

Ancillary Detector and Ancillary Detector

Integration Working Group for:

AGATA

The Advanced Gamma Ray Tracking Array

- **European 4π γ -array for structure studies at:**
 - **Radioactive beam facilities: GSI, GANIL, SPES, ...
EURISOL**
 - **High intensity stable beam facilities: LNL, Jyväskylä, ...**

AGATA Organization

Steering Committee **ASC**
Chair: Marcello Pignanelli, Milan
14 representatives of 10 EU countries

Management Board **AMB**
PM: John Simpson, Daresbury
7 Working Groups

Detector
Module
J.Eberth

Local Level
Processing
R.Krücken

Conceptual
Design and
Global Level
Processing
D.Bazzacco

Design
and
Infrastructure
G.Duchêne

Ancillary
Detectors
and their
Integration
A.Gadea

Data
Analysis
J.Nyberg

EU
Contact
W.Korten

Working Teams

AGATA Ancillary detectors and ancillary detector integration working group

Major tasks

- Develop dedicated ancillary and beam tracking devices
- Co-ordinate the integration of AGATA with ancillary detector systems (infrastructure, Mechanical integration, etc...)
- To investigate the impact of the devices on the AGATA performances
- To identify the studies in which the coupling of AGATA and the different ancillary devices will be important
- Study the feasibility of the measurements in the different experimental conditions:
 - Relativistic Radioactive beam (fragmentation or post acceleration)
 - ISOL low energy radioactive beams
 - Low intensity stable beams
 - High intensity stable beams
- Specify electronics and data acquisition requirements. The standardisation of the electronics for ancillary detectors and devices
- Co-ordinate the R&D on electronics for ancillary detectors (electronics on ASICs)

Tasks:

-Ancillary detectors and devices -

Beam tracking devices

Electromagnetic spectrometers

Recoil / product detectors

Light charged particles detectors

Neutron detectors

Conversion electron detector

High energy γ -ray detectors

X-ray detectors

Lifetime measurement devices

g-factor measurement devices

Tagging detectors

- **Evaluation of the ancillary detector impact on the AGATA performances.**
- **Electronics and data acquisition**
- **Mechanical integration of ancillary detectors in AGATA**
- **Ancillary detectors for the “key” experiments and AGATA demonstrator tests.**

AGATA Ancillary detector and ancillary detector integration tasks

- **Evaluation of the ancillary detector impact on the AGATA performances.**

Effect of the ancillary detectors on the performances of tracking arrays, Monte-Carlo simulations of the coupled system.

- **Electronics and data acquisition**

Integration of ancillary detectors in the AGATA trigger and data acquisition system. Development of highly-integrated analogue electronics (ASIC).

- **Mechanic integration of ancillary detectors in AGATA**

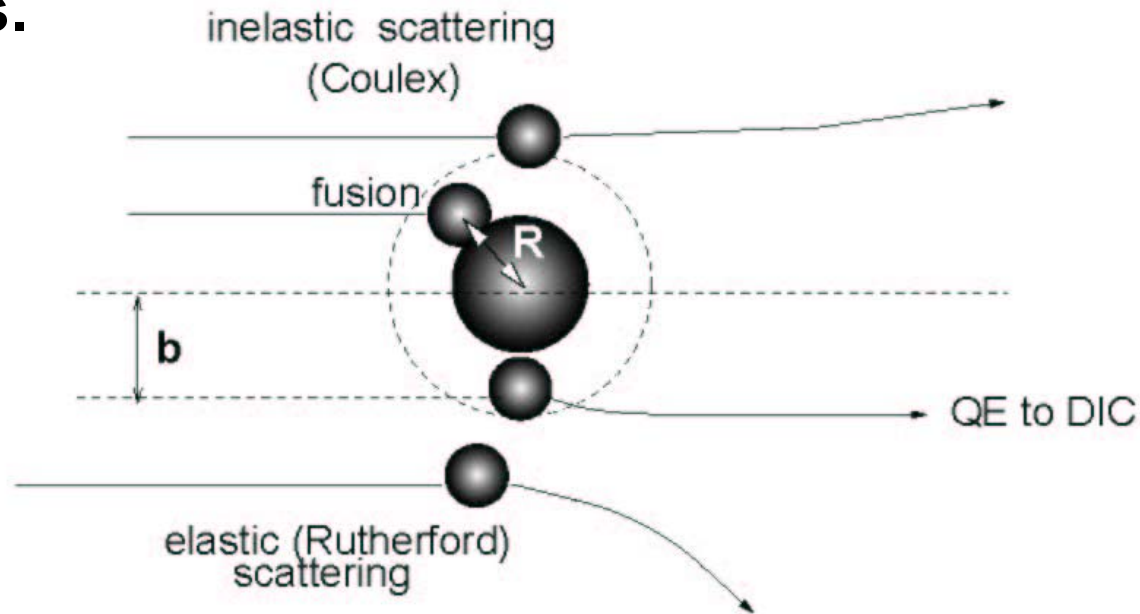
Group taking care of the integration of the ancillary detector mechanics in AGATA with minimum impact for its performance.

