

CURRICULUM VITAE ET STUDIORUM

PERSONAL DATA

Name: Ivano Lombardo

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Nationality: Italian

Birth date: December 29th, 1983.

WORKING ACTIVITIES

1. **Researcher in Nuclear Physics (*permanent* position)** at **Istituto Nazionale di Fisica Nucleare, (Italy)**.
Since September 1st, 2017.
2. **University Researcher in Nuclear Physics (*fixed-term* position)** at **Dipartimento di Fisica “E. Pancini”, University of Naples Federico II (Italy)**. Period: 31/12/2016 al 31/08/2017.
3. **Research associate (“assegno di ricerca”)** in **Nuclear Physics** at **Dipartimento di Fisica “E. Pancini”, University of Naples Federico II (Italy)**. Period: 01/10/2012 – 30/09/2016.
4. **Research associate (“assegno di ricerca”)** in **Nuclear Physics** at **Dipartimento di Fisica “E. Pancini”, University of Naples Federico II (Italy)**. Period: 01/10/2011 – 30/09/2012).
5. **Post-Doctoral grant in Nuclear Physics** at **Centro Siciliano di Fisica Nucleare e Struttura della Materia (CSFNMS)**. Period: 20/07/2011 – 30/09/2011 .
6. **Tutoring contract in Experimental Physics** at **University of Enna Kore (Italy)**. Period: January 2011 – June 2011.

TEACHING ABILITATIONS AT UNIVERSITY LEVEL

I accomplished the *Italian National Scientific Abilitation (Abilitazione Scientifica Nazionale, Ministero della Pubblica Istruzione, Università, Ricerca)* to the role of *Associate Professor* in Physics (S.C. 02/A1). Validity period: 04/04/2017 - 04/04/2023.

TEACHING ACTIVITIES AT UNIVERSITY LEVEL

a – PROFESSORSHIP CONTRACTS

1. **Professor of General Physics I (mechanics-waves-thermodynamics)** for Engineering students at **University of Catania**, Academic Year 2018/2019.
2. **Professor of General Physics II and Laboratory (electromagnetism-optics-statistical methods for physics experiments)** for Chemistry students at **University of Catania**, Academic Year 2018/2019.
3. **Professor of General Physics I (mechanics-waves-thermodynamics)** for Engineering students at **University of Catania**, Academic Year 2017/2018.

4. **Professor of General Physics II and Laboratory (electromagnetism-optics-statistical methods for physics experiments)** for Chemistry students at **University of Catania**, Academic Year 2017/2018.

b – OFFICIAL TEACHING DUTIES

5. **Professor of Elements of Nuclear and Subnuclear Physics** (exercises part, **16 credits**), for Physics students at **University of Naples Federico II**, Academic Year 2016/2017.
6. **Professor of the *Advanced Nuclear Physics* (5 CFU)** course for Ph. D students in Physics, **University of Naples Federico II**, Academic Year 2016/2017.

