



Science and
Technology
Facilities Council

The AGATA Spectrometer ASC Update

John Simpson
Daresbury Laboratory

AGATA Collaboration Meeting
Nov-2021-LNL

AGATA Collaboration



Bulgaria:	Univ. Sofia
Finland:	Univ. Jyväskylä
France:	GANIL Caen, IP2I Lyon, IJC Orsay, IPHC Strasbourg, DRF/IRFU Saclay,
Germany:	GSI Darmstadt, TU Darmstadt, Univ. zu Köln
Hungary:	ATOMKI Debrecen
Italy:	INFN Firenze, Lagnaro, Milano, Padova
Poland:	IFJ PAN Krakow, University of Warsaw (HIL)
Spain:	CSIC-Universidad de Valencia, Instituto de Fisica Corpuscular. Universidad de Valencia, Escuela Tecnica Superior de Ingenieria CSIC, Instituto de Estructura de la Materia, Madrid Universidad de Salamanca, Laboratorio de Radiaciones Ionizantes.
Sweden:	Lund Univ., KTH Royal Institute of Technology Stockholm, Uppsala Univ, Stockholm Univ.
Turkey:	Univ's Ankara, Istanbul, Kocaelli, Bitlis Eren
UK:	Univ's Brighton, Edinburgh, Liverpool, Manchester, West of Scotland, Surrey, & York, UKRI-STFC Daresbury
Romania:	IFIN-HH Bucharest
Slovenia:	Ljubljana

13 Countries
~40 Institutions

AGATA Steering Committee

John Simpson (UK, Chair), Giacomo de Angelis (Italy), Piotr Bednarczyk (Poland), Mike Bentley (UK), Angela Bracco (Italy), Bo Cederwall (Sweden), Gilbert Duchêne (France), Jürgen Gerl (Germany), Paul Greenlees (Finland), Ayşe Kaşkaş (Turkey), Begoña Quintana (Spain), Peter Reiter (Germany), Dora Sohler (Hungary), Christophe Theisen (France), Dimitar Tonev (Bulgaria)

Jelena Vesić (Slovenia) Observer

Nicolae Marginean (Romania) Observer

Wolfram Korten (NuSTAR)

Benedicte Million (Resources)

Emmanuel Clement / Andres Gadea (Project Managers)

Silvia Leoni (ACC Chair)

MoU: “The AGATA Steering Committee, acting on behalf of the Parties, is responsible for the Project coordination and the science policy of the collaboration”

Outline

- NuPECC Long Range Plan 2017
- Science Case (White Book) 2020
- Memorandum of Understanding
- Other news

NuPECC Long Range Plan 2017



SUMMARY AND RECOMMENDATIONS

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Support to the completion of AGATA in full geometry

AGATA represents the state-of-the-art in γ -ray spectroscopy and is an essential precision tool underpinning **a broad programme of studies in nuclear structure, nuclear astrophysics and Nuclear reactions.**

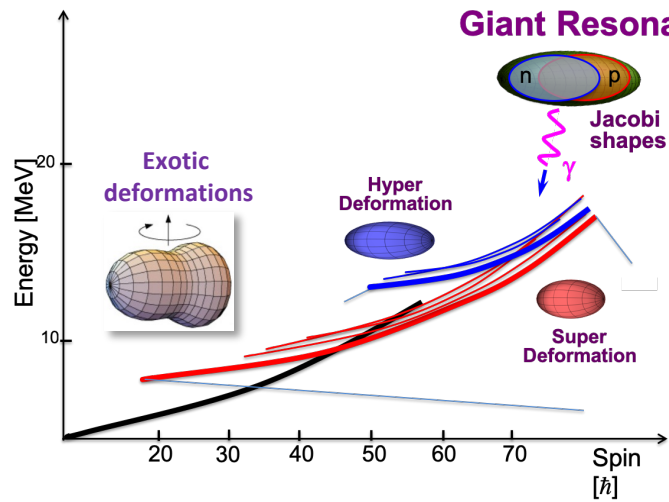
AGATA will be exploited at all of the **large-scale radioactive and stable beam facilities** and in the long-term must be fully completed in **full 60 detector unit geometry** in order to realise the envisaged scientific programme.

AGATA will be realised in phases with the goal of completing the first phase with 20 units by 2020.

