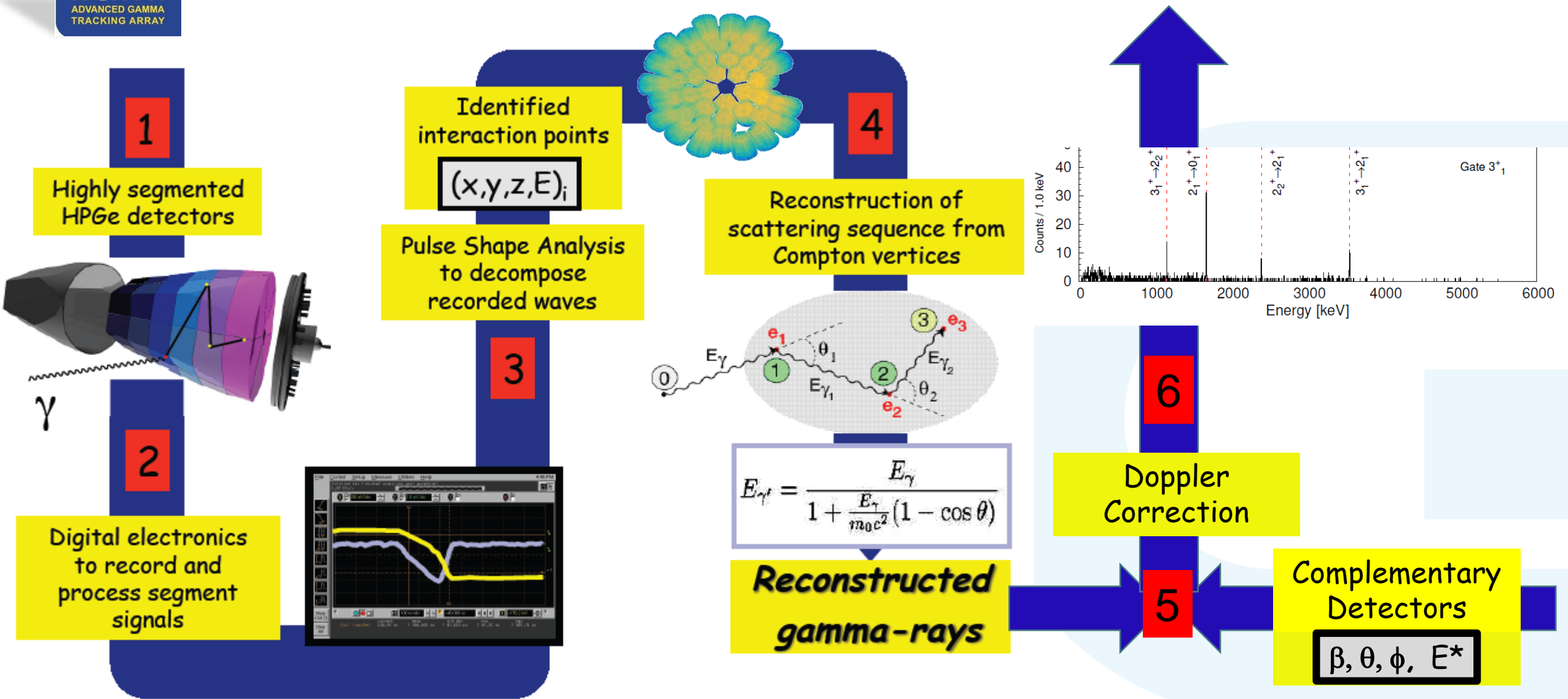




Project Manager Report 2025 evaluation

Emmanuel Clément (GANIL)
on behalf of the AMB, LNL and Padova local team

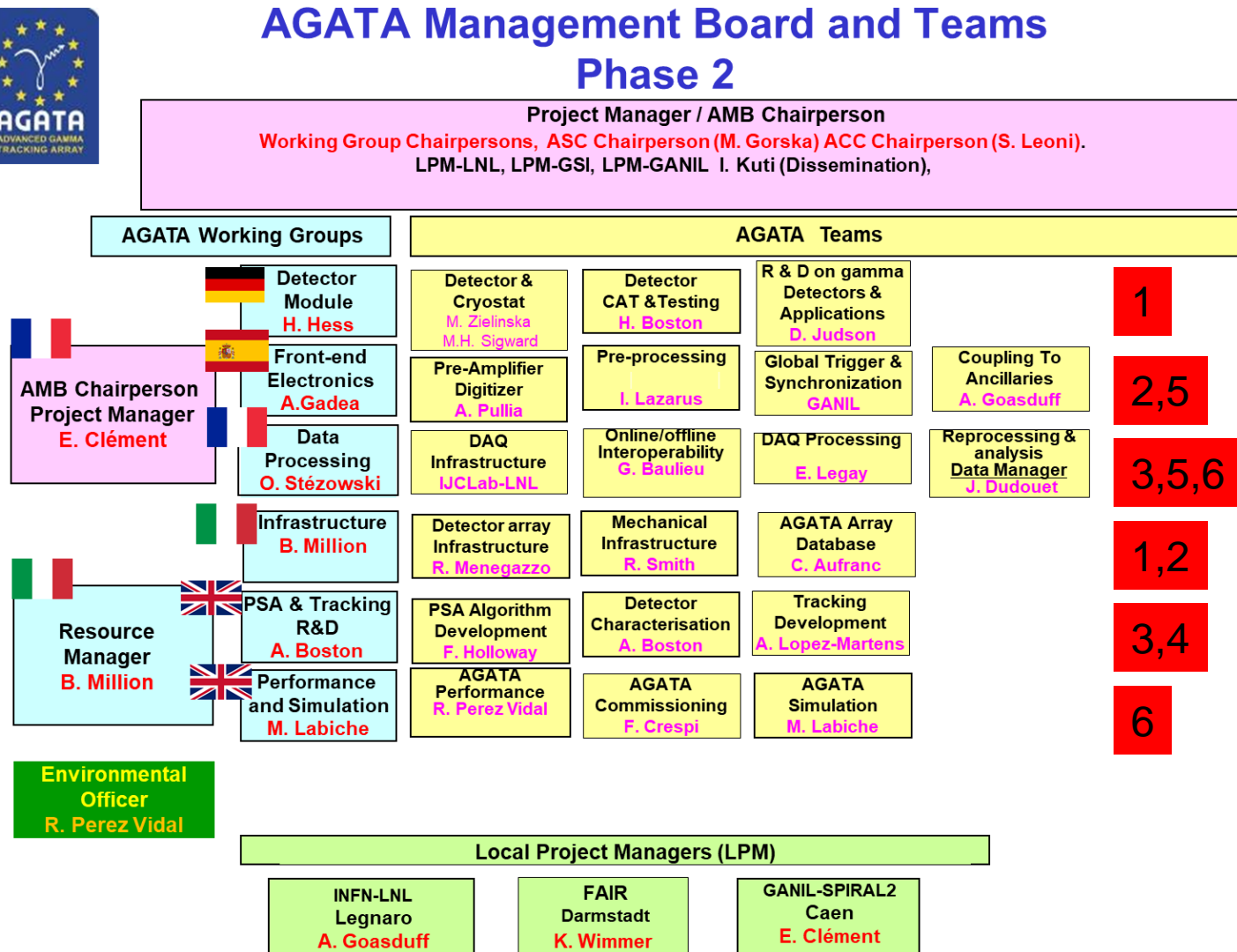
ARRB April 2025



AGATA : WBS



AGATA Management Board and Teams Phase 2



- ☐ The AMB meets every month by zoom
- ☐ Excellent stability and smooth evolutions of the board
- ☐ One AMB meeting per year in presence
- ☐ 3 AMB meetings per year include all team leaders.
- ☐ The AMB organises the annual AGATA week
- ☐ The next one is in GSI

The 25th AGATA week and ACC Meeting

15–19 sept. 2025
GSI - Germany
Fuseau horaire Europe/Paris

Most likely the 2026 AW will be proposed to Poland

Detector status (April 2025)

Detector procurement

The total number of delivered AGATA asym-capsules is **71**
