Paolo Giubellino

Curriculum Vitae

Paolo Giubellino è un fisico sperimentale che lavora nel campo delle collisioni nucleari di alta energia. Ha studiato all'Università di Torino e, dopo esperienze negli Stati Uniti e in Svizzera, è dirigente di ricerca presso la sede di Torino dell'Istituto Nazionale di Fisica Nucleare (INFN). Da inizio 2011 a fine 2016 ha guidato al Centro Europeo di Ricerche Nucleari (CERN) l'esperimento ALICE. Dal Gennaio 2017, è stato nominato Direttore Responsabile del GSI Helmholtz Center e del FAIR International Laboratory di Darmstadt, il maggiore laboratorio in Europa dedicato alla Fisica Nucleare con oltre 1500 dipendenti e 3000 utenti provenienti da tutto il mondo, un budget di 200 Milioni di Euro l´anno per operare e altri 300 annui per la realizzazione di grandi progetti, e professore ordinario presso l'Istituto di Fisica Nucleare del Politecnico di Darmstadt. FAIR è un Landmark Laboratory fra le Infrastrutture Europee della Ricerca (ESFRI) ed è uno dei maggiori investimenti in Europa nel campo della ricerca fondamentale (oltre 3 Miliardi di euro). Sia GSI che FAIR sono caratterizzati da un ampio programma di ricerca, che include fisica adronica, astrofisica nucleare, struttura nucleare, studio della materia nucleare ad altissime densità, fisica atomica, biofisica, fisica dei plasmi e scienza dei materiali. La carica di Direttore responsabile (amministratore delegato) contempla la leadership scientifica ma anche la gestione del personale, delle infrastrutture e della amministrazione. Nell´ambito della sua attività, Paolo Giubellino e stato membro di numerosi comitati scientifici e ne ha presieduti diversi, in vari paesi del mondo. L´elenco dei principali si trova alla voce "science management". Paolo Giubellino ha pubblicato oltre 500 lavori su riviste internazionali con referee, e ha un h-index di 126 su Google Scholar, 126 su INSPIRE, 89 su Web of Knowledge)

Principali premi e riconoscimenti:

2024 Membro Correspondente della Accademia dei Lincei
2014 "Lise Meitner" Prize, highest recognition of the European Physical Society for Nuclear Physics
2013 "Enrico Fermi" Prize, highest recognition of the Italian Physical Society
2012 "Commendatore" , nominato per meriti scientifici dal Presidente Napolitano.
2019 Membro Corrispondente della Accademia delle Scienze di Torino
2018 GENCO Award 2018, Darmstadt, Germany
2016 Doctor Honoris Causa, Suranaree University of Technology, Thailand
2016 Doctor Honoris Causa, National Academy of Sciences of Ukraine, Kiev, Ukraine
2016 Member of the Academia Europaea
2013 Honorable Mention of the Ministry of Science of the Slovak Republic
2010 Medal of the Division of Particles and Fields of the Mexican Physical Society

Educazione:

1983 Laurea in Fisica, 110/110 e lode e mezione special onorevole.
1984/85 Fulbright fellow at the University of California, Santa Cruz.
2000 Awarded the title of Doctor in Physics and Mathematics (Habilitation), Dubna Academic Council (Russia).

Posizioni:

2024 – presente Presidente Commissione Scientifica Nazionale III, INFN
2017 - 2024 Scientific Managing Director of the FAIR and GSI laboratories, following the vote by the Councils of both laboratories on March 2nd, 2016, confirmed for a second 5-year term on Dec 2nd, 2020
2017 - presente Full Professor (W3) at the Institut für Kernphysik of TU Darmstadt
2011 - 2016 congedo al CERNt CERN con il titolo di "Guest Professor", per guidare la Collaborazione ALICE.
2006 INFN: promozione a dirigente di ricerca
2000 – 2002 congedo al CERN con il titolo di "scientific associate" per servire come deputy spokesperson della Collaborazione ALICE
1996 INFN: promozione a primo ricercatore.
1985 INFN: assunto come ricercatore a tempo indeterminato

Science Management:

2024 Member of the Evaulation Committee of IRFU, CEA, France
2023 Chair of the selection committee for the director of IN2P3, France

2023 - present Member of the Science Advisory Committee of the Institute for Rare Isotope Science, Daejeon, Korea

2023 - present Member of the RMU Partnership Board, Advisory Board of the strategic alliance of the Rhine-Main Universities

2022 Chair of the International Advisory Committee tasked to evaluate the large research infrastructure projects in Nuclear, Particle and Astroparticle Physics of the Chinese Academy of Sciences

2021 – 2024 Member of the council of the European Physical Society

2021 – present Member of the International Scientific Advisory Board for Research at Goethe University Frankfurt

2018 – present Member of the International Advisory Board IGFAE – Univ. de Santiago de Compostela, Spain

2017 – present Member of WG9, International Cooperation in Nuclear Physics (ICNP), of the IUPAP, International Union of Pure and Applied Physics

2017 – present Member of NUPECC, The Nuclear Physics European Collaboration Committee

2020 – 2022 Member of the International Committee tasked by IN2P3 and CEA to define the long term strategy of the GANIL Laboratory, France

2018 – 2022 Member of the IAC (International Advisory Committee) of the J-PARC laboratory, Japan

2018 – 2022 Member of the Scientific Council of the JINR, Dubna, Russia

2017 – 2022 Member of the of the Scientific Council of the GANIL Laboratory, France

2018 – 2019 Member (co-chair) of the international evaluation committee of the 5 IN2P3 Orsay Laboratories, for the Haut Conseil de l'Evaluation de la Recherche et de l'Enseignement Supérieur (HCERES)

2000 – 2018 Member of the Instrumentation Panel of the ICFA.

2010 – 2016 Chair of the GSI G-PAC.

2013 – 2016 Member of the Comisión de Infraestructuras de Fisica de Particulas y Aceleradores del Ministerio de Economia y Competitividad, Spain

2009 – 2016 Member of the EMMI Program Advisory Committee

2010 – 2014 Member of the Scientific Council of the IN2P3 (National Institute of Nuclear and Particle Physics) of France.

2003 – 2011 Chair of the scrutiny group charged of assessing and monitoring the running and maintenance expenses for the CDF International Finance Committee at Fermilab, USA.

2007 – 2010 Member of the GSI General Physics Advisory Committee (G-PAC)

2008 – 2010 Member of the SPS and PS experiments Committee (SPSC) at CERN.

2003 – 2010 Member of the Conseil Scientifique of the SUBATECH Laboratory, Nantes, France.

2010 President of the Evaluation Committee of the Subatech Laboratory in Nantes.

2010 Convener of the "Phases of nuclear matter" working group for the NUPECC Long Range Plan.

2008 Member of the Evaluation Committee of the IPN Laboratory in Orsay for the Agence d'Evaluation de la Recherche (AERES) of the French Government: ,

2008 Member of the Evaluation Committee of the LPSC Laboratory in Grenoble, France

2006 Member of the 4-yearly CNRS/IN2P3 Evaluation Committee of the SUBATECH Laboratory, Nantes, France.

2004 Member of the "Phases of Nuclear Matter" working group for the NUPECC (Nuclear Physics European Collaboration Committee) Long Range Plan.

2010 – 2016 Coordinator Work package 1 of the EPLANET project of scientific cooperation between Europe and Latin America (about 4 M euros, four-year EU program), member of the Scientific Advisory Committee and of the Executive Board of EPLANET.

2005 – 2009 Chair of the Scientific Advisory Committee of the HELEN project, largest among the ALFA programs of scientific cooperation between Europe and Latin America.

1990 – 1996 Membro della Commissione Nazionale Scientifica II dell´INFN

- Referee per la valutazione o selezione di progetti per INTAS, diversi programme EU Europei, Il MIUR, il ministero Russo per la Ricerca, il Governo della Repubblica Ceka, la National Research Foundation della Republic of South Korea e la National Research Foundation of South Africa.
- Membro dell'International Advisory Committee di numerose Conferenze Internazionali fra cui INCP, LHCP, Nucleus-Nucleus, Quark Matter, Hard Probes, Strange Quark Matter e ICPAQGP. Organizzatore, assieme a Federico Antinori, della conferenza internazionale Quark Matter 2018, con oltre 800 partecipanti.
- Referee per diverse riviste internazionali di Fisica, fra cui Physical Review Letters, Physical Review, Nuclear Physics, Physics Letters e Nuclear Instruments and Methods.

Principali elementi di carriera scientifica:

- Responsabile di programmi INFN, e di grants NATO, INTAS e EU.

1990 – 1996 Coordinatore di Gruppo II per la sezione INFN di Torino

1995 – 2000 Responsabile del gruppo ALICE ITS dell´INFN di Torino

2007 - 2010 Responsabile del gruppo ALICE ITS dell´INFN di Torino

1985 – 1990 Responsabile, in NA34/1 di design, costruzione e gestione del rivelatore SCI-PAD.. Responsabile, in NA34/2, dei rivelatori al silicio Ring Counters.