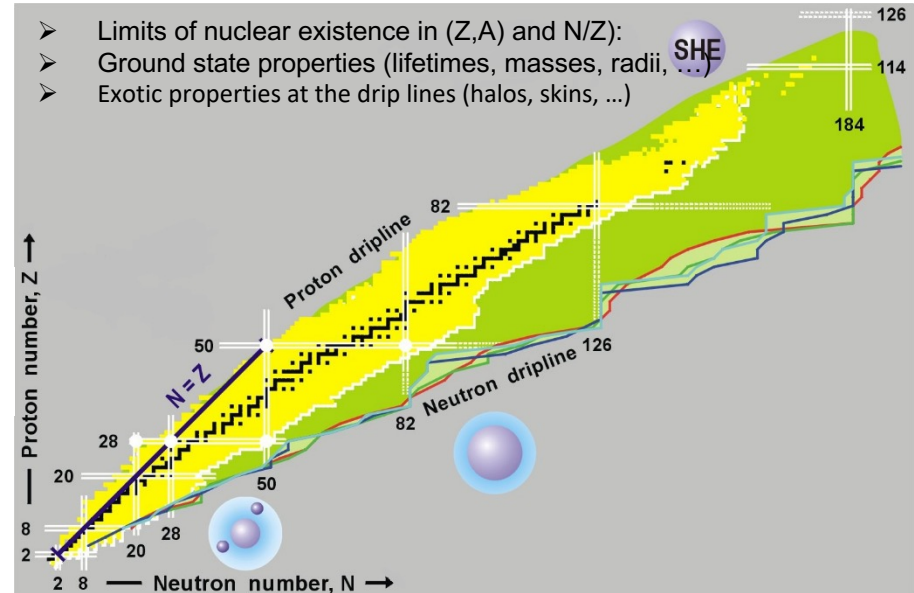
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AGATA physics case

Challenges in Nuclear Structure Physics



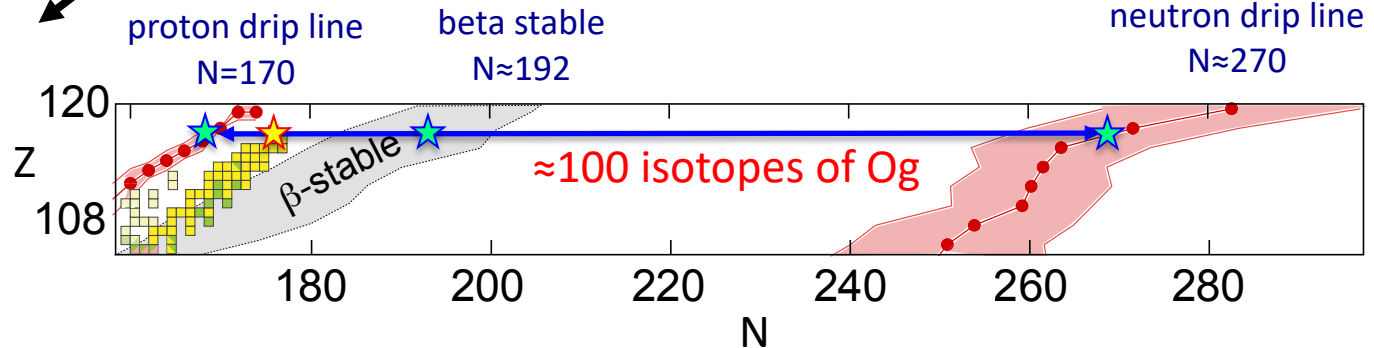
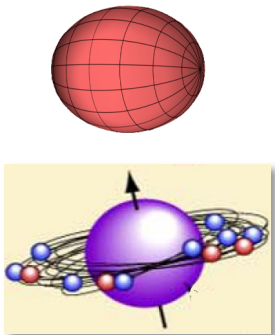
Energy/
Temperature



Properties of excited states
 → γ -ray spectroscopy

N/Z - isospin

Spin



AGATA Science White Book

[Physics opportunities with the Advanced Gamma Tracking Array: AGATA | SpringerLink](#)

