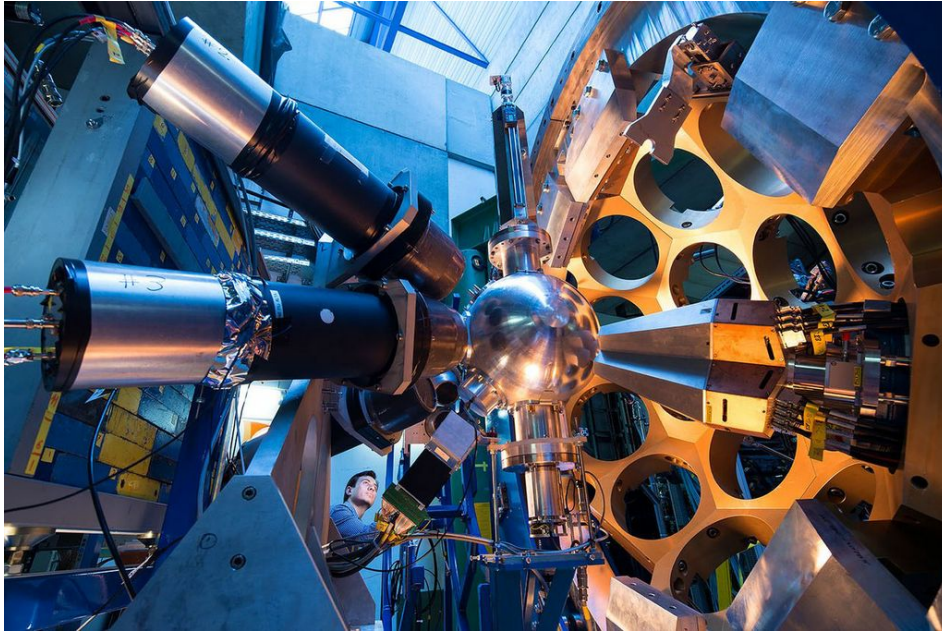


The 25th AGATA week and ACC Meeting

lundi 15 septembre 2025 - vendredi 19 septembre 2025

GSI - Germany



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Report on the AGATA experiment number 23.011

Auteur: Damiano Stramaccioni^{None}

Co-auteur: Jose Javier Valiente Dobon ¹

¹ *Laboratori Nazionali di Legnaro (INFN)*

We present the preliminary analysis of an experiment performed at INFN LNL in November 2023 aimed at studying the two-octupole phonon collectivity in ^{96}Zr . The goal of the experiment was to perform a γ -decay branching ratio measurement from the 6^+ to the 3^- state, so as to extract the $B(E3; 6^+ \rightarrow 3^-)$ value. If large, this parameter would indicate for the level to be a member of the $3^- \otimes 3^-$ multiplet. The state was populated via the $^{96}\text{Zr}(p,p')^{96}\text{Zr}$ proton inelastic scattering and the scattered protons were measured in the SAURON Double-Sided Silicon Strip detector. These were used to select the reaction channel of interest, in coincidence with the γ rays in the AGATA array.

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(online) Report on the AGATA experiment number 24.008

Auteurs: Nirupama Sensharma¹; Marco Siciliano¹

¹ *Argonne National Laboratory*

We report on the current status of the Coulomb excitation experiment on ^{82}Se performed at INFN-LNL using the AGATA array and the SPIDER particle detector. The experiment aimed to investigate the low-lying nuclear structure of ^{82}Se through safe Coulomb excitation. Preliminary analysis of the online data has provided encouraging results, including clear identification of key γ -ray transitions. For the offline analysis, we have applied improved neutron damage corrections and refined the energy calibration. The ancillary detector events have been rebuilt using the updated ReadCaen-Raw framework. We are currently processing the dataset with femul and resorting the events to enable precise Doppler correction. Preliminary spectra and insights from the online analysis will be presented, along with an update on the status and direction of the offline data processing.