1991- 1997 Responsabile, in NA50 di design, costruzione e gestione del rivelatore silicon multiplicity detectors. In questo contesto, crea il gruppo di microelettronica e il laboratorio di rivelatori al Silicio presso la sezione INFN di Torino.

1990 - 2000 Participa in diversi programmi di R&D dedicati allo sviluppo di rivelatori al silicio e elettronica tollerante alle radiazioni.

1992 – 2010 Project leader/deputy project leader del Inner Tracking System di ALICE. Membro del management dell´esperimento ALICE, membro del Technical and Management Board e, dal 2002, del Physics Board. Membro dell´editorial board del ALICE Physics Performance Report.

2000 - 2002 Deputy spokesperson della ALICE collaboration

2004 - 2010 Deputy spokesperson della ALICE collaboration

2009 – 2010 Responsabile per gli ALICE Upgrades e Chair Conference Committee

Jan 2011 – Dec 2016 Spokesperson della Collaborazione ALICE (eletto per un mandato di 3 anni nel Marzo 2010, and per un secondo mandato second in Luglio 2013, con una amplissima maggioranza). Ha guidato la collaborazione ALICE nella preparazione di una proposta di upgrade, fino alla sua approvazione da parte del CERN nel Settembre 2012.

Jan 2017 - present In qualità di Direttore Scientifico di GSI e FAIR, definisce la strategia scientifica dei due laboratori

Talks and Pubblicazioni:

Ha presentato oltre 70 relazioni su invito a conferenze internazionali, oltre 60 seminari su invito in varie università, numerose lezioni a scuole internazionali di Fisica e relazioni a conferenze nazionali. Co-autore di oltre 600 lavori a stampa su riviste internazionali con referee (h-index 140 su Google Scholar, 135 su INSPIRE, 95 su Web of Knowledge).

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Breve CV di Enrico Fragiacomo

Sono primo ricercatore INFN presso la Sezione di Trieste. Sono autore di circa 500 articoli su riviste internazionali e ho presentato i miei lavori a 40 conferenze internazionali. Mi occupo di fisica degli ioni pesanti ultrarelativistici con l'esperimento ALICE al CERN. Da più di dieci anni contribuisco con analisi dati e attività di referaggio al gruppo di lavoro su light flavour e ai gruppi di analisi sulle risonanze (PAG-RSN) e sui generatori Monte Carlo. In particolare, sono stato coordinatore del PAG-RSN per quattro anni dal 2019 al 2022. Ho seguito l'esperimento ALICE con diversi incarichi dall'inizio delle operazioni di LHC. Precedentemente, ho condotto attività di ricerca nel campo della fisica delle particelle delle basse energie al TRIUMF. Mi sono occupato di intelligenza artificiale, calcolo distribuito e di software per i rivelatori di particelle. Per l'INFN, ho svolto vari incarichi di servizio. Dal 2019 al 2023 sono stato rappresentante locale dei ricercatori e tecnologi. Dall'inizio del 2023 sono coordinatore di Gruppo 3 e membro della CSN3. Sono referee della sigla LEA, che racchiude tutti i cinque esperimenti INFN di antimateria. Sono membro di sottocommissioni della CSN3 e osservatore in CSN4. Ho tenuto corsi universitari per la laurea triennale e per la laurea magistrale. Dal 2021 sono titolare di un corso di dottorato sulla fisica degli ioni pesanti.

Trieste, 10 gennaio 2025

In fede

Enrico Fragiacomo

Alain Goasduff

Work

Today	**Ricercatore III livelo a tempo indeterminato**
Nov. 2022	LNL-INFN, Legnaro, Italy
Oct. 2022	**Tecnologo III livelo a tempo determinato**
May 2020	LNL-INFN, Legnaro, Italy
Apr. 2020	**Invited lecturer:** 30h lecture cycle on Digital Signal Processing
Feb. 2020	Department of Physics, University of Warsaw (Poland)
Jan. 2020	**Researcher:** CaRipaRo Starting grant on Condensed states in nuclear physics
Jan. 2017	Università degli Studi di Padova - Dipartimento di Fisica e Astronomia
July. 2018	**Invited Scientist:** NEDA@GANIL physics campaign manager
Apr 2018	GANIL, Caen, France
Sept. 2016	**INFN Post-doctoral fellow**: GALILEO project at LNL
Oct. 2014	LNL-INFN, Legnaro Italy
Sept. 2014	**P2IO Post-doctoral fellow**: Electromagnetic moments in exotic nuclei
Oct. 2012	CSNSM Orsay – CNRS/IN2P3 - Université Paris Sud, Orsay, France

Education and Academic career

Sept. 2012	**Ph.D in Experimental Nuclear Physics**
Oct. 2009	IPHC Strasbourg – Université de Strasbourg, Strasbourg, France
Sept. 2009	**Master's degree in Subatomic and astroparticle physics**
Oct. 2007	Université de Strasbourg, Strasbourg, France
Sept. 2007	**Bachelor's level degree in Physics and applications**
Oct. 2004	Université Louis Pasteur, Strasbourg, France
Sept. 2004	**French scientific high school diploma**
Sept. 2003	Lycée Fustel de Coulanges, Strasbourg, France

Technological activities

Support experiments @ LNL

During all the GALILEO campaign at the LNL (2015-2021), I have been in charge of the data acquisition system and the development of analysis routines. I have coordinated the redaction and the submission of the GALILEO technical reference papers which will be in press in the coming months. I have followed the implementation of the GALILEO phase II from its design, doing the preliminary simulations, to the mounting of the detectors and finally the setting of the electronics and exploitation of the new array.

Since my Ph.D. thesis I have been collaborating to the PRISMA/PISOLO experiments in particular on the setting of the electronics, acquisition system and data analysis. In particular in the upgrade of the PRISMA readout system for the coming AGATA campaigns at LNL starting in 2021.

International team leader of the data acquisition of the NEDA project

The NEutron Detector Array, NEDA, represents the next generation of neutron detector array to be operated together with γ-ray arrays, such as the tracking array AGATA. NEDA has been designed to be a versatile array with high detection efficiency, excellent neutron-γ discrimination and high rate capabilities. Within this international collaboration, I am responsible for the data acquisition system (DAQ). I have thus been working on the data frame definition in the FPGA of the NUMEXO2 digitizers, data quality and integrity and finally the development of the whole data acquisition chain. As the DAQ team leader, I have been invited by the GANIL laboratory for the AGATA-NEDA-DIAMANT campaign.

Development of the CloudVeneto for the GAMMA group

Due to the constantly increasing amount of data collected by trigger-less acquisition system, the use of single PC or even servers for the sorting of the raw data is nor time nor cost effective. The INFN LNL and Padova together with the University of Padova have recently developed a local cloud computing solution: the CloudVeneto. I have been working with the LNL and Padova IT services in order to integrate all the data analysis tools for the AGATA campaigns of 2018 (AGATA-NEDA-DIAMANT) and 2019-2020 (AGATA-MUGAST-VAMOS) on the cloud. The CloudVeneto is now used by the Padova/LNL PhD students for the analysis of their data, strongly reducing the time lost on the installation of software and increasing the interaction and collaboration between the people involved in the analysis. The CloudVeneto is also used for the Monte-Carlo simulations performed for the preparation of new experiment and the interpretation of the data.

Conceptualization of new readout system for the CAEN digitizer

The coupling of AGATA and GALILEO HPGe array with state-of-the-art ancillary detectors to extend the sensitivity of the γ-ray array to the weakest reaction channel is of key importance for the study of nuclei far from the β-stability region. To be coupled with the AGATA or GALILEO arrays, both using similar trigger-less back-end readout and synchronization system, the ancillary readout needs to be integrated in both clock distribution system and readout. A dedicated module synchronization module was developed in order to be able to couple analog readout chain with the AGATA array. However, the inherent rate capabilities of this analog system strongly limits its application. To overcome this limitation, I have been working with S. Brambilla (INFN Milano) and N. Toniolo (INFN LNL) on the integration of the CAEN digitizers in clock distribution system of AGATA. We successfully synchronized CAEN and GALILEO/AGATA electronics and performed test over more than 24h. Our work is used for the physics experiments at SPES, LUNA experiment at Gran Sasso and the PARIS project but also for the NEEDLE array at HIL (Warsaw, Poland).

Responsible for the development of on-line and off-line analysis tools at ALTO (France) and LNL (Italy)

Since my first post-doctoral fellow, I have been in charge of the development of analysis tool for several experimental setups in several laboratories. In particular I have been developing tools for the analysis of γ-ray array data such as ORGAM, MINORCA and GALILEO and also worked at LNL in strong collaboration with the PRISMA group to implement advanced data monitoring tools and improve the offline analysis ones. As the team leader of the Data Analysis group, I organized the first international GALILEO workshop at the Legnaro National Laboratories on the future development for the array and its ancillaries, followed by a data analysis school.

