



Istituto Nazionale di Fisica Nucleare
LABORATORI NAZIONALI DI LEGNARO



The LNL campaign: physics campaigns

Alain Goasduff (INFN LNL)
26th AGATA Week meeting
7-11 September 2026
HIL - Warsaw

Local project manager

J.J. Valiente-Dobón – A. Goasduff

Scientific coordinator

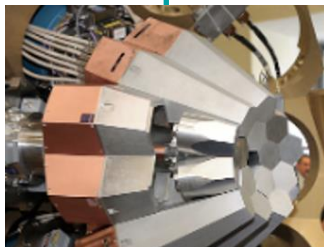
M. Zielinska

The AGATA Timeline

AGATA@GSI

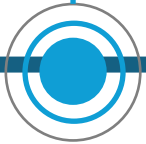


2009

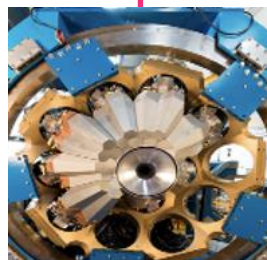


AGATA@LNL

2011



2014

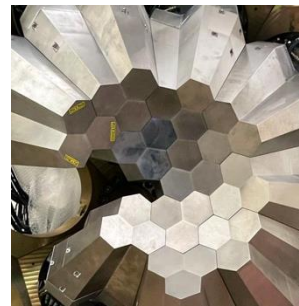
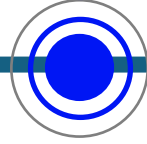


AGATA@GANIL

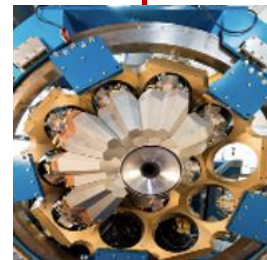
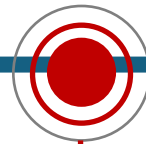
PHASE 2



2021



2029-203X



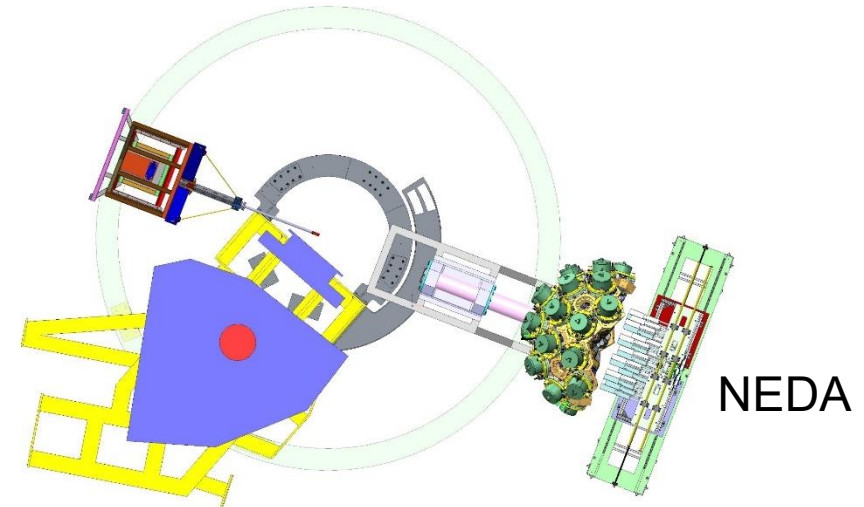
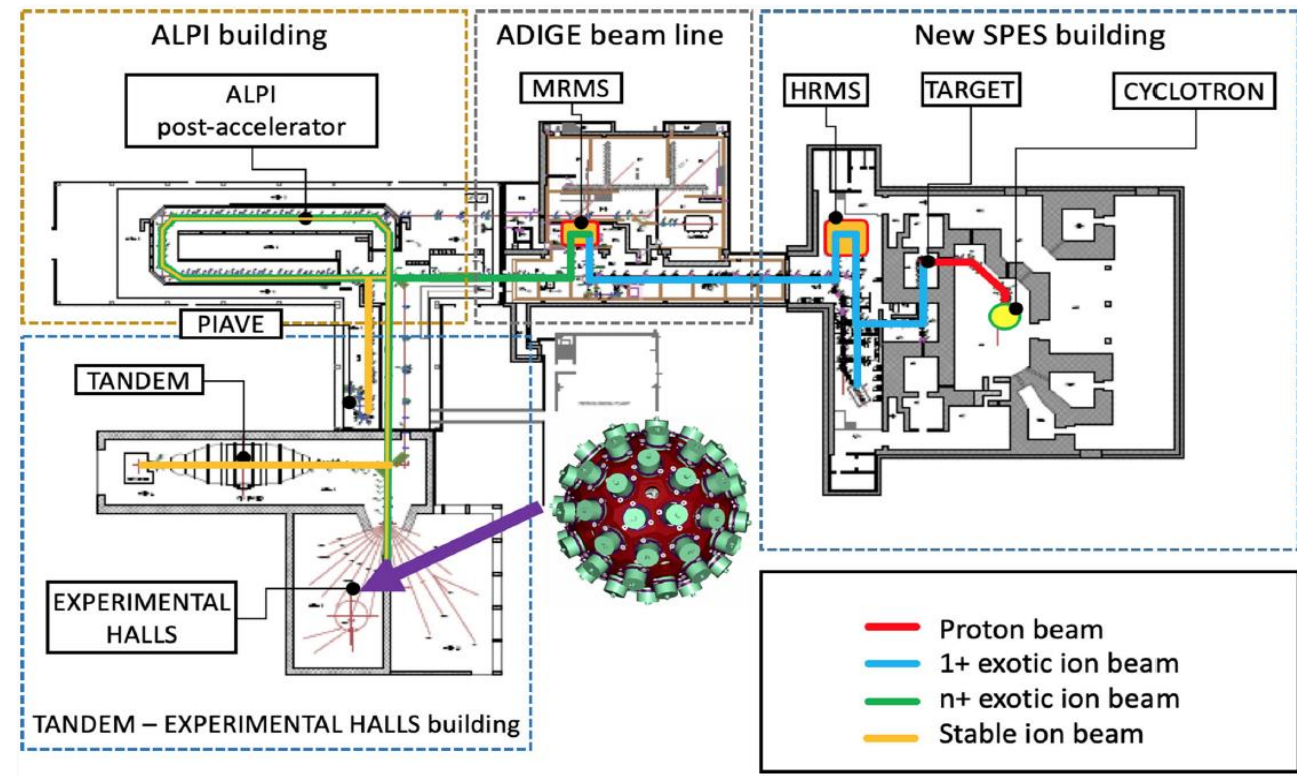
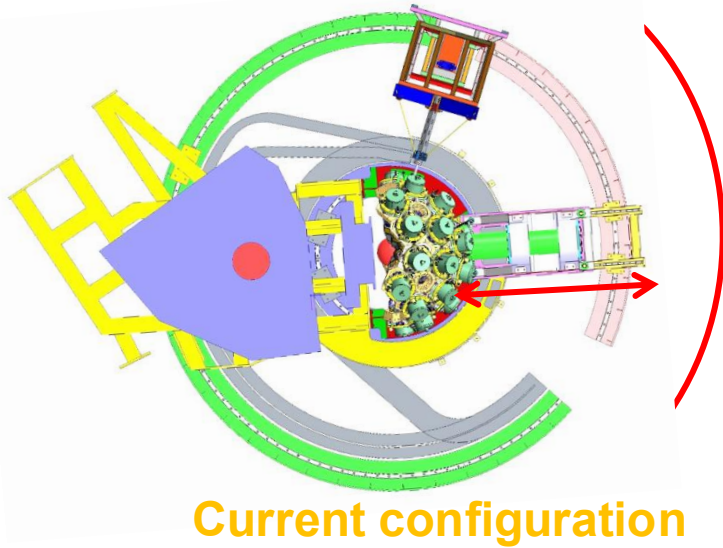
AGATA@GANIL

