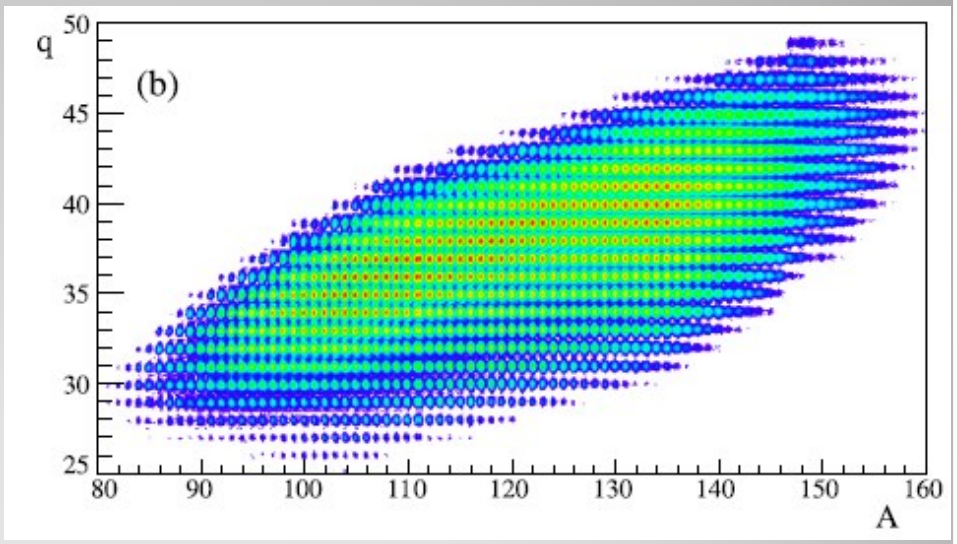


Energy losses of beam and reaction products in target taken into account.

Results: Q vs A



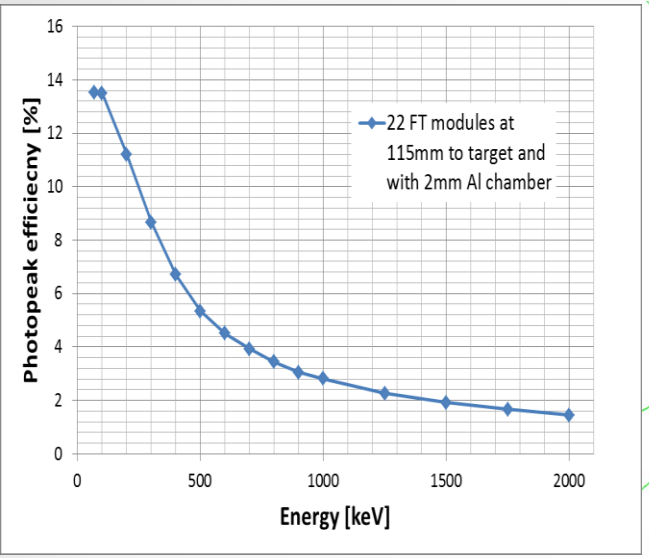
simulated



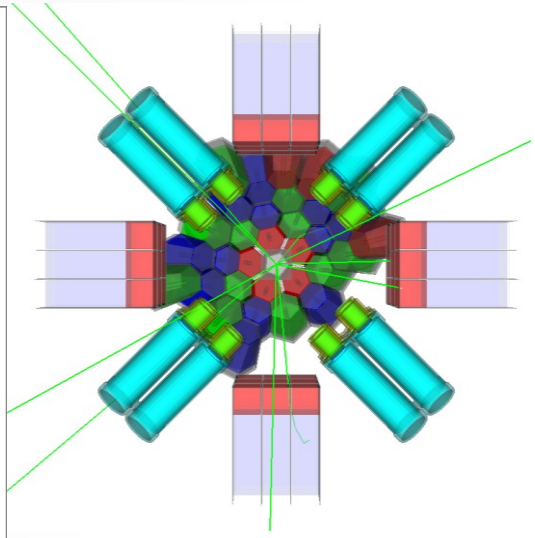
experimental:
A. Navin et al., Phys. Lett B, 724 (2014)

ASC Recent Developments

- New classes added to implement ancillary detectors
  - ~16 ancillary detectors now implemented
  - **PARIS** & **Fast Timing** detectors recently added.
  - **VAMOS FP** detectors , **NEDA** & **GALILEO** implementation in progress.