Development of the GEANT4 simulations of GALILEO and its ancillaries

During my post-doctoral fellow at LNL (INFN, Italy), I took the responsibility to implement the numerical simulations of the GALILEO array within the AGATA simulation code. Since then, I have added several ancillaries, such as SPIDER for Coulomb excitation measurement, the $LaBr_3$ array, the plunger device in order to optimize the placement of the additional material within the reaction chamber to minimize the absorption of the low energy γ-rays. The simulations were used during the interpretation of the experimental data. Recently I have been in charge of the general design of the GALILEO phase II in which 10 triple clusters will be added to the existing array. Thanks to my work on the simulations the placement of the detectors have been optimized for the future physics campaigns. Finally I have been working with the mechanical design office of the INFN Padova, in order to improve as much as possible the conception of the anti-Compton shield for the triple cluster.

In charge of the OUPS plunger and GALILEO plunger

During my post-doctoral fellow at CSNSM (2012-2014), I was responsible for the installation and operation of the plunger during the experimental campaigns with the ORGAM and MINORCA detectors during which the plunger was successfully used for static and dynamic electromagnetic moment measurements. I was in charge of the production and development of plunger targets and stopper (Gold, Neodymium, Carbon, Beryllium, Lithium) using evaporation techniques and rolling. I pursued this activity later on, by taking care of the plunger installation and operation during the AGATA@GANIL campaigns. Thanks to the experience gained during my stay at CSNSM, I was in charge of the development of a new plunger device for the GALILEO γ-ray array to be coupled with the light charged particle detector EUCLIDES. The new device has been successfully commissioned at LNL and used since then in several experiments aiming at studying the shape coexistence phenomenon and shell evolution.

Activities of coordination and management

Local Project Manager for the AGATA@LNL campaign

The Advanced GAmma Tracking Array (AGATA) is a European γ-ray spectrometer used for nuclear structure studies. Each AGATA detector is composed of a highly segmented High Purity Germarnium (HPGe) crystal. For each crystal 36 segments and two additional central contact signals are acquired. Since january 2025, I am the local project manager of the AGATA campaign at LNL.

Coordinator of the CSN3 group at LNL

Local responsible of the GAMMA collaboration at LNL

Coordinator of the electronics and DAQ for the AGATA@LNL campaign

In 2021, when AGATA will be installed at LNL, a total of about 2000 high resolution electronic channels will be available. To cope with the high counting rate, a distributed acquisition system (DCOD) will be used for the AGATA array and coupled to the XDAQ acquisition system used for the LNL ancillaries. I am leading the working group in charge of the installation and operation of the electronic and acquisition system for the AGATA@LNL campaign.

Coordinator of the AGATA Ancillary detector team

The AGATA array consists of a number of items including detectors and their support, electronics, data acquisition, data analysis and infrastructure systems that are moving with the array to be installed in different host laboratories. The AGATA collaboration through the AGATA Teams and the AGATA Managing Board (AMB) are responsible for the installation and maintenance of these sub-systems. I am the responsible person for the team in charge of the complementary detectors and their coupling with the AGATA electronic and acquisition system.

Principal investigator of the CaRipaRo starting grant COPHYNT (200 k€, 2017 - 2020)

I have been the principal investigator of the COPHYNT project. The project was centered on the development of a new segmented silicon detector for the study of exotic structure in nuclei. The array was designed and built in collaboration with Dr. S. Capra for the electronic part, and has been used to select the reaction channel of interest and/or study the particle decay of the highly collective states. The array is the first prototype array of the TRACE array as a part of the European highly segmented silicon array project GRIT which will be used at SPES (LNL, Legnaro) with the radioactive ion beams. Coupling of the array with GALILEO was used to study near-threshold resonances in light nuclei and to investigate their γ-decay. Upgrade of the prototype is on-going, for a coupling with the AGATA array in 2025.

Coordinator of the 4^{th} working group of the NUSPIN network (2017 - 2020)

The NUSPIN network is an European network of nuclear physicists working on the nuclear structure. The goal of the working groups is to facilitate the development of new experimental techniques and/or apparatus in order to increase the sensitivity of our measurements and push back the detection limit. The working group I am coordinating is specialized in the development of new devices for the measurement of electromagnetic moments to be used for high precision measurement and/or radioactive ion beams such as the ones that are or will be delivered by the HIE-ISOLDE, SPES, SPRIAL2 and FAIR projects.

Scientific communication

Referee activities

2020- Reviewer for the European Physics Journal (EPJ)

2017- Reviewer for the Journal of Instrumentation (JINST)

Scientific communication

Tutor in charge of the summer stage: ”Alla scoperta del nucleo atomico: L’esperimento di Rutherford” at the Legnaro National Laboratories for the 2018 edition: this stage offers the possibility to the students to participate in the experiments performed during their stay in Legnaro. During this period, students can deepen their experience in science and technology, which is essential for their academic training.

In the last years, I have been proposing and realizing small experimental setups for the laboratory classes proposed at the LNL for the continuing training for physics teachers of the secondary schools in Italy (PID program).

Open lecture on the Application of fundamental nuclear physics to societal applications at the University of Warsaw. (Available on YouTube)

Tutor for the Advance laboratory course of the University of Padova for master students (resp. J. J. Valiente Dobon)

Organization of international workshops

Oct. 2019 GRIT 2019, Florence, Italy

Chair and organizer of the workshop

Oct. 2019 AGATA-NEDA-DIAMANT Analysis Workshop, Florence, Italy

Member of the organizing committee

Sept. 2019 AGATA week

Member of the organizing committee

March 2019 AGATA Workshop on Physics with Stable beams at LNL

Coordinator of the working group on the PRISMA-AGATA setup

Jun. 2018 NUSPIN Annual meeting, Valencia, Spain

Coordinator of the working group on electromagnetic moment measurements

Sept. 2017 GALILEO workshop, Legnaro, Italy
Chair and organizer of the workshop

Jun. 2017 NUSPIN Annual meeting, Darmstadt, Germany
Coordinator of the working group on electromagnetic moment measurements

Jan. 2016 Physics with MUGAST, Padova, Italy
Member of the organizing committee

Student supervision

Supervision of Ph.D students:

Teaching

2020-2020 Pulse shape analysis techniques applied to nuclear physics - University of Warsaw

2016-2020 Physics Laboratory - 4^{th} year of university

2014-2020 Advanced laboratory courses - 4-5^{th} year of university

2016-2019 Physics I - 1^{st} year of university

2011-2012 Tutorials in Electromagnetism - 1^{st} year of university

2009-2012 Tutorials in Classical Mechanics - 1^{st} year of university

2009-2012 Practicals of general Physics - 1^{st} year of university

2009 Tutorials in Electromagnetism - 3^{rd} year of university

Approved proposals

May 2022 LNL (Italy): Spectroscopy of light actinides with AGATA-PRISMA using multinucleon transfer reaction

May 2019 LNL (Italy): A Fast Ionization chamber for the Z-identification for the future transfer reactions studies with the neutron-rich beams of SPES.

Jul. 2018 GANIL (France): Lifetime measurements of the 2_2^+ and 3_1^+ states in ^{20}O populated by direct nucleon transfer

Jul. 2018 LNL (Italy): Lifetime measurements in ^{105}Sn: the puzzle of $B(E2)$ and $B(M1)$ in Sn isotopes

May 2018 LNL (Italy): In-beam commissioning of the new DSSD TRACE detectors using the p+^{7}Li reaction

Mar. 2018 ALTO (France): In-beam commissioning of the new DSSD TRACE detectors using multi-nucleon transfer reaction

Feb. 2015 LNL (Italy): Anomalous proton-neutron multiplet splitting in the $N = 50$ region: investigation of the high spin structure of ^{84}Br using Li induced reaction

Apr. 2013 GANIL (France): Search for collectivity in neutron rich Cl, Ar and K isotopes: lifetime measurements using multi-nucleon transfer reactions

Jan. 2013 ALTO (France): Lifetime measurements using the RDDS method after incomplete fusion

Presented LoIs

Mar. 2019 LNL (Italy): Lifetime measurements of low-lying states in light actinides with AGATA

Oct. 2016 SPES (Italy): Electromagnetic moment measurements with radioactive ion beams

Jun. 2016 LNL (Italy): High precision electromagnetic moment measurements with stable and radioactive nuclei with GALILEO and GALILEO plunger

Apr. 2016 GANIL (France): Oblate driving force in neutron-deficient nuclei above ^{56}Ni: occupation in ^{68}Se

Language skills

French Native speaker

English fluent, both written and spoken

Italian fluent, both written and spoken

Contribution to Conferences, Seminars and Workshops

8 international conferences
4 invited seminars
19 workshops

Conferences

Sept. 2023 Congresso Nazionale SIF 2023, Salerno, Italy
Status and perspectives of LNL physics programs (invited oral contribution)

Oct. 2022 Fifth EuNPC, Santiago de Compostela, Spain
High resolution γ-ray spectroscopy of Exotic nuclei (invited oral contribution)

Sept. 2022 Congresso Nazionale SIF 2022, Milano, Italy
Experiments with AGATA (invited oral contribution)