AGATA @ LNL: 2021 - 2028

Two configurations:

- 2021 – July 2026: AGATA coupled to PRISMA
- July-2026 – mid-2028: AGATA at “zero-degree”

AGATA coupled with PRISMA



AGATA zero degrees

PAC meetings at LNL

February 21-23, 2022
TAP beams

- 28 proposals submitted**
- **10** (+3 commissioning) priority A
 - **5** priority B

December 5-6, 2022
TAP beams

- 24 proposals submitted**
- **6** priority A
 - **10** priority B

January 22-24, 2024
TAP beams

- 18 proposals submitted**
- **5** (+ 3 recovery) priority A
 - **4** priority B

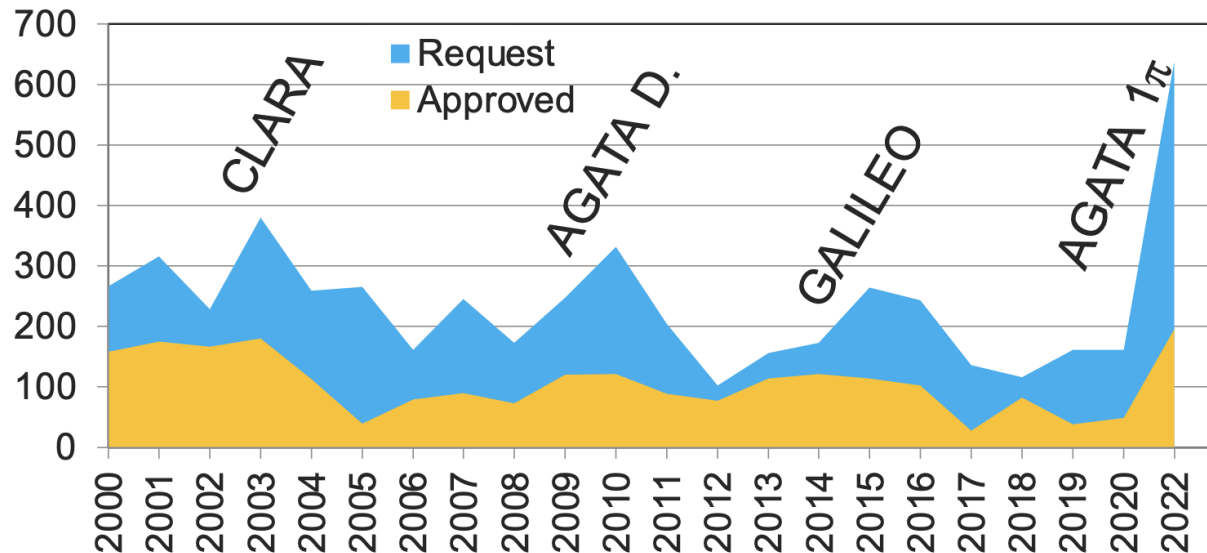
January 22-24, 2025
TAP beams

- 22 + 2 proposals submitted**
- **11** priority A
 - **5** priority B

+ 3 PAC meetings
for Tandem-only beams:

July 10-12, 2023
July 15-17, 2024
January 23-24, 2025

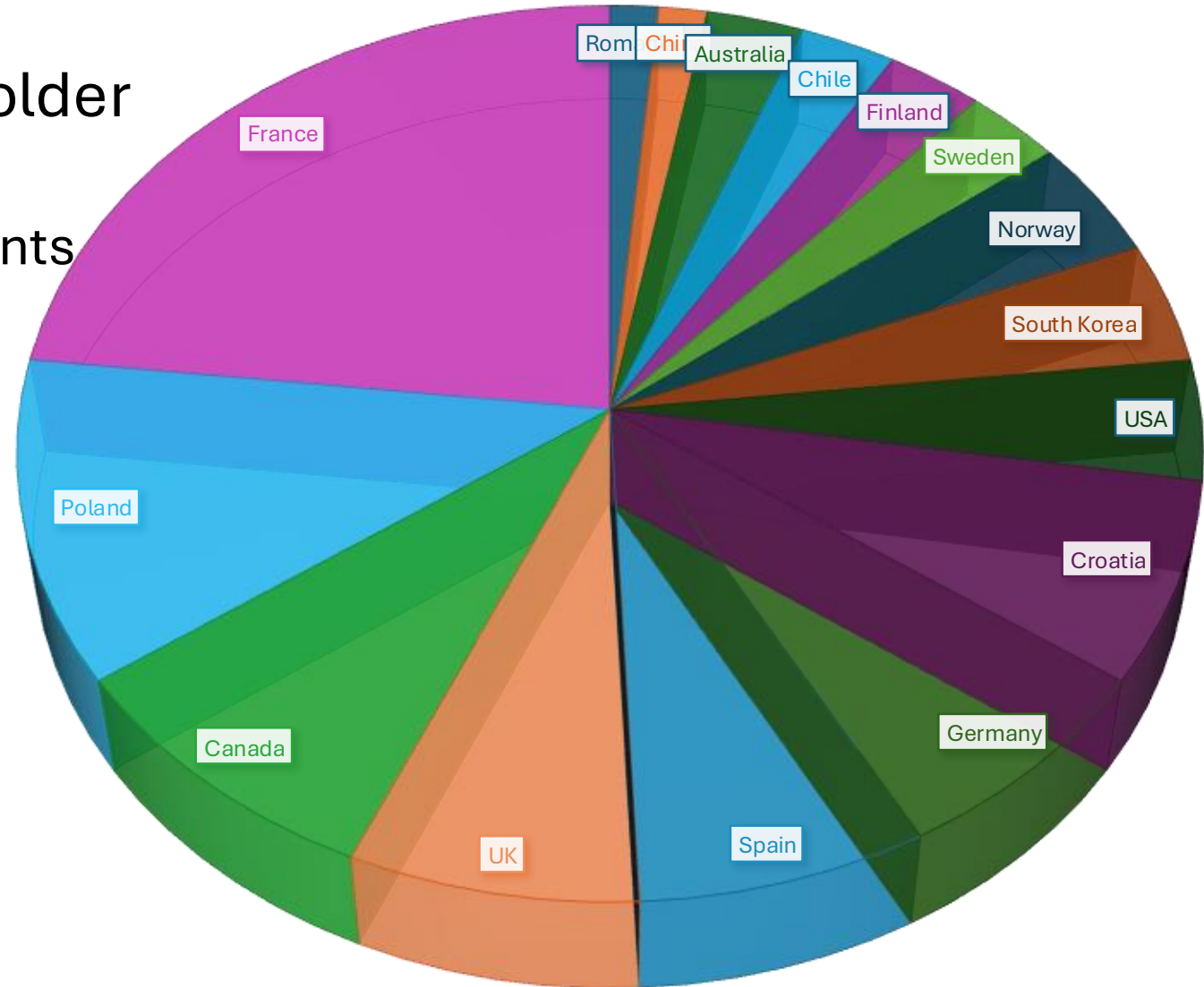
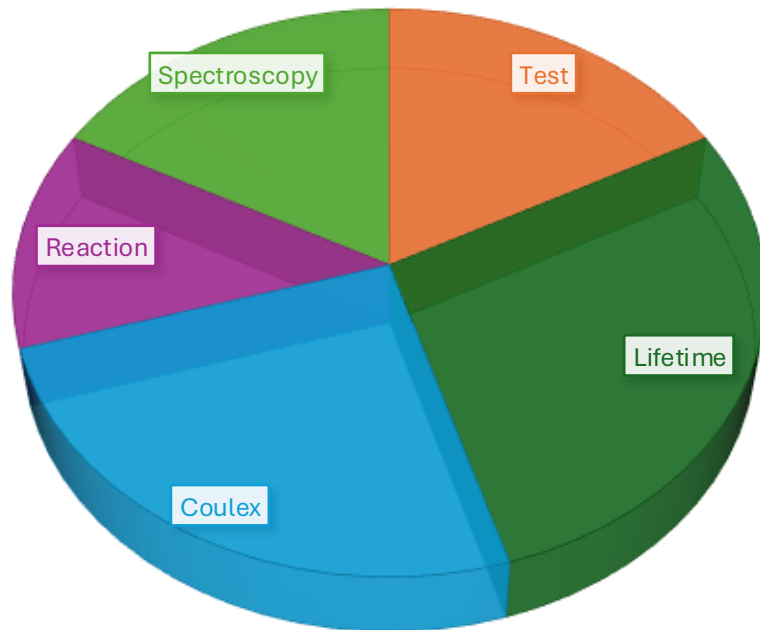
- 40 proposals submitted**
- **23** priority A
 - **4.5** priority B



