

Curriculum Vitæ

Simone Biagi

Informazioni personali

- *Data e luogo di nascita:* 3 maggio 1981, Latina, Italia.
- *Nazionalità:* Italiana.
- *Email:* simone.biagi@lns.infn.it, simonebiagi@pec.it
- *Conoscenze linguistiche:* Inglese: scritto ottimo, parlato ottimo.
Spagnolo: scritto buono, parlato ottimo.

Esperienza lavorativa

- Da Febbraio 2017: **Ricercatore di III livello professionale** a tempo indeterminato.
Istituto Nazionale di Fisica Nucleare, Laboratori Nazionali del Sud, Catania.
Staff Permanent Researcher.
- Agosto 2016 – Gennaio 2017: **Ricercatore di III livello professionale** a tempo determinato.
Istituto Nazionale di Fisica Nucleare, Laboratori Nazionali del Sud, Catania.
Partecipazione alla fase di assemblaggio e test di KM3NeT; partecipazione a fase di commissioning e di presa dati del telescopio KM3NeT; simulazione Montecarlo e analisi dati KM3NeT-ARCA.
- Agosto 2014 – Luglio 2016: **Assegno di ricerca** “Post dottorale”.
Istituto Nazionale di Fisica Nucleare, Laboratori Nazionali del Sud, Catania.
Titolo del progetto: *Esperimenti di fisica del neutrino.*
- Agosto 2012 – Luglio 2014: **Assegno di ricerca** “Post dottorale”.
Dipartimento di Fisica e Astronomia dell’Alma Mater Studiorum Università di Bologna.
Titolo del progetto: *Measurement of the differential energy spectrum of atmospheric neutrinos and limits on UHE cosmic neutrinos.*
- Maggio 2010 – Maggio 2012: **Assegno di ricerca** “Post dottorale”.
Dipartimento di Fisica dell’Alma Mater Studiorum Università di Bologna.
Titolo del progetto: *Ricerca di neutrini diffusi di alta energia da oggetti cosmici extragalattici.*
- Gennaio 2007 – Maggio 2010: **Dottorato di ricerca**.
Dipartimento di Fisica dell’Alma Mater Studiorum Università di Bologna.
Titolo della tesi di dottorato: *Search for a Diffuse Flux of Astrophysical Muon Neutrinos in the ANTARES Telescope.*

Incarichi e responsabilità in collaborazioni internazionali

- Luglio 2015: **Detector Operation Manager** per il sito di KM3NeT-IT. Nominato dal Management della collaborazione internazionale KM3NeT. Le principali mansioni consistono nell'organizzazione delle operazioni a terra durante l'installazione di *Detection Unit* e nel coordinamento delle operazioni di presa dati.
- Maggio 2014 – Luglio 2015: **Coordinatore della presa dati e dell'operabilità** del prototipo di *Detection Unit* sviluppato da KM3NeT. Nominato dal Management della collaborazione internazionale KM3NeT. I risultati di fisica ottenuti con il prototipo sono stati pubblicati su Eur. Phys. J. C in un articolo di cui sono autore principale.
- Maggio 2013 – Luglio 2013: **Run Coordinator** per l'esperimento ANTARES. Attività di supporto e coordinamento delle operazioni degli *shifters* durante la presa dati.
- Dicembre 2012 – Maggio 2013: **Internal referee** dell'analisi per la ricerca di un segnale dalle Fermi Bubbles della collaborazione ANTARES. I risultati principali sono stati pubblicati su Eur. Phys. J. C.

Finanziamenti per progetti di ricerca nazionali e internazionali

- 2018 – 2020: **INFN Starting Grant** per giovani ricercatori.
Principal Investigator, finanziamento: **20 k€**.
Titolo del progetto: **Study for a real-time underwater detector of Nanoplastic Pollution (SNAP)**.
Studio e caratterizzazione della produzione di nanoplastiche in ambiente marino, confronto di campioni di acqua marina raccolta nel Mar Mediterraneo con campioni di nanoplastiche prodotte in laboratorio, progetto e realizzazione di un rivelatore prototipo real-time per inquinamento da nanoplastiche capace di operare a grandi profondità marine (> 3000 m) per tempi lunghi (> 1 anno).
- 2017 – 2019: Progetto **KM3NeT 2.0 (INFRADEV – H2020)** Astroparticle & Oscillation Research with Cosmics in the Abyss (ARCA & ORCA).
Membro WP6 (Establish a scientific exchange program for KM3NeT), **membro WP7** (Develop real-time systems to distribute/receive alerts in a multi-messenger astronomy context), **membro WP8** (Develop the technology to provide access for external users to the neutrino telescope infrastructure and to the environmental data).

Istruzione e formazione

- 4 Maggio 2010: **Dottorato di Ricerca in Fisica**, XXII ciclo. Giudizio: **Ottimo**.
Tutor: Prof. Maurizio Spurio, Alma Mater Studiorum Università di Bologna.
Titolo della tesi: *Search for a diffuse flux of astrophysical muon neutrinos in the ANTARES telescope*.
- Giugno 2008 – Febbraio 2009: **Periodo di formazione all'estero** per il Dottorato di Ricerca finanziato dal progetto “Marco Polo”, presso l'*Instituto de Física Corpuscular (IFIC)* Valencia, Spagna.
- 30 Marzo 2006: **Laurea in Fisica**. Votazione: **110 e lode/110**.
Relatore: Prof. Antonio Capone, Università degli Studi di Roma “La Sapienza”.
Titolo della tesi: *Dimensionamento e realizzazione di un apparato autonomo per la misura di parametri ottici ed ambientali inerenti un telescopio Čerenkov sottomarino per neutrini astrofisici di alta energia*.