EDUCATION AND TRAINING

- **2011: Ph.D in Physics**, University of Catania (Italy), *summa cum laude*. Thesis: *N/Z Effects on Nuclear Reactions Near the Fragmentation Threshold*. Mentors: Prof. Francesco Porto (University of Catania) and Dr. Giuseppe Cardella (INFN – Catania).
 - **2007-2010: Student of XXIII Ph.D. Course in Physics**, University of Catania (Italy). **Disciplines:** *Nuclear Reactors, Monte Carlo Techniques in Nuclear Physics, Trigger Systems in Nuclear Physics Experiments, Nuclear Electronics – Advanced Course, Introduction to the Field Theory*.
 - **2007: Master Degree in Nuclear Physics**, University of Catania (Italy), *summa cum laude*. Thesis: *Studio dell'emissione di protoni nelle reazioni nucleari $^{40}\text{Ca}+^{40}\text{Ca}$, $^{40}\text{Ca}+^{46}\text{Ti}$, $^{40}\text{Ca}+^{48}\text{Ca}$ a 25 MeV/A*. Mentors: Prof. Francesco Porto (University of Catania) and Dr. Giuseppe Cardella (INFN – Catania).
 - **2005-2007: Student of Physics (Master degree in Physics – Nuclear)**, University of Catania (Italy). **Disciplines:** *Quantum Mechanics II, Lab. Physics IV, Mathematical Methods in Physics II, Structure of Matter II, Fundamentals of Nuclear and Particle Physics II, Nuclear Physics (annual course), Laboratory of Nuclear Physics, Nuclear Spectroscopy, Radioactivity, Nuclear Reactions, Heavy Ion Physics, Computer Science Methods in Physics, High Energy Physics, Nuclear Physics with Electromagnetic Probes*.
 - **2005: Degree in Physics**, University of Catania (Italy), *summa cum laude*. Thesis: *Nuclei lontani dalla Simmetria Sferica*. Mentor: Prof. Francesco Porto.
 - **2002-2005: Student of Physics (1st level degree)**, University of Catania (Italy). **Disciplines:** *General Physics I, Mathematical Analysis I, Algebra and Geometry, Computer Science, Lab. Classical Physics I, English, General Physics II, Mathematical Analysis II, Analytical Mechanics, Lab. Classical Physics II, Numerical Methods in Physics, Relativity, Oscillations and Waves, Modern Physics, Quantum Mechanics I, Fundamentals of Astrophysics, Lab. Physics III, Mathematical Methods in Physics I, Structure of Matter I, Fundamentals of Nuclear and Particle Physics I, Radiation Dosimetry, Nuclear Electronics, Introduction to Particle Physics, Statistical Mechanics*.
- 2002: High school leaving qualification in scientific studies**, Liceo Scientifico Statale “Alessandro Volta”, Caltanissetta (Italy), *highest score*.

SCIENTIFIC ACTIVITY

a – RESEARCH ACTIVITIES

The research activity I have done so far involved a wide range of topics related to Nuclear Physics, which included the Cluster Structure and the Nuclear Spectroscopy of Light Nuclei, the study of the Dynamics and Thermodynamics of very excited nuclei produced in the collisions between heavy ions, the determination of the behavior of the Symmetry Term of the State Equation of Nuclear Matter, and finally Nuclear Astrophysics. All these activities have led to publications (personally handled by me) of great resonance. As an example, one of them was selected among the PRL Editor suggestions and was the subject of a Viewpoint in Physics, an INFN news and a scientific popularization article for the general public on Physics World (IOP). Another one was chosen as highlights of Journal of Physics G for 2013. As a result of such successful research activities, many experimental and applied nuclear physics journals have asked my collaboration as a referee. I had also the privilege of organizing (serving as scientific secretary) one of the oldest nuclear physics conferences in the world, the CLUSTER (exists and has been renewed since 1969), which had a very large participation and a great success.

In the following I will show a brief summary of these activities, roughly following the chronological order.

During the Ph.D. and research grants period I was strongly involved in the systematic study of $^{40}\text{Ca}+^{40}\text{Ca}$, $^{40}\text{Ca}+^{48}\text{Ca}$, $^{48}\text{Ca}+^{40}\text{Ca}$, $^{48}\text{Ca}+^{48}\text{Ca}$ and $^{40}\text{Ca}+^{46}\text{Ti}$ reactions at 25 MeV/nucleon bombarding energies, by using the Chimera multi-detector (installed at the LNS, Catania) as a detection apparatus. The analysis of experimental data, which I performed in first person, allowed us to observe how the isospin degree of freedom plays a fundamental role in the competition between different reaction mechanisms involved in the most central collisions. A very significant result of this analysis, which is discussed in detail in my doctoral thesis, was the observation that in the case of neutron rich systems (such as $^{48}\text{Ca}+^{48}\text{Ca}$) the emission of evaporative residues is favored, while in the case of more symmetrical N/Z systems (such as $^{40}\text{Ca}+^{40}\text{Ca}$), the emission of evaporation residues is less favored than the emission of two or more fragments. Comparisons between experimental results and calculations made with the CoMD-II Molecular Dynamics model allowed to highlight the key role played by the Coulomb and Symmetry terms of the Equation of State in Nuclear Matter in the description of the phenomenon. From the comparison with the simulations it was therefore possible to obtain an estimate of the density dependence of the Symmetry Term of the Equation of State, a key-piece of fundamental importance for the correct modeling of nuclear collisions at intermediate energies and for the interpretation of the structure and temporal evolution of astrophysical objects such as neutron stars and supernova explosions. These studies led to the publication of an article in Physical Review Letters in 2009 and one, more recent (2012) on Physical Review C, of which I am the corresponding author. The results of these experiments had great scientific relevance; they were mentioned in the NuPECC Long Range Plan 2010 and were the subject of invited talks, held by me, at the prestigious Nucleus-Nucleus 2012 and NuSym13 conferences.