+ 1 DEGAS ATC completed in IKP
+ 1 ORTEC prototype, not functional
+ 3 symmetric capsules

Open Orders: 6 capsules

- 4 x Owner (Italy) delivery expected in 2025 and 2026
- 2 x Owner (France) delivery expected 2025

Cluster Assembly

ATC24 (GSI) delivered

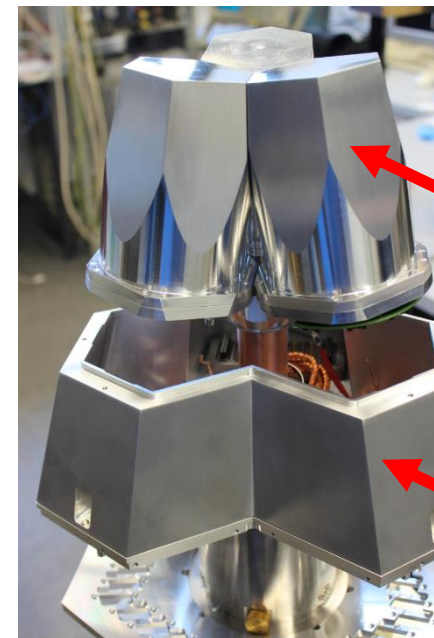
ATC25 (GANIL) in progress

ATC16 (conversion of ADC03 - GANIL): completed

Test cryostats refurbishment done

Maintenance

A 4 years contract (1.6 M€) between GANIL and MIRION for new orders/ annealing / repairs has been signed using the OC located in the GANIL common account. Started in January 2025



GANIL

3 x encapsulated HPGe
crystal from MIRION®

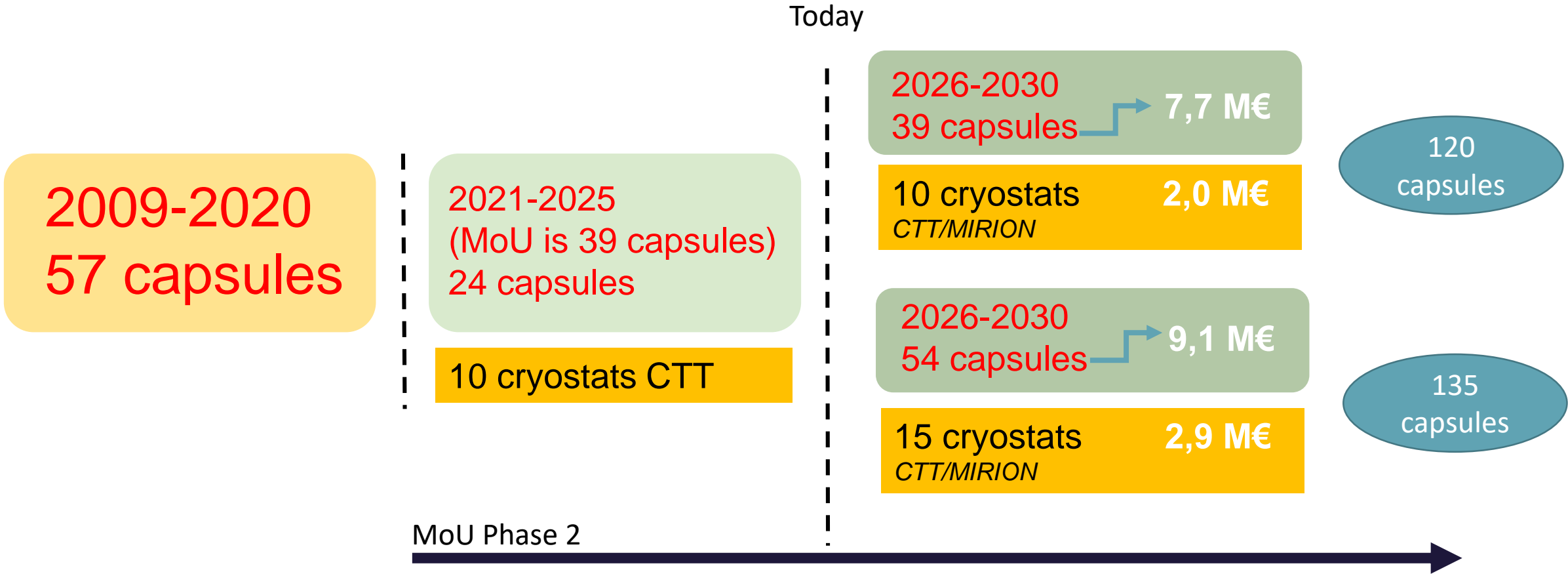
1 x cryostat from CTT®

AGATA Triple Cluster (ATC)