Sept. 2020 Congresso Nazionale SIF 2020, Online
Exploring the nucleon-nucleon interaction using the tracking gamma-ray array AGATA. (invited oral contribution)

Feb. 2016 III Topical Workshop on Modern Aspects in Nuclear Structure, Bormio, Italy
The GALILEO γ-ray spectrometer at LNL: first experiments (Oral Contribution)

July 2012 Nuclear Structure and Dynamics, Opatija, Croatia
^{12}C+^{16}O: Properties of sub-barrier resonances γ-decay (Oral Contribution)

May 2011 Fusion 11, St-Malo, France
^{12}C+^{16}O sub-barrier radiative capture cross-section measurements (Oral Contribution)

Sept. 2010 Extremes of the nuclear landscape, Zakopane, Poland
Particle-hole intruder states in sd-nuclei: cluster states in ^{28}Si and $1\hbar\omega$ excitations in Ne isotopes (Poster Contribution)

Invited seminars

Apr. 2020 Heavy Ion Laboratory, Warsaw, Poland
γ-ray spectroscopy at LNL: past, present and future

Feb. 2016 Ruder Bošković Institute, Zagreb, Croatia
The GALILEO array at LNL: recent developments and first results

Mar. 2014 IPNO, Orsay, France
Evolution of nuclear structure at high excitation energy in the valley of stability and far from the valley

Feb. 2014 IPHC, Strasbourg, France
Electromagnetic moment measurements in exotic nuclei

Workshops

Jan. 2025 LNL User community meeting, Legnaro, Italy
Status and future perspectives for the AGATA@LNL campaign (Oral contribution)

Nov. 2024 AGATA-GRETINA/GRETA Joint Meeting, Leemont, USA
AGATA@LNL status (Oral contribution)

Sept. 2024 AGATA week, Milano, Italy
Complementary detectors @ LNL (Oral contribution)
DAQ infrastructure @ LNL (Oral contribution)
Trigger issues and solutions for AGATA @ LNL (Oral contribution)

June 2024 SOTANCP 2024, Hvar, Croatia

Exploring the capabilities of the AGATA tracking array for cluster studies at LNL (Oral contribution)

Dec. 2022 Nuclear Physics Mid Term Plan in Italy, Frascati, Italy

New facilities at Laboratori Nazionali di Legnaro (Oral Contribution)

Sept. 2019 20^{th} AGATA week, Legnaro, Italy

Complementary detector: The NEDA array (Oral Contribution)

The distributed acquisition system used at LNL: XDAQ (Oral Contribution)

Mar. 2019 AGATA@LNL Physics with stable beam meeting

Lifetime measurements of low lying-states in light actinides Exotic nuclei for EDM search: lifetime measurements in octupole deformed Ra and Th nuclei by multinucleon transfer (Oral contribution)

Mar. 2019 Joint LIA COLL-AGAIN COPIGAL POLITA Workshop, Warsaw, Poland

The GALILEO γ-ray array at LNL: past, present and future perspectives (Oral Contribution)

Jan. 2019 AGATA Analysis Workshop, Orsay, France

Analysis of the NEDA and DIAMANT data (Oral Contribution)

Oct. 2018 NEDA week, Istanbul, Turkey

The NEDA Acquisition System (Oral Contribution)

Future development for the NEDA Acquisition System (Oral Contribution)

Sept. 2018 19^{th} AGATA week, Strasbourg, France

Complementary Detectors: NEDA and DIAMANT (Oral Contribution)

Apr. 2016 Joint LIA COLL-AGAIN COPIGAL POLITA Workshop, Catania, Italy

Recent developments on electromagnetic moment measurements using plunger techniques at ALTO and LNL (Oral Contribution)

May 2015 Nuclear Structure at N = Z and at the proton drip line with the AGATA and GALILEO arrays

GALILEO: γ-ray array at LNL (Oral Contribution)

Oct. 2014 Workshop Miniball, IPNO, France

Time dependent recoil in vacuum for Na-like ^{56}Fe ions (Oral Contribution)

Feb. 2014 AGATA@GANIL Pre-PAC Workshop, GANIL, Caen, France

The Orsay Plunger System for AGATA campaign at GANIL (Oral Contribution)

Jan. 2014 14^{th} Agata Week, Madrid, Spain

The Orsay Universal Plunger System (Oral Contribution)

Oct. 2013 Workshop Miniball, CERN, Geneve, Switzerland

Recoil Distance Doppler Shift measurements using the OUPS Plunger (Oral Contribution)

Jun. 2012 AGATA France meeting, Orsay, France

Status of the lifetime measurements in $N = 20$ isotones of Si, P and S (Oral Contribution)

Sep. 2011 AGATA France meeting, Orsay, France

Lifetime measurements in $N = 20$ isotones of Si, P and S (Oral Contribution)

Research activities

My activities are placed in the general context of experimental nuclear physics. Since 2009, I have been involved in many experimental campaigns in several international facilities: TRIUMF (Canada), Jyvaskyla (Finland), ALTO and GANIL (France) and the LNL (Italy). I thus had the opportunity to work on different aspects of experimental nuclear physics from detector design and construction, electronics and data acquisition and finally data analysis software development. This experience has allowed me to take responsibilities in several international collaborations developing acquisition systems for large arrays such as NEDA, PARIS, LUNA or overseeing the one of AGATA for the LNL experimental campaigns starting in 2022. Since the beginning of the GALILEO project at LNL, I have been in charge of the data analysis tools development, data management and of the configuration of the data acquisition system.
Since my Ph.D. thesis in 2012, I have been supervising students from bachelor up to the Ph.D. I am participating to the

PID program at the LNL. Since 2017, I am offering my technical expertise to the activities of scientific communication to the young Ph.D. students to help them propose new experiments for the events such as the "Notte dei ricercatori".

I have addressed the nuclear structure through various probes, through the γ-spectroscopy of nuclei in the vicinity and far from the valley of stability as well as through the influence of the structure on reaction mechanisms. These research activities, conducted in various European and North American laboratories, made me familiar with several experimental devices and associated experimental techniques and work in close collaboration with theorists from both structure and reaction.
In the recent years, my activities have been focused on one observable: the electromagnetic moments which allow to test directly the theoretical wave functions. Indeed electromagnetic moments, both static (magnetic dipole moments and electric quadrupole) and dynamic (lifetime), constitute an observable of first importance to experimentally characterize the nuclear deformation and to quantify its evolution with respect to the number of nucleons or with respect to the excitation energy.

Interplay between nuclear reactions and nuclear structure

In parallel with the research themes related to my thesis work and to my post-doctoral positions, I had the opportunity to work more specifically on reaction mechanisms. Multi-nucleon transfer and deep inelastic reactions are proved to be useful tools to populate neutron-rich exotic nuclei to perform spectroscopic studies. I was involved in the study of the Ar isotopes with $N > 20$ and the measurement of spectroscopic factors using the CLARA-PRISMA set-up. In particular, I worked with the Strasbourg shell-model theorists on the calculation and comparison spectroscopic factors calculated using the SDPF interaction to our experimental results. This work is presented in Ref. [66, 62].
In multi-nucleon transfer reactions, transfer probabilities seem to exhibit an enhancement for even number of neutrons compared to theoretical calculations. I have been involved in several PRISMA experiments to test whether this enhancement indicates the presence of correlation effects or the lack of theoretical ingredients in the calculations. I focused on the ^{116}Sn+^{60}Ni reaction in both direct and inverse kinematic [57]. I worked on the analysis of data from the demonstrator of the γ-ray array AGATA to determine the direct population of excited states for different quasi-elastic channels, + 1n and +2n using the intensity of the different transitions. The obtained results demonstrate that excited states in the pair transfer contribute for less than 25 % of the +2n cross-sections.
I am also involved in fusion cross sections measurements at energies near and below the Coulomb barrier. By comparing the behaviour of different systems, we have demonstrated the influence of both positive Q-value transfer channels and nuclear deformation in the description of effective low-energy reaction cross sections [65, 63, 59, 56]. More recently, I got involved in the development of on- and off-line analysis tools for the experiments conducted with the PISOLO electrostatic deflector at LNL. These tools were used for the analysis of our latest campaigns. They were in particular used for the analysis of the experiment in which we observed for the first time a broad maximum in the ^{24}Mg+^{30}Si S-factor used to predict the evolution of reaction cross sections down to astrophysical energies. This observation implicates that the cross section of this reaction decreases faster than expected at low energy [58]. This could be extended to other systems with positive Q-value involved in the carbon combustion cycle of massive stars.
During my Ph.D thesis, I investigated the structure of the high excitation energy states in ^{28}Si. ^{28}Si displays a rich variety of structures: several shapes with different deformations at low energy as well as the appearance of collective states, cluster states, when increasing the excitation energy. To explore such large deformations, we used the radiative capture process between heavy ions. The populated resonances correspond to $n\hbar\omega$ excitations which decay through γ-ray emissions to low-lying states. Gamma spectroscopy is therefore essential to understand the transition between the cluster structure and mean-field structure in the nuclear system. Using the high-efficiency BGO array associated to the 0° DRAGON spectrometer (TRIUMF, Vancouver) full γ-spectra of the explored resonances were observed [64, 61]. For this experiment, I was in charge of the data analysis and their comparisons with Monte-Carlo simulations of the complete detection setup taking into account the γ-ray angular distribution in order to better reproduce the recoil acceptance. I was thus able to extract the radiative fusion cross sections at the two explored sub-barrier energies, and also to shed light on a new strong γ-decay branch to low spin, $T = 1$ states in the 11 MeV excitation energy region [64].