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Report on $^{238}\text{U}(^{22}\text{Ne}, \text{x})$ and $^{238}\text{U}(^{26}\text{Mg}, \text{x})$ to approach the Island of Inversion at $N=20$

Auteur: Floris Drent¹

¹ *GSI*

In this presentation, we report on our current status of the analysis and preliminary results of two AGATA-PRISMA experiments performed at Laboratori Nazionali di Legnaro, consisting of a ^{22}Ne and ^{26}Mg beam emitted upon an ^{238}U target. AGATA is coupled with mass spectrometer PRISMA for ion identification and γ -ray coincidence. In both experiments, the ^{238}U target is backed with a ^{93}Nb degrader for lifetime measurements using the Doppler-Shifted Attenuation Method. The goal is to invoke multi-nucleon transfer reactions in order to produce neutron-rich Ne, F & Mg nuclei. This will allow us to map the transition into the Island of Inversion at $N=20$ and map out the boundaries

of the island. Of particular interest are negative parity states, arising from particle-hole excitations to the fp-shell. Such intruder states are energetically favored in the Island of Inversion. Decay branching ratios and lifetimes of negative parity states will help to refine the theoretical description of the onset of deformation and shape coexistence.

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Lifetime measurements for the study of intruder states towards the island of inversion along the $N = 20$ shell closure

Auteurs: Irene Zanon¹; Daniele Brugnara²; Raquel Nicolás Del Álamo³

¹ KTH - Royal Institute of Technology

² GSI/TU Darmstadt

³ INFN Padova and Università degli studi di Padova

Lifetime measurements are commonly used to unravel the nature and properties of nuclear states, as they are closely related to transition probabilities, which provide information on the nuclear wave functions. The experiment presented here aimed to study the interplay of spherical ($0 \hbar\omega$) and intruder ($2 \hbar\omega$) configurations in the low-lying states of isotopes on the edge of the $N=20$ island of inversion. Specifically, the goal was to determine the lifetime of the first two $2+$ states of ^{34}Si and the first state of ^{35}P using the Doppler Shift Attenuation Method. The experiment was conducted at the LNL facility in November 2022, employing the PRISMA magnetic spectrometer and the AGATA array.

This presentation offers an overview of the current status of data analysis. The data sorting has been completed, with our main focus now on finalising the simulations to extract the values of the lifetimes of the states of interest.

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(online) Report on the AGATA experiment number 24.027

Auteurs: Federico Simioni¹; José Javier Valiente-Dobon²; Damiano Stramaccioni¹

¹ UNIPD, INFN LNL

² IFIC, CSIC-University of Valencia

Inverse beta decay (IBD) is a crucial process historically employed to study neutrinos. For example, discrepancies between measured and expected IBD rates on (^{71}Ga), the so-called *gallium anomaly*, suggest the possible existence of sterile neutrinos. A recent publication showed that the poorly known associated Nuclear Matrix Element (NME) can be extracted measuring the decay width from the Isobaric Analog State (IAS) in (^{71}Ge). In this talk, I will present the preliminary results from the experiment 24.027 carried out in February 2025 and aimed at studying the feasibility of this measurement.

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Report on the AGATA experiment number 039 (24.011)

Auteur: Julgen Pellumaj¹

¹ *University of Padova, INFN-Padova*

The appearance of a subshell closure in ⁵⁶Cr (N=32) is confirmed by high excitation energy of the 2₁⁺ state and reduced B(E2; 2₁⁺ → 0₁⁺) but shell model calculations do not reproduce the drop of collectivity at N=32.

The discrepancy between the experimental data and the theoretical calculations for ⁵⁶Cr may be as a result of coexisting shapes in this nucleus and triaxiality which greatly reduces the B(E2) values. Indeed, calculations performed with the AMD+HFB framework aiming to investigate the triaxial deformation of the states and shape coexistence in this region show coexisting prolate and spherical shapes along the N=32 isotonic chain with the largest deformation in chromium isotopes. Triaxial deformation lowers the excitation energy of the 2₁⁺ state a few hundred of keV and reduces the B(E2) values, being able to reproduce the drop of collectivity at N=32 in agreement with experimental data, but still the theoretical values of B(E2) remain much higher than the experimental ones.