Attività scientifica

- 2005 – 2015: Membro della collaborazione **NEMO**.
Sistema di acquisizione dati TriDAS (*Trigger and Data Acquisition System*), ottimizzazione procedure di calibrazione temporale.
- Dal 2007: Membro della collaborazione **ANTARES**.
Produzione di simulazioni MonteCarlo, studio muoni atmosferici, sviluppo algoritmi per stima dell’energia degli eventi da neutrini cosmici, responsabile analisi per la ricerca di flussi diffusi di neutrini cosmici ad alta energia, misura dello spettro energetico dei neutrini atmosferici, referee analisi per ricerca di segnale da neutrino proveniente dalle *Fermi Bubbles*, misura di parametri di oscillazione di neutrino, caratterizzazione del segnale dovuto a *after-pulses* sui fotomoltiplicatori.
- Dal 2012: Membro della collaborazione **KM3NeT**.
Progettazione dell’elettronica di modulo ottico, sviluppo di software e firmware per dispositivi di *slow control*, responsabile delle operazioni del rivelatore prototipo (PPM-DU) di KM3NeT, *Detector Operation Manager* per il sito italiano di KM3NeT, attività di analisi dei dati acquisiti dal telescopio.
- Dal 2017: Membro della collaborazione **DUNE**.
Simulazione di interazioni da neutrino nel *Near Detector* (ND) di DUNE, ottimizzazione della geometria del rivelatore al ND.

Attività didattiche e tutoring

- 2016 – 2019: Co-tutor della studentessa di **Dottorato** in Fisica, Dr. Giovanna Ferrara, Università di Catania. Attività di calibrazione e analisi dati di KM3NeT, ricerca di un segnale correlato tra ANTARES e HAWC, tesi in preparazione.
- Vincitore di 5 selezioni come **tutor didattico** negli anni 2010 – 2014 nei corsi di **Fisica Generale I e II** per i CdL in Ingegneria Civile, Ingegneria Energetica e Ingegneria Edile/Architettura, presso l’Università di Bologna.
Ho tenuto le lezioni di esercitazione e partecipato alle commissioni di esame.
- A.A. 2011/2012: Correlatore del lavoro di tesi di **Laurea Magistrale** del Dott. Luigi Antonio Fusco dal titolo “*Misura dello spettro energetico dei neutrini atmosferici con il rivelatore ANTARES*”. Relatore: Prof. Maurizio Spurio.
- A.A. 2010/2011: Correlatore del lavoro di tesi di **Laurea Magistrale** della Dott. Irene Madore dal titolo “*Study of the atmospheric muon neutrino flux with the ANTARES telescope*”. Relatore: Prof. Maurizio Spurio.
- A.A. 2009/2010: Correlatore del lavoro di tesi di **Laurea Specialistica** del Dott. Francesco Borracci dal titolo “*Source stacking analysis of blazar neutrino sources with the ANTARES neutrino telescope*”. Relatore: Prof. Maurizio Spurio.
- 2007 – 2008: **Tutor** del progetto “Lauree Scientifiche” per studenti di scuola secondaria superiore presso l’Università di Bologna.
- 2007: **Tutor di fisica** in “Progetti didattici” presso Mirabilandia.

Seminari

- 15 aprile 2016: Seminario “**Il Mar Mediterraneo: un laboratorio sottomarino per lo studio dei neutrini**”.
Incontro con Lucia Votano per la presentazione del libro “Il fantasma dell’Universo. Che cos’è il neutrino”. Organizzazione a cura dell’Università di Catania e dell’INFN.
- 11 novembre 2014: Lezione “**Detectors for underwater experiments**”.
IV Seminario Nazionale Rivelatori Innovativi per dipendenti INFN. LNS, Catania.

Talk su invito

- 9th International Workshop on Ring Imaging Cherenkov Detectors (RICH).
Bled, Slovenia, 5-9 Settembre 2016.
Results of the first detection units of KM3NeT.

Presentazioni a Conferenze

- The European Physical Society Conference on High Energy Physics (EPS-HEP). Vienna, Austria, 22-29 Luglio 2015.
Recent results from ANTARES & Status and perspectives of KM3NeT.
- 5th Roma International Conference on Astroparticle Physics (RICAP). Noto, Italia, 30 Settembre-3 Ottobre, 2014.
Operation and results of the prototype KM3NeT detection unit.
- 48th Rencontres de Moriond. La Thuile, Italia, 9-16 Marzo, 2013.
Measurement of the atmospheric ν_μ energy spectrum and improved limits on the ν_μ diffuse fluxes with ANTARES.
- 4th International Fermi Symposium. Monterey, California, 28 Ottobre-2 Novembre, 2012.
Search for a neutrino emission from the Fermi Bubbles with the ANTARES telescope.
- International Workshop on “Double Beta Decay and Neutrinos” (DBD). Osaka, Giappone, 14-17 Novembre, 2011.
The ANTARES telescope: status and results.
- 12th International Conference on Topics in Astroparticle and Underground Physics (TAUP). Monaco, Germania, 5-9 Settembre, 2011.
The KM3NeT project.
- XCVI Congresso Nazionale Società Italiana di Fisica (SIF). Bologna, Italia, 20-24 Settembre, 2010.
Search for a diffuse flux of high-energy ν_μ with the ANTARES neutrino telescope.
- Cosmic Ray International Seminar 2010 (CRIS). Catania, Italia, 13-17 Settembre 2010.
Search for a diffuse flux of high-energy ν_μ with the ANTARES neutrino telescope.
- 24th International Conference on Neutrino Physics and Astrophysics (NEUTRINO). Atene, Grecia, 14-19 Giugno 2010.
Upper limit on the diffuse ν_μ flux with the ANTARES telescope.

Il presente curriculum ai sensi dell’art. 47 D.P.R. 28.12.2000 n. 445 è da considerarsi dichiarazione sostitutiva di atto di notorietà. Le informazioni riportate sono conformi al vero.

Catania, 25 giugno 2018.

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Attività scientifica

La mia attività di ricerca è stata dedicata essenzialmente a due temi: lo studio della fisica nucleare con ioni pesanti alle energie intermedie (10-100 MeV) e poi a cominciare da circa l'anno 2000 lo studio della fisica astroparticellare in particolare la rivelazione di neutrini di alta energia ($E > 100 \text{ GeV}$).