- **Ancillary detectors for the “key” experiments and AGATA demonstrator tests.**

Strongly interacting with the “key” experiment simulation group, has the task to study possible ancillary detectors for the pre-AGATA period.

Low Energy reaction mechanisms

- Coulomb excitation (Coulex) and Inelastic scattering.
- Transfer and quasi-elastic processes (p,n capture, etc...).
- Multi-nucleon transfer.
- Deep Inelastic Collisions.
- Quasi-fusion reactions.
- Fusion – evaporation.
- Fusion-fission.



High energy reaction mechanisms

(exotic ion beams produced by fragmentation)

→ **Relativistic (single step)**

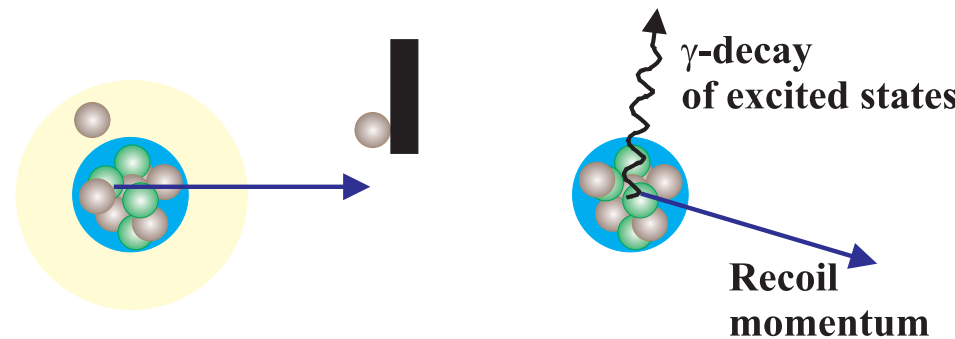
Coulomb excitation

→ **Inverse proton scattering**

→ **Knockout reactions**

Break-up reactions

→ **Fragmentation reactions**

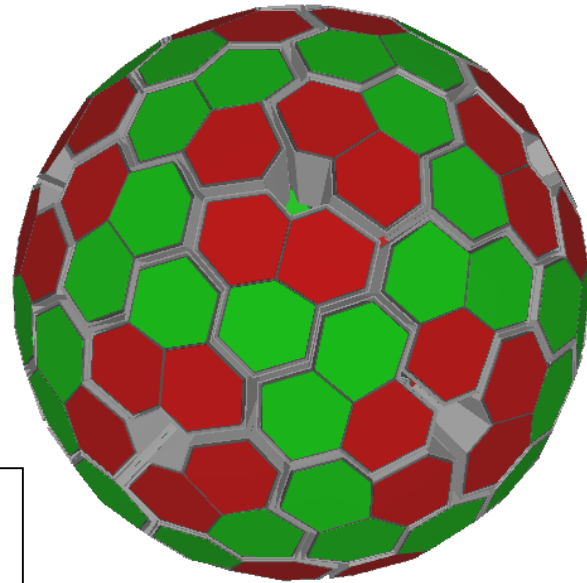
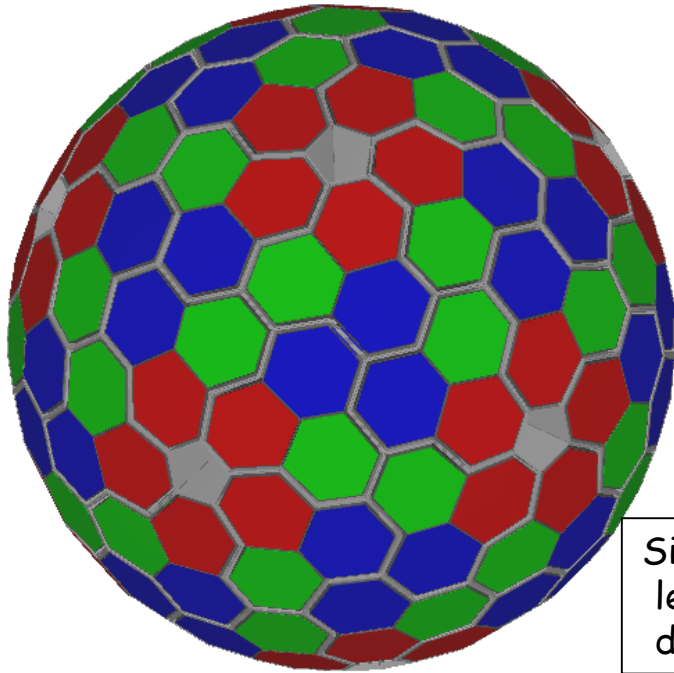