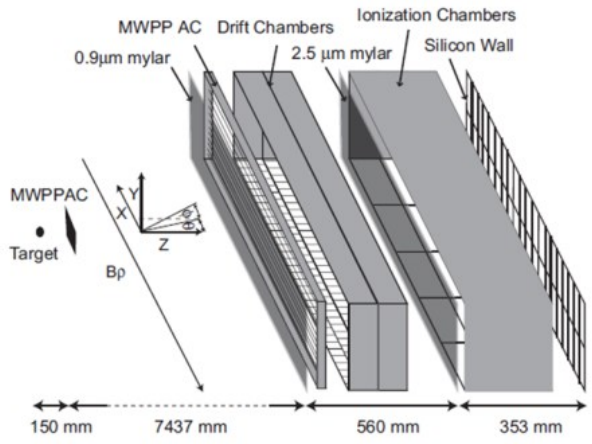


AGATA + Fast Timing



AGATA + PARIS + Fast Timing

VAMOS FP



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ASC Future Developments

- Documentation/ Dissemination
  - Manual update, tutorial
- Design a series of tests for compilation/installation checks
- Complete the most recent additions (Detector, Generators)
- Collaborate with other Simulation frameworks.
  - Investigate possible synergies.
  - ICC meeting 26/11/2014

ICC-SPIRAL2 meeting input & outcome

- NPTool framework *(Adrien Matta – Uni. of Surrey)*
- Development of the SToGS framework *(Ulia Companis- IPN Lyon)*
- KaliVeda data analysis framework (INDRA/FAZIA) *(John Frankland - GANIL)*
- ACTARSim *(Hector Alvarez-Pol – USC)*
- NEDA Simulations *(Marcin Palacz – Uni. Warsaw)*
- FairDB *(Denis Bertini - GSI)*
- FAIRRoot & R3BRoot *(Dmytro Kresan - GSI)*
- AGATA Simulation code (Marc Labiche - *STFC Daresbury)*

Main outcome:

Agreement from each tool package leader to try to produce exchangeable detector geometry file
in root or/and gdml formats.

Summary

- AGATA code developed for quite a long time now
  - Geant4 program – Open source
  - Recent integration of new detectors / evt generators
    - More complete & realistic simulations
  - Increasing number of users (exp. campaigns)
    - Need better documentation and tutorials
  - Further developments
    - Synergies with other frameworks

Thanks to

- Joa Ljungvall,
- Michal Ciemala,

…. and you for listening !

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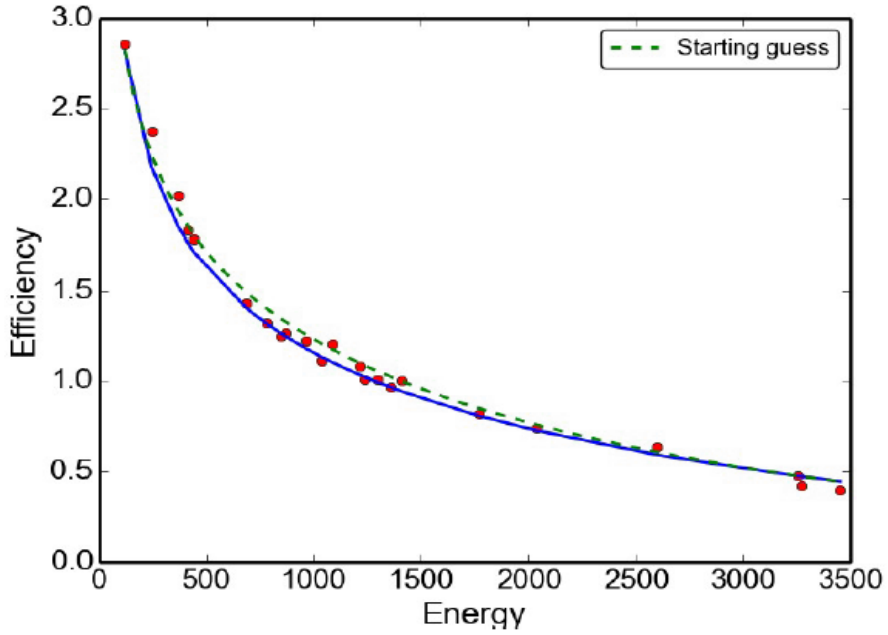
AGATA efficiency

- Efficiency curved normalised at 1400keV, for 21 crystals at nominal position

- Eu-152 and Co-56



Note:
Calorimetric efficiency
at 1332 keV is 3.3%