Dai i primi anni della mia carriera fino a circa il 2000, la mia attività si è svolta nell'ambito della fisica nucleare studiando le reazioni nucleari fra ioni pesanti alle energie intermedie. Tale sperimentazione è stata effettuata principalmente con il rivelatore MEDEA che ha lavorato con successo negli anni 1990-1993 presso il laboratorio francese Grand Accelerator National d'Ion Lourdes (GANIL, Francia) e poi in seguito accoppiato con i rivelatori MULTICS, SOLE e MACISTE presso i Laboratori Nazionali del Sud. Una parte delle mia attività è stata dedicata alla progettazione, realizzazione e messa in opera di questi apparati di rivelazione.

La mia attività di ricerca in fisica astroparticellare, i cui i primi approcci cominciarono nel 1998, è stata dedicata alla rivelazione di neutrini di alta energia ($E > 100 \text{ GeV}$) di origine astrofisica con apparati Cerenkov sottomarini.

Il principale scopo di questi apparati è quello di scoprire e studiare i siti extraterrestri di accelerazione di neutrini di alta energia. La misura dei neutrini di alta energia e la loro origine è anche un punto chiave per la comprensione dell'origine dei raggi cosmici di altissima energia che è ancora ignota.

I neutrini, essendo neutri, non sono deflessi dai campi magnetici come i protoni, principali costituenti dei raggi cosmici. Inoltre, interagendo debolmente, possono attraversare indisturbati grandi distanze e dense quantità di materia che può circondare le sorgenti di neutrini stesse. Queste caratteristiche fanno dei neutrini un'ottima sonda per esplorare zone ancora ignote dell'Universo e identificare in modo chiaro, come un telescopio, le sorgenti di neutrini.

Nei primi anni del 2000 si cominciò a definire la volontà di costruire un rivelatore di volume dell'ordine del km^3 nel mar Mediterraneo e si costituì con questo scopo in Italia la collaborazione NEMO a cui io ho partecipato sin dalla suo inizio.

Già due grosse collaborazioni operavano nel Mediterraneo. La prima ANTARES con un piccolo rivelatore (dell'ordine di un centesimo di km^3) che in quegli anni era in fase di costruzione al largo delle coste di Tolone ed un'altra NESTOR che ambiva a costruire un rivelatore al largo delle coste greche di Pylos. Negli stessi anni era stata avviata la costruzione del rivelatore IceCube al Polo Sud. A causa della sua posizione IceCube ha la visibilità, con basse soglie in energia, del solo cielo Nord. Un rivelatore posto nel mar Mediterraneo risulta invece complementare e può osservare gran parte del piano galattico con soglie basse in energie e quindi con ottima sensibilità.

Alla fine dello scorso decennio le tre collaborazione NEMO, ANTARES e NESTOR sono confluite nella collaborazione europea KM3NeT. La mia attività è stata svolta all'interno delle collaborazioni ANTARES, NEMO e KM3NeT.

Attualmente sono coordinatrice all'interno della collaborazione KM3NeT del working group "Neutrino Astronomy". Questo working group ha il compito di valutare tramite simulazioni Monte Carlo le prestazioni del rivelatore per le principali sorgenti di neutrini e per flussi diffusi. Inoltre nel Dicembre 2015 sono stata nominata da KM3NeT coordinatrice del working group "DU Data Analysis" che si occupa dell'analisi dei dati di KM3NeT.

Curriculum vitae et studiorum

Nata a Catania il 14 Febbraio 1961

12/1984	Consegue la laurea in Fisica indirizzo applicativo (orientamento nucleare) presso l'Università degli studi di Catania con voti 110/110 e lode discutendo la tesi "Studio dei frammenti del proiettile prodotti nella reazione $^{40}\text{Ar} + ^{\text{nat}}\text{Ti}$ a 44 MeV/A" relatori Prof. Lo Nigro e Dott. G. Lanzanò.
1985-1986	Dal 1° Ottobre 1985 al 30 Giugno 1986 ha usufruito della borsa di studio presso il C.E.N. di Saclay (Francia)
1986-1988	Dal 1° Luglio 1986 al 30 Giugno 1988 è borsista dell'INFN presso i Laboratori Nazionali del Sud.
9/1988	Dal 15 Settembre 1988 è dipendente dell'INFN presso i Laboratori Nazionali del Sud
11/2003	Dichiarata vincitrice del concorso 9725/2003 per il profilo di primo ricercatore INFN - II livello professionale
2/2006	Inquadrata in prova nel profilo di Primo Ricercatore di II livello professionale con decorrenza dal 16-12-2005

Incarichi e responsabilità

1994-1997	Responsabile locale presso i LNS della linea di ricerca DYNAMICS in seno alla commissione Scientifica Nazionale III
1999	Responsabile locale presso i LNS della linea di ricerca OUVERTURE in seno alla commissione Scientifica Nazionale III
2000- 2002	Responsabile locale presso i LNS della linea di ricerca FORWARD in seno alla commissione Scientifica Nazionale III
2003	Responsabile locale presso i LNS della linea di ricerca ISOSPIN in seno alla commissione Scientifica Nazionale III
2007-2013	Rappresentante del Personale ricercatore dipendente o dotato di incarico di ricerca in seno al Consiglio direttivo dei Laboratori Nazionali del Sud e membro del Consiglio di Laboratorio (LNS).
2007-2009	Membro della commissione per il conferimento degli assegni di ricerca presso i Laboratori Nazionali del Sud.
4/2007	Nominata membro della commissione esaminatrice del concorso INFN 6N/T3/STR per l'assunzione di personale a tempo determinato con profilo di Tecnologo di III livello
4/2007	Nominata membro della commissione esaminatrice del concorso INFN 7N/T3/MAC per l'assunzione di personale a tempo determinato con profilo di Tecnologo di III livello
2007	Responsabile Unico del Procedimento (R.U.P.) presso i Laboratori Nazionali del Sud
2008-2012	Responsabile locale presso i LNS della linea di ricerca ANTARES in seno alla commissione Scientifica Nazionale II
2008-2012	Membro dell'Institution Board della collaborazione ANTARES in rappresentanza dei LNS
11/2008	Nominata membro della commissione esaminatrice della selezione riservata al personale dei profili di tecnologo stabilizzante presso l'INFN
2009-2012	Membro del Publication Committee all'interno della collaborazione internazionale ANTARES
2010-2012	Membro del Comitato Unico di Garanzia dell'INFN. Dimessa dalla carica il 11-12-2012.
2012-2015	Eletta Physics Coordinator di KM3NeT-Italia
2012	Nominata dal management di KM3NeT coordinatrice del gruppo di lavoro "High Energy Astrophysics"
11/2012	Eletta chairperson dell'Institution Board della collaborazione ANTARES. L'incarico ha una durata triennale.