Phenomena related to the neutron enrichment of the entrance channel were also observed in the semi-peripheral collisions where, thanks to the analysis of the emission of light isobars and isotopes by the quasi-projectile and mid-velocity sources, sizable effects of isospin transport were observed. They are due to the exchange of neutrons and protons between the reaction partners and to the presence of a baryonic density gradient between the quasi-projectile and the quasi-target in the region of the neck that connects them during the interaction phase. These studies led to the publication of an article on Physical Review C, of which I am the corresponding author and have been discussed at many international conferences, also by invitation, such as the NuSYM13. It was also possible to estimate the degree of isospin equilibration in the studied peripheral collisions at 25 MeV/nucleon. This information, coupled with others coming from measurements at higher and lower energies, is very important for estimating the relaxation time of the isospin degree of freedom in nuclear reactions, another fundamental parameter for the modeling of nuclear reactions characterized by strong isospin asymmetry between reaction partners.

The study of the emission of light fragments in these reactions displayed the presence of odd-even effects in the Z and N distributions of fragments. These staggering phenomena are quite ubiquitous in nuclear physics, having been observed in the elemental distributions of the sun, in the composition of cosmic rays, in multi-fragmentation processes, in fusion-evaporation reactions, in fission. Qualitatively, these effects can be explained by considering the one-particle separation energy distributions in light nuclei, which are in turn influenced by nuclear pairing. At present it is believed that, in the case of reactions between heavy ions at

intermediate energies, these effects are attributable to the de-excitation of the pre-fragments emitted in the early stages of the collision. In our work it was also clearly demonstrated that the amplitude of odd-even oscillations is influenced by the total N/Z ratio of the studied reaction. For the first time in the literature, a mirror behavior of this effect was observed on charge and neutron number distributions. These investigations have been discussed at various international conferences (also by invitation, such as NN2012) and have led to the publication of a very highly cited Physical Review C article, of which I am the corresponding author.

I also participated in numerous experiments of nuclear reactions at low and intermediate energies giving my contributions both on the mounting and testing of experimental devices and/or the data analysis and reduction. They were done at the LNS Catania (experiments Isodec, Timescale, Equilibration, Unstable, Correlation, Break-up, InKilsSy, Pygmy, FaziaSym, FaziaCor, FaziaPre, FaziaBUUA), the National Laboratories of Legnaro (Aclus2 experiment) and at the GSI in Darmstadt (Asy-Eos experiment, S394, aimed at studying the term of symmetry at densities higher than the saturation one). I participated also to the experiment E613 at the GANIL Laboratories, aimed at the study of the emission of radial flux of particles in collisions between heavy ions and intermediate energies within the international collaboration INDRA-FAZIA, of which I am a member. As part of the NUCL-EX FAZIA collaboration, I lead the construction of a new modular hodoscope (OSCAR), consisting of a 20 μm thick silicon strip detector coupled to a wall of 16 silicon pad detectors 300 μm thick. A technical article on NIM A (of which I am a corresponding author), illustrates its main features and application domains. In 2018, this detector was used with success in a proton transfer experiment at Legnaro National Laboratory (TAU-DEU), aimed at obtaining the C^2S spectroscopic factor of low-lying states in the proton rich ^{33}Cl nucleus. I was the *spokesman* of this experiment, whose analysis is currently ongoing. Because of its ultra-low detection and identification thresholds, we think to use OSCAR as a backward detection device for quasi-target detection coupled with a hodoscope made by several FAZIA blocks put at forward angles. In this respect, the test phase of digitization of the strip and pad signals via the FAZIA electronic as already been successfully performed.