April 2022 – May 2026: 58 experiments with AGATA,
over 80% of the total beam time with TAP
(without beam preparation)

Brief summary of the campaign so far

- Since April 2022, 65 experiments folder created:
 - 12 commissioning and test experiments
 - 53 in-beam experiment performed

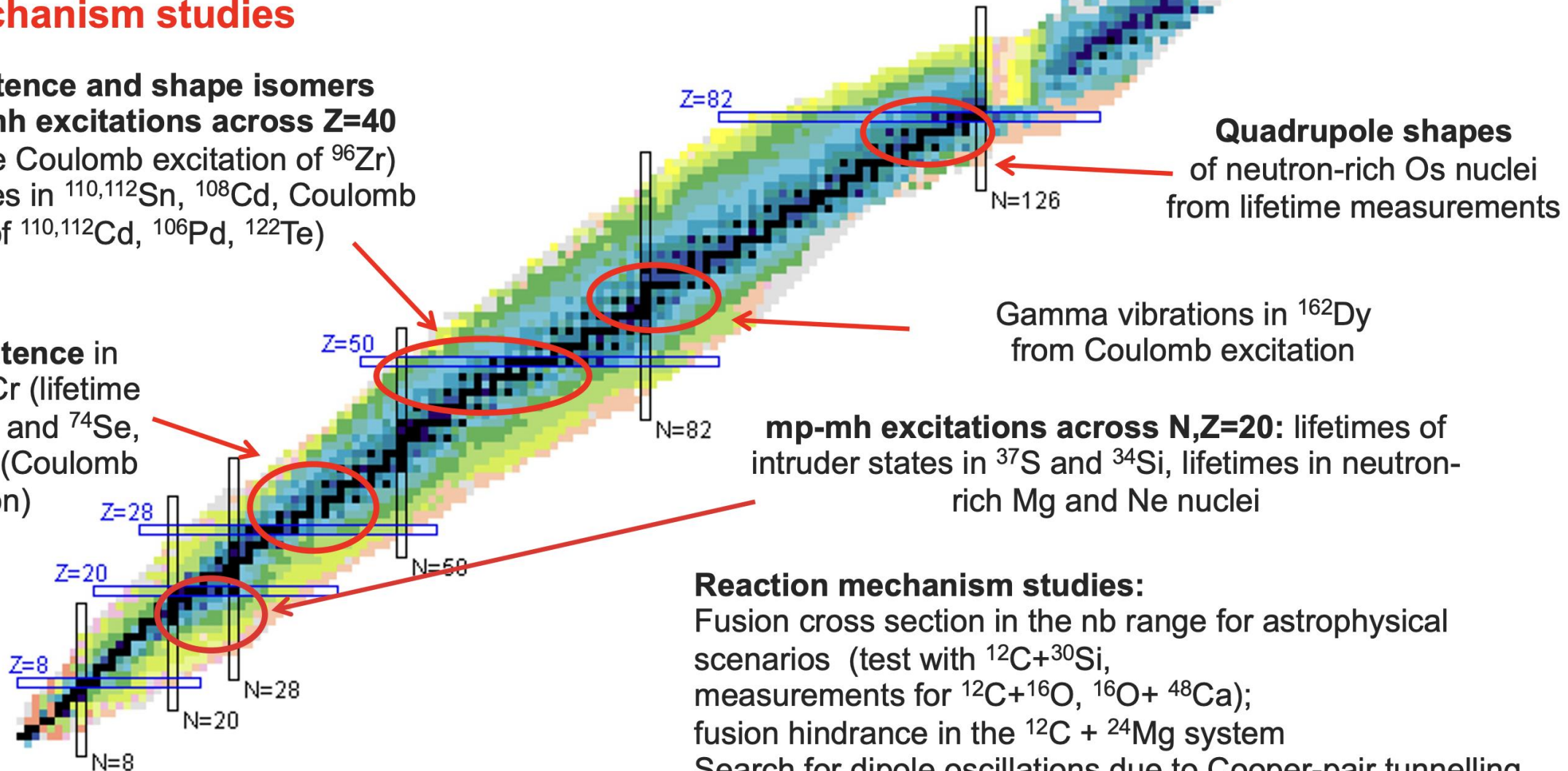


Physics cases – accepted projects

Quadrupole shapes and shape coexistence Reaction mechanism studies

Shape coexistence and shape isomers related to mp-mh excitations across $Z=40$
(safe and unsafe Coulomb excitation of ^{96}Zr)
and $Z=50$ (lifetimes in $^{110,112}\text{Sn}$, ^{108}Cd , Coulomb excitation of $^{110,112}\text{Cd}$, ^{106}Pd , ^{122}Te)

Shape coexistence in
 ^{60}Fe , ^{60}Zn , $^{52,56}\text{Cr}$ (lifetime measurements) and ^{74}Se , ^{82}Se , ^{60}Ni , ^{64}Zn (Coulomb excitation)



Quadrupole shapes
of neutron-rich Os nuclei
from lifetime measurements

Gamma vibrations in ^{162}Dy
from Coulomb excitation

mp-mh excitations across $N,Z=20$: lifetimes of intruder states in ^{37}S and ^{34}Si , lifetimes in neutron-rich Mg and Ne nuclei

Reaction mechanism studies:

Fusion cross section in the nb range for astrophysical scenarios (test with $^{12}\text{C}+^{30}\text{Si}$, measurements for $^{12}\text{C}+^{16}\text{O}$, $^{16}\text{O}+^{48}\text{Ca}$);
fusion hindrance in the $^{12}\text{C} + ^{24}\text{Mg}$ system
Search for dipole oscillations due to Cooper-pair tunnelling in $2n$ transfer ($^{60}\text{Ni}+^{116}\text{Sn}$)
Probing nucleon-nucleon correlations ($^{48}\text{Ca}+^{208}\text{Pb}$)

Physics cases – accepted projects

Collectivity close to closed shells

Octupole correlations

Fundamental symmetries and astrophysics

High-spin states

High-spin structures in $^{136,137}\text{Nd}$
Benchmarking AGATA performance