Production line status



Tables 5 and 6 : capsules and cryostats cost



Detector status ; Project Definition

Procurements :

- Capsules procurement at 2025 milestone will be 85% of the objective [2010-2025]
- Cryostat procurement at 2025 milestone will be 100% of the objective

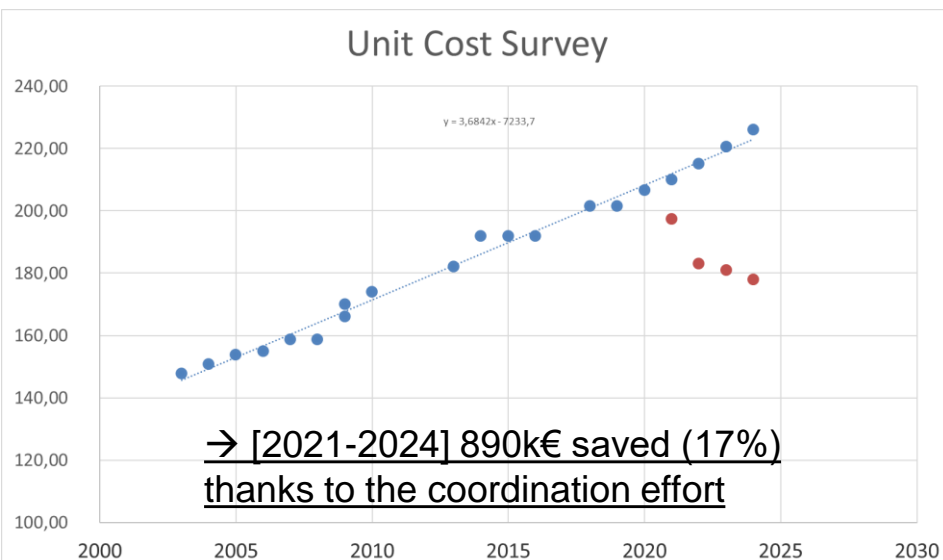
Improvements :

- Improving the vacuum in the cryostat by new getter → done
- Survey of obsolete component for the preamps → done

R&D :

- ORTEC option → went far thanks to the UK investment
- p-type design, electric cooling, ASIC preamps → to be continue in the second part of the decade

Cost optimisation :



Efforts :

- Based on the involvement of Univ. of Cologne, Univ. of Liverpool, IRFU Saclay, IPHC Strasbourg, Host Lab's.
- The detector laboratories are committed to pursue their activity for AGATA with perspectives of acquiring more knowhow
- Toward a GRETA business model with the CTT-MIRION agreement

Infrastructures

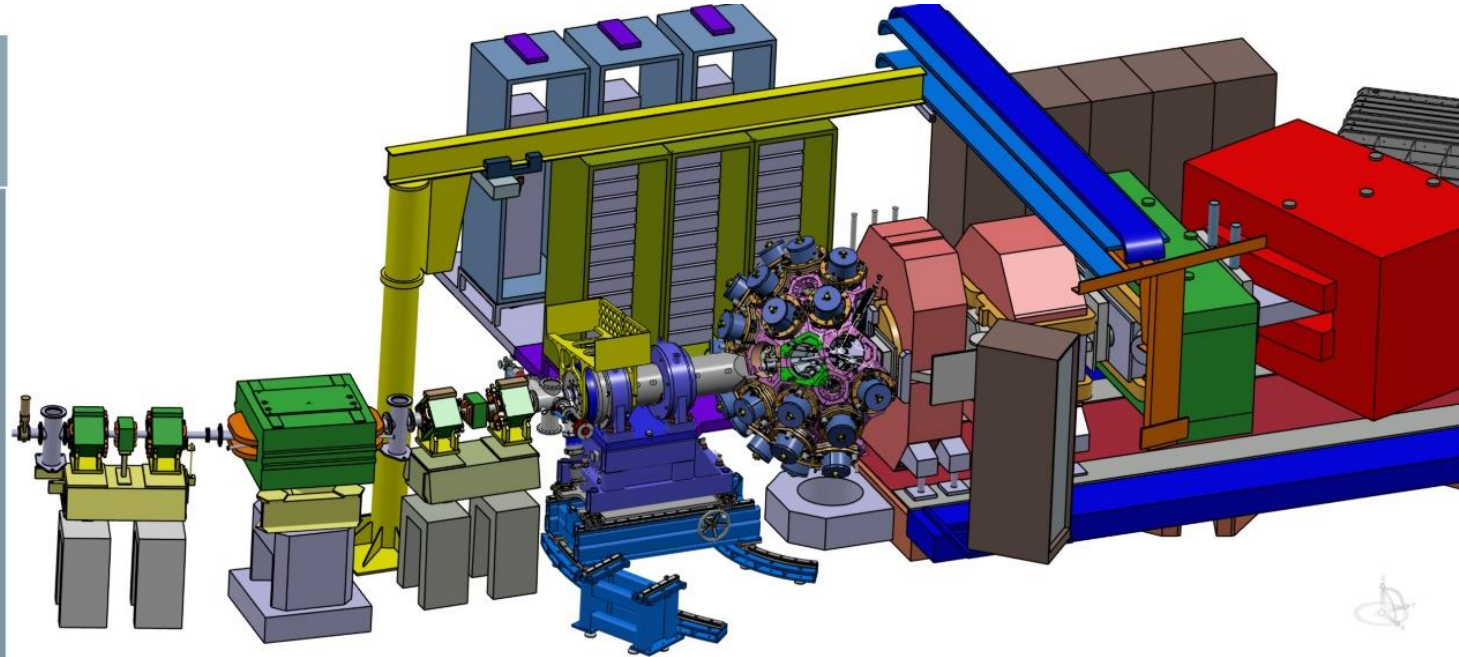
Mechanics (STFC, LNL, GANIL) :