Another important research topic I carried out in first person was the study of the structure of light nuclei by means of high precision measurements of nuclear reactions at energies around and below the Coulomb barrier. In this perspective, from the moment of my transfer to Naples during the period of research grants and the the university researcher position, I take advantage of the wherewithal offered by the small 3MV TTT3 tandem accelerator installed at the Accelerator Laboratory (LdA) of the University of Naples Federico II. In particular I was spokesman of the SER experiment, which was aimed at studying the resonant elastic scattering of α -particles on ^9Be at energies of 3.5 - 10 MeV, both for purposes of Nuclear Structure and Applied Physics. The analysis of the excitation functions obtained made possible to clarify the nuclear spectroscopy of many states of the compound nucleus ^{13}C above the α emission threshold and then to gather information on the cluster structure of excited states in ^{13}C . The results were discussed at international conferences (also by invitation, such as SNP'16). An article on these data (which received the compliments of the referee: "*this paper reports a very nice piece of analysis regarding the states in ^{13}C above the alpha-decay threshold*") was recently published in Physical Review C, and I am the corresponding author. In another article on NIM B, with me as corresponding article, I have also discussed as the accurate knowledge of the elastic scattering excitation functions $\alpha+^9\text{Be}$ can be useful for the analysis of beryllium-containing materials through Ion Beam Analysis measurements. These data was included in the IAEA EXFOR and IBANDL databases.

Another experiment of which I was spokesman at the tandem of Naples involved the study of the nuclear reaction $^{19}\text{F}(p,\alpha_0)$ at low energies (0.6-1.1 MeV) with the aim of solving different ambiguities in the ^{20}Ne spectroscopy (a self-conjugate nucleus with a pronounced particle α -cluster structure) and to clarify discrepancies in the cross section measurements reported in the literature. Further, this reaction may play an important role in the destruction of fluorine in proton-rich stellar environments. Our measurement made it possible to clarify the J^π values of different ^{20}Ne states at excitation energies around 14 MeV and to resolve the discrepancy in the absolute cross section values ($E_p < 0.7$ MeV) seen in the literature. The results of these measures were presented by me at numerous international conferences, including two by invitation (SEA Workshop 2014 and SNP'16 in 2016), and were published in the Journal of Physics G (I am the corresponding author). They have also been chosen among the highlights of the journal for 2013; it is still a highly cited paper.

The results obtained with the previous experiment made at the TTT3 tandem (Naples) led me to propose, as a *spokesman*, a new measure of the $^{19}\text{F}(p,\alpha_0)$ reaction cross section close to the energy domain of astrophysical interest ($E_p = 0.18-0.6$ MeV). The experiment was carried out at the AN2000 accelerator of the National

Laboratories of Legnaro in February 2014. The results highlighted the role played by low-energy broad resonances, which lead to an increase in the astrophysical factor compared to previous estimates based on extrapolations from high-energy data. The results were presented at several international conferences (among which, by invitation, SEA2014, SNP'16 and GGI Doctoral School 2016) and were published (I was the corresponding author) on *Physics Letters B* in 2015. These results had broad echoes, and opened a collaboration with physicists engaged in building the JUNA facility in China, with whom we wrote an article in *Chinese Physics C* where we revise all the literature data on this reaction.

In 2014 I proposed a new experiment in Naples aimed at studying the reaction $^{10}\text{B}(p,\alpha\alpha)^7\text{Be}$ at energies between 0.6 and 1 MeV. This reaction is very important both because it allows investigating the cluster structure of the ^{11}C compound nucleus and for radioprotection purposes in the study of nuclear aneutronic fusion involving p+B reactions. By means of a refined method of particle identification based on the use of thin absorbers, it was possible to discriminate the α particles from the elastic protons, and this allowed the measurement (for the first time in this energy regime) of both the differential and integrated cross sections of the $^{10}\text{B}(p,\alpha\alpha)^7\text{Be}$ reaction. The *R*-matrix analysis of the experimental data allowed improving the knowledge of the ^{11}C spectroscopy, pointing out the existence of a state near the α emission threshold characterized by a pronounced cluster structure. The results of such experiment have been published in *Journal of Physics G* (I am the corresponding author), and have been shown at various conferences (including the NN2015), some of which on invitation (SNP'16 and GGI Doctoral School 2016).

From the point of view of experimentation on new detectors, I personally dealt with the construction of a large-area and high-efficiency micro-channel plate detector. It was coupled to a silicon strip detector for the identification in charge and mass of the nuclear species constituting the cocktail beam of radioactive nuclei produced by means of the FRIBS facility of the LNS, Catania. This tagging system was used with the Chimera multi-detector for the study of nuclear reactions induced by exotic beams on stable targets; its characteristics are discussed in an article on *Nuclear Physics B-PS* of which I am a corresponding author. This system has recently been improved by adding a parallel-plate avalanche counter (PPAC) to trace the radioactive beam. I personally carried out this test and set-up, with the collaboration of the electronic services of the INFN Section of Naples.