2012-2014	Responsabile del corso di formazione “Una nuova frontiera per la ricerca: gli osservatori sottomarini” Progetto di formazione specialistica per la creazione di figure professionali con competenze in ambito scientifico tecnico-scientifico e manageriale. PON Ricerca e Competitività 2007-2013 (bando MIUR 254/ric)
2014	Nominata dal management di KM3NeT coordinatrice dell’analisi dati del prototipo della stringa (PPM-DU) di KM3NeT
12/2015	Nominata dal management di KM3NeT coordinatrice dell’analisi dati di KM3NeT-ARCA
11/2015	Facente parte del progetto ASTERICS dal Novembre 2015 all’interno del WP3 OBELICS

Attività didattica e di tutoring

1997-1998	Relatore della tesi del Dott. P. Ventura “Le emissioni di pre-equilibrio nelle collisioni tra ioni pesanti alle energie intermedie”
2001	Nominata dal consiglio di corso di laurea in Ingegneria elettrica dell’Università di Catania cultore della materia ed ha partecipato alla commissione per gli esami di profitto di Fisica I. Ha collaborato al corso integrativo di Fisica I per gli studenti del corso di laurea in Ingegneria Elettrica dell’Università di catania
2001/2002	Ha collaborato al corso di Fisica Sperimentale I (laurea in Ingegneria Informatica presso l’Università degli studi di Catania.) tenendo il corso di esercitazioni.
2002/2003	Correlatore del lavoro di tesi di laurea del Dott. A. Rizzo dal titolo “Effetti delle caratteristiche del sito sulle prestazioni di un telescopio sottomarino per neutrini di alta energia”
2008-2011	Supervisore della tesi di dottorato del Dott.ssa V. Giordano dal titolo “Statistical methods for the search of high energy neutrinos from galactic sources in KM3NeT and ANTARES telescopes” XXIV ciclo dell’ International Ph.D in Nuclear and Particle Astrophysics” dell’Università di Catania Scuola superiore di Catania.
2004-2005	Correlatore del lavoro di tesi di laurea del Dott.ssa A. Calanna dal titolo “Studio delle prestazioni di un telescopio sottomarino per neutrini di energia dell’ordine del TeV”
2008-2009	Tutor della Dott. R. Calcagno contrattista consorzio COMETA
2008-2009	Correlatore del lavoro di tesi di laurea della Dott.ssa A. Trovato dal titolo “Ottimizzazione delle prestazioni del telescopio per neutrini KM3NeT”
2009-2011	Supervisore della tesi di Dottorato del Dott. D. Lattuada dal titolo “Discovering the dark side of the Universe with neutrinos”
2010-2013	Tutor della tesi di dottorato del Dott.ssa A. Trovato dal titolo “Development of a reconstruction algorithms for large volume neutrino telescope and their application to KM3NeT detector” XXVI ciclo dell’ International Ph.D in Nuclear and Particle Astrophysics” dell’Università di Catania - Scuola superiore di Catania.
2014-2015	Correlatore del lavoro di tesi di laurea della Dott.ssa G. Ferrara dal titolo “Evaluation of the discovery potential of neutrino fluxes from Active galactic Nuclei with the KM3NeT detector”
2015	Tutor del lavoro di tesi di dottorato della Dott.ssa M. Durocher. La Dott.ssa M. Durocher è un PhD student del GSSI dell’Aquila
2015	Facente parte del “GNN Prize Committee” commissione internazionale GNN (Global Neutrino Network) per l’assegnazione di un premio per la migliore tesi di dottorato
2013- 2016	Tutor del Dott. Vladimir Kulikovskiy vincitore di una borsa postdoc per fisici sperimentalisti per stranieri da svolgere presso i LNS nell’ambito della collaborazione KM3NeT
2016	Facente parte del “GNN Prize Committee” commissione internazionale GNN (Global Neutrino Network) per l’assegnazione di un premio per la migliore tesi di dottorato.