The European Physical Journal

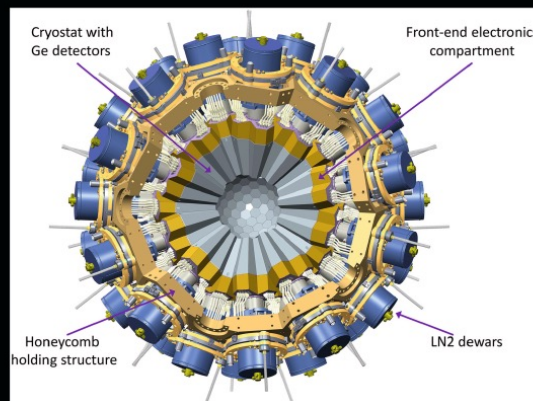
volume 56 · number 5 · may · 2020

EPJ A



Recognized by European Physical Society

Hadrons and Nuclei



View into the Advanced Gamma Tracking Array - AGATA for high-resolution spectroscopy

From: W. Korten et al. on "Physics opportunities with the Advanced Gamma Tracking Array: AGATA"

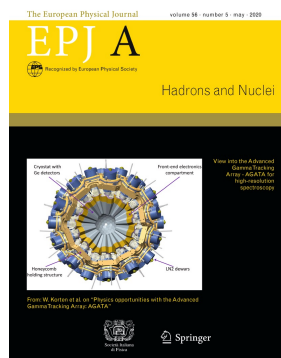


Springer

May 2020

AGATA Science White Book

[Physics opportunities with the Advanced Gamma Tracking Array: AGATA | SpringerLink](#)



Common Physics Working Group

W. Korten (chair)

Gilbert Duchene (co-chair)

Facility Working Group: CERN/ISOLDE

Magdalena Zielińska (chair)

Peter Reiter (co-chair)

Facility Working Group: GANIL/SPIRAL1/SPIRAL2

Bo Cederwall (chair)

Emmanuel Clément (co-chair)

Facility Working Group: GSI/FAIR

Andrea Jungclaus (chair)

Magdalena Górska (co-chair)

Facility Working Group: JYFL

David Jenkins (chair)

Paul Greenlees (co-chair)

Facility Working Group: LNL/SPES

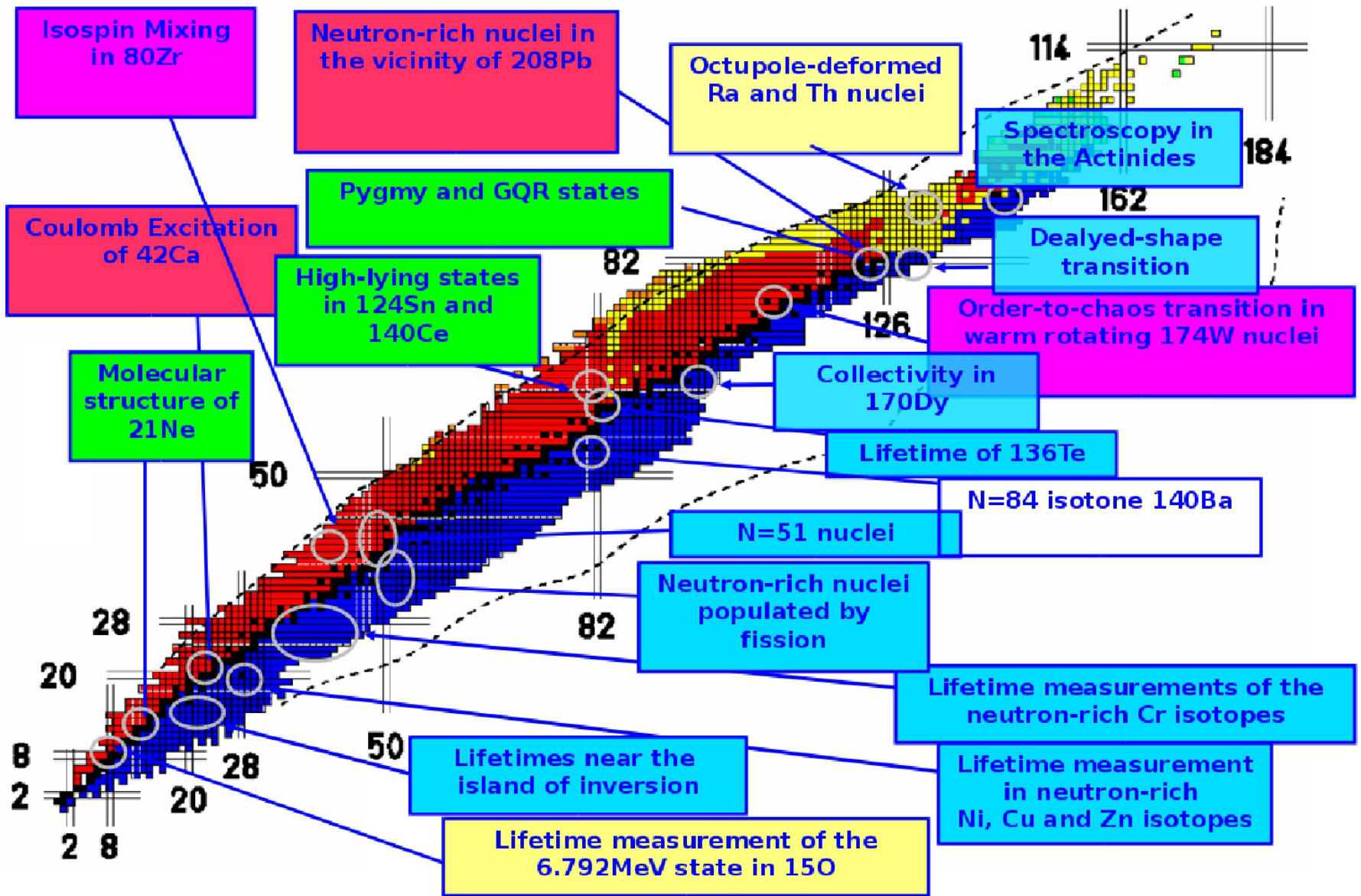
Silvia Leoni (chair)