Thanks to the availability of ^{10}Be and ^{16}C beams obtained with the FRIB facility, I was personally involved with studying the cluster-like α structure of these nuclei through sequential break-up reactions on hydrogenated targets, using the Chimera array as detection device. My studies on invariant mass and angular correlations suggested the possible existence of a molecular state in ^{10}Be characterized by having high spin (6^+). Furthermore, we suggested the existence of a new state at high excitation energy in ^{16}C . It is located in a region where theoretical simulations with molecular dynamics models foresee the existence of states having shapes (triangular or linear) very different from the usual spherical ones. These results were published in *Physical Review C* at the beginning of 2016 (I am a corresponding author), are already widely cited, and have been the subject of various oral contributions, one of them invited by the IPN of Orsay (France).

The studies on the topic of clustering led me to the realization of a new experiment (HOYLE at LNS, Catania) concerning the controversial structure of the state of Hoyle in ^{12}C , responsible for the production of ^{12}C by the process of helium burning in stars. Thanks to this very refined experiment, it was possible to reconstruct, with an unprecedented precision, the emission pattern of three α -particles from the Hoyle state, so as to obtain an accurate estimate of the branching ratios between the sequential emission of the three α -particles respect to a possible direct emission. The upper limit of the branching ratio for the direct decay observed by us has been lowered by about one order of magnitude compared to what is known in the literature. This has very heavy implications both in nuclear structure (the observation of direct decays could in fact be correlated to the presence of Bose-Einstein condensations in nuclei) and in nuclear astrophysics (with orders of magnitude variations of the reaction rate of carbon production in astrophysical scenarios of low-temperature helium burning). Results of these investigations were published in 2017 in *Physical Review Letters*, and I am the corresponding author. Because of its importance, this article was selected in the Editor suggestions of PRL and was the subject of a Viewpoint article on the *Physics* magazine of the American Physical Society, which deepens and makes accessible to the community the most significant discoveries in physics published in *Physical Review* journals. The science magazine *Physics World* has also dedicated an entire article to the discovery, and INFN has announced this in a news item from the Communication Office. For this discovery, I was the recipient of an invited talk at the State of Art on Nuclear Cluster Physics (SOTANCP4) workshop in 2018.

b – PARTICIPATION TO CONFERENCES

1) INVITED TALKS:

1. *The XI conference on Nucleus-Nucleus Collisions - NN 2012*, San Antonio (Texas, USA) May 28 – June 2, 2012 (**invited talk**)
2. *3rd International Symposium on Nuclear Symmetry Energy*, East Lansing (USA), July 22-26 2013 (**invited talk**)
3. *Sicily – East Asia Workshop – Low Energy Nuclear Physics*, July 28-31, 2014, Siracusa (Italy) (**invited talk**)
4. *The 39th Symposium on Nuclear Physics*, January 05-08, 2016, Cocoyoc (Mexico) (**invited talk**).
5. *GGI Institute Doctoral School: Frontiers in Nuclear and Hadronic Physics*, February 22-26, 2016, Firenze (Italy) (**invited talk**).
6. *GDS topical meeting: GDS coupling to auxiliary detection systems*, Legnaro (Italy) January 25-27, 2017 (**invited talk**).
7. *17th Zimanyi Winter School on heavy Ion Physics, Budapest (Hungary) 4-8 dicembre 2017* (**invited talk**).
8. *Workshop on basic research and interdisciplinary applications with small accelerators*, Napoli (Italia) 17-18 gennaio 2018 (**invited talk**).
9. *Fourth International Workshop on “State of the Art in Nuclear Cluster Physics”*, Galveston, Texas, USA, May 13-18, 2018 (**invited talk, declined for serious family reasons**).
10. *Quarto Incontro Nazionale di Fisica Nucleare INFN2018*, Catania, Italy, November 7-9 2018 (**invited talk**)
11. *The 42th Symposium on Nuclear Physics*, January 05-08, 2016, Cocoyoc (Mexico) (**invited talk**).
12. *XLII Brazilian Meeting on Nuclear Physics*, Campos do Jordão, Brazil, September 01 to 05, 2019, (**invited talk**).

