Key Experiments and Simulations: Status Report

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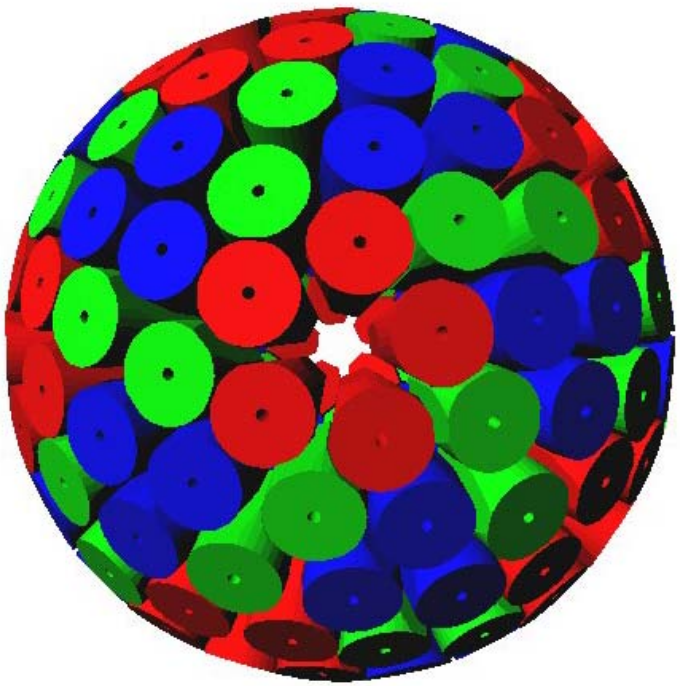
Overview

- Main results from the Monte Carlo simulations
- A few words concerning Key Experiments

Configuration for AGATA

The configuration based on 180 hexagonal crystals has been chosen for AGATA and the crystal shape has been fine tuned to maximize the solid angle coverage and optimize the performance over a range of γ multiplicities.



180 hexagonal crystals	3 shapes
60 triple clusters	all equal
Inner radius	24 cm
Amount of germanium	362 kg
Solid angle coverage	82 %
6480 segments	

Efficiency at 1MeV: 43% (M_γ=1), 28% (M_γ=30)

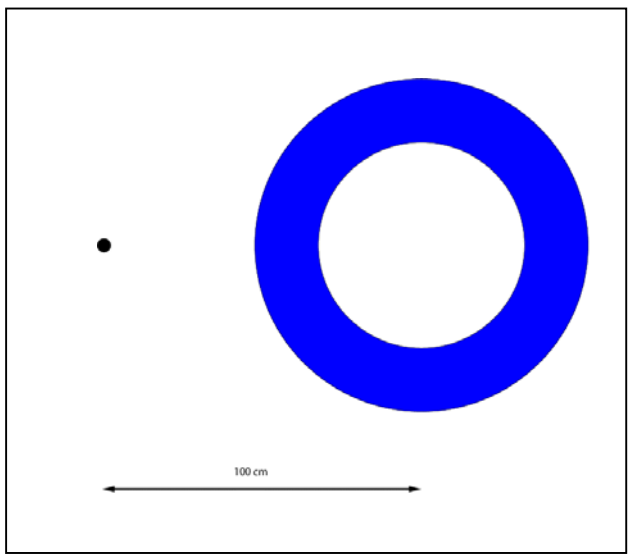
Peak/Total: 58% (M_γ=1), 49% (M_γ=30)

Background Suppression

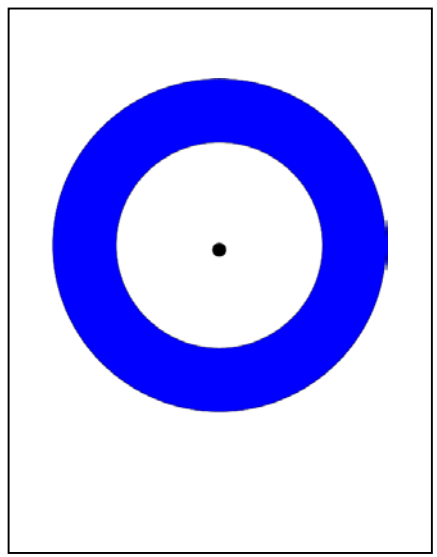
The background suppression capabilities of the mgt tracking algorithm are more limited than expected.
This means that background suppression does not necessarily come for free, rather it requires some specific optimization of the code.