Shape coexistence and triaxial deformation will be studied via lifetime measurements of the 0₂⁺ and 2₂⁺ states in ⁵⁶Cr employing the RDDS/DSAM technique. The states of interest were populated using a transfer reaction: ⁵⁴Cr(¹⁸O, ¹⁶O)⁵⁶Cr. The AGATA array was coupled with the SPIDER detector to reach the needed channel selectivity and control the feeding of the states of interest from higher lying states.

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Report on the AGATA experiment number 23.08 (Coulomb excitation of ⁶⁰Ni)

Auteurs: Agata Krzysiek¹; Kasia Hadynska-Klek²

¹ *University of Warsaw*

² *Heavy Ion Laboratory University of Warsaw*

The nickel isotopes offer a unique laboratory to investigate shape evolution in the vicinity of doubly-magic N=Z nucleus, ⁵⁶Ni (Z=N=28), which should exhibit similar structural properties to those observed in the Z=N=20 region. Indeed, observation of the SD structures was reported also in ⁵⁶Ni, explained as the result of *mp* – *mh* excitations like in the case of ⁴⁰Ca. However, recently the questions on the validity of Z/N=28 as a good magic number have been brought up triggering the discussion on the deformation in the nickel region, including the signatures of shape coexistence. Microscopic and collective properties in the vicinity of ⁵⁶Ni shall be evaluated with the dedicated measurements of the deformation and the neighboring nuclei. To this end, the Coulomb excitation studies focused on the structure of ^{58,60,62}Ni isotopes are currently undertaken at INFN LNL, IJC Lab in Orsay and at HIL Warsaw. These, together with the recent findings from the γ -ray and electron spectroscopy measurements reporting the unexpectedly large *E0* transition strengths for the 2₂⁺ → 2₁⁺ transitions of ^{58,60,62}Ni, shall bring crucial information enabling the further discussion on the electromagnetic properties of Ni isotopes.

Coulomb excitation of ⁶⁰Ni beam impinging on ²⁰⁸Pb target was performed at INFN LNL, Italy, in October 2023. The current status of the data analysis will be presented.

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Pathway to nuclear structure in heavy neutron rich nuclei in the vicinity of N=126 and nuclei northwest of ¹³²Sn via multinucleon transfer reactions

Auteur: Rainer Abels¹

Co-auteur: Peter Reiter²

¹ *University of Cologne*

² *University of Cologne*

Multinucleon transfer (MNT) reactions provide a powerful approach to access exotic neutron-rich nuclei. Excited reaction products have been measured in $^{136}\text{Xe} + ^{208}\text{Pb}$ at 1 GeV with the high-resolution γ -ray tracking array AGATA coupled to the mass spectrometer PRISMA at LNL (INFN, Italy) positioned at the grazing angle. For the beam-like fragments, energy E , atomic number Z , velocity β , charge state q , and mass number A were measured in the range $Z=52-58$, enabling a clean selection of the nuclei of interest. Kinematic coincidences were exploited to improve the identification of the hard-to-reach neutron-rich lead isotopes on the target-like side. Based on relative cross-section distributions for different reaction channels, the potential and limitations of this method for producing neutron-rich nuclei will be presented. Preliminary results on excited states of beam-like nuclei in the Xe–Ba mass region will also be presented.

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Report on the AGATA experiment number 034 (23.049)

Auteur: Julgen Pellumaj¹

¹ *University of Padova, INFN-Padova*

The $^{12}\text{C} + ^{16}\text{O}$ reaction plays a particularly important role in both the carbon and oxygen-burning phases of stars. Fang et al. measured this reaction in a thick-target experiment a few years ago, with both singles and particle- γ coincidence techniques down to a few nanobarns. However, the lowest energy points suffer from large experimental uncertainties which prevent discriminating between the Fowler model and the hindrance approach. Further measurements at low energies with smaller errors are therefore needed to clarify the underlying physics, in order to determine the reaction rate at astrophysical energies.