2) ORAL OR POSTER CONTRIBUTIONS

13. *EURORIB '08*, Giens (France) 9-13 June 2008 (**poster presentation**).
14. *Annual Meeting of the Italian Physical Society (SIF)*, Genova (Italy), September 22th -27th, 2008 (**oral presentation**)
15. *Annual Meeting of the Italian Physical Society (SIF)*, Bari (Italy), September 28th – 3 October 3rd, 2009 (**oral presentation**)
16. *12th International Conference on Nuclear Reaction Mechanisms*, Varenna (Italia), 15-19 June 2009 (**oral presentation**).
17. *10th International Conference on Nucleus Nucleus Collisions*, Beijing (China) 16-21 August 2009 (**oral presentation**).
18. *International Conference on Nuclear Reactions on Nucleons and Nuclei*, Messina (Italy), 5-9 October 2009 (**oral presentation**).
19. *2nd Workshop State of the art on Nuclear Cluster Physics (SOTANCP2)*, Bruxelles (Belgium), 25-28 May 2010 (**oral presentation**)
20. *IPRD 2010 – Topical Seminar on Innovative Particle and Radiation Detectors*, Siena (Italy), 7-10 June 2010 (**oral presentation**)
21. *International Conference on Nuclear Physics – Nucleus 2010*, Saint Petersburg (Russia), 6-10 July 2010 (**oral presentation in plenary session**)
22. *Zakopane Conference on Nuclear Physics – Extremes of Nuclear Landscape*, Zakopane (Poland), 30 August – 5 September 2010 (**oral presentation**)
23. *Annual Meeting of the Italian Physical Society (SIF)*, Bologna (Italy), September 20th – 24th, 2010 (**oral presentation**)

24. Annual Meeting of the Italian Physical Society (SIF), L'Aquila (Italy), September 20th – 24th, 2011 (**oral presentation**)
25. *Fusion 11*, Saint-Malo (France) 2-6 May 2011 (**poster presentation**)
26. *Nordic Conference on Nuclear Physics*, Stockholm (Sweden) 13-18 June 2011 (**oral presentation**)
27. *International Workshop on Multi-fragmentation and Related Topics*, Caen (France) 2-5 November 2011 (**oral presentation**)
28. Ion Beams 2012, Legnaro (Italy), 6-8 June 2012 (**poster presentation**)
29. *The X International Conference on Clustering Aspects in Nuclear Structure and Dynamics*, Debrecen (Hungary) 2-5 November 2012 (**oral presentation**)
30. Annual Meeting of the Italian Physical Society (SIF), Napoli (Italy), October 17th – 21th, 2012 (**oral presentation**)
31. Annual Meeting of the Italian Physical Society (SIF), Trieste (Italy), September 23th – 27th, 2013 (**oral presentation**)
32. *63th International Conference on Nuclear Physics "Nucleus 2013"*, October 08-12, 2013, Moscow, Russia (**oral presentation in plenary session**)
33. *International Symposium "Entrance Channel Effect on the Reaction Mechanism in Heavy Ion Collisions"*, Messina (Italy), 6-8 November 2013 (**oral presentation**)
34. *II Topical Workshop on Modern Aspects in Nuclear Structure*, Bormio (Italy), 19-22 February 2014 (**oral presentation**)
35. *3rd Int. Workshop on State of the Art in Nuclear Cluster Physics"*, May 26-30, 2014, Yokohama (Japan) (**oral presentation in plenary session**)
36. Nuclear Physics in Astrophysics VII, 18-22 May 2015, York (England) (**oral presentation**)
37. 14th Int. Conference on Nuclear Reaction Mechanisms, Varenna (Italy) June 15-19 2015 (**oral presentation**)
38. The 12th Int. Conference on Nucleus-Nucleus Collisions (NN2015), Catania, June 21-26 2015 (**oral presentation**).
39. Annual Meeting of the Italian Physical Society (SIF), Padova (Italy), September 26th –30th, 2016 (**oral presentation**)
40. *Zakopane Conference on Nuclear Physics – Extremes of the Nuclear Landscape*, Zakopane (Poland), August 28 – September, 2016 (**oral presentation in plenary session**).
41. *Nuclear Physics in Astrophysics NPA8*, Catania (Italia), 18-23 giugno 2017 (**poster presentation**).
42. *International Workshop on Multi-fragmentation and Related Topics*, Catania (Italia), May 22-25, 2018 (**poster presentation**).
43. *Zakopane Conference on Nuclear Physics – Extremes of the Nuclear Landscape*, Zakopane (Poland), August 26–30, 2018 (**oral presentation**).
44. *European Nuclear Physics Conference EuNPC2018*, Bologna (Italy), September 2–7, 2018 (**oral presentation**).
45. *Nuclear Structure and Dynamics NSD2019*, Venezia (Italy), May 13–17, 2019 (**oral presentation in plenary session**).