for high-spin studies on ^{158}Er

Quadrupole collectivity in light Te-Xe
from lifetime measurements

Octupole collectivity in ^{96}Zr
studied via inelastic proton scattering

Isospin mixing in ^{72}Kr
 γ decay of **Isobaric
Analogue State** in ^{71}Ge

$Z=8$
 $N=8$
 $N=20$
 $N=28$

Superaligned β Decay of ^{10}C

Lifetime of the 6.8-MeV state in ^{15}O for **astrophysical reaction rates**

$Z=82$

$N=126$

Lifetime measurements in the vicinity
of ^{132}Sn and ^{208}Pb :
precision tests of LSSM

Spectroscopy of nuclei around ^{78}Ni
Precision tests of LSSM calculations from
lifetime measurements around ^{68}Ni and in ^{56}Ni

shell-model descriptions around ^{48}Ca : lifetimes of
heavy Ar isotopes, Coulomb excitation of ^{44}Ca

Spectroscopy of
octupole structures in
 $^{232,234}\text{Pu}$ and $^{224-228}\text{U}$
populated via MNT
Octupole correlations
in ^{232}Th from Coulomb
excitation

News since the last AGATA week

- First publications from the campaign are coming out
- **AGATA used for sub-barrier reaction cross-section measurements**
- **2 physics papers under review**
- **4 PhD theses completed**
 - (+3 expected by the end of the year)
- **Several Master's and Bachelor's theses**

Eur. Phys. J. A (2026) 62:163
<https://doi.org/10.1140/epja/s10050-026-01941-1>

THE EUROPEAN
 PHYSICAL JOURNAL A



Regular Article - Experimental Physics

The combined AGATA-DSSD set-up for the measurement of very small heavy-ion fusion cross sections

M. Del Fabbro¹, G. Montagnoli², A. M. Stefanini^{3,a}, M. Balogh³, D. Brugnara³, L. Corradi³, O. Carletto³, G. Colucci⁴, E. Fioretto³, F. Galtarossa⁵, A. Goasduff³, A. Gottardo³, M. Loriggiola³, D. Mengoni², T. Mijatovic¹, J. Pellumaj², S. Pigliapoco², S. Szilner¹, N. Toniolo³, J. J. Valiente-Dobon^{3,6}, L. Zago³