Knockout reaction

Cross sections :

- up to 1 barn for Coulex (large Z nuclei)
- tens of mbarn for proton scattering and 1 nucleon knockout,
- down to few mb for 2 nucleons knockout.

Two candidate configurations



Size of Ge crystals :
 length 90 mm
 diameter 80 mm

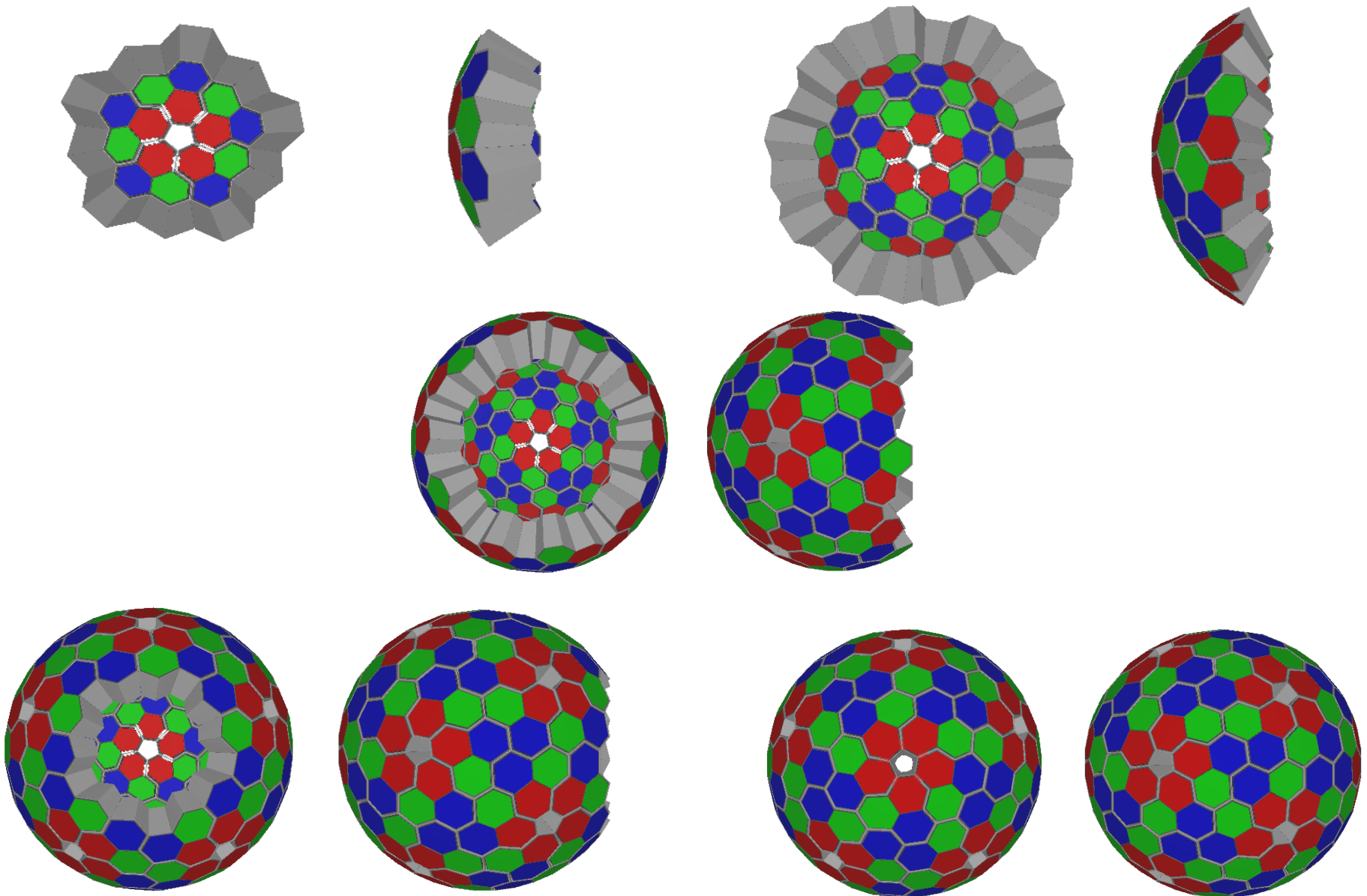
180 hexagonal crystals
 60 triple-clusters
 Inner radius (Ge) **22 cm**
 Amount of germanium 310 kg
 Solid angle coverage ~80 %
 Singles rate ~50 kHz
 6660 channels