Involved in LNL campaign (STFC- LNL – PD)

Involved in the next Host Lab discussion

EMC (IJCLab)

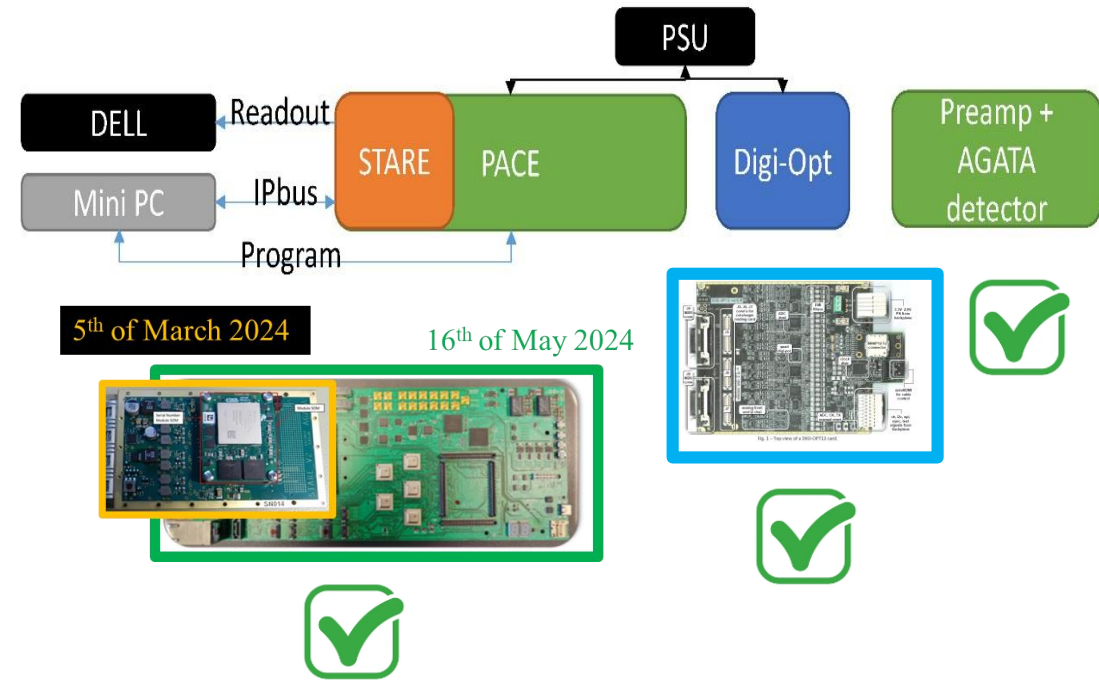
Detector Support System (CEA)



- ✓ Phase 2 LVPS designed (CEA) and 2π delivered, operational at LNL
- ✓ HV replacement funded. Done.
- ✓ LN2 system for phase 2 designed (CEA), delivered and operation at LNL
- ✓ Design of the mechanical support completed, 2π delivered (STFC)

The 2π solid angle is covered

Phase 2 FEBEE : evaluation status



- The most challenging R&D of phase 2
- Mass production has started for all hardware parts in 2024. Procurement delays are > 12 months
- The critical path is the integration at the firmware level in the existing system (GTS, network, flow, RUDP etc...) due to human resource availability

The ASC approved to charge the OC at GANIL for the maintenance of the firmware with the ZeptoNova company contract (52 k€)



