AGATA Demonstrator at LNL
status of the installation

A.Gadea  INFN-LNL

- Status of the installation
- Installation planning and milestones
- Commissioning planning
The AGATA Demonstrator
Objective of the final R&D phase 2003-2008

1 symmetric triple-cluster
5 asymmetric triple-clusters
15 36-fold segmented crystals
540 segments
555 high resolution digital-channels

Eff. 3 - 8 % @ \( M_\gamma = 1 \)
Eff. 2 - 4 % @ \( M_\gamma = 30 \)

Operate in real time ACQ, Pulse Shape Analysis and \( \gamma \)-ray Tracking

Hosting sites:
LNL → 2008
GANIL → 2010
GSI → 2012
AGATA Demonstrator – PRISMA setup

Schematics of the mounting frame holds up to 15 clusters

From CLARA-PRISMA to the AGATA Demonstrator - PRISMA
Status of the Installation:

• Mechanics of the AGATA Demonstrator
• Reaction Chamber and Beam-Line
• Cryogenic and Power Supply Infrastructure
• Electronics and Cabling Infrastructure
• Control Room (Box)
• AGATA Ge detector Lab.
Support Structure Mechanics:

- Design completed by STFC Daresbury early summer 2007
- Machining of the flanges done by INFN – Padova, Milano and LNL
- 16 Flanges ready, excluding limited machining at LNL.
- Mounting test (5 flanges) performed end of June. Required tooling for accurate mounting
- Surface treatment expected ready by December 2007

- Purchased the pre-machined parts to build the under-lying (welded) structure
- Design of the LN2 cryogenic line support by STFC ready.
- Scheduled the construction of the structures from December
AGATA Demonstrator
Reaction chamber with low gamma-ray absorption
build by INFN-Milano and INFN-LNL
Angular range ~0° to ~130°

Reaction chamber main body
with the 90° DANTE ring
Angular Range For The AGATA DEMONSTRATOR- PRISMA Setup

Distance target-AGATA ~14cm (efficiency ~6%)

58° to 130°
fix 37° and 0°

Distance target-AGATA ~23cm (efficiency ~3%)

38° to 130°
fix 21° and 0°

Design Engineer: Rob Griffiths
Project Engineer: John Strachan
STFC Daresbury Laboratory
Beam-Line for the CLARA reaction Chamber

New telescopic beam line designed by LNL
Liquid Nitrogen distribution system and collector for the residual Liquid/gas Nitrogen. The optical fibres and the vacuum hose for the residual LN2 will be inside a cabling flexible tray.
Conditioned room DAQ (and PSA) in Exp. Hall 3

AGATA Ge-detector Lab. Infrastructure Installation ongoing

AGATA control-box ACQ-Run Control pre-processing. Infrastructure installation ongoing

75m
Milestones for the Preparatory Phase:

• Nov. 2007 all 16 flanges ready. Surface treatment preserving high conductivity by mid Dec. 2007.

• Test of the 15 flanges mounting to be scheduled after delivery of the mounting tools end Dec. 2007 to mid Jan. 2008

• Reaction Chamber ready by Jan. 2008

• Control room with pre-processing racks ready by Jan. 2008

• Support structure ready by end Feb. 2008

• Cryogenic infrastructures ready for installation Feb. 2008

• AGATA Ge detector lab. basic infrastructure ready March 2008

• Mechanics of new beam-line ready by March 2008
**Installation Plan**

<table>
<thead>
<tr>
<th>Task Name</th>
<th>2008</th>
<th>2009</th>
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<tbody>
<tr>
<td></td>
<td>1st Quarter</td>
<td>2nd Quarter</td>
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<td></td>
<td>Jan</td>
<td>Feb</td>
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<tr>
<td>CLARA at LNL</td>
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<td>Easter</td>
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<td>Fixing remaining Mechanics</td>
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<td>AD Installation</td>
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<td>Detectors</td>
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<td>Electronics Inst. &amp; Test</td>
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<td>AD source commissioning</td>
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<td>AD in-beam commissioning</td>
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<td>AD + PRISMA Experiments</td>
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- End of Clara activity mid March 2008.
- Clara decommissioning last week March to mid April.
- Setup installation started beginning of May.
- Installation and test of triple clusters (including noise test in different positions) starting probably early July.
- AGATA Demonstrator electronics due by end October.
Requested support of the collaboration at LNL:

test and check of the mechanics.
15 flanges mounting test as soon as tooling is available.