José Javier Valiente Dobón (co-chair)

Many people contributed

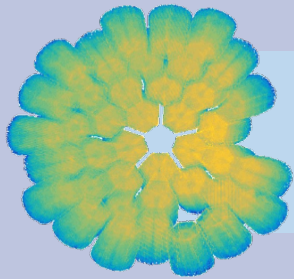
THANKS TO ALL

LNL EXPERIMENTS: 20 exps, 148 days, 3500 hs



AGATA	PRISMA	TRACE	DANTE	HELENA	DSSSD
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Experiments performed in 2015-2021 at GANIL with AGATA



RIB

SHE Cross section $^{238}\text{U}+^{238}\text{U}$ in MNT

Search for Double Gamma decay in ^{137}Cs source

Reaction mechanism : Fission of Light Hg

Octupole – Quadrupole correlation in ^{112}Xe ^{208}Pb

Studies of excited states in $^{102,103}\text{Sn}$

Octupole correlation in ^{207}Pb

Evolution of collectivity around N=50:
lifetime measurements $^{104,106}\text{Sn}$

Exploration of alpha-cluster : the
unique case of ^{212}Po ($^{208}\text{Pb} + \alpha$)

Evolution of collectivity around
N=50: lifetime measurements ^{94}Ru

N=126 Xe+Pt spectroscopy after MNT

Shape transition in the neutron-rich W isotopes

Search for isoscalar pairing in
the N=Z nucleus ^{88}Ru

Transition Quadrupole Moments in $^{166,168}\text{Dy}$.

$i_{13/2}$ single particle state in ^{133}Sn and high spin in ^{108}Zr

Isospin Symmetry Breaking in
the A=63,71 mirror nuclei

Shape evolution in neutron rich fission
fragments in the mass A~100 region

Above barrier narrow
resonances in ^{15}F

Shell evolution around N=50: ^{81}Ga spectroscopy

Deter. the $\alpha+^{15}\text{O}$
radiative capture rate

Evolution of collectivity around N=52: lifetime measurements in $^{83,84}\text{Ge}$

Evolution of collectivity around N=40: lifetime measurements in $^{73,75}\text{Ga}$

Evolution of collectivity around N=40: lifetime measurements in ^{64}Fe

Proton-neutron
interactions across the N =
28 shell closure via
 $^{47}\text{K}(d,p)^{48}\text{K}$

Lifetime measurements of
excited states in neutron-rich C
and O isotopes

Evolution of the shell structure in the
region of neutron-rich Ti isotopes

The lifetime in ^{23}Mg as a probe
for classical novae models

3-body contribution
in ^{20}O structure

Is there a problem with protons
in N=28 nucleus ^{46}Ar ?