Simulation: ideal Ge shell (16-25cm)
100000 photons (1MeV energy)
Tracking code: mgt

Off-centre source, direction of gammas limited to hit the shell always (tracking performed as if in the centre)



Peak area: 60350



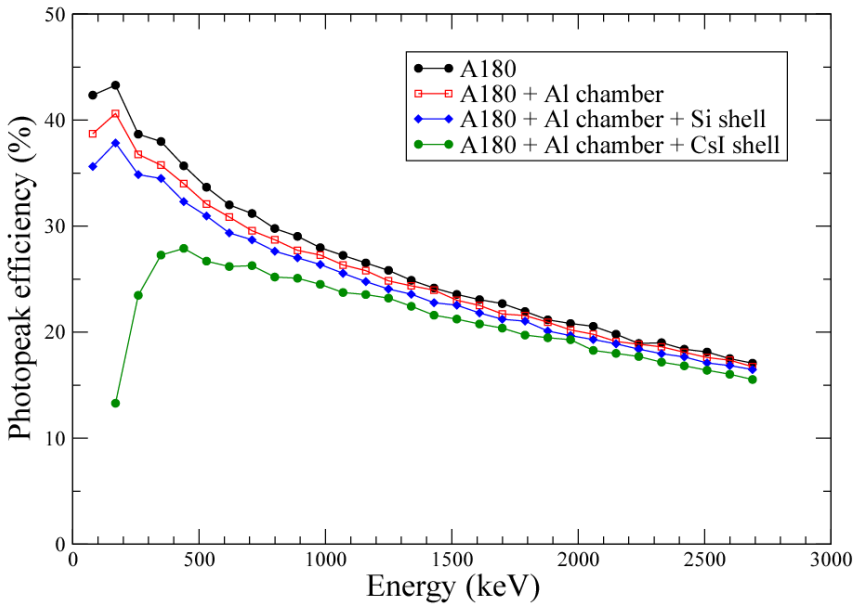
Source in the geometrical centre of the shell