Mounting of the mechanics in the final location.
Grounding tests.
Installation and test of the DSS LN2 LVPS/HVPS.
Test of the Digitizers in the final location.
Test of the signal transmission through optical link ?
Start installation of the PSA and DAQ farms.

Installation of the first detector modules.
Test and check mounting and positioning the detectors
Commissioning DSS with detector modules
Installation and commissioning electronics and DAQ
# Commissioning Preliminary Plan

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<tr>
<th>Task Name</th>
<th>2008 1st Quarter</th>
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<th>3rd Quarter</th>
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The earliest possibility to run in-beam tests is end-Nov. - Dec.2008

- **Phase 0**: commissioning with radioactive sources starting when detectors and electronics are available (even partially).
- **Phase 1**: easy test with tandem beams with no ancillary detectors. Radiative capture or fusion-evaporation reactions with light targets in inverse kinematics.
- **Phase 2**: test with a “simple” ancillary detector with limited number of parameters (DANTE). Coulomb excitation reactions with medium mass beams (A<100) in inverse kinematics.
- **Phase 3**: test with PRISMA with multi-nucleon transfer reactions and at high multiplicity with appropriate ancillaries.
- In-beam test with no ancillary. Initial test of the PSA and tracking algorithms. Required reactions products with narrow angular distributions, inverse kinematics.

  radiative capture $\rightarrow$ low cross sections?

  fusion evaporation with light targets ($\theta_{\text{FWHM}} << 1^\circ$)

  $^{63}\text{Cu} \ 240\text{MeV} + \text{deuterated Pd target } \rightarrow ^{64}\text{Zn} \ (E_{\gamma} = \sim 1\text{MeV})$

  $^{81}\text{Br} \ 270\text{MeV} + \text{deuterated Pd target } \rightarrow ^{82}\text{Kr} \ (E_{\gamma} = \sim 0.8-1.5\text{MeV})$

Peak resolution (FWHM) as function of the PSA resolution (FWHM) for an AGATA detector placed at 14 cm from the target at 90°
• Coulomb excitation with a high accuracy position sensitive ancillary detector

DANTE: position sensitive product detector for binary reactions.

4 parameters per detector unit: X, Y, amplitude and time.
PRISMA: Large acceptance tracking Magnetic Spectrometer Q-D
Designed for the HI-beams from XTU-ALPI

\[ \Omega = 80 \text{ msr} \]

\[ \Delta Z/Z \approx 1/60 \text{ (Measured) IC} \]

\[ \Delta A/A \approx 1/190 \text{ (Measured) TOF} \]

Energy acceptance \( \pm 20\% \)
Max. \( B/\rho = 1.2 \text{ T.m.} \)
Tracking on PRISMA

true recoil velocity
trajectory in dipole

A/q

true recoil velocity+
trajectory in dipole+
total energy

S. Beghini et al. NIM A551, 364 (05)
G. Montagnoli et al. NIM A547, 455 (05)
Outlook:

• The preparatory phase for the installation of the AGATA Demonstrator at the PRISMA target location is proceeding well.

• Following the time schedule we aim to have all the infrastructure installed by Spring 2008 and to start to mount the detector units early Summer 2008.

• The goal is to perform the radioactive source commissioning and possibly some in-beam test before the end of 2008.

• We are grateful to all the AGATA community and to the INFN AGATA collaboration and technical personnel, working on the project, for their efforts to complete the installation of the AGATA Demonstrator at LNL on time.
Clover processing with the help of IPHC and Jyvaskyla
Infrastructures to be done in 2008

Infrastructures for the Ge detector Lab.
- Vacuum and annealing infrastructures
- Cryogenic infrastructures
- PLC Siemens 319 3PN/DP for HV control
- Vacuum oven
- Low voltage / High voltage power supply
- Detector holder table

Infrastructures for the test bech of the AGATA electronics