Presentazioni a conferenze e seminari

- 1/1992 Presenta nell'ambito del "XXX International Winter Meeting on Nuclear Physics" tenutosi a Bormio, il contributo orale dal titolo "MEDEA: a 4p Multi Element Detector Array for γ -rays and light charged particles at the LNS-Catania"
- 4/1993 Presenta nell'ambito di un workshop sulle emissioni di pre-equilibrio tenutosi a Milano, una relazione dal titolo " Studio del meccanismo di produzione di protoni veloci nelle reazioni indotte da fasci di ^{40}Ar e ^{132}Xe a 44 MeV/A"
- 10/1995 Presenta una relazione su invito al LXXXI Congresso Nazionale della Società Italiana di Fisica, tenutosi a Perugia, dal titolo "Emissione di pre-equilibrio in reazioni fra ioni pesanti alle energie intermedie"
- 1/1996 Presenta nell'ambito del workshop "LNShow" tenutosi presso i LNS, una relazione dal titolo "Emissione di pre-equilibrio in reazioni fra ioni pesanti"
- 10/1997 Presenta nell'ambito dell "ECT* Workshop on photons Probing Dynamics in Simple Systems (N-N and p-A Bremsstrahlung)" tenutosi a Trento, una relazione dal titolo "Emission of photons and protons with energies well above the kinematical limit in heavy-ion reaction at intermediate energie"
- 6/2000 Presenta una relazione su invito alla conferenza internazionale "Bologna 2000 – Structure of the nucleus at the down of the century" dal titolo "Energetic proton emission and reaction dynamics in heavy ion reactions close to the Fermi Energy"
- 7/2001 Presenta una relazione alla conferenza internazionale INPC 2001 tenutasi a Berkeley (U.S.A.) dal titolo "Hard gamma and energetic photons as probes of nuclear dynamcis"
- 9/2001 E' stata invitata a tenere una relazione su invito dal titolo "Hard gammas and energetic photons as probes of nuclear dynamics" alla "IV latin American Symposium on Nuclear Physics" tenutasi a Citta del Messico.
- 6/2002 Presenta una breve relazione su invito alla conferenza internazionale "Nuclear Chemistry Gordon Conference", tenutasi a New London (U.S.A.), dal titolo "Energetic proton production"
- 2/2005 Presenta una relazione all' "International Workshop on a Very Large Volume Neutrino Telescope for the Mediterranean (VLVnT02)" tenutosi a Catania dal titolo "Effects of architectural and environmental issues on a km³ detector"
- 2005 Nel comitato organizzatore locale dell' "International Workshop on a Very Large Volume Neutrino Telescope for the Mediterranean (VLVnT02)" tenutosi a Catania dall'8 all'11 Novembre 2005
- 9/2005 Presenta una relazione al "9th International Conference on Topics in Astroparticle and Underground Physics (TAUP2005)" tenutosi a Saragoza (Spain) dal titolo "Status Report on NEMO"
- 2006 Editore dei proceeding del "2nd Internazional Workshop on very large Volume Neutrino Telescope (VLVnT02)" pubblicati su Nucler Instrument and Method 567 Novembre 15, 2006.
- 9/2006 Presenta una relazione alla conferenza internazionale "Neutrino Oscillation Workshop (NOW2006)" tenutasi a Conca Specchiulla (Otranto, Lecce, Italy) dal titolo "Status of the NEMO project"
- 2/2007 Presenta una relazione al "Workshop on Nuclear and Neutrino Astrophysics (WNNA)" tenutosi a Catania dal titolo "Study of the performance of an underwater km³ neutrino telescope"
- 4/2008 Presenta una relazione alla conferenza internazionale "VLVnT08 International Workshop on a Very Large Volume Neutrino Telescope for the Mediterranean Sea" tenutasi a Tolone (France) dal titolo "KM3NeT: Optimization studies for a cubic kilometer neutrino detector"
- 1/2009 Invitata a tenere un seminario presso il Liceo Scientifico Boggialera di Catania dal titolo "La fisica astroparticellare: un nuovo modo di guardare l'Universo"
- 10/2009 Presenta una relazione alla conferenza internazionale "VLVnT09 International Workshop on a Very Large Volume Neutrino Telescope for the Mediterranean Sea"

	tenutasi ad Atene (Grecia) dal titolo “Study of the sensitivity to point-like neutrino sources for a flexible-tower geometry for KM3NeT”
7/2010	Presenta una relazione alla conferenza internazionale “TeV Particle Astrophysics 2010” tenutasi a Parigi (Francia) dal titolo “KM3NeT: a project for an underwater cubic kilometre neutrino telescope”.
9/2010	Presenta una relazione alla conferenza internazionale “SciNeGHE 2010 8th Workshop on Science with the New Generation of High Energy Gamma-ray Experiments” tenutasi a Trieste dal titolo “First results of the ANTARES neutrino telescope”
4/2011	Presenta una <u>relazione su invito</u> al workshop “From Neutrino to multimessanger astronomy: status and perspectives” tenutasi a Marsiglia (Francia) dal titolo “KM3NeT:status and performance”
9/2011	<u>Coordinatrice della sessione</u> “Fermi Bubble/estended sources” al workshop MANTS2011 (Mediterranean Antarctic Neutrino Telescope Symposium) tenutosi a Uppsala (Svezia)
9/2011	Presenta una relazione al workshop Mediterranean Antarctic Neutrino Telescope Symposium (MANTS2011) tenutosi a Uppsala (Svezia) dal titolo “Fermi bubbles and extended sources”.
10/2011	Presenta una relazione al “Very Large Volume Neutrino Telescope Workshop (VLVnT11)” tenutosi a Erlangen (Germany) dal titolo “The KM3NeT high energy neutrino telescope and Fermi bubbles: some predictions”
11/2011	Tiene delle lezioni alla scuola nazionale “Methods of Analysis for Physics in Space, Earth and Sea (MAPSES)” tenutosi a Lecce (Italy) dal titolo “Tecniche di analisi per la ricerca di neutrini di alta energia di origine cosmica”
11/2011	Presenta una relazione al “International workshop on high energy geophysics: muon and neutrinos” tenutosi a Tokio (Giappone) dal titolo “ANTARES: the first operational neutrino telescope in the Mediterranean sea”.
7/2013	Presenta una relazione all’ “International Cosmic Ray Conference (ICRC2013)” tenutosi a Rio De Janeiro (Brasile) dal titolo “KM3NeT detection capability for high-energy neutrinos from the Fermi bubbles”
8/2013	Presenta una relazione al “Very Large Volume Neutrino Telescope Workshop (VLVnT13)” tenutosi a Stoccolma (Svezia) dal titolo “Sensitivity of the KM3NeT detector to a neutrino flux from the Fermi Bubbles”
9/2013	Presenta una relazione al “13th International Conference on Topics in Astroparticle and Undergrouns Physics (TAUP2013)” tenutosi a Asilomar California (U.S.A.) dal titolo “Status of the KM3NeT project”
10/2013	Presenta una relazione al workshop “Mediterranean Antartic Neutrino Telescope Symposium (MANTS2013)” tenutosi a Wurzburg (Germania) dal titolo “KM3NeT and diffuse flux: preliminary results”
5/2014	Tiene una lezione alla scuola nazionale “XI Seminar on software for Nuclear, Subnuclear and Applied Physics” tenutosi ad Alghero dal titolo “Monte Carlo simulations and data analysis technics for high energy neutrino detectors”
9/2014	Presenta una relazione al “24 th European Cosmic Ray Symposium (ECRS14)” tenutosi a Kiel (Germania) dal titolo “The KM3NeT project”.
10/2014	Nel comitato organizzatore locale della conferenza “The Roma International Conference on Astroparticle Physics (RICAP-14)” che si è tenuta a Noto dal 30 Settembre al 3 Ottobre.
10/2014	Invitata al workshop “Multiple Messengers and Challenges in Astroparticle Physics” organizzato nell’ambito del GSSI dell’ Università dell’Aquila che si è tenuto presso il Laboratorio Nazionale del Gran Sasso
9/2014	Fa parte del gruppo di lavoro <u>“Figure of Merit”</u> al workshop “Mediterranean Antarctic Neutrino Telescope Symposium (MANTS2014)” tenutosi al CERN (Germania) e presenta una relazione riassuntiva del lavoro del gruppo di lavoro dal titolo: “Figure of Merit: point-like sources”.
11/2014	Tiene un seminario dal titolo “Detectors for underwater experiments” al IV Seminario Nazionale Rivelatori Innovativi tenutosi a Catania il 10-14 Novembre 2014
12/2014	Presenta una relazione dal titolo “KM3NeT” alla riunione di “What next: Oscillazioni di Neutrino” tenutasi a Padova il 1 e 2 Dicembre 2014