An experiment on $^{12}\text{C} + ^{16}\text{O}$ aiming at the measurement of fusion cross sections below the μb range with the combined set-up of AGATA and silicon detectors was performed at LNL. The fusion events were identified by coincidences between the prompt γ -rays and the light charged particles (p , α) evaporated from the compound nucleus ^{28}Si .

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Report on the experiment 22.101: Nuclear structure studies of neutron-rich isotopes in the vicinity of $Z=28$ and $N=40$

Auteurs: Andrés Gadea¹; Andrés Illana²; Eda Sahin³; Ida Rosenqvist³; Jaime Benito⁴; Joa Ljungvall⁵; Luca Zago⁶; Luis Mario Fraile⁷; María Doncel⁸; RUTH MICAELA ILLICACHI GUAMAN¹; Rosa Pérez¹; Simone Bottoni⁹

¹ *IFIC-CSIC-UV*

² *Universidad Complutense de Madrid*

³ *University of Oslo*

⁴ *INFN-LNL*

⁵ *Université de Strasbourg*

⁶ *University of Milano and INFN-LNL*

⁷ *ISOLDE-CERN*

⁸ *Stockholm University*

⁹ *University of Milano and INFN*

The experiment 22.101 is a joint experiment to address four different physics cases devoted to studying the physics of the $\nu g_{9/2}$ beyond $N = 40$. These are aimed at investigating:

- Collectivity and seniority conservation in the $\nu g_{9/2}$ orbital
- Shape coexistence and octupole vibrations in ^{68}Ni
- Island of inversion and the role of intruders at $N = 40$

For these purposes, lifetime measurements by means of the Recoil-Distance Doppler-Shift Method with a differential plunger were performed at LNL. The nuclei of interest were populated by multi-nucleon transfer reactions of a ^{70}Zn beam with an energy of 500 MeV impinging on an ^{238}U target of the plunger, while a Nb foil was used to degrade the energy of the reaction products. The beam-like products were identified in the PRISMA spectrometer in coincidence with γ rays in the AGATA tracking array.

In this contribution we will present the current status of the analysis regarding the optimization of the AGATA and PRISMA data processing.

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(online) Superaligned ^{10}C β -decay branching ratio measurement at INFN-LNL: report of Exp. 22. 72 and 24. 12

Auteurs: Jeongsu Ha¹; Pablo Aguilera²; Yonghyun SON³

¹ *Center for Exotic Nuclear Studies, IBS*

² *Comisión Chilena de Energía Nuclear*

³ *Seoul National University / Center for Exotic Nuclear Studies, IBS*

We report preliminary results from the measurements of the superallowed ^{10}C β -decay branching ratio with the AGATA HPGe tracking array at INFN-LNL. The precedent experiment, Exp. 22. 72 was performed in June 2023. A 10-MeV proton beam accelerated from the Tandem-XTU impinged to a 1-mg/cm²-thick, Au-sandwiched ^{10}B target. The experiment was run in two modes: in-beam mode and decay mode. The in-beam mode employed a continuous beam, and the decay mode used a cycle of beam on-axis for 60 seconds and off-axis for 120 seconds using a beam steerer. The AGATA was employed to detect γ rays from ^{10}B following the β decay of ^{10}C , and γ rays from the inelastic scattering of ^{10}B , to determine the count and efficiency ratios of the 1022-keV and 718-keV γ rays in the ^{10}C β -decay. We also measured the lifetime of the ^{10}C with same dataset.

After the experiment, we improved our idea to make the setup capable of high-count rate, and performed the test experiment, Exp. 24. 12 last December. We employed a tantalum target ladder, a tantalum mask, and a ^{10}B target with carbon backing to suppress the background. The new logical signal-based trigger and the new trigger processing could increase the maximum count rate to 4 kHz in decay and in-beam modes. The new experiment was performed this July and according to the preliminary result, a statistical uncertainty less than the 0.2% level on the branching ratio is anticipated.