Nuclear structure through γ-spectroscopy

The structure of odd-odd nuclei situated next to a major shell closure is in principle characterized by relatively simple and clean proton-neutron configurations. The identification of the members of the multiplets arising from the coupling of unpaired neutron and proton can give indication on the effective two-body forces in the vicinity of magic number for particular values of orbital angular momenta and spin orientations of the two interacting nucleons. In particular in the vicinity of the $N = 50$ shell closure, this constitutes a valuable piece of information as experimental inputs to the effective interaction and associated monopole drifts in the ^{78}Ni natural valence are scarce.
During my first post-doctoral fellow, I got familiar with the use of low-energy radioactive beams at the ALTO installation

and got involved in several experiments with the β-decay station BEDO. I worked in particular with a Ph.D student of CSNSM (Asénath Etilé) on the de-excitation of odd-odd nucleus ^{82}As ($N = 49$). During this experiment we were able to extend the level scheme of ^{82}As and demonstrate the presence at low energy of a large number of low spin and negative parity states and of only three potential 1^+ states. Those results show the importance of orbital beyond $N = 50$ to explain the low energy structure of this nucleus and published in Ref. [53].
Following this result at ALTO, I proposed to use the recently built and commissioned γ-ray array GALILEO at LNL to re-investigate the structure of the odd-odd nuclei in the vicinity of $N = 50$ above ^{82}As, namely in ^{84}Br and ^{86}Rb. Using Li-induced reaction, I am willing to study the medium-spin structures in those nuclei in order to identify the states resulting from different proton-neutron coupling based on experimental facts. This data will be complementary to the β-decay data, as the energy splitting of the multiplets is one of the input used in the core-coupling approaches [53].
Thanks to the experience gained working on the BEDO decay station, I am part of the group designing the future β-decay station. My contribution is on the simulation of the future system and the optimization of the 4π-β detectors and the β-veto detector in front of the HPGe detectors. I have thus been leading the simulations design, together with the β-decay responsible Dr. G. Benzoni, to propose several different designs using the GALILEO single detectors or the GALILEO triple cluster in order to increase the detection efficiency.

Electromagnetic moment measurements in exotic nuclei

During my Ph.D thesis, I worked with a new full $1\hbar\omega$ interaction for the *sd*-nuclei which allowed to calculate positive and negative parity states with an overall good agreement for all *sd*-nuclei. Using this interaction I was able to predict lifetimes for positive and negative states for *sd*-nuclei in the vicinity of $N = 20$ especially in S, P and Si isotopes. Those predicted lifetimes fall in the range of differential Doppler shifted method. Using the AGATA demonstrator, a high resolution segmented HPGe detector array, coupled to the large acceptance magnetic spectrometer PRISMA we measured low-lying state lifetimes of neutron-rich isotopes of S, P and Si. Moreover, these isotopes and in particular the Si isotopes are at the boundaries of the so-called island of inversion where higher order excitations appear in low-lying states wave functions. Indeed recent shell-model calculations have shown that $2\hbar\omega$ excitations represent more than half of the wave functions of the first states in the ^{34}Si. For the data analysis, I was in charge of the fragment identification and their trajectories reconstruction for all masses for the Strasbourg-Paisley collaboration. Moreover I was able to obtain the lifetime of the first excited state in ^{32,33}Si and ^{35,36}S. Comparing the results obtained in the ^{33}Si with theoretical calculations, a major discrepancy in energy for the first excited state has been observed. This shift proved to be caused by a problem in the interaction, similar to what was found by F. Nowacki in the ^{38}K. The results obtained during my thesis on the PRISMA spectrometer data were reused in collaboration to extract other lifetimes in different reaction channels. A general publication on the different lifetimes obtained in this experiment is currently under discussion in our collaboration.
During my first post-doctoral fellowship, I worked with a new plunger device, developed at CSNSM. Using the beam delivered by the ALTO tandem (Orsay, France) and the ORGAM array, composed of ten Compton suppressed Ge-detectors, I was able to extract for the first time the lifetimes of the two first excited states of the neutron deficient ^{170}Os. The obtained lifetime for the 2_1^+ in ^{170}Os follows nicely the systematics and is in agreement with the hypothesis of a shape transition from well deformed prolate shape at the neutron mid-shell ($N = 104$) to near spherical shape at the neutron shell closure ($N = 82$). However, the low statistics obtained in this experiment is not sufficient to give a definitive answer to the question of the shape coexistence in ^{170}Os [24].
Going back to lighter nuclei, I recently worked on the high precision determination of the transition probabilities in the vicinity of ^{100}Sn. This new lifetime measurements of the first 2^+ state of ^{106,108}Sn should help us to better understand the evolution of the $Z = 50$ shell closure in the vicinity of $N = 50$. For this experiment, after optimizing the setup, in particular of the plunger device and the beam energy tuning for the fragment identification in the VAMOS spectrometer (GANIL, France), I was co-tutor of Marco Siciliano who is in charge of the data analysis at LNL [78]. The results we obtained in this experiment, strongly suggest that the traditional seniority scheme used in the past to describe this region does not hold when going closer to $N = 50$. By comparing our results with state-of-the-art theoretical models, shell-model and beyond mean field, we demonstrated the importance of proton excitation across the $Z = 50$ shell-gap to reproduce the spectroscopic properties of the excited states of ^{108}Sn.
The Time Dependent Recoil In Vacuum technique (TDRIV) has been used in the 70's for g-factor measurements in the *sd*-nuclei, with a plunger device equipped with a stopper foil. The hyperfine interaction couples the nuclear and electronic spins and causes a precession of their nuclear moments about the total (atomic+nuclear) spin of the free ion. This precession has a frequency that is proportional to the magnitude of the nuclear g-factor. However, in the case of Radioactive Ion Beams, the ions cannot be stopped inside the zone viewed by the γ-detectors, thus the stopper foil of the plunger has to be replaced by a thin foil that resets the electron configuration. I was strongly involved in the proof of principle experiment of this technique, in particular in the supervision of the Ph.D student in charge of the analysis (Aslı Kuşoğlu). Using recoil-γ coincidence, we were able to measure the recoil-γ angular correlation and hence the g-factor of

^{24}Mg with a precision of $\sim 3\%$. This measurement allowed us to confirm experimentally for the first time the departure from 0.5 of the g-factor in a self-conjugate *sd*-nucleus. This result was published in Ref. [55].
As this first measurement was successful, a new experiment was performed to probe the feasibility of this technique not only with H-like ions but also with Na-like, which will give us access to a new region of nuclei. This experiment was performed during the MINORCA (MINIBALL array at Orsay) campaign . This new technique was also used during the physics campaign of the new generation γ-ray array AGATA at GANIL in 2015 with the OUPS plunger. More recently I proposed the development within the GAMMA group and an international collaboration of a new segmented plastic detector compatible with the GALILEO plunger and reaction chamber to use this technique with the stable beams of the Tandem-PIAVE-ALPI accelerator complex and the post-accelerated radioactive ion beams that will be available in the coming years with the SPES facility. I thus presented two letters of intent in this sense: one to the LNL advisory committee for high precision g-factor measurement, and the second one to the SPES workshop.

