Matúš Balogh

Date of birth: 30/04/1992 | **Phone:** (+39) 3792611321 (Mobile) | **Email:** matus.balogh@cern.ch

WORK EXPERIENCE

INFN LABORATORI NAZIONALI DI LEGNARO – LEGNARO, ITALY

POST-DOCTORAL FELLOWSHIP – 08/07/2024 – CURRENT

Research grant of PRIN project
Title: *"Study of the ion tracking in direct reactions in inverse kinematics: detectors and physics case"*

INFN LABORATORI NAZIONALI DI LEGNARO – LEGNARO, ITALY

POST-DOCTORAL FELLOWSHIP – 15/05/2023 – 07/07/2024

Research grant of PRIN project.
Title: *"Study of the integration of cryonic targets with the gamma-ray array AGATA, development of physics cases for possible nuclear reactions"*

INFN LABORATORI NAZIONALI DI LEGNARO – LEGNARO, ITALY

INFN POST-DOCTORAL FELLOWSHIP IN EXPERIMENTAL PHYSICS – 12/05/2021 – 11/05/2023

Main project: *"GEANT4 simulations for feasibility study of competitive double-γ decay"*

EDUCATION AND TRAINING

01/09/2016 – 16/02/2021 Bratislava, Slovakia
PHD. Comenius University in Bratislava and Slovak Academy of Sciences, Slovakia

Field of study Nuclear and Subnuclear Physics | **Final grade** Graduated with honours | **Level in EQF** EQF level 8 |

Thesis Spectroscopy of excited states in light Au isotopes

01/09/2014 – 21/06/2016 Bratislava, Slovakia
MGR. (MSC. EQUIVALENT) Comenius University in Bratislava

Field of study Nuclear and Subnuclear Physics | **Final grade** Graduated with honours | **Level in EQF** EQF level 7 |

Thesis Nuclear structure and phenomenon of shape coexistence in gold isotopes

2025 Vilnius, Lithuania
ISOTDAQ - INTERNATIONAL SCHOOL OF TRIGGER AND DATA ACQUISITION CERN

2025 Padova, Italy
DATA ACQUSITION USING NI-DAQMX AND LABVIEW NI Education Services

2022 Bertinoro, Italy
ESC - INTERNATIONAL SCHOOL ON EFFICIENT SCIENTIFIC COMPUTING INFN

2018 Bucharest, Romania
CHETEC - THE CHEMICAL ELEMENTS AS TRACERS OF THE EVOLUTION OF COSMOS TRAINING SCHOOL IFIN-HH

2023
CERTIFICATE OF COMPETENCE TO OPERATE CN AND AN2000 ACCELERATORS AT INFN LNL INFN LNL

RESEARCH PROGRAM

Coulomb excitation of 44Ca

Spokesperson
INFN LNL Italy
Approved - planned execution February 2026
Experimental setup AGATA + SPIDER + DANTE

Coulomb excitation of 64Zn

Co-spokesperson
INFN LNL Italy
Executed in 2024, under analysis
Experimental setup AGATA + SPIDER + DANTE

Performance of AGATA at high energies

Spokesperson & investigator
INFN LNL Italy
Executed in 2024, under analysis
Experimental setup AGATA

Gamma decay study of the Double Isobaric Analog State in 48Ti

Co-spokesperson
IP PAN Poland
Awaiting scheduling
Experimental setup KRATTA + array of $LaBr_3$ scintillators

Spherical and deformed structures in 56Ni investigated via lifetime measurements

Investigator
INFN LNL Italy
Executed in 2023, under analysis
Experimental setup AGATA + OSCAR

Shape Coexistence in Odd-Au Isotopes: In-beam Gamma-ray and Conversion Electron Coincidence Spectroscopy of the 179Au

Investigator
University of Jyväskylä Finland
Executed in 2014, analysis concluded
Experimental setup RITU + Jurogam2 + SAGE + GREAT

Light-ion tracking with a microchannel-plate (MCP) detector: efficiency evaluation

Spokesperson
INFN LNL Italy
Submitted to PAC 2025, awaiting evaluation
Experimental setup DANTE + Silicon monitors

