

Status of AGATA detectors and cryostats

University of Cologne

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Activities on capsules since last AGATA week

A010 : deliv. Jul 2016, accepted in Sep 2016 by Liverpool
B014 : deliv. Dec 2015, accepted in Jan 2016 by CEA Saclay
A011 : deliv. Mar 2016, accepted in Apr 2016 by CEA Saclay
C004 : deliv. Mai 2016, accepted in Sep 2016 by Liverpool
C002 : deliv. Apr 2016, accepted in Jun by CEA Saclay
B009 : deliv. Jun 2016, accepted in Sep. 2016 by Liverpool
A012 : deliv. Jul 2016, accepted in Sep by CEA Saclay

Christophe Theisen: Detector CATs and DSS activities at Saclay
Andy Boston : Status of AGATA detector laboratory at Liverpool



Overview Capsules

40 detectors available for AGATA

Delivered:

12 x A-Type: A001 - A012

14 x B-Type: B001 - B014

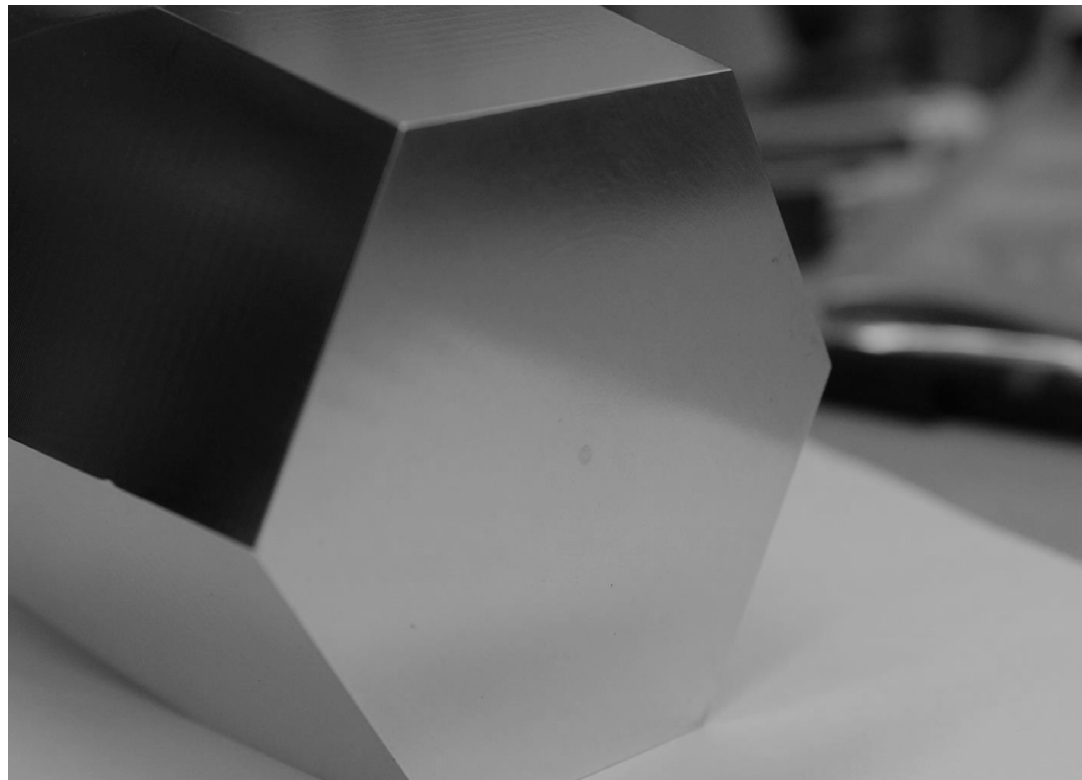
14 x C-Type: C001 - C014

Under repair:

None

Pending:

None



Status Capsules

32 detectors in GANIL for physics campaigns since March

ATC01: A008, B001, C003

ATC02: A003, B003, C005

ATC03: A002, B010, C001

ATC04: A007, B007, C007

ATC05: A005, B002, C009

ATC06: A001, B004, C010

ATC07: A006, B013, C006

ATC08: A009, B005, C008

ATC09: A004, B008, C013

ATC10: A010, B012, C014

ADC03: - B011, C011



Status Capsules

A011, **B006**, **C012**: Cologne,
assembly of ATC11

C002: Cologne

B009, **C004**: Liverpool, waiting
for transport to Cologne

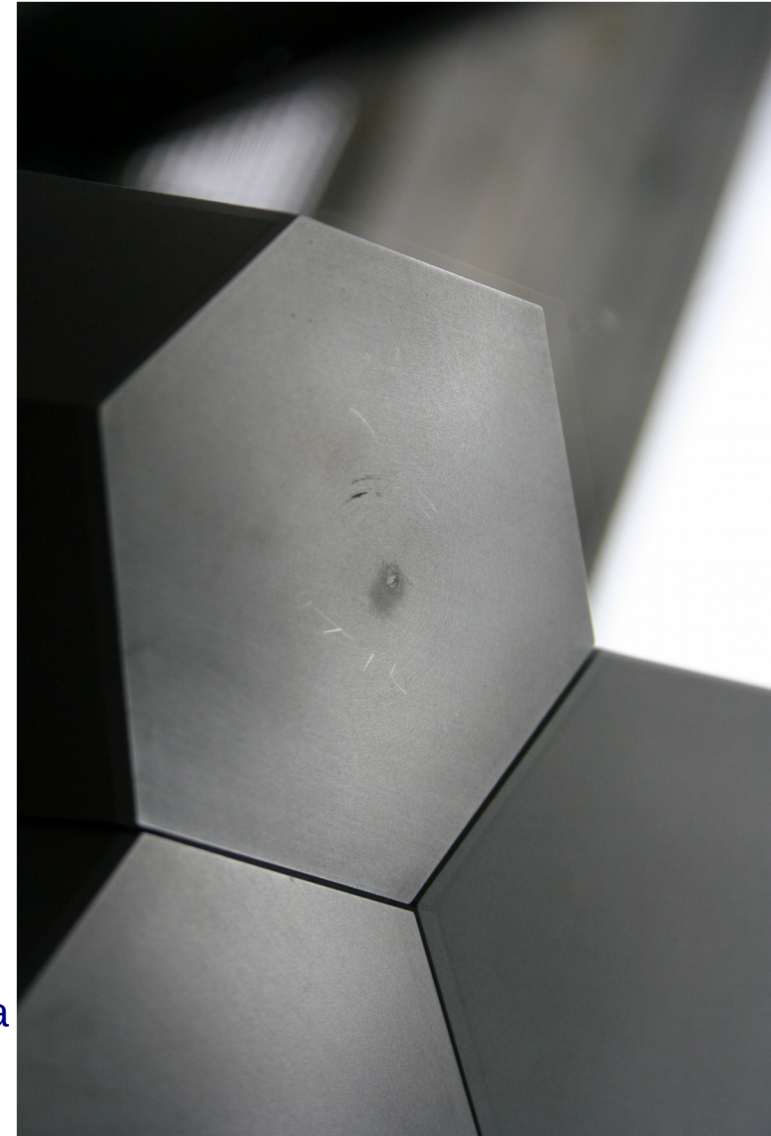
Andy Boston: Status of AGATA detector laboratory at Liverpool

A012: CEA Saclay, waiting for
transport to Cologne

Christophe Theisen: Detector CATs and DSS activities at Saclay

B014: Salamanca, scanning

Begonia Quintana: The AGATA scanning system SALSA at Salamanca



Orders

A013 (TU Darmstadt): 1st semester 2017

A014 (IKP Cologne) : Late September 2016

B015 (TU Darmstadt): 1st semester 2017

B016 (IKP Cologne) : Late July 2016

C015 (TU Darmstadt): 1st semester 2017

C016 (IKP Cologne) : Late September 2016

ATC 12 (TU Darmstadt): Under construction by CTT

ATC 13 (IKP Cologne) : Under construction by CTT

Summary and overview detectors & cryostats

14 x A-Type: A001 - A014

16 x B-Type: B001 - B016

16 x C-Type: C001 - C016

+ future orders 2 x A-Type (Italy, Finland)