- 9/2015 Presenta la relazione su invito al “Very Large Volume Neutrino Telescope Workshop (VLVnT15)” tenutosi a Roma dal 14 al 16 Settembre dal titolo “KM3NeT-ARCA project status and plans”
- 9/2015 Coordinatrice della sessione “Physics results” alla conferenza Very Large Volume Neutrino Telescope Workshop (VLVnT15)” tenutosi a Roma dal 14 al 16 Settembre.
- 9/2016 Presenta una relazione al “25th European Cosmic Ray Symposium (ECRS16)” tenutosi a Torino (Italy) dal titolo “High-energy neutrino astronomy with KM3NeT/ARCA”.
- 9/2016 Fa parte del gruppo di organizzatore del workshop “Mediterranean Antarctic Neutrino Telescope Symposium (MANTS2016)” tenutosi al Maintz (Germania) e presenta una relazione dal titolo: “KM3NeT/ARCA prospect”.
- 11/2016 Tiene una relazione su invtio dal titolo “KM3NeT muography project” al workshop “Mugraphers 2016” tenutosi a Tokyo Japan il 7 Novembre 2016
- 7/2017 Presenta una relazione dal titolo “The KM3NeT detection capability to a diffuse flux of cosmic neutrinos” al 35Th International Cosmic ray Conference (ICRC2017) tenutosi a Busan (Corea) il 12-20 Luglio 2017.
- 9/2017 Fa parte del gruppo di organizzatore del workshop “Mediterranean Antarctic Neutrino Telescope Symposium (MANTS2017)” tenutosi al Marseille (Germania).

Marisa Gulino

CURRICULUM VITAE ET STUDIORUM

Dati Personalii:

Data nascita: 11 settembre 1973 Catania, Italy
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telefono: +39.095.7916103 Cellulare: +39.340.9851204
e-mail: gulino@lns.infn.it
Spoken languages: Italian (native), English (fluent), French (fair)

Attuale posizione accademica:

Professore Associato dal 16/04/2014
Settore scientifico disciplinare: FIS/01 - Fisica sperimentale
Sede universitaria: UKE - Università Kore di ENNA - Facoltà di INGEGNERIA e ARCHITETTURA
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&
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Titoli di Studio:

- Laurea in Fisica v.o.: esame sostenuto con voti 110/110 e lode presso il Dipartimento di Fisica, Università degli Studi di Catania, Italia, il 23 luglio 1996. Titolo della tesi: "Rivelazione di K+ con lo spettrometro CLAMSUD in reazioni p-nucleo a 1.2 GeV" dal 23-07-1996 al 23-07-1996
- Dottorato di Ricerca in Fisica: esame sostenuto "cum laude" presso il Dipartimento di Fisica, Università degli Studi di Catania, Italia, il 9 febbraio 2000. - Titolo della tesi: "Produzione di stranezza in collisioni tra ioni pesanti ad energie ultra-relativistiche" dal 01-11-1996 al 09-02-2000

Posizioni accademiche ricoperte

- Ricercatore Post-Doc alla Katholieke Universiteit Leuven, Leuven, Belgio (1 settembre 2000 – 31 agosto 2002, sospeso il 30 aprile 2002 causa maternità) dal 01-09-2000 al 30-04-2002
- Titolare di assegno per la collaborazione alla ricerca presso l'Università degli Studi di Catania, Dipartimento di Metodologie Chimiche e Fisiche per l'Ingegneria, Catania, Italia. Programma di ricerca: "Metodi sperimentali per lo studio dell'interazione di campi elettromagnetici con i sistemi biologici" dal 03-06-2002 al 02-06-2006
- Cultore della Materia per il settore scientifico disciplinare FIS/01 Fisica Sperimentale Secondo nomina all'unanimità del CAD in Ingegneria Informatica, dal 12-07-2002 a oggi
- Professore a contratto del settore scientifico disciplinare FIS/01-Fisica Sperimentale presso la Facoltà di Ingegneria dell'Università di Catania A.A. 2004-05, 2005-06, 2006-