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(online) Report on the AGATA experiment number 23.003

Auteur: Jakub Skowronski^{None}

The lifetime of the 6.793 MeV subthreshold state in ^{15}O plays a central role in constraining the astrophysical S-factor of the $^{14}\text{N}(p,\gamma)^{15}\text{O}$ reaction, the slowest process in the CNO cycle. This state has long been the source of large uncertainties in extrapolations to stellar energies, and previous lifetime measurements were unable to resolve the problem due to limited sensitivity. The measurement was conducted at the AGATA setup at LNL coupled with the SAURON array in November 2023. The

measurement pushed the AGATA γ -ray tracking array to the very limit of its sensitivity and demanded an exceptionally precise energy calibration over a wide dynamic range. In this talk we will present the current status of our advanced analysis of the Doppler Shift Attenuation Method (DSAM) and the development of an innovative analysis technique to extract the half-life in the femtosecond range.

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Excited States Lifetime measurements in neutron-rich Ca, Ar isotopes

Auteurs: Giuseppe Andreetta¹; Andrea Gottardo²

¹ INFN e Laboratori Nazionali di Legnaro

² LNL INFN

The region around doubly magic ^{48}Ca is a cornerstone of our understanding of nuclear structure, characterized by the appearance of subshell closures at $N=32$ and 34 [1], and by the gradual disappearance of $N=28$ shell closure below $Z=20$ [2]. However, several experimental findings have challenged this understanding. Large charge and matter radii were found in $^{51-53}\text{Ca}$ [3,4], showing insensitivity to the $N=32,34$ subshell closures. The long-standing conundrum of the small $B(E2)$ value in Ar [5,6] has recently been attributed to a new proton sub-shell closure at $Z=18$ in Ar [7]. We measured lifetimes of excited levels in $^{50-(52)}\text{Ca}$ and $^{46-(48)}\text{Ar}$ isotopes (and other nearby nuclei) produced in a multi-nucleon transfer reaction at the Legnaro Laboratories. A beam of ^{48}Ca at 300 MeV impinged on a U target and the target-like recoils were identified event-by-event in mass and atomic number by the mass spectrometer PRISMA [8]. Gamma rays were measured in coincidence with reaction recoil with the AGATA γ -ray tracking array [9]. Lifetimes were measured using the recoil differential Doppler shift method by mounting the uranium target on a plunger device. Shorter lifetimes were probed using the differential Doppler shift attenuation technique, using a U target with a thick niobium backing. Thanks to the cutting-edge AGATA resolving power, the lifetimes of several yrast and yrare states with $\text{spin} \leq 4$ were measured. We will present preliminary results concerning the analysis status.

- [1] D. Steppenbeck et al., Nat. 502, 207–210 (2013)
- [2] T. Glasmacher et al. Phys. Lett. B, 395, 163 (1997)
- [3] R.F. Garcia Ruiz et al., Nat. Phys. 12, 594 (2016)
- [4] M. Tanaka et al., Phys. Rev. Lett. 124, 102501 (2020)
- [5] A. Gade et al., Phys. Rev C 68, 014302 (2003)
- [6] S. Calinescu et al., Phys. Rev. C 93, 044333 (2016)
- [7] D. Brugnara et al., submitted
- [8] A. Stefanini, et al. Nuc. Phys. A, 701, 217 (2002)
- [9] S. Akkoyun et al, NIM A 668, 26 (2012)

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(online) Shape coexistence in ^{52}Cr : lifetime measurement of the 0_2^+ and the 4_1^+ states

Auteurs: Sara Pigliapoco¹; Franco Galtarossa²; Andrea Gottardo³

¹ UniPD and INFN-PD

² INFN-PD

³ INFN-LNL

Coexistence between spherical and deformed shapes is largely found in and near semi-magic or doubly-magic nuclei.