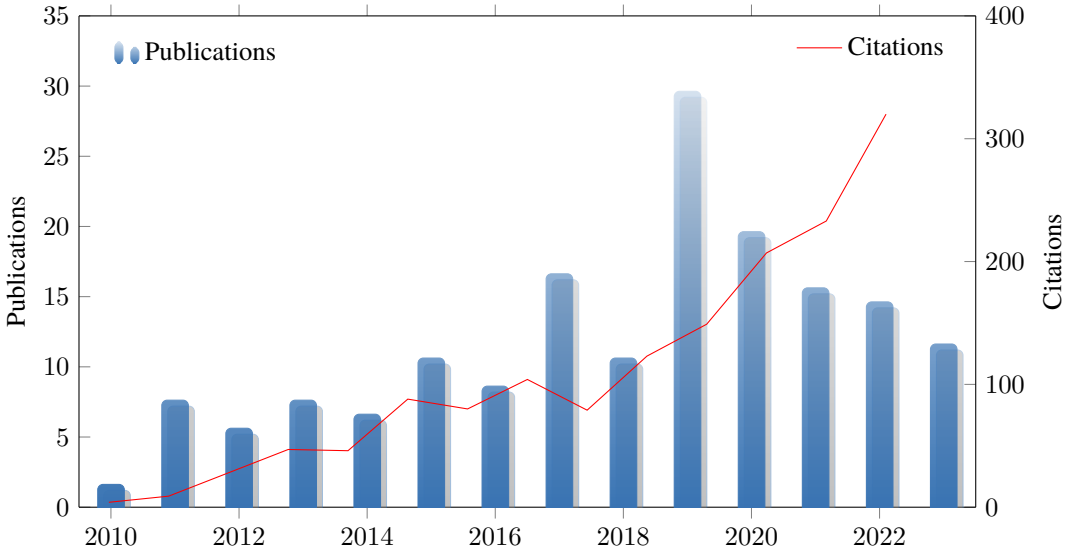
New experimental developments

I proposed to probe the feasibility of lifetime measurements after incomplete fusion reactions, where the break-up of the weakly-bound nucleus occurs before the fusion of one of the break-up component with the target or projectile. This kind of reaction was extensively used in direct kinematic for γ-spectroscopy studies to populate moderately neutron-rich nuclei at high spin. However, for lifetime measurement using the RDDS method, the inverse kinematics is more suitable as Doppler broadening of the peaks due to recoil emission cone will be reduced. However in order to use inverse kinematic, I needed to develop new Li target suitable for the plunger, i.e. with a suitable in-beam behavior and stretchable. After several tests with different backings and Li compounds I concluded that the best choice was to use a thin Ni foil and to evaporate $LiSO_4$. The in-beam test at ALTO was successful, unfortunately within the allocated beam-time only one plunger distance was achievable.
As post-doctoral fellow at LNL, I have been working on the development of a new plunger device. After considering several options in order to fit into the existing mechanics and ancillaries, a compact design has been selected. In this configuration the motor is directly placed below the target and the stopper foils. Thus a good transparency can be achieved for all GALILEO HPGe detectors, except for one detector located at 90 degrees with respect to the beam axis, which is in any case not usable for RDDS measurements. The new device was successfully commissioned mid-February 2016 [32]. The results of this commissioning experiment have been analyzed by one of my students (D. Brugnara) and demonstrated the reliability of the plunger device. Since then this new plunger device was used in several experiment to explore the shape coexistence phenomenon in the neutron deficient region around $Z \sim 82$ (master thesis of I. Zanon) and the shell-evolution around $Z \sim 50$, which is part of my main research activities.
I am also in charge of the development of the Monte-Carlo simulations for the GALILEO array under GEANT4. Thanks to the use of the AGATA Simulation Code, I was able to develop a new γ-ray array geometry corresponding to the actual phase of the GALILEO project. I also included some of the GALILEO ancillaries (Plunger, TRACE, SPIDER, $LaBr_3$) in the simulation packages. This work was used in collaboration with Dr. M.Rocchini (INFN Firenze) for the analysis of a Coulomb excitation measurement performed with GALILEO and SPIDER. Thanks to the good reproduction of the detector response functions, I succeeded to reproduce the experimental spectra within a few keV deviation and shed light on the deviation between the expected transition probabilities and the experimental ones [79]. I am currently using the developed simulation tool to optimize the design of the anti-Compton shield of GALILEO triple cluster and the placement of the triple cluster in the array. I have been working in close collaboration with the mechanical and designers offices of Padova in order to define the positioning of the γ-ray detectors but also to increase the flexibility of the full setup to facilitate the placement of future ancillary devices such as TRACE, in the reaction chamber.
I am currently working on the design of a new multi-detector using the TRACE prototypes in order to be able to propose experiments in 2019 with stable beams to study cluster states in light *sd*-shell nuclei and other nuclear structure studies (spectroscopy, electromagnetic moment measurements, ...) using transfer reactions. In parallel to this phase foreseen in the project task for the first year of the CaRipaRo project, the implementation of the TRACE detectors in the existing GALILEO electronics chain is under evaluation. Three different electronics are currently under investigation: a commercial one (CAEN V1730) and two "home-made" digitizers (GALILEO @ 100 MS/s and NUMEXO2 @ 200 MS/s). I proposed to test the performances in terms of counting rates, stability and data integrity of the CAEN V1730 during an in-beam experiment at LNL with the EUCLIDES Si-array. The results have been analyzed by one of my student (G. Sighinolfi) and his preliminary analysis has been published in the annual report.
In order to get more familiar with the NUMEXO2 electronic, I dedicated a large fraction of my research activities to research and development, in particular for the NEutron Detector Array (NEDA) in the last three years [35]. As the responsible person for the data acquisition group, I have been working together with the electronic team to develop and improve the readout of the NUMEXO2 board through PCIe link, in the implementation of the pulse shape analysis in the online data processing and finally to the coupling of the NEDA data acquisition system with the AGATA one [26].

The first in-beam commissioning experiments performed at the end of 2017, demonstrated the overall stability of the newly developed system. I have been invited at GANIL for the whole duration of the AGATA-NEDA campaign as the responsible for the NEDA apparatus. After the campaign with AGATA, NEDA has been transported and installed at the Heavy Ion Laboratory of the University of Warsaw and combined to the EAGLE spectrometer. For this campaign, we adapted the developments made at LNL on the CAEN digitizers and installed them for both the NEDA detectors and the HPGe ones.

Publications

Summary



Peer reviewed articles: 95
Conference proceedings: 54
h-index: 23 (Web of Science Core Collection)

A Padova il 26/01/2025

Alain Goasduff

Curriculum vitae di Angela Badalà

Angela Badalà è una Prima Ricercatrice della Sezione di Catania dell'Istituto Nazionale di Fisica Nucleare ed è una dipendente dell'INFN dal 1991. Dal 2019 coordina le attività della Sezione di Catania presso la Commissione Nazionale III dell'INFN e da Febbraio del 2020 ha il ruolo di osservatore per la CSN3 presso la Commissione Nazionale I. A. B. ha sempre lavorato nel campo della fisica nucleare e ha partecipato alla progettazione, realizzazione e analisi di diversi esperimenti condotti in vari laboratori europei (GANIL, CERN, IPN-Orsay, Moskow Meson Factory-Troisk (Mosca), The Svedberg Laboratory Uppsala (Svezia)) dando il suo originale contributo sia nella costruzione di rivelatori dedicati che nello sviluppo di nuove tecniche di analisi dati, ricoprendo incarichi di responsabilità sia a livello nazionale che internazionale. Attualmente é coordinatrice della Sezione di Catania presso la Commissione Nazionale III ed é Team Leader del gruppo INFN di Catania della collaborazione ALICE presso il LHC del CERN e responsabile locale dell'esperimento ALICE presso la Sezione di Catania. Da Ottobre 2019 a Giugno 2024 è stata la presidente del Comitato Unico di Garanzia dell'INFN.
Una breve sintesi della attività di ricerca di A. B. è la seguente:

A) Collisioni fra ioni pesanti alle energie ultrarelativistiche: Ricerca e studio del Quark-Gluon-Plasma e della materia fortemente interagente (1996-oggi)

   1) Esperimento ALICE presso LHC (CERN) - Studio della materia fortemente interagente a estreme densità di energia (1997-oggi)
      - Fisica delle risonanze adroniche (2006-oggi)
      - Progettazione, realizzazione e messa in opera del secondo Inner Tracking System (ITS2) (2011-2023)
      - Progettazione e realizzazione del Silicon Pixel Detector (SPD) dell'Inner Tracking System (ITS) (1997-2008)
      - Progettazione e realizzazione del Calorimetro Elettromagnetico (EMCal) (2005-2011)
      - Tracciamento e studi di simulazione (1997-2005)
   2) Esperimento NA57 presso SPS (CERN) - Studio di produzione di barioni strani e multistrani in collisioni Pb-Pb (1996-2005)

B) Produzione di pioni e kaoni in collisioni p-nucleo. Esperimenti nei laboratori IPN-Orsay, MMF-Troisk, The Svedeberg Laboratory-Uppsala(1987-2000):

- Produzione di kaoni sottosoglia N-N in reazioni p-nucleo (1995-2000)
- Produzione di pioni carichi in collisioni p-nucleo sottosoglia e sopra soglia N-N (1987, 1993-1997)
- Progetto, realizzazione e messa in opera dello spettrometro magnetico per pioni/kaoni CLAMSUD (1987-1992)

C) Collisioni fra ioni pesanti alle energie intermedie. Esperimenti nei laboratori GANIL, CERN con fasci di ioni di E<100 MeV/nucleone su diverse targhette (1984-1997):

- Produzione sottosoglia di pioni neutri e produzione di gamma di alta energia (E>30 MeV)
- Produzione sottosoglia nucleone-nucleone (N-N) di pioni carichi