Peak area: 69900

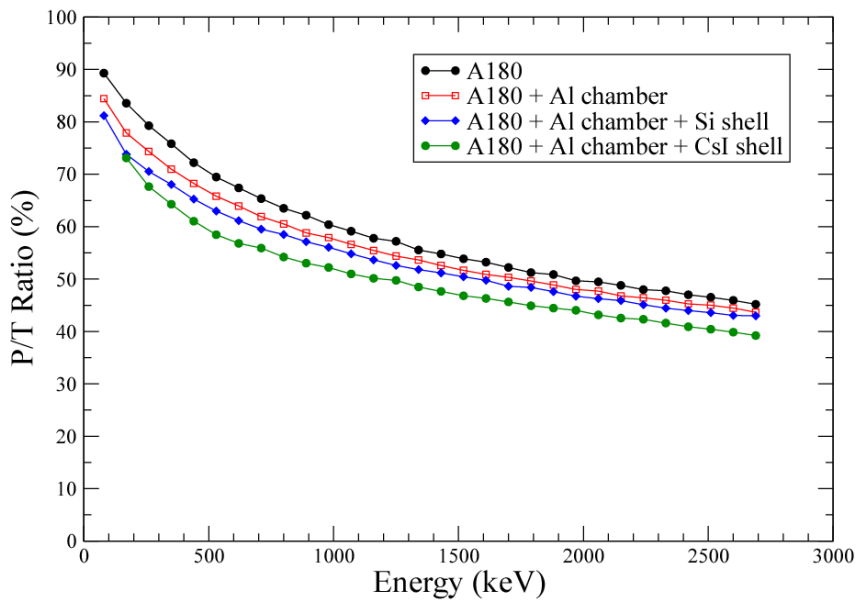
Effect of ancillary devices

Ancillary devices have an impact comparable to the case of conventional arrays

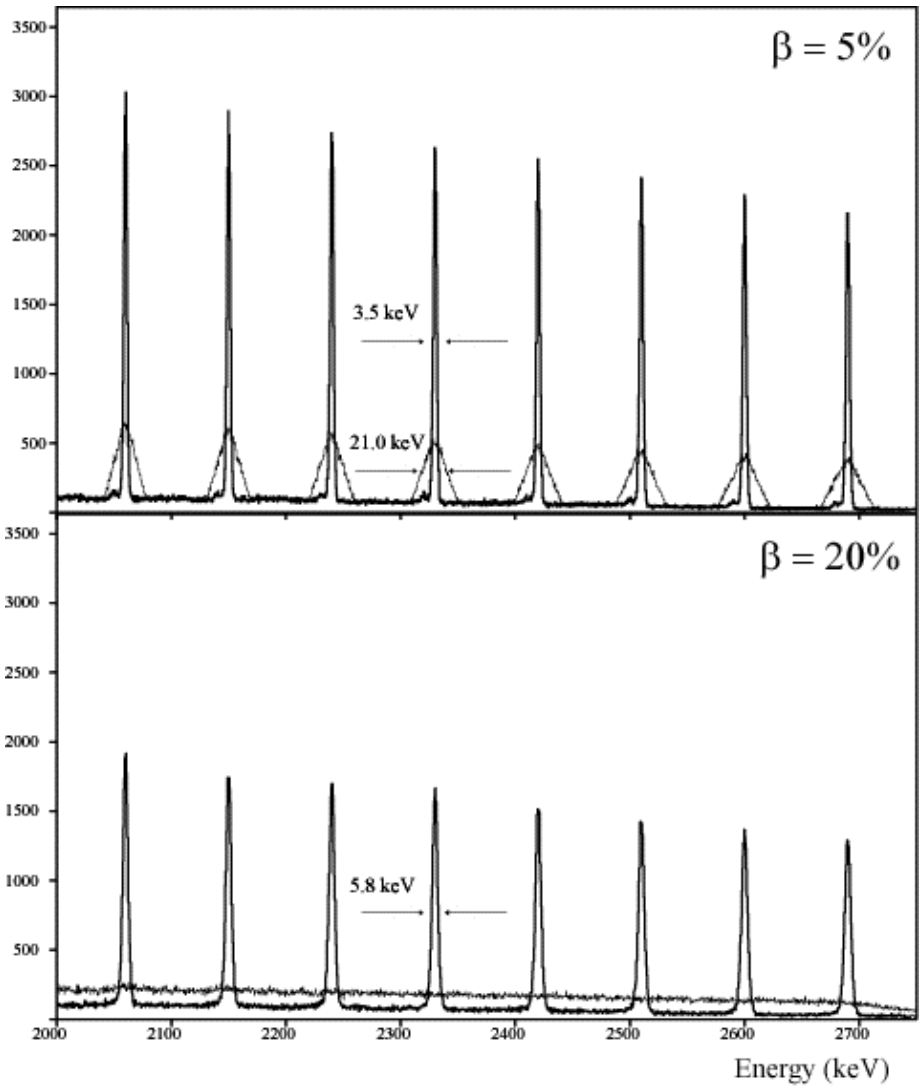
Absolute photopeak efficiency (tracking included)



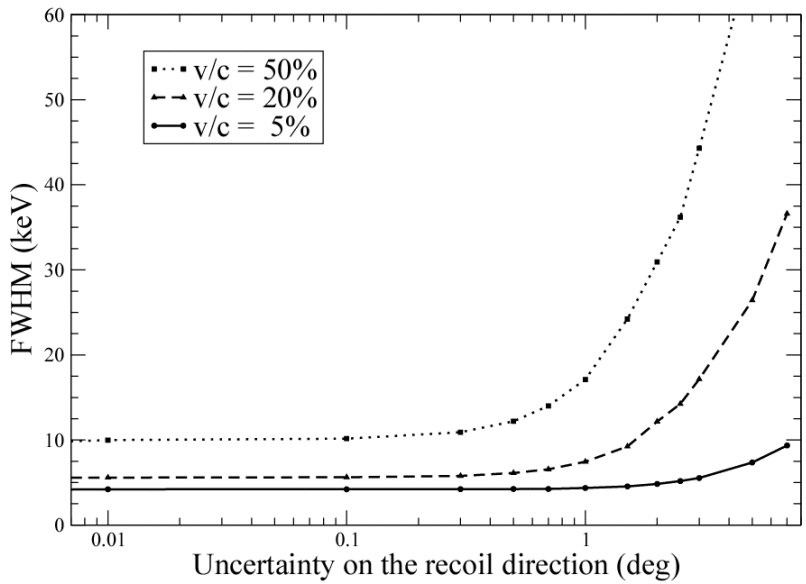
Peak-to-total ratio (response function)