The region between the doubly-magic ^{48}Ca and ^{56}Ni nuclei is predicted to present phenomena of shape coexistence, although experimental information on E0 and E2 transition strengths connecting deformed and spherical configurations remains rather limited. In ^{52}Cr ($Z = 24$, $N = 28$), a recent measurement of the $X(E0/E2)$ ratio between the deformed 0_2^+ state and the spherical 0_1^+ and 2_1^+ states suggests that sizeable E0 strengths are indeed present. However, the determination of the $\rho^2(E0)$ value—crucial to characterizing the nature of shape coexistence in this nucleus—requires a measurement of the lifetime of the excited state.

A lifetime measurement of ^{52}Cr was carried out at the Legnaro National Laboratories using the γ -ray tracking array AGATA, coupled to the charged-particle detector SPIDER, with the nucleus of interest populated via a two-neutron transfer reaction. We will present the status of the ongoing analysis together with preliminary results concerning the 4_1^+ state.

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DSAM of ^{56}Ni and ^{60}Zn

Auteurs: Andrea Gottardo¹; Daniele Mengoni²; Elia Pilotto²; Franco Galtarossa³; Matus Balogh¹

¹ INFN LNL

² University of Padova

³ INFN Sezione di Padova

In this contribution, we will present the current state of the analysis of experiments 23.07 and 23.09 studying the ^{56}Ni and ^{60}Zn isotopes. The goal of these experiments is to investigate the $N=Z$ region by measuring lifetimes using the DSAM technique. These experiments were performed back-to-back, using an identical 16O@80 MeV beam and an identical AGATA+OSCAR (dE-E telescope) setup. Currently, the analysis is still in the calibration phase in effort to optimize the energy calibration of the telescopes to achieve the best excitation energy resolution. Clean selection of the populated excited states is crucial for the final DSAM analysis.

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Report on the AGATA experiment number 22.97

Auteurs: Tea Mijatović¹; Lorenzo Corradi²; Suzana Szilner¹; Mirco Del Fabbro¹

Co-auteurs: Ablaihan Utepov³; Alain Goasduff²; Alberto Stefanini²; Andrea Gottardo²; Andrea Gozzellino²; Andrés Gadea⁴; Aysegul Ertoprak²; Benito Gongora²; Daniel Ricardo Napoli²; Daniele Brugnara²; Daniele Mengoni⁵; Deša Jelavić Malenica¹; Dieter Ackermann³; Dino Bazzacco⁵; Elia Pilotto⁵; Enrico Fioretto²; Francesco Recchia⁵; Franco Galtarossa⁵; Giacomo De Angelis²; Giovanna Montagnoli⁵; Giovanni Pollarolo⁶; Igor Gašparić¹; Irene Zanon²; Ivana Lihtar¹; Jaime Benito Garcia⁵; José Javier Valiente Dobon²; Julgen Pellumaj²; Kseniia Rezyunkina⁵; Laura Busak¹; Luca Zago²; Luka Palada¹; Marco Rocchini⁷; Marco Siciliano⁸; Margareta Sigmund¹; Marta Polettini⁵; Matko Milin⁹; Matus Balogh²; Matúš Sedlák²; Md Sazedur Rahaman Laskar¹⁰; Neven Soić¹; Nikola Vukman¹; Pablo Aguilera⁵; Rafael Escudeiro⁵; Roberto Menegazzo⁵; Rosa Maria Pérez-Vidal²; Rosanna Depalo¹⁰; Sara Carollo⁵; Sara Pigliapoco⁵; Silvia Monica Lenzi⁵; Tommaso Marchi²

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⁷ INFN Firenze

⁸ Argonne National Laboratory

⁹ Physics Department, Faculty of Science, University of Zagreb

¹⁰ Dipartimento di Fisica, Università degli Studi di Milano

We will present the progress of the data analysis for the PRISMA + AGATA experiment titled “Probing nucleon-nucleon correlations in the $^{48}\text{Ca} + ^{208}\text{Pb}$ system below the Coulomb barrier”, conducted in March 2023 at LNL. The experiment aimed to measure the transfer probabilities for multi-neutron and multi-proton transfer channels in the $^{48}\text{Ca} + ^{208}\text{Pb}$ system at energies close to and below the Coulomb barrier.