120 hexagonal crystals
 40 triple-clusters
 Inner radius (Ge) **17 cm**
 Amount of germanium 220 kg
 Solid angle coverage ~74 %
 Singles rate ~70 kHz
 4440 channels

Efficiency: **40%** ($M_\gamma=1$) **25%** ($M_\gamma=30$)
 Peak/Total: **65%** ($M_\gamma=1$) **50%** ($M_\gamma=30$)

Efficiency: **38%** ($M_\gamma=1$) **21%** ($M_\gamma=30$)
 Peak/Total: **63%** ($M_\gamma=1$) **47%** ($M_\gamma=30$)

The Phases of AGATA-180

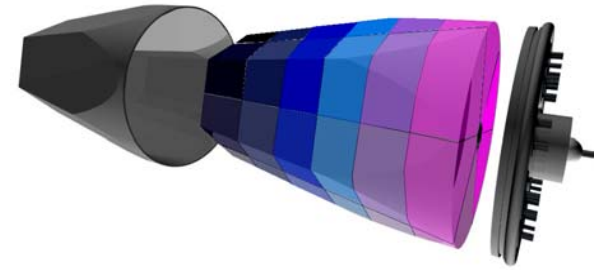


Working Group Meeting (16,17/05/03) :

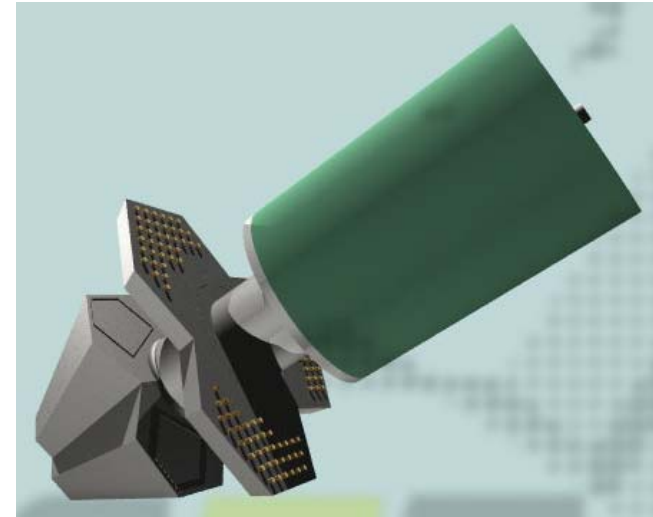
- Beam tracking detectors: New developments on beam tracking detectors at GSI by N. Saito (GSI).
- Recoil/Products detectors: Present and future of RFD by W. Meczynski (Krakow). Shapir fission fragment detector and annular Si detector by Ch. Theisen (Saclay).
- Neutron detectors: N-Wall by M.Palacz (Warsaw).
- Light particle detectors: CUP by M.Palacz (Warsaw). From Euclides to Trace by E.Farnea (Padova). Diamant by B.Nyako (Debrecen). Exodet by E.Verdaci (Napoli). LUSiA by D.Rudolph (Lund)
- Lifetime measurement devices: New developments on Plunger devices by A.Dewald (Koeln)
- Tagging detectors: The INTAG project by E.Fioretto (LNL).