Effect of the recoil velocity



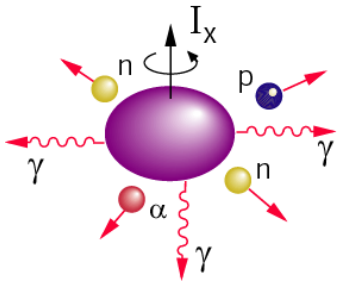
The comparison between spectra obtained knowing or not knowing the event-by-event velocity vector shows that additional information (ancillary detectors!) will be essential to fully exploit the concept of tracking



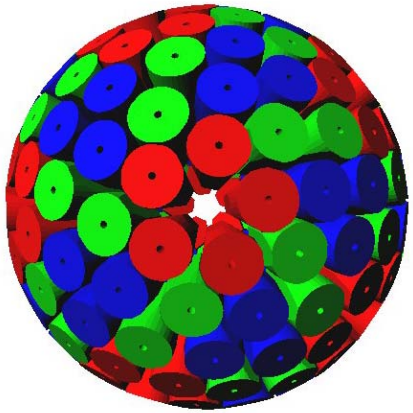
Status of the Monte Carlo Simulations

- A Geant4-based code is available
- Active or passive ancillaries can be considered in the simulation
- "Realistic" events can be decoded from formatted input files
- On-line documentation at http://agata.pd.infn.it/info.html

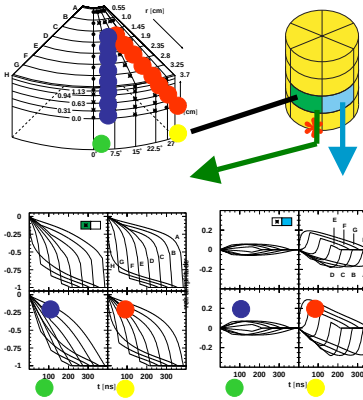
Event generation



Detector response

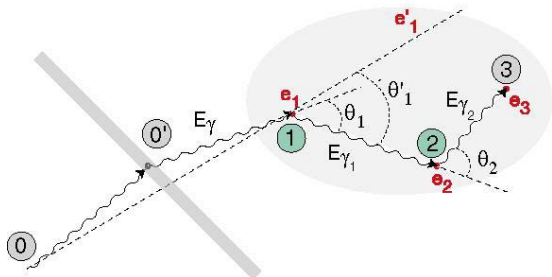


Pulse shape generation



Electronics Response Function

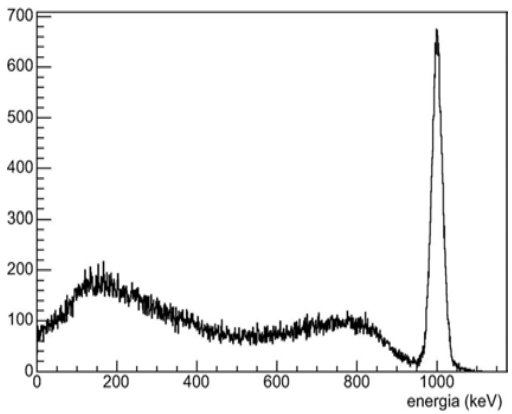
Pulse Shape Analysis to decompose recorded waves