The experiment was carried out in inverse kinematics, using a ^{208}Pb beam directed at a ^{48}Ca target, employing the superconducting PIAVE-ALPI accelerator complex.

In this selected system, both neutron and proton stripping and pick-up processes are open, providing the opportunity to investigate nucleon-nucleon correlations simultaneously for a complete set of transfer channels.

The PRISMA magnetic spectrometer was used to identify the light reaction products with excellent charge and mass resolution, allowing for the clear separation of multiple transfer channels, despite some experimental challenges.

Up to five proton pick-up channels were observed, as well as proton stripping down to -2.

The Q-value distribution for the different transfer channels displays, at least for a few neutron transfers, a well-defined peak centred around the ground-to-ground-state transitions, as expected in a regime where quasi-elastic processes are dominant.

As more nucleons are transferred, a tail toward larger energy losses starts to develop, indicating that secondary processes may contribute.

For all channels, AGATA will provide crucial information about the populated excited states and will allow to extract both the intensities of these excited states and, using also the information measured with PRISMA, the intensities of the ground-state populations.

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(online) Report on the AGATA experiment 009

Auteur: Filippo Angelini¹

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In December 2022, an experiment was performed at INFN-LNL with a ^{208}Pb beam at 1300 MeV impinging on a ^9Be target, using the inverse kinematics fusion-fission reaction for both nuclear structure and reactions studies. The experiment was performed using the AGATA γ -ray tracking array coupled to the magnetic spectrometer PRISMA [1-3].

This setup allowed one to measure the γ rays from the de-excitation of the fission fragments and to study the dynamics of the fission of the compound nucleus, ^{217}Rn .

One of the interesting nuclear structure issues [moeller_prc_2015] that can be tackled in the neutron-rich region reached through the fission of this system is the evolution of the shell gap at $N = 50$.

The observation of the reduction of the $N = 50$ shell gap [4-5] is a phenomenon that motivated different measurements in the $N = 50$ isotones towards ^{78}Ni .

In particular, estimates starting from mass measurements show a decrease of the $N = 50$ gap size from $Z = 40$ until ^{82}Ge , while for ^{80}Zn a re-increase is observed [4-5]. A second method to estimate the gap size is with the energy of medium-spin states in $N = 50$ even-even isotones.

The fusion-fission reaction mechanism is an effective production method for spectroscopy of these levels because it can populate states at higher spins than transfer reactions, up to 6-8 units of angular momentum [6].

While the production cross section for the very exotic $N = 50$ nuclei with $Z < 31$ becomes small, the less neutron-rich isotopes in this region are populated with higher yields and a more detailed spectroscopy of their excited levels is possible.

We will show preliminary results on γ -ray spectroscopy of $N = 50$ isotones as well as $N = 40 - 50$ Zn and Cu isotopes.

In parallel to the γ -ray spectroscopy of the energy levels of the fission products, the measurement

of the fragments with the large acceptance spectrometer PRISMA gives access to key quantities for the description of the fission dynamics of the ^{217}Rn compound nucleus.

In recent studies, the role of nuclear structure in the dynamics of fission has been investigated with different systems in the actinide region. These studies showed that even in highly-excited fissioning systems, such as ^{250}Cf at $E^* = 45\text{-MeV}$ [7], where the high excitation energy is expected to wash out the shell effects and produce a symmetric fission, contributions from different fission modes associated with structure effects could not be excluded.

Therefore, the fusion-fission of ^{217}Rn , which lies in a region where symmetric fission is expected at low energies [8], represents an interesting case to understand the role of shell effects at high excitation energy in a region that is much lighter than the actinides that was never studied before. The measurement of the fission fragments with PRISMA allows the (A, Z) identification and the reconstruction of the fragment velocities in the center of mass of the fissioning system.

After the optimization of the fission fragment identification we will present preliminary results on reconstructed fission yields.