07, 2007-08, 2008-09

- Titolare di assegno per la collaborazione alla ricerca presso l'Università degli Studi di Catania Dipartimento di Metodologie Chimiche e Fisiche per l'Ingegneria, Catania, Italia. Programma di ricerca: "Metodi sperimentali per lo studio dell'interazione di campi elettromagnetici con i sistemi biologici" (3 giugno 2006 - 2 giugno 2008, data effettiva di fine contratto 2 novembre 2008 per maternità) dal 03-06-2006 al 02-11-2008
- Ha acquisito il giudizio d'idoneità per l'eventuale costituzione di rapporti di lavoro a tempo determinato di personale ricercatore di III livello presso l'Istituto Nazionale di Fisica Nucleare (INFN), tramite superamento di concorso nazionale (Bando N 13153/2009)
- Titolare di assegno per la collaborazione alla ricerca presso l'Università degli Studi di Catania, Dipartimento di Metodologie Chimiche e Fisiche per l'Ingegneria, Catania, Italia. Programma di ricerca: "Imaging a singolo fotone mediante matrici di SPAD – Single Photon Avalanche Diode" dal 01-04-2009 al 31-03-2011
- Professore a contratto del settore scientifico disciplinare FIS/03–Fisica della Materia presso la Facoltà di Ingegneria dell'Università di Catania A.A.2009-10 dal 01-10-2009 al 30-09-2010
- Ha superato le prove per il concorso nazionale per n. 4 posti di ricercatore di III livello a tempo indeterminato presso l'INFN per il settore Fisica Nucleare, Gruppo III (Bando N.13707/2010) dal 01-01-2010 a oggi
- Ricercatore a tempo determinato (art.1 comma14 L.230/05) con funzioni di Assistant Professor per il SSD FIS/01 presso la Facoltà di Ingegneria e Architettura della Università degli Studi di Enna "Kore" dal 01-10-2011 al 15-04-2014

Argomenti di ricerca

- Fisica Nucleare
- Astrofisica Nucleare
- Biofisica

Pubblicazioni scientifiche:

- più di 150 ISI-Web of Science Scientific Journals Publications,
- contributi a diverse conferenze internazionali

Esperienze didattiche:

- Partecipazione al collegio dei docenti del dottorato di ricerca in: "INFRASTRUTTURE CIVILI PER IL TERRITORIO" Ateneo proponente: UKE - Universita` Kore di ENNA dal 01-04-2014 a oggi
- Membro della commissione di esame finale per il conseguimento del titolo di Dottore di Ricerca in Fisica XXVII Ciclo presso l'Università degli Studi di Catania dal 16-02-2015 al 16-02-2015
- Professore di Fisica Generale per i corsi di studio in Ing. Informatica, Ing. Civile e Ambientale e Ing. Aerospaziale, Università degli Studi di Enna "Kore", Italy dal 2011 ad oggi
- Professore a contratto del settore scientifico disciplinare FIS-01–Fisica Sperimentale presso la Facoltà di Ingegneria dell'Università di Catania A.A. 2004-05
- Docente degli insegnamenti "*Campi elettromagnetici e Metodi di misura di C.E.M. derivanti da attività antropiche*" nel Corso IFTS: "Sistemi di produzione con certificazione ambientale (ISO 9000 e ISO 14000) con particolare riferimento all'inquinamento elettromagnetico".

2005 Codice Progetto: 1999.IT.16.1.PO.011/3.07/9.2.14/0113

2006 Codice Progetto: 1999 IT 16 1 PO 011/3.07 / 9.2.14 / 0275

- Attività di tutoraggio per gli insegnamenti di *Fisica Sperimentale I e Fisica Sperimentale II* presso la Facoltà di Ingegneria, Università degli Studi di Catania

Affiliazioni:

- Visiting Scientist presso il Radioactive Isotope Physics Laboratory, Riken Nishina Center for Accelerator-Based Science (RNC), Wako, Saitama, Japan; Research Group Leader: Prof. Hirotoshi Sakurai dal 01-10-2015 a oggi
- Istituto Nazionale di Fisica Nucleare (INFN), Laboratori Nazionali del Sud, (LNS), Italy dal 1-1-2002 a oggi
- Centre de Recherches du Cyclotron (CRC), Louvain la Neuve, Belgium dal 1-9-2000 al 31-12 2002
- CERN EP-Division dal 1-11-1996 al 31-12-2002
- Istituto Nazionale di Fisica Nucleare (INFN), Sezione di Catania, Italy dal 1995 al 2000
- The Svedberg Laboratory (TSL), Uppsala, Sweden dal 1995 al 1999
- "Cyclotron Institute -Texas A&M University - College Station - USA" (03/2005) dal 01-03-2005 a oggi
- "Acad Sci Czech Republic, Inst Nucl Phys, CZ-25068 Rez, Czech Republic" dal 05-05-2005 a oggi
- "ATOMKY, Institute of Nuclear Research, Debrecen, Hungary" (11/2005) dal 01-11-2005 a oggi
- "Florida State University, Dept Phys, Tallahassee, FL32306 USA" dal 01-01-2009 a oggi
- "Rudjer Boskovic Institut", Zagreb, Croazia dal 01-01-2014 a oggi

Referee for:

- Materials Science and Engineering B - ELSEVIER
- Journal of Photochemistry and Photobiology B: Biology – ELSEVIER
- Journal of Physics G: Nuclear and Particle Physics - IOP PUBLISHING

Collaborazioni internazionali:

Université Catholique de Louvain, Louvain la Neuve, Belgium; Katholieke Universiteit Leuven, Leuven, Belgium; Åbo Akademi, Turku, Finland; Università di Jyväskylä, Jyväskylä, Finland; Institut de Recherches Subatomiques, IN2P3/ULP, Strasbourg, France; Technische Universität Darmstadt, Darmstadt, Germany; Universitetet i Bergen, Bergen, Norway; University of Oslo, Oslo, Norway; Utrecht University, Utrecht, The Netherlands; University of Birmingham, Birmingham, UK; Joint Institute of Nuclear Research, Dubna, Russia; Kurchatov Institute, Moscow, Russia; Nuclear Physics Institute of Czech Academy of Sciences, Prague-Rez, Czech Republic; ATOMKI Institute of Nuclear Research, Debrecen, Hungary; Instituto de Estructura de la Materia, Madrid, Spain; University of Uppsala, Uppsala, Sweden; University of Notre Dame, Notre Dame, Indiana (USA); University of South Carolina, Columbia, South Carolina (USA); Texas A&M University, College Station, Texas (USA); Laboratory for Fluorescence Dynamics, University of California, Irvine, California (USA); Department of Bioengineering, University of Washington, Seattle, Washington (USA); RIKEN, Wako Institute, Wako (Japan).