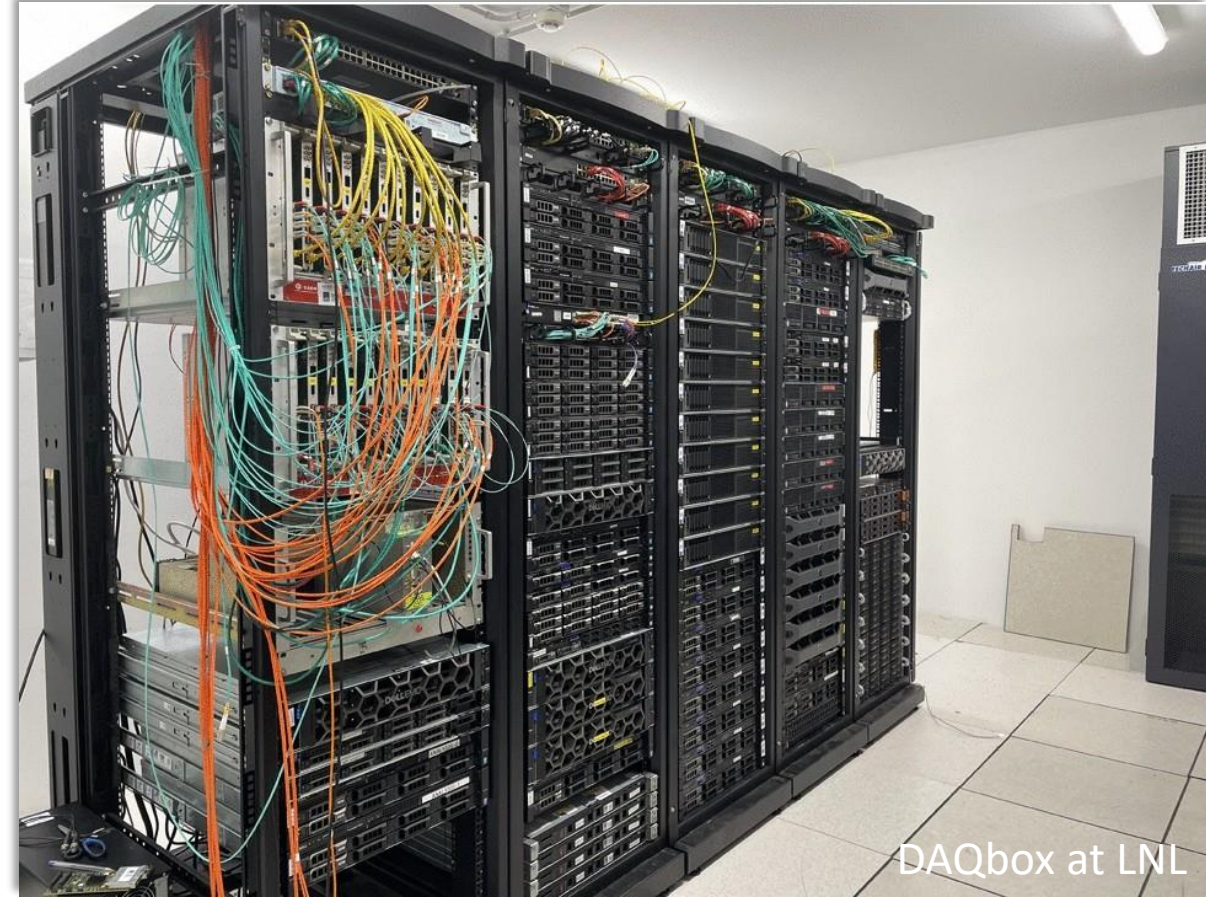
→ Signed by GANIL on February 2025

Present schedule

- DIGOPT mass production is on time
- 3 years delay in the mass production of PACE/STARE boards due to difficulties now resolved
- 75 x complete chains are now ordered and to be delivered by summer 2025
- Integration work to coupled with phase 1 (> 100 channels)
- Expected delivery end of 2025
- 2026- 2030 period, extending the system to cover the full AGATA solid angle

Data flow and Acquisition status

- Maintaining the present system with upgrades
- The phase 2 data pipe line is ready
- Software Slow Control installed in LNL
- Performances are testes using an V2 emulator and real data taken in LNL
- Preparing the migration to new PSA including the use of GPU
- Mini daq box for data flow R&D setup in Orsay to validate the most recent technologies (PSA > 20 kHz reached on recent technologies)
- Improvements in accessing the data from GRID and maintaining the identification process
- The investment remained low in 2020-2025 due to a constant number of channel to be instrumented
- After V2 implementation, due to the rapid increase of the number of detector, a massive investment will be needed in 2026 -2030 (0.9M€) with savings possible thanks to the CNRS accord cadre



Performances and Simulations ; status



Neutron damage : the Performance team monitors the resolution of the array after the neutron damage following the high luminosity.

18 capsules are already being annealed by MIRION in 2024

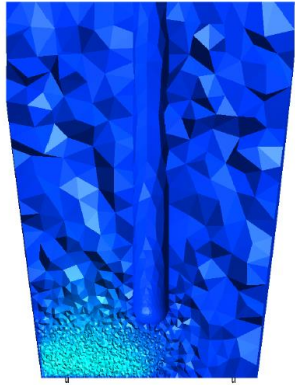
Operation Cost are fundamental for this operation.

High energy gamma ray benchmark for the future campaigns in SPIRAL1 and SPES

- The AGATA package is maintained following the GEANT4 releases → done
- Including new ancillaries → done
- Event generators :Integration of the FAIR MOCADI frameworks → done
- The improve characterization of the crystal geometry or sensitivity relies on the systematic study of the measured efficiency and performances as well as the scanning data in tomography mode

→ to be completed in this second half of the MoU

PSA-Tracking R&D ; status

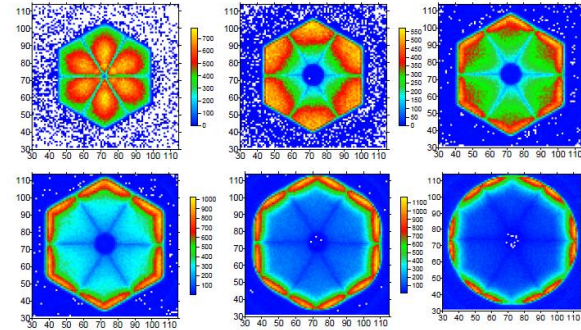


New simulation package, AGATAGeFEM

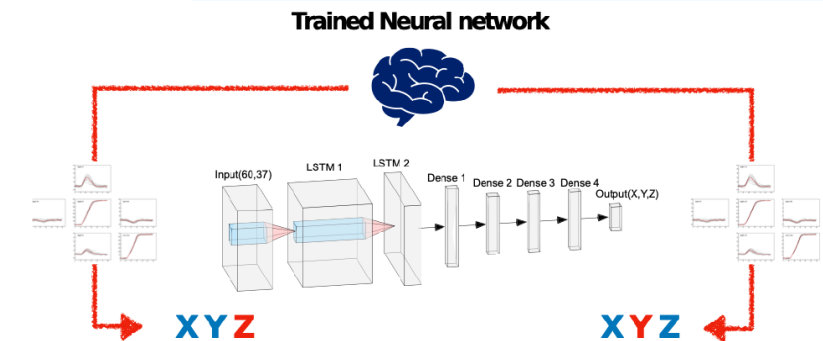
→ J. Ljungvall, EPJA 57, 198 (2021) [10.1140/epja/s10050-021-00512-w](https://doi.org/10.1140/epja/s10050-021-00512-w)

→ Dependencies investigation

→ Improved geometries



Characterization with IPHC scanning table and elsewhere (Salamanca and GSI)
Ip2i involvement in the analysis



Implementation of the multi-interaction PSA grid search using the GRETINA approach :
This has been fully implemented in AGAPRO and works (Univ. Liverpool)

Tracking

Investigation into how tracking behaves when the proper position & energy dependent uncertainties are used to estimate the error on the Compton scattered energies

workshops

OASIS AGATA AI workshop 2024, 13th of May
AGATA – GRETINA in ANL (Nov. 2024)

<https://indico.in2p3.fr/event/32594/overview>

Dissemination



https://www.agata.org



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Search



The Advanced Gamma Tracking Array (AGATA) is a European gamma-ray spectrometer used for nuclear structure studies. Click [about](#) for further information.