Ruoli di responsabilità e incarichi all'interno dell'INFN

- Coordinatrice della Sezione di Catania presso la Commissione Nazione III dell'INFN (26-03-19 - oggi)
- Responsabile per la Sezione di Catania dell'esperimento ALICE (01-01-2025 - oggi))
- Osservatrice per la CSN3 presso la Commissione Nazionale I del INFN (13-02-2020 -oggi)
- Presidente del Comitato Unico di Garanzia dell'INFN (01-10-19 - Giugno 2024)
- Vicepresidente Comitato Garante del Codice Etico (22-01-2020 - Giugno 2024)
- Componente del Comitato Unico di Garanzia dell'INFN (09-2015-Giugno 2024)
- Responsabile per la Sezione di Catania dell'esperimento ALICE (2001-2011)
- Responsabile per la Sezione di Catania dell'esperimento NA57 (2004)
- Rappresentante dei Ricercatori della Sezione di Catania (2004-2010)

Incarichi di responsabilità e coordinamento scientifico in collaborazioni, gruppi, strutture o progetti di ricerca

- Team Leader per Università e INFN Catania team per la collaborazione ALICE (04-2018-oggi)
  - Componente supplente del Collaboration Board di ALICE (2006-2018)
  - Componente del Collaboration Board di ALICE (Aprile 2018 a oggi)
- Componente dell'ITS Board (2018 - oggi)
- Responsabile dell'analisi delle risonanze adroniche (Resonance PAG) per l'Esperimento ALICE (2006-2013)
- Responsabile dei test e dell'assemblaggio dei fotosensori del Electro-Magnetic Calorimeter (EMCal) di ALICE (2005-2009)
- Responsabile della simulazione dello spettrometro magnetico CLAM-SUD (1987-2000)
- Responsabile della calibrazione e della 'riduzione dati': costruzione di n-uple contenente i dati 'fisici' a partire dai dati raw del multirivelatore MEDEA+Odoscopio di scintillatori plastici usato nella campagna di misura 90-91 (1991-1993).

Progetti di ricerca internazionali e nazionali

- PI2S2 - Progetto per l'implementazione e lo sviluppo di una e-infrastruttura in Sicilia basata sul paradigma della grid (PON 2000-2006-Misura II.2) - Collaboratore Scientifico.
- Joint research activity - WP27- JetCal- electromanetic Calorimeter for Jet quenching study- in Hadron Physics 2- VII programma quadro - Local Activity Leader (30 mesi).
- Joint research activity - WP27- Di-JetCal- A Di-Jet electromagnetic calorimeter for jet quenching study- in Hadron Physics 3- VII programma quadro - Local Activity Leader (36 mesi)
- Progetto STRONG 2020 (1-06-2019 a 31-05-2024) WP25-JRA7 Light and heavy quark spectroscopy (HaSP) -Local activity leader

Attività come referee e editor

- **Referee** per CSN3 dell'esperimento ASACUSA (2019 - 2021)
- **Referee** per CSN3 dell'esperimento LEA (2021- oggi)
- **Referee** di proposal di ricerca per il National Science Centre (NCN), Polonia
- **Referee** per le seguenti riviste: Journal of Physics G: Nuclear and Particle Physics, EPJ-Web of Conferences, Nuovo Cimento e Canadian Journal of Physics
- **Editor** dei seguenti volumi:
  - -Nuovo Cimento della Società Italiana di Fisica C34(2011) Editors: A. Badalà, P. La Rocca, C. Petta, A. Pulvirenti
  - -The European Physical Journal - Web of Conferences, 36(2012) Editors: A. Badalà, M. Bleicher, L. Fabbietti, C. Markert, RF. Rapp, J. Stroth
  - -The European Physical Journal - Web of Conferences, 97(2015) Editors: J. Aichelin, A. Badalà, M. Bleicher, L. Fabbietti, V. Greco, C. Markert, H. Van Hees.
- Per la collaborazione ALICE, Chair e/o componente di Internal Review Committee e Paper Committee

Attività didattica

- Co-relatrice di tesi di laurea (vecchio ordinamento e magistrale) e Supervisor esterno di tesi di dottorato.
- Lezioni per il dottorato di ricerca in Fisica presso l'Università di Catania, VII ciclo 1992, XIII ciclo 1998, XVIIII ciclo 2003.
- Professore a contratto per l'Università degli studi di Catania per modulo "Interazione della radiazione con la materia" (30 ore) per intervento formativo "Formazione tecnica e scientifica di ricercatori e operatori esperti nell'utilizzo di tecnologie innovative basate sull'impiego di raggi cosmici per il rivelamento di materiali nascosti a rischio radiattivo".
- Seminario su "ALICE experiment at the Large Hadron Collider - How to recreate in laboratory the Big Bang primordial matter" nell'ambito del training course for AL-FARABI Kazakh National University students (LNS 26 June - 4 July 2017).

- Seminario su "The ALICE experiment at the Large Hadron Collider and the study of the Quark Gluon Plasma" nell'ambito del training course for AL-FARABI Kazakh National University students (LNS 1-12 April 2019).
- Docente del modulo "Parità e Pari Opportunità sul lavoro" nell'ambito di corsi di formazione organizzati dal dal Centro Siciliano di Fisica Nucleare e Struttura della Materia nell'ambito del progetto "Esperti nel trattamento e monitoraggio dei dati"(2022)

Si é presa carico della **Organizzazione di workshop e conferenze nazionali e internazionali** in particolare:

1. Primo Convegno Nazionale sulla Fisica di ALICE (Catania, Gennaio 2005)
2. First workshop on Soft Physics in Heavy Ion Collisions (SPHIC06) (Catania, 27-29 Settembre 2006)
3. Workshop on the Interplay between Soft and Hard interactions in particle production (WISH2010) (Catania, 8-10 Settembre 2010)
4. Resonance workshop at Catania (Catania, 3-7 Novembre 2014)
5. The 27th International Conference on Ultrarelativistic Heavy Ion Collisions (QM2018) (Venezia, 13-19 Maggio 2018)
6. XVI Workshop on Particle Correlations and Femtoscopy & IV Resonance Workshop (Catania, 6-10 Novembre 2023)

É stata componente e coordinatrice di vari **Scientific Committee** di workshop/conferenze, in particolare:

1. International Workshop on the Interplay between Soft and Hard interactions in particle production (WISH2010) (Catania, Italy 8-10 Settembre 2010). (chair)
2. Resonance workshop at UT Austin (Austin, Texas 5-7 Marzo 2012) (chair)
3. Resonance workshop at Catania (Catania, Italy 3-7 Novembre 2014) (chair)
4. Third Resonance workshop in Bergamo (Bergamo, Italy 10-13 Ottobre 2017) (chair)

5. International workshop “Nuclear Reactions on Nucleons and Nuclei” (Messina, Italy 25-26 October 2017)

6. NSTAR2022 - 13th International Workshop on the Physics of Excited Nucleons (Santa Margherita Ligure (Italy), 17-21 Ottobre 2022) (convener)

7. HADRON2023 - 20th International Conference on Hadron Spectroscopy and Structure (Genova, 5-9 Giugno 2023) (convener)

8. XVI Workshop on Particle Correlations and Femtoscopy & IV Resonance Workshop (Catania, 6-10 Novembre 2023) (chair)

Relazioni a conferenze e workshop internazionali e attivitá divulgativa

A. Badalà ha partecipato a un centinaio di Conferenze, Workshop Internazionali e Nazionali, presentando relazioni dei suoi lavori in 50 di esse ed é stata chairperson in varie conferenze.

Ha inoltre effettuato delle presentazioni/seminari divulgativi durante “Celebrazioni per il cinquantesimo anniversario della fondazione del CERN” (2004); cerimonia inaugurazione a Catania (Castello Ursino) della mostra itinerante “Donne alla guida della più grande macchina mai costruita dall’uomo” ovvero “La complessità di LHC in mano alle donne” (2010); ”Metro di Scienza” Notte Europea dei Ricercatori programma SHARPER Catania (2018); Speaker corner aa Notte Europea dei Ricercatori programma SHARPER Catania (2019).

Ha organizzato attivitá divulgative nell’ambito della mostra “Donne alla guida della più grande macchina mai costruita dall’uomo” (2010) e nell’ambito delle iniziative per “”XX Settimana della Cultura Scientifica e Tecnologica”” (2010)

Ha organizzato corsi di formazione su temi quali paritá e pari opportunitá, prevenzione molestie e violenze per dipendenti INFN.

Pubblicazioni

- Pubblicati 634 paper h-index = 118 Fonte INSPIRE

Curriculum vitae et studiorum di Maria Cristina Morone

GENERALITA'

NOME E COGNOME: Maria Cristina Morone
POSIZIONE LAVORATIVA ATTUALE: Professore Associato confermato nel settore scientifico disciplinare FIS/07 presso Università di Roma Tor Vergata dal 27/10/2017.

CONTATTI:

TITOLI

- 1996: Laurea in Fisica presso l'Università di Napoli ``Federico II".

- 1997: Diploma di Master di secondo livello rilasciato dalla Regione Campania di "Esperto in sicurezza sul lavoro e gestione ecocompatibile delle PMI".

-2003: "Docteur ès sciences, mention physique", presso l'Università di Ginevra, Svizzera, equiparato al titolo di dottorato italiano con delibera del MIUR.