13 x ATCs: ATC01 -ATC13

→ ***for full configuration 3 x Triple Cryostats are missing***

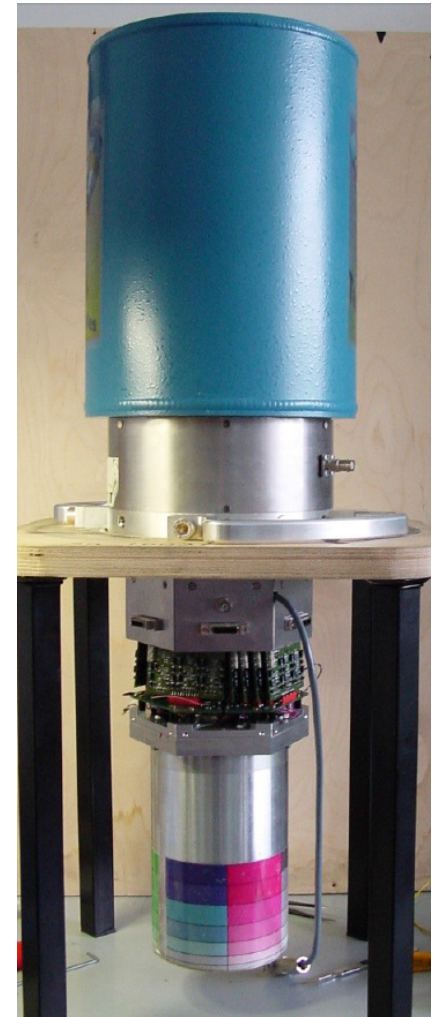
3 x ADCs: ADC1, ADC3, ADC5

→ conversion into ATCs

Overview Test Cryostats (TC)

- TC1: Cologne, CAT
- TC2: Saclay, CAT
- TC3: Liverpool, CAT
- TC4: Liverpool, CAT
- TC5: Cologne, capsule development
- TC6: Cologne, CAT
- TC7: Salamanca, scanning
- TC8: Cologne, repaired

Begonia Quintana: The AGATA scanning system SALSA at Salamanca



AGATA @ GANIL

32 detectors were prepared by the detector group in cooperation with the GANIL staff until March for the physics campaign

→ *System running with 1184 out of 1184 high-resolution spectroscopy channels during the whole physics campaign*



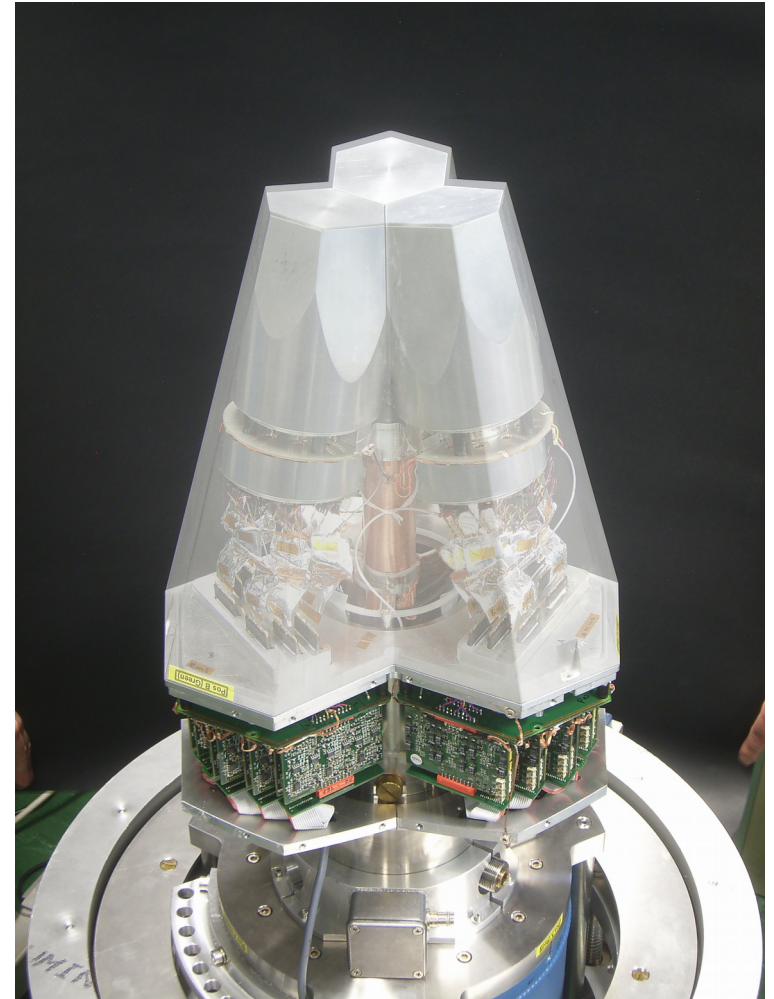
AGATA @ GANIL

Debugging at GANIL:

ATC5: det **A005**, missing
segment C1 recovered

ATC7: mechanical damage
star-shaped spacer broken,
end cap replaced due to
material fatigue

ATC10: short connection in cabling,
repaired



Status ATC11

ATC11 equipped with A011, B006, C012 (in Cologne)

Assembled by CTT
Feedthroughs: Ceramic

FWHM Core ($^{241}\text{Am}/^{60}\text{Co}$):

A011: 1.34/2.26 keV

B006: 1.32/2.45 keV

C012: 1.46/2.28 keV

Resolution of all segments within specification

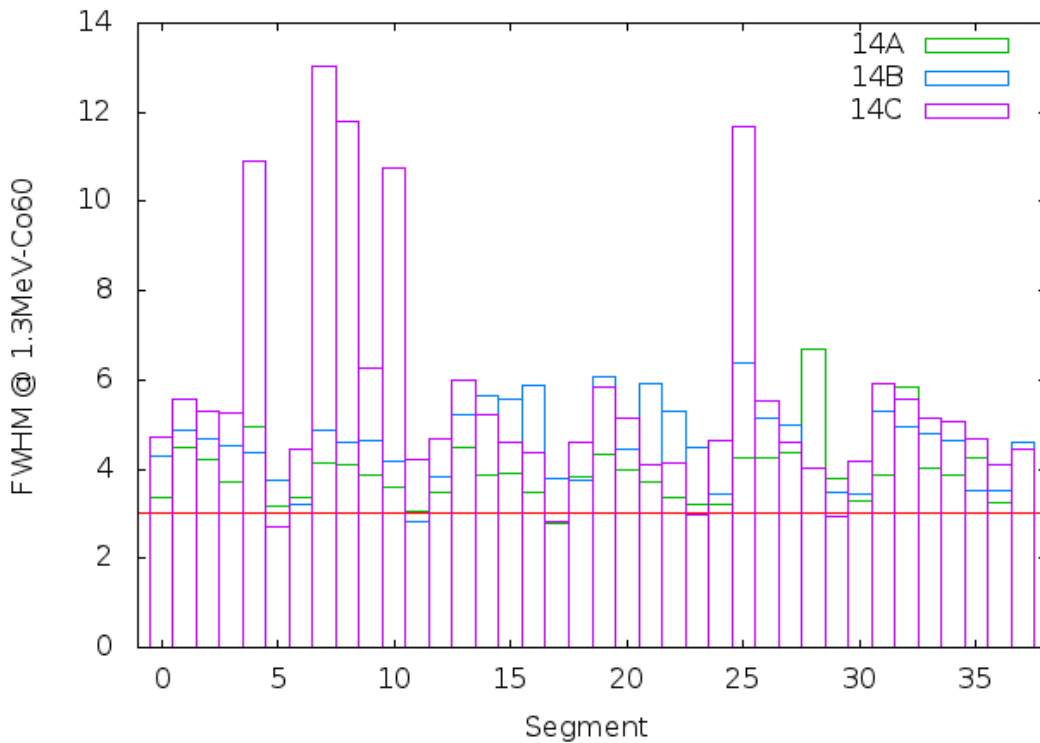
Shows crosstalk on A011 between seg. B1, B2, B3 & C4, C5, C6

Ongoing debugging

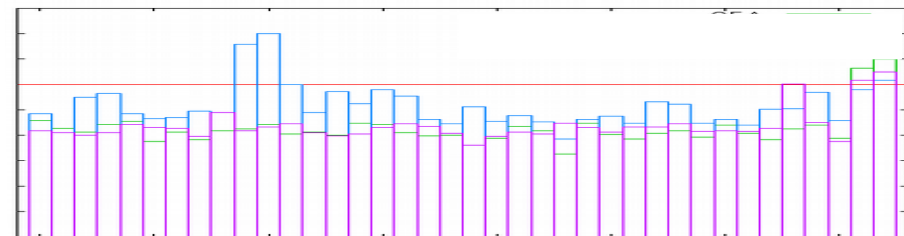
Delivery foreseen for Oct.