News

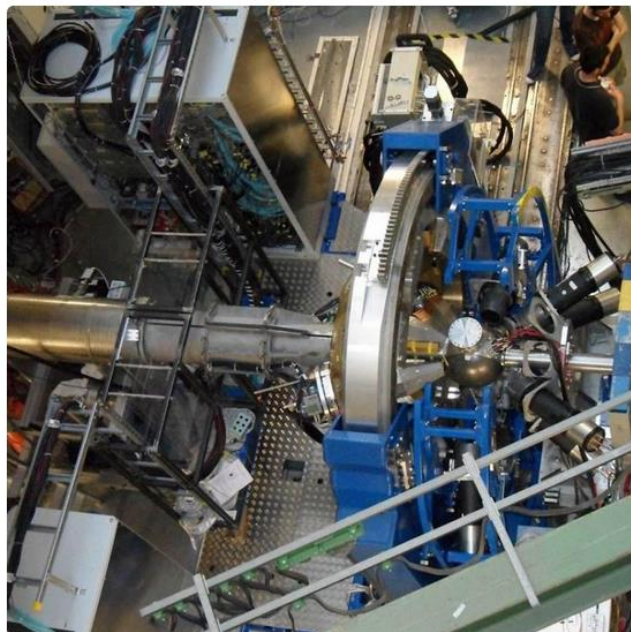
AGATA GANIL2.0 Workshop

Workshop for the GRIT-AGATA-VAMOS 2029-2030 Campaign at GANIL to be held in France 11-13 June 2025.
[Read more](#)

25th AGATA Week and Annual AGATA Collaboration Meeting

The 25th AGATA Week and the Annual AGATA Collaboration Meeting will be held at GSI, Darmstadt, Germany, 15-19 September 2025.
[Read more](#)

AGATA Home Page



PRESPEC-AGATA setup at GSI 2012-2014.

Recent Publications

High-resolution spectroscopy of neutron-rich Br isotopes and signatures for a prolate-to-oblate shape transition at $N = 56$

Search for ^{22}Na in novae supported by a novel method for measuring femtosecond nuclear lifetimes

High-Precision Spectroscopy of ^{20}O Benchmarking *Ab Initio* Calculations in Light Nuclei

Shape evolution in even-mass $^{98-104}\text{Zr}$ isotopes via lifetime measurements using the $\gamma\gamma$ -coincidence technique

AGATA DAQ-box: a unified data acquisition system for different experimental conditions

Agata characterisation and pulse shape analysis

Agata detector technology: recent progress and future developments

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[Web design](#)

Risk Analysis – from 2020 evaluation



- The CTT company is presently the only company constructing the AGATA cryostats (ATC).
 - Great progresses in 2024 toward an agreement between MIRION and CTT
 - Pr. P. Reiter is following the discussion closely on behalf of the collaboration with an ASC mandat
- Obsolete electronic components for production and maintenance of the FEBEE in a long-term view.
 - The AMB has taken the decision in 2024 to secure all the possible hardware in 2025 for 3π
- The newly designed SMART clock and trigger system does not provide the required performance.
 - Most of the hardware has been delivered. A reduced system is running at GANIL
 - Full implementation in AGATA has been secured via the ZeptoNova contract
- Long-term vision of the availability of engineers and technicians working on specific tasks related to the detector, front-end electronics and data acquisition activities until 2030
 - It remains a risk
 - The MIRION- CTT agreement will obviously change the commitment beyond 2030
 - Firmware has been sub-contracted
 - Pushing the development for 3π ASAP
- Long-term commitment on budget allocated by the partners.
 - Impact on the final solid angle and therefore efficiency



**Thanks to all AGATA
contributors
The local team LNL/PD**



GANNIL

Phase 2 FEBEE status



The main developer is presently under contract with the ZeptoNova compagny, University of Leuven Spin-off

IFIC has negotiated a quotation between ZeptoNova and « AGATA » for ~31 working days to complete the firmware
The contract is established for maintenance of the firmware phase 2 and can therefore covered by the AGATA OC
All individual blocks have been delivered by the partners (IN2P3, GANIL, IFIC, INFN)

The maintenance services is defined as the needed maintenance of the firmware to make the integration into the AGATA existing system

The ASC approved to charge the OC at GANIL for the maintenance of the firmware and proceed with the ZeptoNova contract (52 k€)

→ Signed by GANIL with ZeptoNova on February 2025



	Owner		Owner		Owner
S001	IKP	S002	GSI	S003	TUM
A001	GANIL	B001	INFN Padova	C001	INFN Padova
A002	INFN	B002	IN2P3	C002	CEA Saclay
A003	Liverpool	B003	Liverpool	C003	Liverpool
A004	Ankara	B004	Ankara	C004	Ankara
A005	Sweden	B005	Sweden	C005	Sweden
A006	INFN Padova	B006	INFN Padova	C006	INFN Legnaro
A007	INFN Milano	B007	IKP Cologne	C007	IKP Cologne
A008	IKP Cologne	B008	IKP Cologne	C008	Liverpool
A009	Liverpool	B009	Liverpool	C009	CEA Saclay
A010	INFN Milano	B010	INFN Milano	C010	IFIC Valencia
A011	IN2P3	B011	INFN Legnaro	C011	IN2P3
A012	CEA Saclay	B012	IN2P3	C012	IN2P3
A013	TU Darmstadt	B013	CEA Saclay	C013	IFIC Valencia
A014	IKP Cologne	B014	INFN Milano	C014	INFN Milano
A015	IN2P3	B015	TU Darmstadt	C015	TU Darmstadt
A016	Finland	B016	IKP Cologne	C016	IKP Cologne
A017	Atomki	B017	Univ. of York	C017	Univ. of York
A018	UWS	B018	Atomki	C018	Atomki
A019	GANIL	B019	UWS	C019	UWS
A020	IN2P3	B020	GANIL	C020	IN2P3
A021	Liverpool	B021	INFN	C021	INFN
A022	Spain	B022	Liverpool	C022	GANIL
A023	GSI	B023	GSI	C023	GSI
A024	Liverpool	B025	CEA Saclay		