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(online) Report on the AGATA experiment number 23.054

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Experiment 23.054 was proposed to clarify the possible shape coexistence in the nucleus ^{106}Pd . Around the $Z=50$ shell closure, shape coexistence has been firmly established in several isotopic chains, particularly in the tin and cadmium isotopes. Intruder states have also been identified in the palladium isotopes. Nevertheless, the coexistence of different shapes has not yet been unambiguously established in these nuclei. Recent results from our group suggested a different shape for the first excited 0^+ state compared to the ground state in ^{106}Pd , based on $E0$ transition measurements. Obtaining detailed information on the quadrupole shape of the states in this isotope is, therefore, extremely timely.

A Coulomb-excitation experiment was carried out at the INFN-LNL laboratory with the AGATA-SPIDER setup to investigate the quadrupole collectivity of ^{106}Pd . The analysis is still ongoing; significant effort has been devoted to optimizing the spectral resolution in order to disentangle the numerous doublets present. Preliminary spectra with the best resolution currently achieved will be presented.

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LNL AGATA Exp 24.01: Development of a self-calibration technique for gamma-ray tracking arrays

Auteurs: Sidong Chen¹; Stefanos Paschalis¹

¹ *University of York*

The performance of γ -ray tracking with AGATA critically depends on the accuracy of Pulse-Shape Analysis (PSA), which in turn is governed by the fidelity of the signal basis describing detector response. The currently employed AGATA Data Library (ADL) basis is derived from simulations, and its limitations are widely recognized as a key factor constraining the achievable position resolution. To address this, we have developed a novel self-calibration technique that generates an experimental signal basis directly from high-statistics source calibration data acquired in situ with AGATA. The method employs an iterative minimization procedure, guided by the Compton scattering formula, to progressively refine position assignments within detector segments until convergence to their true interaction points. Tests with simulated data demonstrate that this approach provides a more faithful description of experimental pulse shapes compared to the ADL basis, offering clear potential to

enhance AGATA's position resolution.

To complete the development and validation of this technique, we carried out a dedicated, long source calibration with ^{88}Y and an in-beam experiment at LNL in 2024 (LNL AGATA Exp 24.01), where Coulomb excitation of ^{28}Si on a thin Au target was studied with the AGATA + PRISMA setup. The quality of the Doppler correction, which is directly sensitive to PSA accuracy, serves as a stringent benchmark for comparing the self-calibrated basis with the standard ADL. This presentation will discuss the methodology and report on the preliminary results of the self-calibration analysis of this experimental data.

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Search for a nuclear Josephson effect in $^{60}\text{Ni}+^{116}\text{Sn}$ sub-barrier transfer reactions with the PRISMA+AGATA set-up

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¹ UNIPD, INFN PD

Sub-barrier transfer experiments have been recently carried out at LNL in the $^{60}\text{Ni}+^{116}\text{Sn}$ system, where the two neutron transfer channel is well Q -value matched. Reaction products have been detected in inverse kinematic and at forward angles with the large solid angle magnetic spectrometer PRISMA, providing high efficiency and resolution. In these studies one follows the behavior of the transfer probabilities by varying the internuclear distance, a method which turned out to be fundamental to probe nucleon-nucleon correlation effects. Indeed most of the cross section of the two neutron transfer channel has been shown to be in the ground-to-ground state transition, indicating the possibility to study into detail the effect of pair transfers.

Very recently, the coupling of the AGATA gamma array to PRISMA offered a unique opportunity to study a nuclear (alternating current, AC) Josephson-like effect, with Cooper-pair tunneling between superfluid nuclei, whose manifestation has been recently proposed using the $^{60}\text{Ni}+^{116}\text{Sn}$ data as a stepping stone. Predictions have been made of a specific gamma strength function associated with the dipole oscillations generated by the, mainly successive, two neutron transfer process. We directly tested for the first time the possible manifestation of this important effect of Cooper pair behavior, observed to date only in condensed matter physics.

This talk focuses on the ongoing analysis of these new results, accompanied by simulations that include the presence of the predicted gamma-ray distribution.

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The STARE-DAQ 12 Bay test set-up. and monitoring for EMC issues in AGATA