Phys. Lett. B 872 (2026) 140084

Contents lists available at ScienceDirect

Physics Letters B

journal homepage: www.elsevier.com/locate/physletb

Letter

Fusion of $^{12}\text{C} + ^{28}\text{Si}$ at deep sub-barrier energies

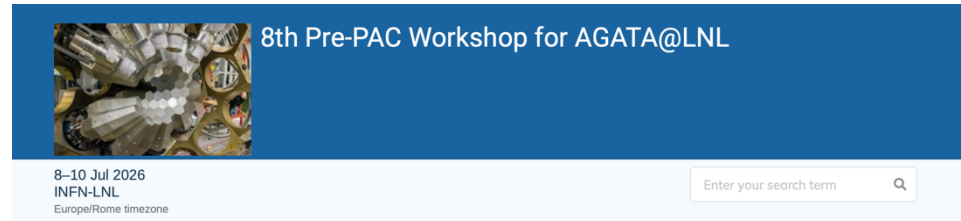
A. M. Stefanini^{a,*}, G. Montagnoli^{b,c}, M. Del Fabbro^{b,c}, A. Goasduff^a, P. A. Aguilera Jorquera^{b,c}, G. Andreetta^{b,c}, F. Angelini^{a,b}, L. V. D'Auria^b, M. Balogh^a, D. Bazzacco^c, J. Benito^{b,c}, G. Benzoni^d, M. A. Bentley^e, N. Bez^c, A. Bonhomme^f, S. Bottoni^{d,g}, A. Bracco^{d,g}, D. Brugnara^a, L. Busak^h, S. Capra^d, S. Carollo^{b,c}, S. Casansⁱ, E. Clément^j, P. Cocconi^a, A. Cogo^a, G. Colucci^{b,k}, A. Conte^a, E. Coradin^b, L. Corradi^a, S. Courtin^f, G. Deangelis^a, J. M. Deltoro^l, G. Del Piero^b, R. Depalo^{d,g}, J. Dudouet^m, A. Ertoprak^a, E. Fioretto^a, A. Gadea^k, F. Galtarossa^{b,c}, A. Gambalonga^a, A. Giaz^d, B. Gongora Servin^{a,n}, V. Gonzálezⁱ, A. Gottardo^a, A. Gozzelino^a, G. Harmant^f, M. Heine^f, I. Kuti^o, M. Labiche^p, S.M. Lenzi^{b,c}, S. Leoni^{d,f}, M. Mazzocco^{b,c}, R. Menegazzo^c, D. Mengoni^{b,c}, T. Mijatović^h, B. Million^d, E. Monribat^f, A. Nannini^q, D. R. Napoli^a, A. E. Navarro-Antónⁱ, R. Nicolas Del Alamo^{b,c}, J. Nyberg^r, S. Paschalis^e, J. Pellumaj^{b,c}, R. M. Pérez-Vidal^{a,i}, M. Petri^e, E. Pilotto^{b,c}, S. Pigliapoco^{b,c}, Z. S. Podolyak^s, M. Poletti^{b,c}, A. Pullia^{d,g}, L. Ramina^c, M. Rampazzo^c, W. Raniere^a, M. Rebeschini^c, F. Recchia^{b,c}, P. Reiter^t, K. Rezyrkina^{b,c}, M. Rocchini^q, D. Rosso^a, E. Sanchisⁱ, M. Scarcioffolo^b, D. Scarpa^a, M. Şenyigit^u, J. Simpson^p, D. Sohler^o, O. Stezowski^m, D. Stramaccioni^{a,b}, S. Szilner^h, C. Theisen^{v,1}, N. Toniolo^a, A. Trzcinska^k, J. J. Valiente Dobon^l, F. Veronese^c, J. Vesic^w, V. Volpe^a, K. Wimmer^x, L. Zago^{a,g}, I. Zanon^y, M. Zielińska^v

News since the last AGATA week

- **EXOTIC beams successfully delivered to AGATA**
 - Intensities up to 10^5 pps at the AGATA target position
 - Three experiments performed using TANDEM primary beams
 - See talks of S. Bottoni and A. Togni
- **^{238}U beam delivered on AGATA**
 - Delays due to **the consequences of the heatwave on the laboratory infrastructure**
 - Beam time reduced from 2 down to 1 month
 - 1 experiment + Merging of the 2 nuclear reaction studies performed
 - See talk of A. Gottardo

Pre-PAC for the LNL ZD campaign

- Pre-evaluation of projects for the ZD campaign at a dedicated workshop (April 2023):
 - 42 projects + 4 umbrella proposals, including 13 for SPES beams and 7 for gas targets
- Stable beams from Tandem – ALPI – PIAVE
 - First call for AGATA at zero degrees
 - PAC meeting in December 2026 or January 2027 (**TBD**)
- In the current call, we **have received** 52 new projects and 2 resubmissions, for a **total request of almost 400 beam days** (more than the remaining duration of the campaign!)