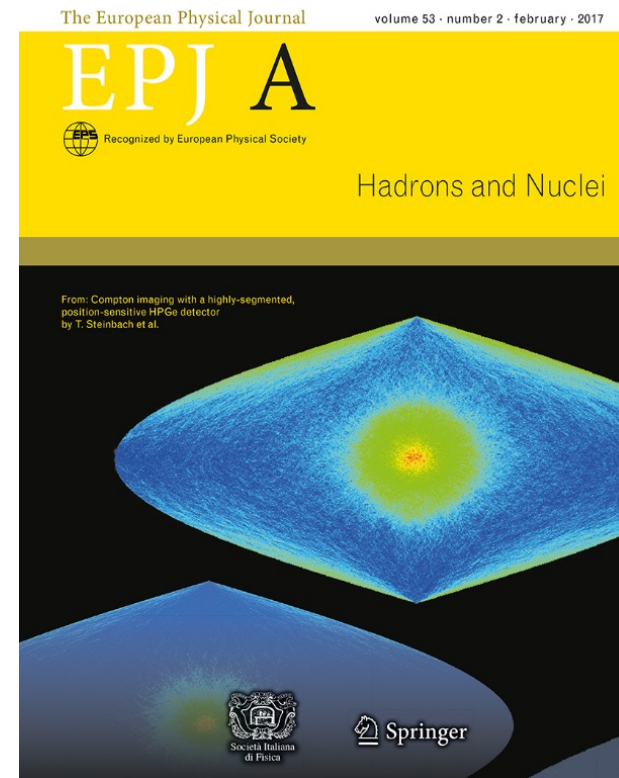
AGATA scientific results: technical publications

85 scientific publications (10 PRL/PL)

108 technical publications

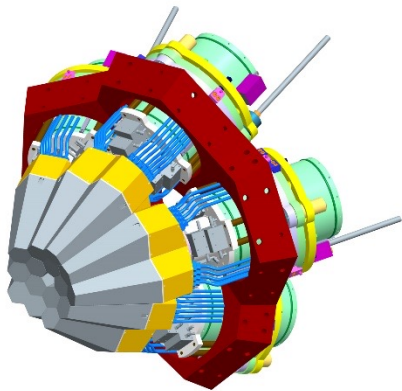
66 PhDs, 18 Masters, 9 Diplomas, 11 Bachelor, 1 Licentiate (6/10/21)