Neutron damage after physics campaign

ATC 01



ATC 10



Most detectors suffer from neutron damage

Line shape of neutron damaged detectors

Hole trapping due to neutron damage → all segments are affected

Correction possibility:
Pulse Shape Analysis

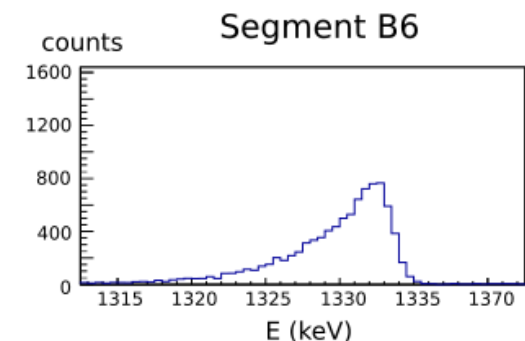
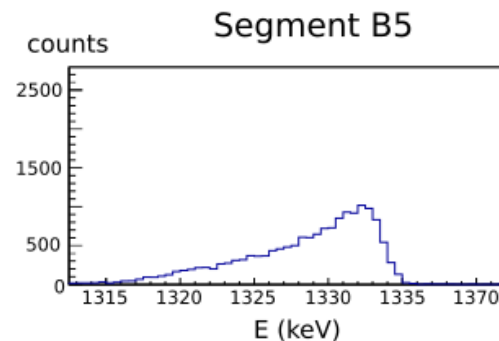
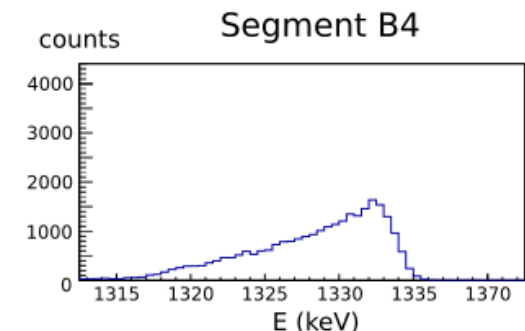
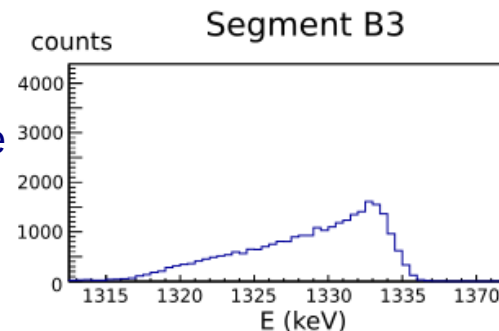
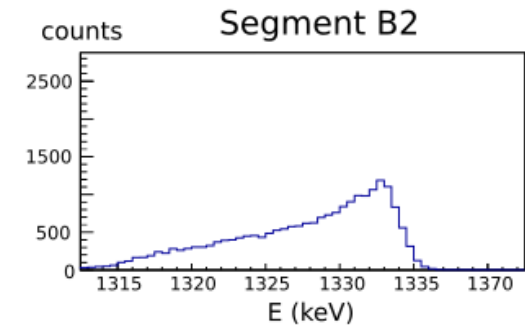
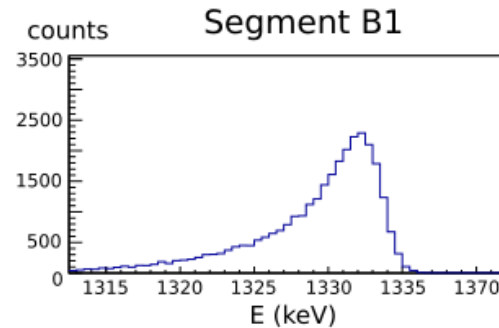
Robert Hetzenegger:

Numerical correction methods for neutron damage

→ numerical methods limited for severe neutron damage

→ annealing of detectors to be discussed

Detector C001



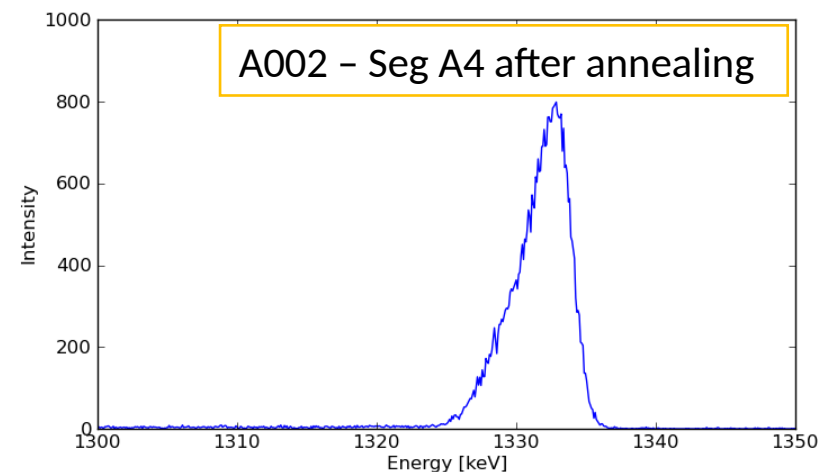
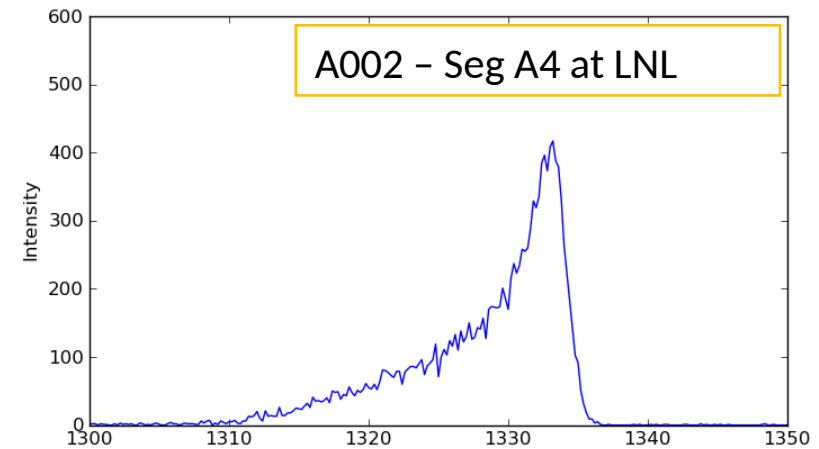
Reminder: Annealing of detectors

After LNL campaign 11 detectors were annealed

3 detectors showed leakage current after annealing

120 h at 102°C was not sufficient to restore the original performance

ATC1 needs annealing



Future activities

Increasing the number and performance of detectors for the physics campaign (ATC11)

Annealing of detectors in ATC01:

A008: will be replaced by **A012**

B001: will be replaced by **B009**

C003: will be replaced by **C004**

A008, **B001**, **C003** annealed in a vacuum oven
→ individually tested in TC

ATC01 glued feedthroughs could be replaced by ceramic ones etc.
→ ATC01 could be mounted in frame

Details will be discussed on Thursday in the Detector WG meeting - parallel session

Summary

32 detectors were running stable during the physics campaign 2016

7 repaired & new detectors were accepted

No failures with new delivered detectors

40 detectors available for AGATA

6 detectors & 2 ATCs ordered

2 detectors will be ordered

Increased efficiency

Missing Triple Cryostats



THANK YOU !!!



UNIVERSITY OF
LIVERPOOL



Many Thanks to Bene



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Special Article – Tools for Experiment and Theory

Pulse shape analysis and position determination in segmented HPGe detectors: The AGATA detector library

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Abstract. The AGATA Detector Library (ADL) was developed for the calculation of signals from highly segmented large volume high-purity germanium (HPGe) detectors. ADL basis sets comprise a huge amount of calculated position-dependent detector pulse shapes. A basis set is needed for Pulse Shape Analysis (PSA). By means of PSA the interaction position of a γ -ray inside the active detector volume is determined. Theoretical concepts of the calculations are introduced and cover the relevant aspects of signal formation in HPGe. The approximations and the realization of the computer code with its input parameters are explained in detail. ADL is a versatile and modular computer code; new detectors can be implemented in this library. Measured position resolutions of the AGATA detectors based on ADL are discussed.

Neutron damage of HpGe - Detectors

T.W. Raudorf, R.H. Pehl / Effect of charge carrier trapping