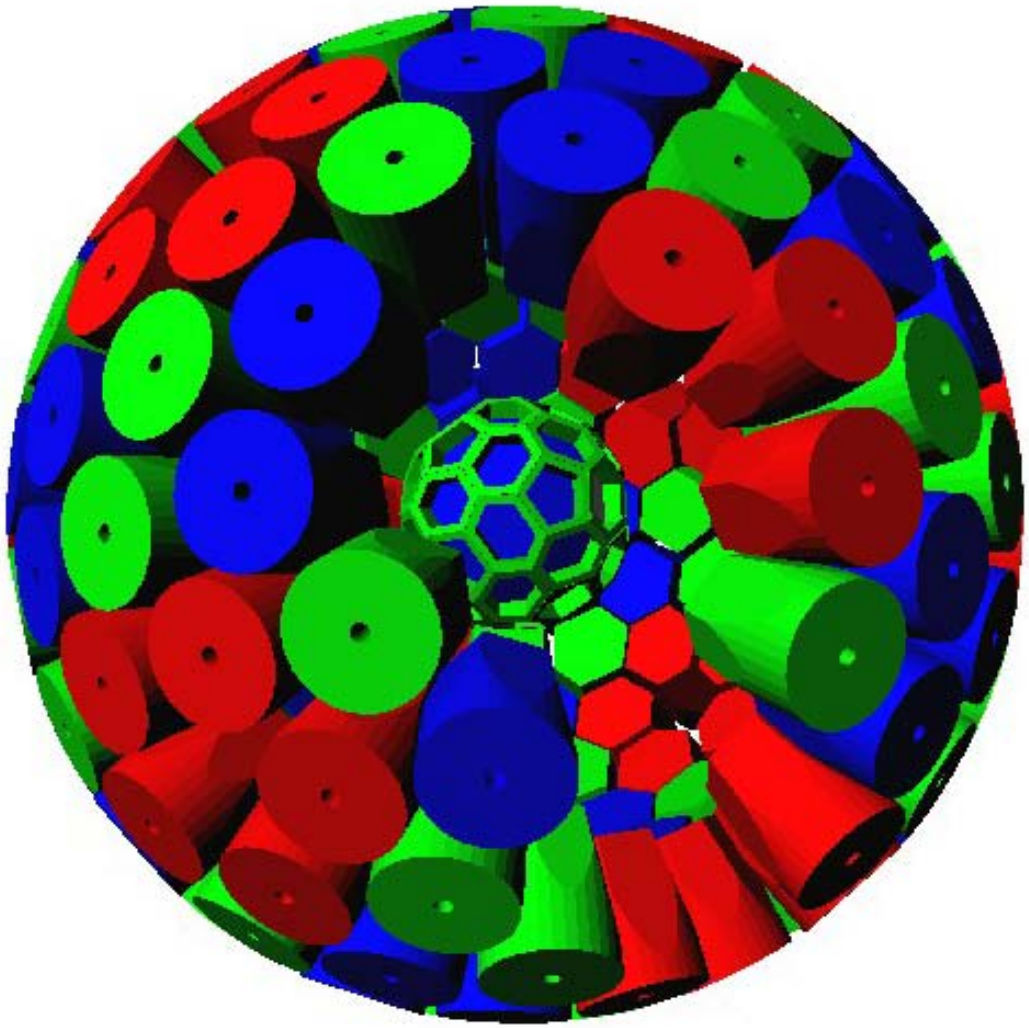
γ-ray tracking

Packing and smearing of simulated data

Data Analysis

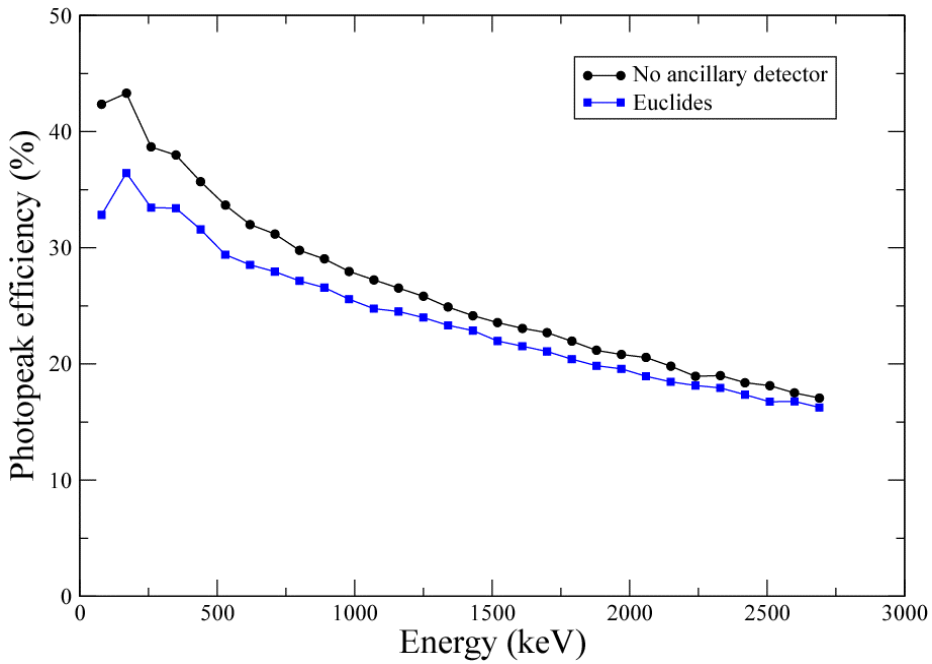


An example: AGATA + Euclides

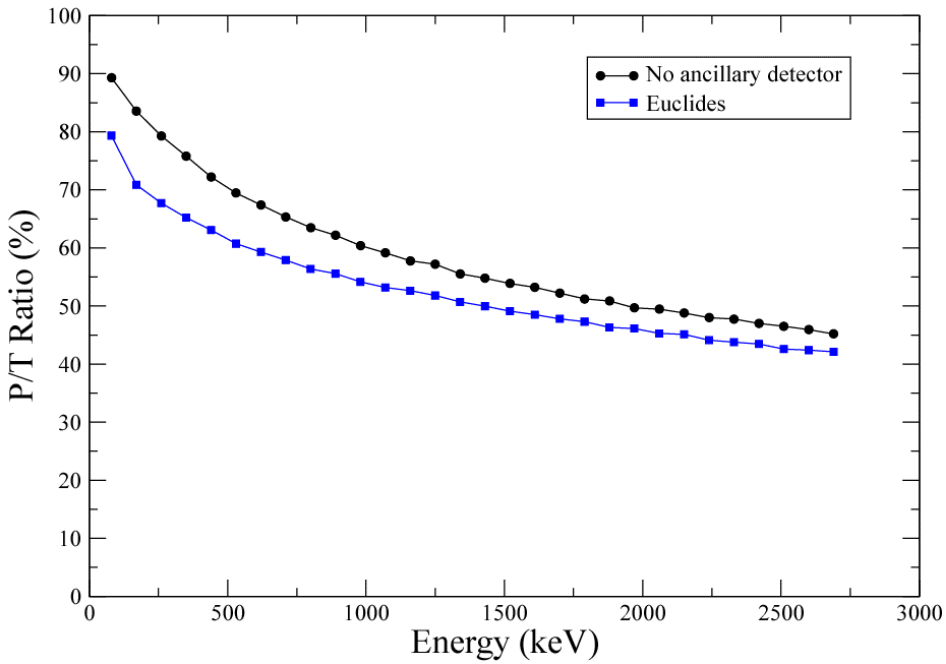


AGATA + Euclides

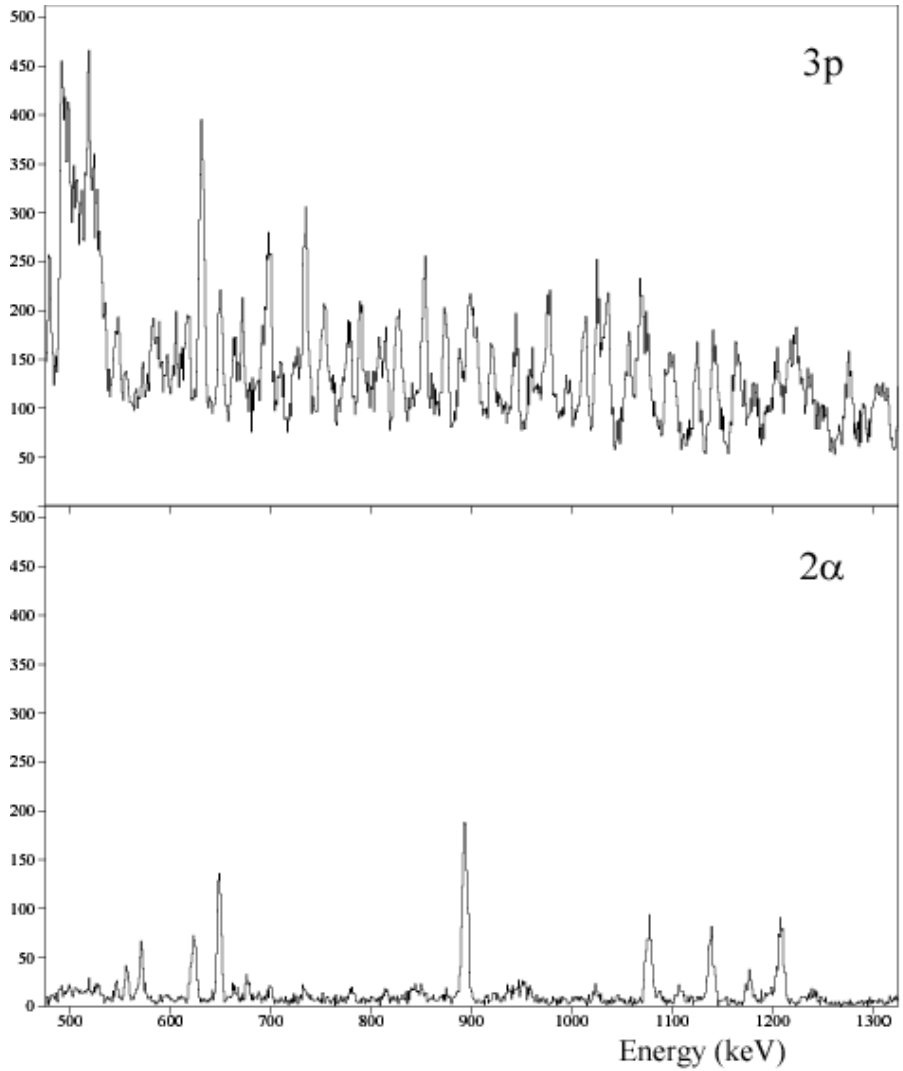
Absolute photopeak efficiency (tracking included)



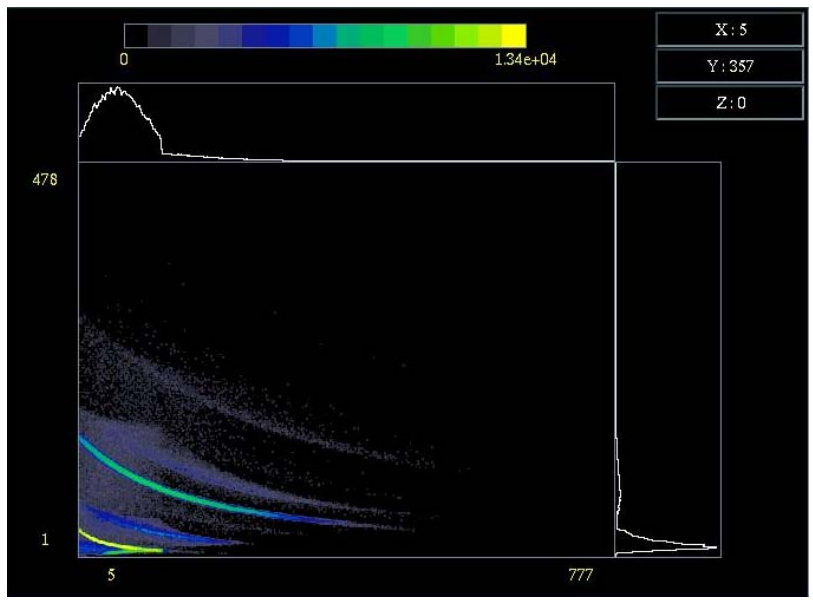
Peak-to-total ratio (response function)



AGATA + Euclides



Preliminary results (F.Recchia):
$^{32}S(125MeV) + ^{40}Ca$
Particle-gamma coincidences after tracking (using the detector position as gamma direction)



Things to do

- Improve the generation of realistic events
- Include more ancillary detectors in the simulation code
- Define an interface with the Pulse Shape Calculations

Key Experiments

- A Web discussion was started recently
- Messages available on-line at http://agata.pd.infn.it/info.html
- Team Meeting later this afternoon!

Summary

- The Geant4-based code for Agata has been extensively used to define the final geometry of the array and to understand specific features
- Preliminary results with more physically meaningful events are available
- As usual, there is still plenty of things to do!!!