-2006: Qualifica professionale di ``Esperto qualificato in radioprotezione di terzo grado" attribuita dal Ministero del Lavoro italiano.

POSIZIONI RICOPERTE PRESSO ISTITUZIONI ESTERE

- 1999-2003: Posizione di ``Assistante - Doctorante'' presso l'Universita` di Ginevra (Svizzera), per attività di ricerca e didattica.

-2002: Vincitrice della selezione per un ``Research Fellowship'' (non usufruito) presso l'European Space Agency di Estec (Olanda).

-2013-2014: Contratto di ``Project Associate'' presso la divisione EN/STI del CERN per attività connesse allo sviluppo del codice monte carlo FLUKA.

POSIZIONI RICOPERTE PRESSO ISTITUZIONI ITALIANE

- 2002-2004 "Co-Co-Co" presso "Museo storico della fisica e Centro Studi e Ricerche Enrico Fermi" per la redazione di contenuti didattici per il sito web.

-2003-2006: Consulente a tempo pieno per attività connesse alla fisica medica presso il Policlinico Universitario di Tor Vergata.

-2003-2005: Professore a contratto dell'Universita` di Roma Tor Vergata.

-2006-2016: Incarico di strutturazione presso il Policlinico Universitario di Roma Tor Vergata per attività connesse alla radioprotezione e dosimetria.

-2006-2017: Ricercatore a tempo indeterminato nel settore scientifico-disciplinare FIS07 presso l'Università di Roma Tor Vergata.

-2017- Presente: Professore Associato confermato nel settore scientifico-disciplinare FIS07 presso il Dipartimento di Fisica dell'Università di Roma Tor Vergata.

RESPONSABILITA' IN PROGETTI DI RICERCA

-2004-2009: Coordinatrice delle attivita` di ricerca oggetto della convenzione tra INFN, Policlinico e Universita` di Tor Vergata per lo sviluppo di attività interdisciplinari di interesse comune.

-2003-2005: Referente del progetto di protonterapia del Policlinico Tor Vergata e autri-

ce dello studio di fattibilità del centro.

-2006-2008	Responsabile per la sezione INFN di Roma Tor Vergata dell'esperimento MOBIDIC
-2008-2011	Coordinatrice per la sezione INFN di Roma Tor Vergata dell'esperimento TPS
-2012-2015	Coordinatrice per la sezione INFN di Roma Tor Vergata dell'esperimento RHD_FIRST
-2009-2022	Coordinatrice per la sezione INFN di Roma Tor Vergata degli esperimenti FLUKA2 e MC-INFN .
-2016-presente	Coordinatrice per la sezione INFN di Roma Tor Vergata dell'esperimento FOOT.
-2016-presente	Membro IB esperimento FOOT
-2025	Coordinatrice per la sezione INFN di Roma Tor Vergata dell'esperimento ERNA.

PARTECIPAZIONE A COMITATI SCIENTIFICI NAZIONALI

-2020-presente	Eletta coordinatrice del gruppo 3 (Fisica nucleare) della sezione INFN di Roma Tor Vergata
-2020-presente	Membro della Commissione Scientifica Nazionale 3 dell'INFN
-202 1- 2023	Presidente della commissione biennale Assegni di ricerca della sezione INFN di Roma Tor Vergata
-2023-presente	Membro commissione Borse della Commissione Scientifica Nazionale 3
- 2021-presente	Referee dell' esperimento n-ToF che effettua misure di fisica nucleare di base, astrofisica nucleare, di interesse medico.
-2023-presente	Referee dell' esperimento SPES-MED che misura sezioni d'urto nucleari rilevanti per la produzione di radioisotopi per uso medico
-2023-presente	Coordinatrice della linea 4 (Nuclear Astrophysics and Interdisciplinary Research) della Commissione Scientifica Nazionale 3 dell' INFN
-2023-presente	Membro del comitato scientifico dei Colloqui di Fisica per la sezione INFN di Roma Tor Vergata
2024-presente	Referente Commissione 3missione del Dipartimento di Fisica di Roma Tor Vergata

PARTECIPAZIONE A COMITATI SCIENTIFICI INTERNAZIONALI

-2006-2010: Responsabile italiano del progetto di ricerca internazionale coordinato dalla International Atomic Energy Agency (IAEA) “Heavy charged particle data for radiotherapy" (https://wwwnds.iaea.org/charpar/public.html) con obiettivo l'identificazione di dati nucleari che quantifichino le interazioni degli adroni con la materia biologica rilevanti ai fini dell’adroterapia, a partire dalla generazione dei fasci e alla loro conformazione al target, fino all'interazione con il paziente ed i rivelatori. Questa commissione ha prodotto tre reports (IAEA INDC(NDS) 0504, 0523, 0560).

-2020-presente Membro dell’ Institution Board della collaborazione internazionale FOOT

PARTECIPAZIONE A ENTI E ISTITUTI DI RICERCA

-1998-2003: ``Unpaid scientific associate" presso la divisione EP del CERN.

-2004-2009: Associazione scientifica all'INFN.

-2009-2017: Incarico di ricerca tecnologica INFN.

-2014-presente: “User’’ presso la divisione EN/STI del CERN.

-2018-presente Incarico di Ricerca Scientifica INFN.

ATTIVITÀ DIDATTICHE

Presso l'Università di Ginevra, didattica in lingua francese:

-Anni Accademici 1998-1999 e 1999-2000:
Corso di ``**Traveaux pratiques**"

per studenti dei primi due anni di Fisica, equivalente al corso di Esperimentazioni di fisica 1 e 2 italiano.

-Anno Accademico 2000-2001:
preparazione di esperienze didattiche di fisica generale per l'insegnamento di fisica del primo anno di medicina e presentazione agli studenti nell'ambito del corso ``Physique generale''.

-Anno Accademico 2001-2002:
corso di ``**Exercices de physique 1**'', esercitazioni di Fisica Generale per studenti del primo anno delle facolta` scientifiche.

Presso l'Università di Roma Tor Vergata:

-Anno Accademico 2003-2004 - presente:
corso di ``**Fisica applicata alle apparecchiature di diagnostica per immagini**''
per i Medici della Scuola di Specializzazione in Medicina Nucleare.

-Anno Accademico 2005-2006, 2006-2007, 2007-2008, 2008-2009,
corso di ``**Adroterapia**''
per i Fisici della Scuola di Specializzazione in Fisica Sanitaria.

-Anno Accademico 2006-2007, 2007-2008, 2008-2009, 2009-2010:
Membro del Consiglio del Master di II livello in Basi fisiche e tecnologiche dell' Adroterapia e della Radioterapia di precisione e
docente del corso di ``**Interazione radiazione-materia**''.

-Anno Accademico 2006-2007 all' AA :2022-2023:
insegnamento di ``**Fisica Applicata**''
per il corso di laurea specialistica in Scienza delle Professioni Sanitarie e Tecniche Diagnostiche.

-Dall'Anno Accademico 2006-2007, all' Anno Accademico 2015-2016:
``**Principi fisici nei controlli di qualità**''
per il corso di laurea di I livello in Tecniche di Radiologia Medica per Immagini e Radioterapia.

-Anno Accademico 2006-2007 -presente:
insegnamenti di ``**Fisica atomica e nucleare**'',
``**Principi fisici delle Strumentazioni ed Apparecchiature**'',
``**Introduzione alle Bioimmagini**''
per il corso di laurea di I livello in Tecniche di Radiologia Medica per Immagini e Radioterapia.

-Anno Accademico 2016-2017:
insegnamento di ``**Ionising Radiation for Nuclear Medicine and Radiation Therapy**''
per il corso di laurea specialistica in Fisica.

-Anno Accademico 2016-2017:

seminario dal titolo ``**Introduzione all'Adroterapia**" per il master di II livello in Radioprotezione dell' Università di Roma Tor Vergata.

-Anno Accademico 2017-2018-presente
corso di "**Ionising radiation for Medical Physics**" per il corso di laurea magistrale in Fisica.

-Anno Accademico 2021-2022-presente
corso di "**Nuclear science and Applications**" per il corso di laurea magistrale in Fisica.

-Anno Accademico 2023-2024 - presente:
insegnamento di ``**Fisica Applicata alla ricerca**"
per il corso di laurea specialistica in Scienza delle Professioni Sanitarie e Tecniche Diagnostiche.

Presso la scuola di dottorato "PhD School in Accelerator Physics" dell'Università "La Sapienza"

-2020: Membro effettivo della Commissione Giudicatrice per l' esame finale per il conseguimento del titolo del Dottorato di ricerca in Accelerator Physics – 32° ciclo

-2024: Presidente della Commissione Giudicatrice per l' esame finale per il conseguimento del titolo del Dottorato di ricerca in Accelerator Physics – 36° ciclo

PUBBLICAZIONI SU RIVISTA

Autrice e co-autrice di circa 140 pubblicazioni (dal 1996 ad oggi) su riviste scientifiche internazionali con peer review.