Phase 0 + 1 = 53 caps
+ 1 DEGAS Triple available to the collaboration
+ 1 ORTEC prototype – non functional



-----57 capsules

Phase 0+1

+ Fr(2) GANIL : B024, C025, (2025)
+ INFN(4) : A025, C024 (2025) , 2 orders in March 2025 → 2026 delivery

Phase 0 + 1 = 53 caps
+ 1 DEGAS Triple available to the collaboration
+ 1 ORTEC prototype – non functional

-----57 capsules

Phase 2, ½ = +39 (according to MoU) → 24 achieved

Phase 2 ^{2/2} = +39 (according to Mou)



	Owner		Owner		Owner
S001	IKP	S002	GSI	S003	TUM
A001	GANIL	B001	INFN Padova	C001	INFN Padova
A002	INFN	B002	IN2P3	C002	CEA Saclay
A003	Liverpool	B003	Liverpool	C003	Liverpool
A004	Ankara	B004	Ankara	C004	Ankara
A005	Sweden	B005	Sweden	C005	Sweden
A006	INFN Padova	B006	INFN Padova	C006	INFN Legnaro
A007	INFN Milano	B007	IKP Cologne	C007	IKP Cologne
A008	IKP Cologne	B008	IKP Cologne	C008	Liverpool
A009	Liverpool	B009	Liverpool	C009	CEA Saclay
A010	INFN Milano	B010	INFN Milano	C010	IFIC Valencia
A011	IN2P3	B011	INFN Legnaro	C011	IN2P3
A012	CEA Saclay	B012	IN2P3	C012	IN2P3
A013	TU Darmstadt	B013	CEA Saclay	C013	IFIC Valencia

A014	IKP Cologne	B014	INFN Milano	C014	INFN Milano
A015	IN2P3	B015	TU Darmstadt	C015	TU Darmstadt
A016	Finland	B016	IKP Cologne	C016	IKP Cologne
A017	Atomki	B017	Univ. of York	C017	Univ. of York
A018	UWS	B018	Atomki	C018	Atomki
A019	GANIL	B019	UWS	C019	UWS
A020	IN2P3	B020	GANIL	C020	IN2P3
A021	Liverpool	B021	INFN	C021	INFN
A022	Spain	B022	Liverpool	C022	GANIL
A023	GSI	B023	GSI	C023	GSI
A024	Liverpool	B025	CEA Saclay		

Phase 0+1

	Planned	2021	2022	2023	2024	2025	2021-2025
		64/21	72/24	80/26	88/29	96/31	
DETECTORS	Bulgaria	0	0	0	0	0	0
	Finland	0	0	0	0	0	0
	France	0	4	2	2	0	8
	Germany	0	0	0	3		3
	Hungary	0	0	0	0	0	0
	Italy	0	2	2	2	0	6
	Poland	0	0	0	0	0	0
	Spain	0	0	1	0	0	1
	Sweden	0	0	0	0	0	0
	Turkey	0	0	0	0	0	0
	UK	3	0	2	1	0	6
	total number	3	6	7	8	0	24
	<i>Increase (1.5%/year)</i>	1,62%	2,50%	2,50%	2,50%	2,50%	
	<i>Full price / Unit</i>	209,9	215,1	220,5	226,0	231,7	
	effective total price	591,9	1097,2	1265,7	1428,5	0,0	4383,2
	effective price / Unit	197,3	182,9	180,8	178,6	#DIV/0!	182,6

Total funded so far = 57 + 24 = 81 capsules

+ Fr(2) GANIL : B024, C025, (2025)

+ INFN(4) : A025, C024 (2025) , 2 orders in March 2025 → 2026 delivery

Looking at the origin of the delay

- The design phase was on-time until 2019
- The covid lockdown clearly impacted the development at a key moment
- A mis-understanding appeared between Strasbourg and Valencia slowing down the progresses
- The restart of the LHC (Strasbourg duty) complicated the collaboration
- Valencia recovered the leadership in the development with the help of GANIL for missing parts

PSA-Tracking R&D ; status

GANIL



A plan for neutron damaged measurements is now being finalised with A601 at the University of Birmingham Neutron facility



Strasbourg Scanning table **On the request of AGATA's Performances and PSA Teams, scan of the A005 detector to determine for the first time in 3D various properties of large-volume segmented Ge crystals; strong French involvement in data analysis (IPHC, IJCLab, GANIL, Lyon).** Full 2x2mm scans have been performed and analysed on NN approach. Reprocessing of the PSA based on NN basis, AGATAGeFEM, ADL. Tomography reports. A step is made with this approach (ie using the scanning table). Much more to come Particular care on the data format and access for all the AGATA collaboration

workshops

OASIS AGATA AI workshop 2024, 13th of May

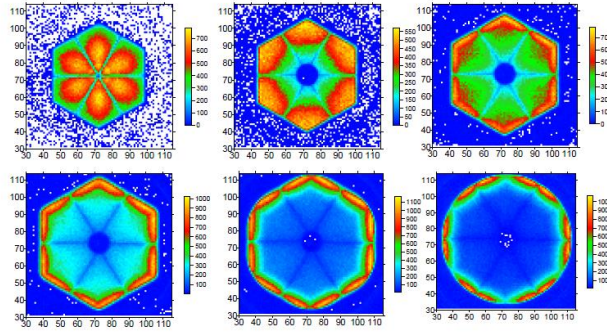
AGATA – GRETINA in ANL (Nov. 2024)

<https://indico.in2p3.fr/event/32594/overview>

Tracking

Investigation into how tracking behaves when the proper position & energy dependent uncertainties are used to estimate the error on the Compton scattered energies