<https://www.agata.org/>

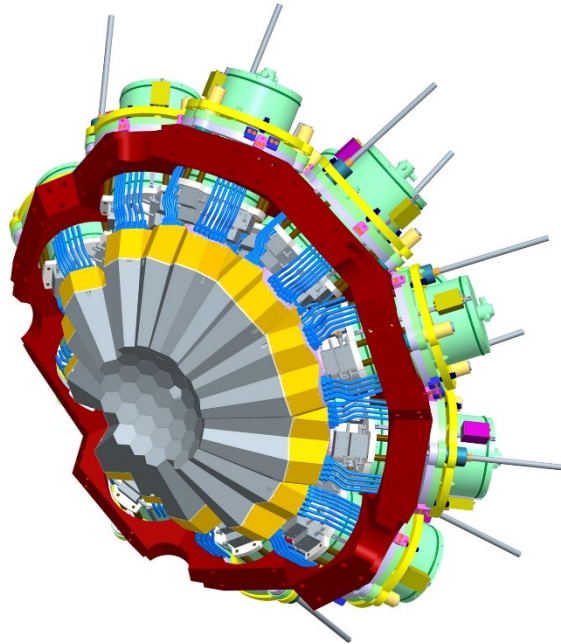


AGATA is operated under a Memorandum of Understanding

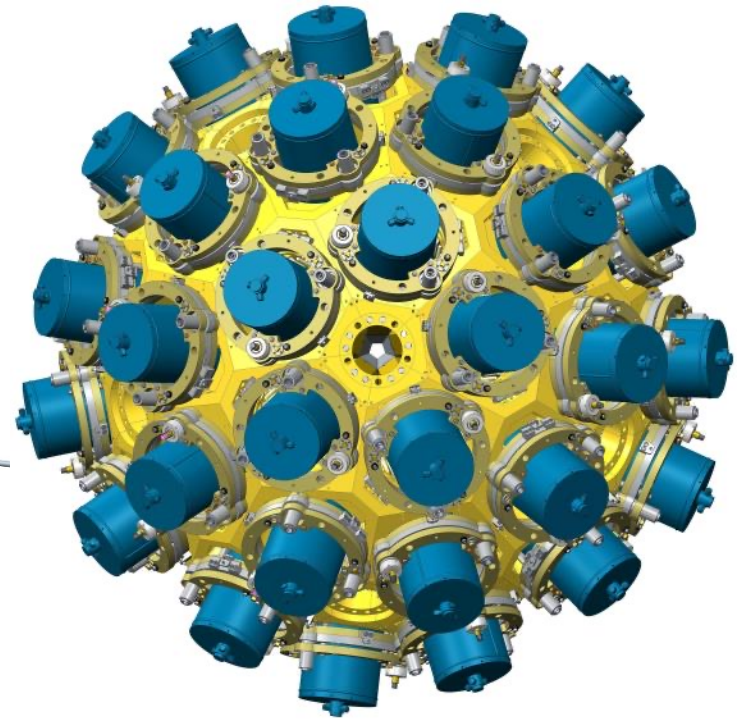
I MoU
AGATA 15
Demonstrator
2003-



II MoU
AGATA 60
2008-2020



III MoU
AGATA 180 = 4π



Memorandum of Understanding

- Science case take next step to 4π
- Presentation of MoU and AGATA plans to funding agencies GSI November 2019
- Positive feedback science convincing
- International Review
 - Membership
 - Robert Janssens (North Carolina at Chapel Hill) chairperson
 - Florence Ardellier CNRS-APC
 - Eric Delannes CAR-IRFU
 - Guiseppe Cardella INFN Catania
 - Alba Formicola INFN LNGS
 - Haik Simon Gsi
 - Augusto Macchiavelli LBNL
 - Reiner Krucken Triumf
 - Charge
 - Science (135/180 Detectors $3\pi/4\pi$) over 10 years, including sites stable/RIBs
 - Technology (choice, cost effectiveness, appropriate..)
 - Organisation
 - Project Management
 - Resources (appropriate to deliver, operate across all partners and host laboratories)

Memorandum of Understanding

International Review

- Review 6-7 July 2020
 - Presentations by:
 - Peter Reiter (AGATA Status)
 - Wolfram Korten (Science)
 - Andres Gadea (Technology)
 - Emmanuel Clement (Project Management)
 - John Simpson (Organisation, Resources and Summary)
- Thanks to all involved in the paperwork and planning required
- Report prepared and sent to AGATA Review Steering Committee (RSC) on 25/8/2020

Memorandum of Understanding

International Review

- Excellent Outcome
- **Conclusion:** Through the completion of phases 1 and 2 of the project and the lessons learned in doing so, the AGATA collaboration has demonstrated that it has developed the technology as well as the management and organisational tools required for the timely completion of phase 3. There is no doubt that the instrument is poised to become the flagship in Europe for nuclear structure research with radioactive and stable beams in the coming decade and beyond. **In its 4π configuration with 180 detectors, AGATA will achieve the detection sensitivity and the tracking capability essential (i) for physics with the low-intensity radioactive beams furthest away from stability, and (ii) for detection of the weakest gamma-ray transitions characteristic of new nuclear modes of excitation. Furthermore, intermediate configurations with a smaller number of detectors, in particular the 3π , 135-detector one, will have unprecedented discovery potential when coupled with powerful magnetic spectrometers and other ancillary detectors.** It is clear, however, that the timely completion of the full 4π configuration will uniquely enable the most science return for the significant investment the project represents. Hence, the review Committee endorses with enthusiasm and without reservation the timely completion of the full AGATA project and the continuous use of the instrument during the construction phase.
- In detail several recommendations

Memorandum of Understanding

- RSC
 - Representatives of funding agencies, Chaired by Fanny Farget (IN2P3)
 - To agree MoU prepared by the collaboration ASC/AMB
- ASC Worked closely with RSC
- AMB planning, resources and project definition
- Present MoU extended to 31/12/21 by an amendment
- Amendment agreed and sent for signature on 3/3/21
- New MoU agreed and sent for signature 30/6/2021
- Signed by Bulgaria, Finland, Hungary, Italy, Poland Spain, Sweden and UK.
- Germany, France, Turkey in progress

Memorandum of Understanding

The high-level philosophy of the MoU:

- The ultimate aim of the collaboration is to build the full 4π device.
- The costings and plans defined in the Annexes of the MoU are based on the completion of the 3π device in 10 years.
- The project is planned to be reviewed every 5 years, with specific goals for each period written into the MoU and costed for the upcoming 5 years.
- Continuation after each 5 year period has to be agreed by the parties
- An AGATA Resource Review Board will be set up to provide financial oversight and contact with the funding agencies.