Other experiments

Active involvement and contribution to:
- additional 44 experiments performed at INFN LNL with AGATA in period 2022-2025
- additional 2 experiments at University of Jyväskylä
- 3 experiments at Argonne National Laboratory
- 3 experiments at CERN ISOLDE
- 2 experiments at iThemba Labs

LANGUAGE SKILLS

Mother tongue(s): **SLOVAK**

Other language(s):

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken production	Spoken interaction	
ENGLISH	C2	C2	C2	C2	C2
ITALIAN	A2	A2	A2	A2	A2
RUSSIAN	A1	A1	A1	A1	A1

Levels: A1 and A2: Basic user - B1 and B2: Independent user - C1 and C2: Proficient user

STUDENTS AND TEACHING

2024 – 2025
Fatemeh Daneshvar - Master thesis supervisor

Thesis: *"Optimizing AGATA Array Performance At High-Energy Gamma-Ray Spectroscopy"*

2022 – 2023
Damiano Stramaccioni - Master thesis supervisor

Thesis: *"Feasibility study of the competitive double-γ decay"*

Supervision & mentoring of students

2025 C. T. Michie
2024 Q. Vullierme, F. Sanial-Gassmann
2023 A. Cobo Zarzuelo
2019 A. Mocellin, P. Patirico, C. Hamon
2018 K. Eycken, M. Murín

2022 – 2024
Teaching

Invited lecturer for *Introduction to C++* course for undergraduate students, University of Padova

Popularization activities

- Guide at INFN LNL 2022-2025, 1-2 tours per year
- *Roadshow of Young Scientists in High Schools*, 2019 and 2020
- *CERN Masterclasses*, 2018 and 2019, speaker
- Popular talks at Slovak high schools, 2016-2025, at least 1 per year

SCIENTIFIC PUBLICATIONS AND METRICS

Selected publications

M. Balogh, *et al.*
New collective structures in ^{179}Au and their implications for the triaxial deformation of the ^{178}Pt core
Phys. Rev. C **106**, 064324 (2022).
https://doi.org/10.1103/PhysRevC.106.064324
Discovery of 2.14μs isomer at excitation energy 1.7MeV and strongly coupled band build on top of it; hitherto unprecedent in ^{179}Au region. Discovery sparked search for similar isomers in vicinity, I am aware of 1 executed experiment and at least 2 proposals. Discovery of weakly coupled band, crucial for determination of triaxial deformation parameters of ^{179}Au.

M. Balogh, et al.
Automated method for offline correction of spectrometry data affected by time instability
Nucl. Instrum. and Methods in Phys. Res., Sect. A **1004**, 165368 (2021).
https://doi.org/10.1016/j.nima.2021.165368
Introduction of a novel robust algorithm to correct energy drifts over time, caused by temperature effect. Algorithm was essential in data recovery of experiment S17, crucial for discoveries made later in ^{179}Au. Algorithm was recently adopted by AGATA community and it is now part of the AGATA toolkit.

M. Sedlák; A. Gottardo; R. Pengo; A. Goasduff; I. Zanon; A. Cobo Zarzuelo; M. Balogh; et al.
CTADIR: A ^{3,4}He Cryogenic TArget for DIrect Reactions at low energy
Nucl. Instrum. and Methods in Phys. Res., Sect. A **1080**, 170626 (2025).
https://doi.org/10.1016/j.nima.2025.170626
Development and commissioning of CTADIR. Designed for use with the radioactive ion beams, soon to be delivered by SPES project of INFN LNL. Crucial instrumentation for direct reaction studies of exotic nuclei.

O. Stézowski, J. Dudouet, A. Goasduff, A. Korichi, Y. Aubert, M. Balogh, et al.
Advancements in software developments
Eur. Phys. J. A **59**, 119 (2023)
10.1140/epja/s10050-023-01025-4
Updates and upgrades of AGATA processing code, necessary for performance improvement of growing array

J.J Valiente Dobón; R. Menegazzo; A. Goasduff; D. Agguiaro; P. Aguilera; F. Angelini; M. Balogh; et al.
Conceptual design of the AGATA 2π array at LNL
Nucl. Instrum. and Methods in Phys. Res., Sect. A **1049**, 168040 (2023).
https://doi.org/10.1016/j.nima.2023.168040
Technical design paper of the AGATA setup during its 2nd experimental campaign at INFN LNL.