PSA-Tracking R&D ; status

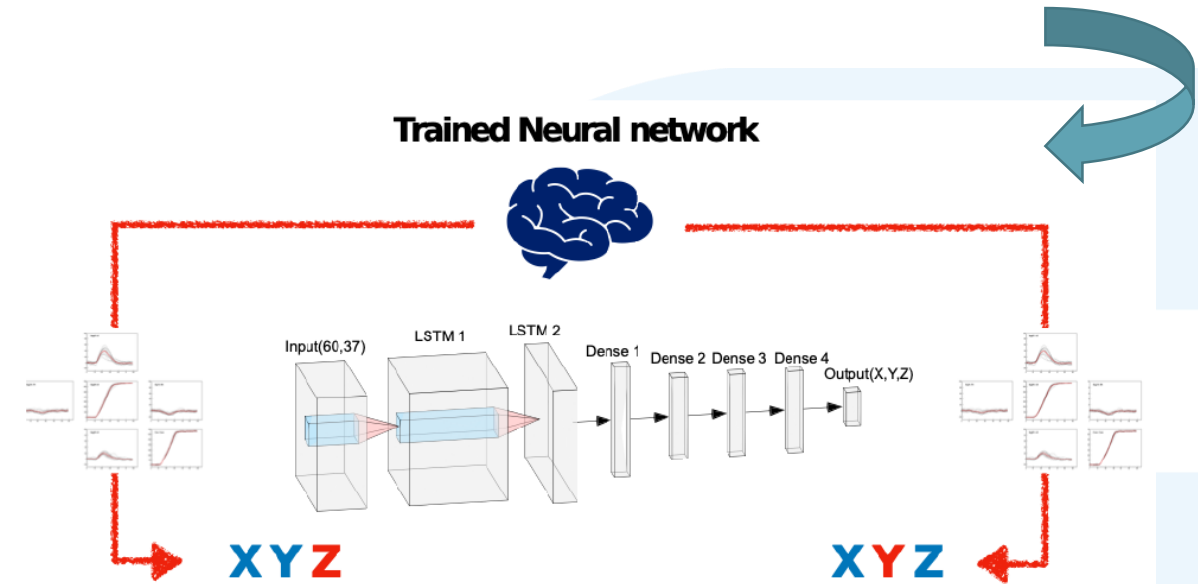


Characterization with IPHC scanning table and elsewhere (Salamanca and GSI)
Ip2i involvement in the analysis

- Self calibration method : data collected and being analysed;
on-going qualification

R&D : Impact on DAQ infrastructure not yet started
(GPU/CPU/cloud)

- GRETINA collaboration cross fertilization



Keeping (young) RH on this subject is crucial

Implementation of the multi-interaction PSA grid search using the GRETINA approach :

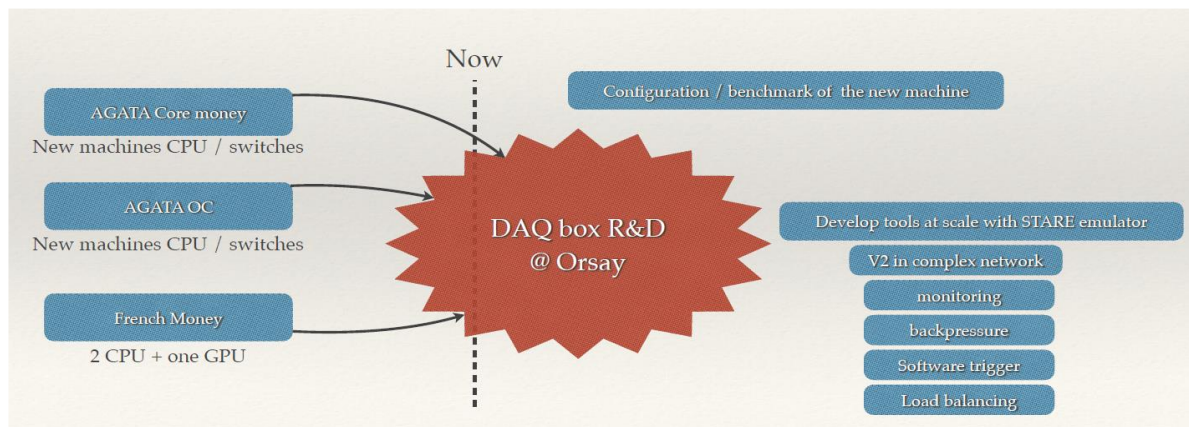
This has been fully implemented in AGAPRO and works (Univ. Liverpool)

Data flow and Acquisition status

- Mini daq box for data flow R&D setup in Orsay .



IN2P3 funds outside of the MoU



- Operational !
 - Installation/tests of new tools (redis,InfluxDB,docker)
 - First benchmarks performed on the new machines
 - More CPU / RAM oriented
 - Confirmed about 8khz current psa thanks to new anode
 - More Parallel processing 20 kHz reached on recent anode
- Next step is to have a full DCOD environment operational
 - More network benchmarks oriented

→ Keeping the HR to explore this new architecture at IP2i and IJCLab is crucial

The investment remained low in the first half to follow closely the needs from the electronic.

Massive investment will be needed in this second half (0.9M€)

Data flow and Acquisition status

Next 5 years objectives

- The monitoring will be extensively benchmarked to correct for weaknesses
 - It will be extended also to all processing nodes
- The processing of few tens of emulated crystals will be tested
 - At high/low rates, possibly including new PSA/Tracking
 - The data transfer through the UDP (RUDP) protocol should be mastered to avoid loss
- A new scalable reprocessing environment will be tested and validated
- Advanced data & metadata management tools (solutions such as ami/rucio) will be tested
- Software triggers are to be developed to allow PSA to be performed only on the most interesting events in order to speed up the global processing rates

In the host laboratories (LNL and then GANIL)

- The server farm will be modified to handle new v2 electronic boards
 - At a first step with a coexistence with old v1 boards then with only v2
- The new processing will be implemented up to the global level
 - A commissioning at high/low rates, possibly including new PSA/Tracking, is to be done