Planning for the next physics campaign

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
2025		TANDEM				TANDEM				TANDEM		
2026	TANDEM			TANDEM/PIAVE-ALPI				MOVE TO 0 DEG				
2027		NEDA								NEDA		
2028		PARIS								AGATA@GANIL		

Details of the configuration change

Task 1: Infrastructure: Roberto Menegazzo & **Walter Raniero**

Task 2: AGATA Mechanics: Franco Galtarossa & **Marco Mazzocco**

Task 3: Experimentation mechanics: Giovanna Benzoni

Task 4: Safety and Quality: Daniela Benini, Luca de Ruvo

Task 5: Computing and network infrastructures: Michele Gulmini,
Marco Roetta

Task 6: Surveyor: Daniele Scarpa

Task 7: Detectors: Walter Raniero, Davide Rosso

Task 8a: DAQ: Alain Goasduff, Nicola Toniolo

Task 8b: Electronics: Andrea Gottardo & Jaime Benito

Task 9: Complementary instrumentation: Daniele Mengoni & **Kseniia Rezynkina**

Task 10: Performance: Fabio Crespi, Simone Bottoni

Task 11: Exploitation: Daniele Brugnara & Marco Rocchini

Task 12: Data Analysis: Francesco Recchia

Task 13: Logistics: Paolo Cocconi

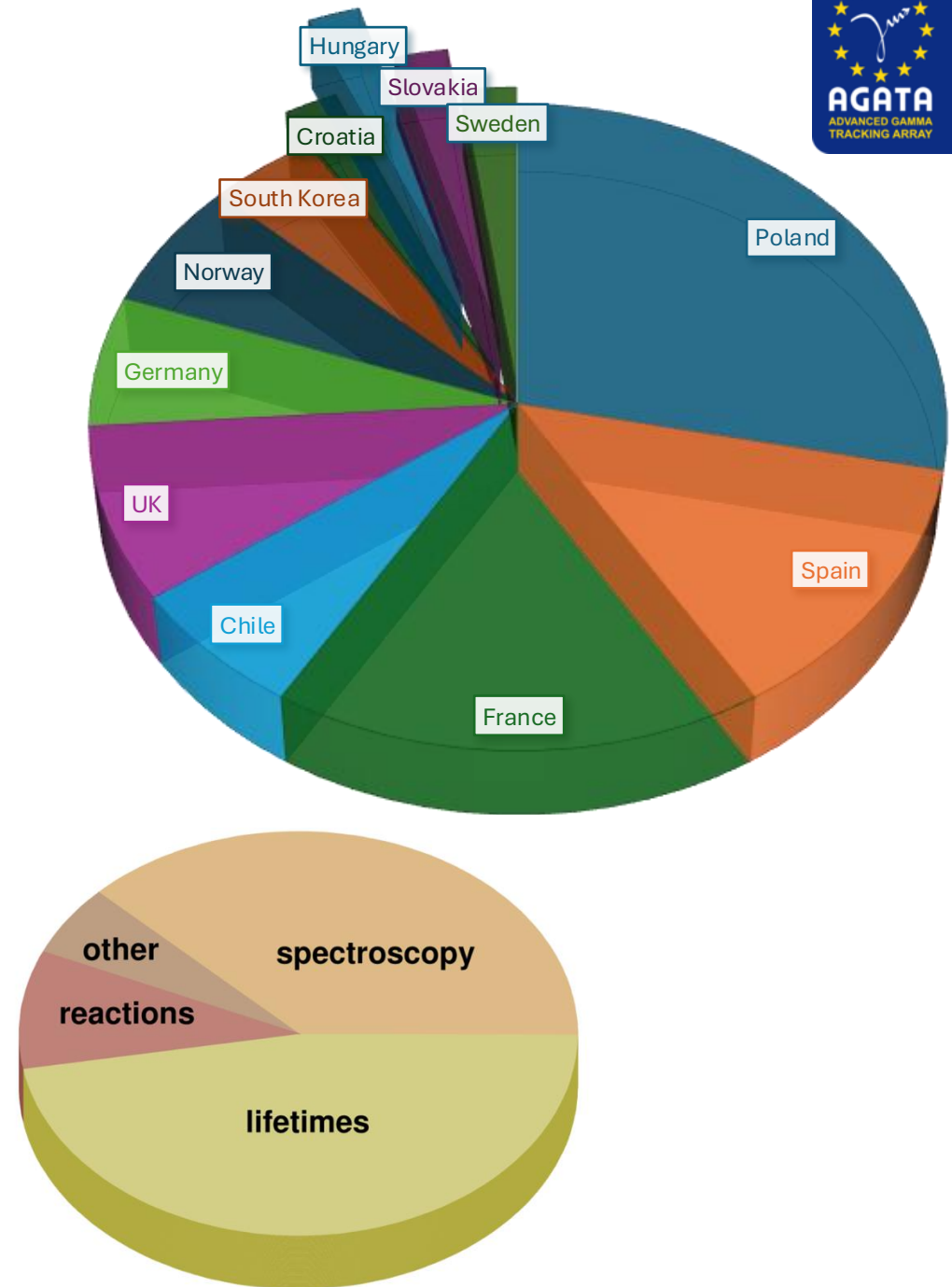
Task 14: Documentation, data base and procurement: Vincenzo Volpe

Task 15: Public exposure of AGATA activities: Andrea Gozzelino



Pre-PAC results

- About 50% of the projects request NEDA
- About 25% request PARIS
- About 25% request neither detector
- **A similar number of lifetime-measurement experiments (plunger and DSAM) and pure spectroscopy experiments, together with some reaction studies**
- Multiple experiments interested in using gas-implanted targets (in particular ^3He)