- Electromagnetic Spectrometers: New developments, P.Spolaore (LNL)
- High energy γ -detectors: Use of HECTOR detectors with AGATA, F.Camera (Milano)
- g-Factor measurement devices: Use of an AGATA ring for g-factor measurements, D.Balabanski (Sofia)
- Conversion electron detectors: Ch.Theisen (Saclay), G.Lo Bianco (Camerino)
- X-ray detectors: G. de Angelis (LNL)

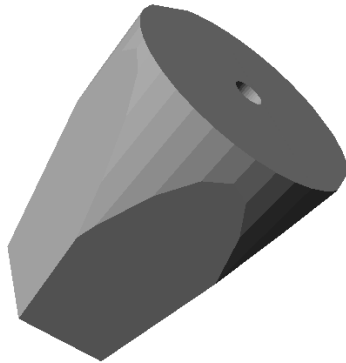
AGATA project scheduling



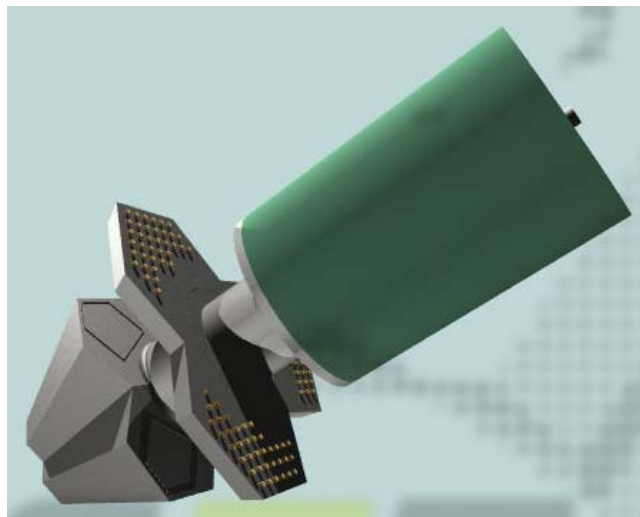
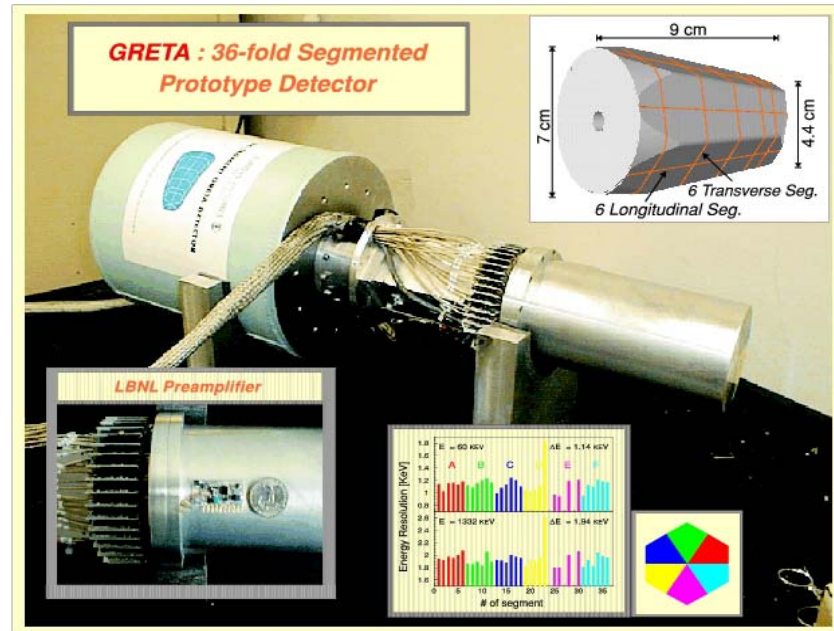
- Production of the first AGATA symmetric module ready by the end 2004
- Test of the first symmetric module: 2005
- Production of the first AGATA asymmetric module ready by the end 2005
- Production of the AGATA Demonstrator (3 to 5 modules ring) ready in 2007



PRE-DEMONSTRATOR TESTS



In-beam test of the single capsules. Test cryostat adapted from Miniball



In-beam test of the symmetric and asymmetric (AGATA) modules

Discussion program

- 1. In-beam test of capsules and modules: Experience from MARS capsule test (T.Kroell)**
- 2. Impact of ancillary detectors on the AGATA performances: Preliminary Monte-Carlo simulations (E.Farnea)**
- 3. Ancillary detectors electronics and data acquisition. Interaction of ancillary devices and AGATA at the trigger level (Convener Ch. Theisen)**
- 4. etc...**