M. Venhart; M. Balogh; et al.
Population of a low-spin positive-parity band from high-spin intruder states in ^{177}Au: The two-state mixing effect

Phys. Lett. B **806**,135488 (2020)
https://doi.org/10.1016/j.physletb.2020.135488
Observation of unprecedented decay mode in ^{177}Au was explained using two-state mixing model, important for systematic view of the neutron-deficient gold isotopes.

M. Venhart; J. L. Wood; M. Sedlák; M. Balogh; et al.
New systematic features in the neutron-deficient Au isotopes
J. Phys. G: Nucl. and Part. Phys. **44**, 074003 (2017).
https://doi.org/10.1103/physrevc.95.061302
Observation of a new intruding configuration in Au isotopes, implication for the whole isotopic chain.

Metrics

Scopus:
- h-index 6
- 18 publications in refereed journals
- 98 citations

ORCID 0000-0002-7804-8958
Web of Science ResearcherID: GZL-6462-2022
Scopus Author ID: 57194549033

SOFTWARE

The Cross-correlation Correction Method (CCM)

M. Balogh
https://github.com/matLogh/CCM
Algorithm library for correcting energy drifts over time. Repository contains concrete implementations for AGATA, OSCAR and PRISMA detectors. It is an essential tool in calibration processes.

GEANT4 simulations for feasibility study of competitive double-γ decay

M. Balogh, D. Stramaccioni
https://baltig.infn.it/gamma/g4-double-gamma (access blocked, subject of active research)
Comprehensive simulations studying feasibility of detection of competitive double-γ decay with direct implications for the neutrinoless double-beta decay – and thus mass of neutrino.

LNL spy

M. Balogh
https://baltig.infn.it/gamma/lnlspy
Tool for visualization and data analysis of an active experiment. Used to monitor ancillary detectors of AGATA during the experiment, such as SPIDER, DANTE, SAURON, PRISMA and EUCLIDES.

AGATA selector

D. Brugnara, M. Sedák, E. Pilotto, L. Zago, M. Balogh, F. Angelini, S. Pigliapoco
https://zenodo.org/records/8329198
Main analysis code of all (45+) experiments performed during second AGATA campaign at INFN LNL.

AGATA efficiency

M. Balogh
https://baltig.infn.it/gamma/agata-efficiency
Tool to obtain efficiency of a detector (any, not just AGATA) from calibration runs. Automated energy peak fitting procedure and covariance-aware fitting of a chosen efficiency curve.

NETWORKS & MEMBERSHIPS

2023 – CURRENT
AGATA performance group

2022 – CURRENT
LNL Data Acquisition group

2021 – CURRENT
Primary responsible of SPIDER and SAURON detector arrays

2021 – CURRENT
Gamma group (INFN)

http://gamma.lnl.infn.it/

2014 – CURRENT
Slovak Physical Society

AWARDS

2022
Slovak Academy of Sciences Award for Building Infrastructure for Science

CONFERENCES & SEMINARS

2025 GSI, Germany
AGATA Week + AGATA Collaboration Council

Speaker (3 invited talks)

2025 Lyon, France
AGATA Analysis Workshop

Invited lecturer

2024 Milano, Italy
AGATA Week + AGATA Collaboration Council

Invited talk

2023 INFN LNL, Italy
AGATA Analysis workshop

Lecturer & organizer

2023 Častá-Papiernička, Slovakia
ISTROS International conference

Speaker & organizer (scientific secretary)

2022 INFN LNL
AGATA Week + AGATA Collaboration Council

Organizer (scientific secretary)

2022 Zakopane, Poland
Zakopane Conference on Nuclear Physics

Speaker

2019 Častá-Papiernička, Slovakia
ISTROS International conference

Speaker & organizer

Others

Member of organizing committee of *INFN LNL PAC meeting (2022), AGATA pre-PAC workshops (2022,2021), ECFA meeting (2018)*