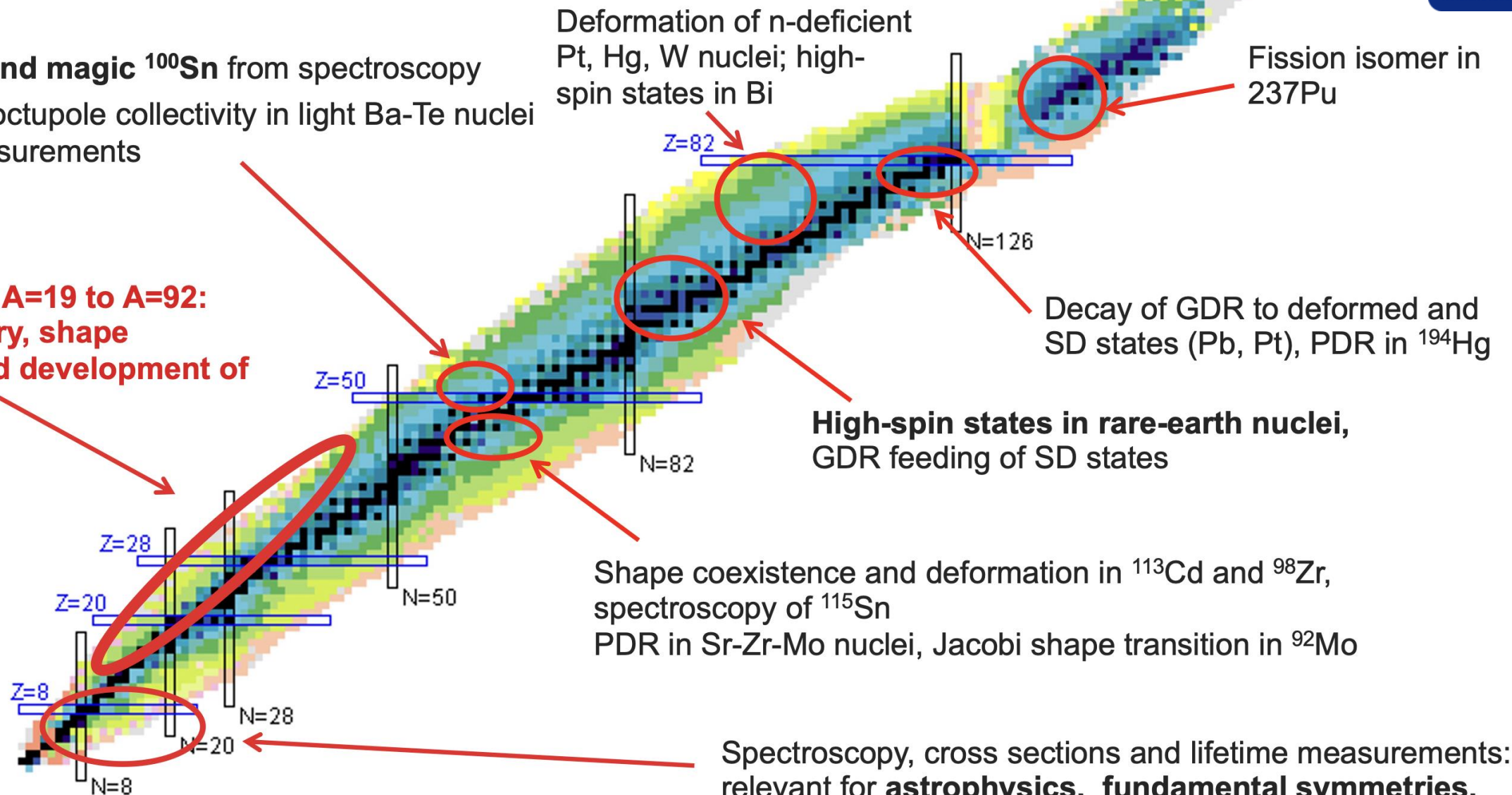


New physics cases – current call

entire nuclear chart covered

Collectivity around magic ^{100}Sn from spectroscopy
Quadrupole and octupole collectivity in light Ba-Te nuclei
from lifetime measurements

**$N \approx Z$ nuclei from $A=19$ to $A=92$:
isospin symmetry, shape
coexistence, and development of
collectivity**



Conclusions

- **So far, we have had a very successful campaign**
- The zero-degree campaign will be divided into **two sub-campaigns**:
 - **First sub-campaign with NEDA**
 - **Second sub-campaign with PARIS**
- **Preparations for both are ongoing in parallel**
- Strong collaboration with **well-established and well-documented procedures** for data analysis



Istituto Nazionale di Fisica Nucleare
LABORATORI NAZIONALI DI LEGNARO

THANK YOU



ALAIN.GOASDUFF@LNL.INFN.IT



[HTTPS://WEB.INFN.IT/GAMMA/](https://web.infn.it/gamma/)
[HTTPS://WWW.AGATA.ORG](https://www.agata.org)