c – RESPONSIBILITY POSITIONS

- **Local responsible** of the NEWCHIM experiment (Nuclear Physics Commission of INFN) at INFN-*Sezione di Napoli* (January 2015 – March 2017).
- **Spokesman** of the experiment *Isospin-1* at INFN-Lab. Naz. del Sud, Catania (2009)
- **Co-spokesman** of the experiment *Test-⁸He* at INFN-Lab. Naz. del Sud, Catania (2011)
- **Spokesman** of the experiment *CLIR* at INFN-Lab. Naz. del Sud, Catania (2012)
- **Spokesman** of the experiment *SER* at Lab. dell'Acceleratore, Napoli (2011)
- **Spokesman** of the experiment *¹⁹F(p, α)* at Lab. dell'Acceleratore, Napoli (2012)

- **Spokesman** of the experiment *NASPENA* at INFN-Lab. Naz. di Legnaro, Legnaro (2013)
- **Spokesman** of the experiment *GHOST* at INFN-Lab. Naz. di Legnaro (2014)
- **Spokesman** of the experiment $^{10}\text{B}(p,\alpha)$ at Lab. dell'Acceleratore, Napoli (2014)
- **Spokesman** of the experiment *HOYLE* at Lab. Nazionali del Sud, Catania (2016)
- **Spokesman** of the experiment *TAU-DEU* at Lab. Nazionali di Legnaro, Legnaro (2018)

d – GRANTS

- **Responsible** of the **SYLINURE** (Symmetries in Light Nuclei Reactions) grant at the **Istituto Nazionale di Fisica Nucleare** for specific scientific activities of young researchers.

e – PRIZES FOR SCIENTIFIC ACTIVITY

1. **Claudio Villi Prize of the INFN** for the *best Ph.D. Thesis in Experimental Nuclear Physics* in Italy in 2011, Rome, January 2012.
2. **Quirino Majorana Prize** of the Italian Physical Society for *Young Graduated Students in Physics* (Bari, September 2009).

f – EDITORIAL ACTIVITIES

- 1) **Editor** for the Experimental Nuclear Physics area of the journal: **Revista Mexicana de Fisica**
- 2) **Referee** of the following journals:
 - **Physical Review Letters**
 - **Physical Review C**
 - **European Physical Journal A**
 - **Journal of Physics G: Nucl. Part. Physics**
 - **Nuclear Instruments and Methods in Physics Research Section A**
 - **Microchemical Journal**
 - **Journal of Physics: Conference Series**
 - **Chemosphere**
 - **Defence technology**
 - **Revista Mexicana de Fisica**
- 3) **Editor** of the volume **863 (2017)** of **Journal of Physics: Conference Series** (IOP Publishing group).
- 4) **Author** of the textbook for physics students: *“Problemi di Fisica Generale. Elettromagnetismo e Ottica”*, EdiSES (Naples, Italy 2014). ISBN: 9788879598378.

g – ORGANIZATION OF INTERNATIONAL CONFERENCES

1. **Scientific Secretary and co-organizer** of the International Conference *“The 11th International Conference on Clustering Aspects on Nuclear reactions and Dynamics”*, Naples (Italy) May 23rd – 27th, 2016.

2. Member of the **Local Organizing Committee** of the International Conference: *Asy-Eos 2010 – International Workshop on Nuclear Symmetry Energy at Medium Energies*, Noto (Italy), May 21st – 24th, 2010.