The specific objectives as defined in the MoU for the first five years are:

- To continue the construction of the Project in line with the final goal;
- To secure funding from the Parties for at least an additional thirteen systems in the next five years, which corresponds to half of the goal to reach 3π , i.e., an additional twenty-six systems. The costs are based on funding a 3π system in ten years; and
- To continue to operate the spectrometer in science campaigns at the Hosts

The MoU started on 1/7/21. The overlap with the present MoU is accepted by the Parties to enable some of them to bid for and approved funding in this initial period.

Other News from ASC

- AGATA Resource Review Board (set-up)
- Core author list LNL
- Vice Chair (Angela Bracco) Chair 4/2022-
- Diversity Charter
- EU Funding Call INFRATECH

Diversity Charter

JENAA-Joint ECFA-NuPECC-APPEC Activities

Diversity working group: to the importance of diversity as a motor to boost productivity and innovation, fight prejudice and discrimination and contribute to the improvement of social and economical standards.

[JENAA \(nupecc.org\)](https://nupecc.org) link to overview

Diversity charter: [Diversity Charter of APPEC ECFA NuPECC-9.pdf](#)

Diversity monitoring: [Monitoring Diversity Charter of APPEC ECFA NUPPEC-9.pdf \(nupecc.org\)](#)

List what they believe can be monitored and an initial list of Consortia , Committees, Collaborations, and Conferences that could involved

AGATA signed up to this charter in 2020

Monitorable variables (as listed by the Diversity group)

- • Gender;
- • Tenure diversity - Career level: not tenured, tenure track, tenured;
- • Age diversity - Age groups (20 - 30, 31 - 40, 41 - 50, 51 - 60, > 60);
- • Country where working;
- • Citizenship.

AGATA starting to collate information on its committees ASC, AMB, ACC

Some information from AGATA week, and these meetings.

COMMENTS?

<https://ecfa.web.cern.ch/>

<http://www.nupecc.org/>

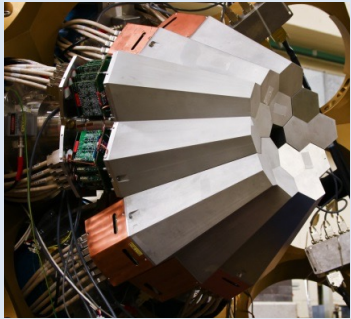
<http://www.appec.org/>



Progress of the AGATA array

2010-2012

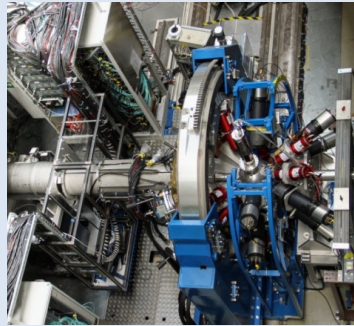
Legnaro, Italy
Intense stable beams
15 detectors



**AGATA Demonstrator +
PRISMA at LNL**

2012-2014

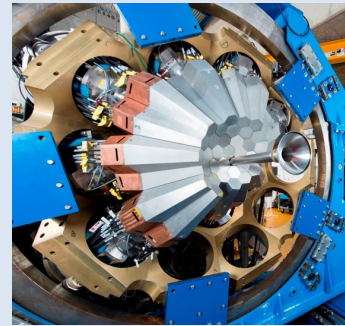
GSI, Germany
Fast fragmentation beams
25 detectors



AGATA at GSI

2014- 2021

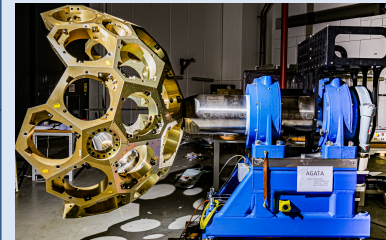
GANIL, France
ISOL and stable beams
approaching 1π (45)



AGATA at GANIL

2021--

LNL, Italy
Stable beams
SPES radioactive beams



AGATA at LNL

Project Managers



Andres Gadea

11 years as project manager
MANY THANKS



Emmanuel Clement

GOOD LUCK



THANK YOU