h – MENTOR OF PH.D., MASTER AND DEGREE THESIS

- Daniele Dell’Aquila, *Clusters in light nuclear systems: a multi-method approach*, Federico II University of Naples, January 2018 (*Ph.D. in Physics*, score: summa cum laude).
- Daniele Dell’Aquila, *Studio della Reazione Nucleare $^{19}\text{F}(p,\alpha)^{16}\text{O}$ a basse energie incidenti ($0.540\text{MeV} \leq E_p \leq 1.034\text{MeV}$)*, University of Catania, A.Y. 2011/2012 (*1st level thesis in physics*, score: 110 e lode)
- Daniele Dell’Aquila, *Studio della struttura a cluster di ^{16}C e ^{10}Be tramite break-up indotto su target CH_2/CD_2 ai LNS*, University of Catania, A.Y. 2013/2014 (*Master thesis in physics*, score: 110 e lode)
- Nunzia Simona Martorana, *Studio del processo di equilibratura di carica in reazioni $^{40}\text{Ca}+^{40}\text{Ca}$, ^{46}Ti , ^{48}Ca e $^{48}\text{Ca}+^{48}\text{Ca}$ a 25 MeV/A con il rivelatore CHIMERA ai LNS*, University of Catania, A.Y. 2013/2014 (*Master thesis in physics*, score: 110 e lode)
- Fabrizio Miano, *Spettri di neutroni emessi da sorgenti standard Am-Be e Pu-Be*, Università di Catania, A.A. 2007/2008 (*1st level thesis in physics*)
- Mario Buscemi, *Analisi delle reazioni nucleari Ca+Ca ad energie intermedie: dinamica ed effetti di isospin*. University of Catania, A.Y. 2010/2011 (*Master thesis in physics*, score: 110 cum laude).
- Giuseppe Ferdinando D’Agata, *Applicazioni del modello a goccia liquida nella descrizione dei nuclei*, University of Catania, A.A. 2009/2010 (*1st level thesis in physics*)
- Pasquale Trinchese, *Caratterizzazione di rivelatori veloci per il tagging di fasci radioattivi*, Federico II University of Naples, A.Y. 2012/2013 (*1st level thesis in physics*)
- Alessandro Verde, *Studio della spettroscopia del nucleo neutron-rich ^{13}B attraverso reazioni di break-up sequenziale del proiettile ai LNS*, Federico II University of Naples, A.Y. 2013/2014 (*1st level thesis in physics*)
- Felice Conte, *Analisi della reazione $^{10}\text{B}(p,\alpha)^7\text{Be}$ in un range di energie incidenti di 0.630 - 1.028 MeV*, Federico II University of Naples, A.Y. 2013/2014 (*1st level thesis in physics*, score: 110).
- Marcello Miranda, *OSCAR: un Odoscopio di Silici per Correlazioni ed Analisi di Reazioni Nucleari*, Federico II University of Naples, A.Y. 2014/2015 (*1st level thesis in physics*, score: 110).
- Maria De Luca, *La Reazione Nucleare $^{14}\text{N}(d,\alpha)^{12}\text{C}$ come sonda dello stato di Hoyle nel ^{12}C* , Federico II University of Naples, A.Y. 2015/2016 (*1st level thesis in physics*, score: 110).
- Daniela Ruggiano, *Spettroscopia di nuclei leggeri mediante reazioni indotte da ^7Li* , Federico II University of Naples, A.Y. 2016/2017, (*1st level thesis in physics*).

j – SCIENTIFIC ASSOCIATIONS AND AFFILIATIONS

1. **Scientific Association** at the Istituto Nazionale di Fisica Nucleare (INFN) – Laboratori Nazionali del Sud during the period september 2006 – September 2011.
2. **Scholarship** (1st ranked) for Master Degree student at INFN – LNS (September 2006 – September 2007).
3. **Scientific Association** at the Istituto Nazionale di Fisica Nucleare (INFN) – Sezione di Napoli. Period: October 2011 – February 2017.
4. **Scientific Association** at the Istituto Nazionale di Fisica Nucleare (INFN) – Sezione di Catania. Period: March 2017 – August 2017.
5. **Member** of the Italian Physical Society since 2007.
6. **Affiliate** to the institute of Physics (IOP) in 2015.

k – MEMBERSHIP OF INTERNATIONAL COLLABORATIONS

1. **CHIMERA** Collaboration (Italy, France, USA, Poland, Romania, India), 2006 - 2017.
2. **INDRA** Collaboration (France, Italy, Canada), since 2012.
3. **NUCL-EX FAZIA** Collaboration, (France, Italy, Poland, Spain), since 2012.
4. **ASY-EOS** Collaboration (Germany, Italy, France, Poland, Romania, Slovakia, Spain, UK, USA), 2010 - 2017.

Catania (Italy), 22/05/2019

Dr. Ivano Lombardo

A handwritten signature in blue ink that reads "Ivano Lombardo". The signature is written in a cursive, flowing style.