Partecipazione a progetti ammessi a finanziamento:

- Partecipazione al progetto P.O.R. Sicilia 2000-2006 - Misura 3.15: Reti per lo sviluppo della ricerca scientifica - Sottrazione C: Potenziamento delle infrastrutture e laboratori esistenti - "Misura dei livelli di radiazione elettromagnetica presenti nel territorio e realizzazione di un apparato mobile di rivelazione dei campi elettromagnetici" dal 01-01-2006 al 01-01-2009
- Partecipazione al progetto P.O.R. Sicilia 2000-2006 - Misura 3.15: Reti per lo sviluppo della ricerca scientifica - Sottrazione C: Potenziamento delle infrastrutture e laboratori esistenti - "Luminescenza fotoindotta e inquinamento ambientale: una nuova metodica per l'analisi dell'inquinamento delle acque" dal 01-01-2006 al 01-01-2009
- Partecipazione al PRIN 2008: Il recettore per la transferrina di tipo I: un potenziale biomarker per nuove strategie diagnostiche e terapeutiche nei tumori della tiroide. dal 01-01-2008 al 31-12-2010
- Partecipazione al Progetto finanziato su FONDO EUROPEO DI SVILUPPO REGIONALE (FESR) 2007/2013 - Asse: Diff. della ricerca, dell'innov. e della soc. dell'informazione. Progetto ECOSINERGIA CUP: G63F11001380004 – "Realizzazione di sistemi innovativi per l'energia rinnovabile" (durata 21 mesi) dal 08-02-2012 al 04-12-2013
- Partecipazione al progetto PON R&C Asse II - Azioni integrate per lo sviluppo sostenibile e la diffusione della società dell'informazione - Linea intervento: Smart Cities – Progetto SINERGREEN CUP: J71H12000010005 - "Produzione e gestione dell'energia, reti di distribuzione e storage a scala locale" (durata 36 mesi) dal 01-11-2012 al 30-11-2015
- Responsabile locale per i Laboratori Nazionali del Sud dell'esperimento INFN della Commissione 3 ASFIN2 dal 01-01-2016 a oggi

Responsabilità di coordinamento di gruppi di ricerca:

- Portaparola dell'esperimento NOVAE presso i LNS-INFN Catania per lo studio della reazione $^{170}(\text{p},\alpha)^{14}\text{N}$ in collaborazione con: (1) C.S.N.S.M., Orsay, France; (2) I.P.N., Orsay, France; (3) CNS, The University of Tokyo, Japan; (4) Heavy Ion Nuclear Physics Lab., RIKEN, Wako, Japan; (5) Cyclotron Institute, Texas A&M Univ., USA dal 01-01-2006 al 31-12-2006
- Spokesperson dell'esperimento IENBIO presso i LNS-INFN, Catania, Italy per l'induzione di mutazioni genetiche in piante con l'uso dei fasci ionici, in collaborazione con: (1) Nishina Center, RIKEN, Wako, Japan (2) Photonics and Electronics Science and Engineering Center, Kyoto University, Japan dal 01-01-2009 al 31-12-2009
- Responsabile locale dell'esperimento INFN di GRUPPO 3 ASFIN2 dal 01-01-2016 a oggi
- Spokesperson dell'esperimento SIR: "A mutagenic program to improve tomato fruit quality" presso i LNS-INFN, Catania in Collaborazione con l'Università degli Studi di Milano

Short CV of Dr. Marco La Cognata

Education and scientific career

Since the time of my degree in Physics in 2003, about the indirect measurement of the ${}^3\text{He}(\text{d},\text{p}){}^4\text{He}$ reaction (accomplished with marks 110/110 cum laude) and since I defended my PhD on proton-induced fluorine destruction in stars (completed cum laude in 2007), I have been working in the field of nuclear astrophysics and low-energy nuclear reactions.

While I was a PhD student and during my post-doctoral position (2007-2010) at the INFN-Istituto Nazionale di Fisica Nucleare (on the measurement of low-energy nuclear reactions of astrophysical importance), I attended 16 national and international schools, including the INFN School on Nuclear and Subnuclear Physics, the Summer School in Cosmology and Astroparticle Physics organized by the International Centre for Theoretical Physics and the Euro Summer School on Exotic Beams.

Since 2010 I am INFN researcher, even if I was selected in 2010 as assistant professor at the Michigan State University (USA), at the National Superconductive Cyclotron Laboratory.

Research activity

My research activity is focused on three main lines:

1. Measurements of cross section of reaction of astrophysical importance at the energies of interest using indirect methods, namely, novel approaches developed to by-pass some issues in direct techniques preventing the access of astrophysical energies. I devised a new method allowing us to analyze resonant reactions, having a peculiar role in astrophysics, and extract resonance strengths right at astrophysical energies. Owing to their impact, the result was published in the Physical Review Letters (PRL 101, 152501 (2008), Impact Factor (I.F.) 8.462). Later, I proved the possibility to unify two widespread indirect approaches, the THM and the Asymptotic Normalization Coefficient (PRL 109, 232701 (2012)). The impact of this research activity is demonstrated by the number of invited talks on the subject and by the publication of review papers on Reports on Progress in Physics 77, 106901 (2014) (I.F. 14.311) and The European Physical Journal A (EPJA 52, 77 (2016)). Recently, our work on ${}^{12}\text{C}+{}^{12}\text{C}$ fusion where the THM, modified to analyze resonant reactions, have been applied to deduce the cross section at astrophysical energies, has been published in Nature as a Letter (Nature, Volume 557, Issue 7707, 31 May 2018, Pages 687-690, I.F. 40.137). In this work, I carried out a significant part of the theoretical analysis, as described in the paper (and being the third author).
2. Application of indirect methods to reactions induced by unstable nuclei. In these cases, direct investigations are even more complicated due to the lower beam intensities in comparison with the case of stable nuclei. In this framework, I have been responsible of the analysis of the first reaction measured in Italy using a post-accelerated short-lived radioactive ion beam, namely, the ${}^8\text{Li}(\text{a},\text{n}){}^{11}\text{B}$ (see, among others, the work in The Astrophysical Journal: APJ 736, 148 (2011), I.F. 5.533). Recently, I have analyzed direct and indirect measurements of the ${}^{18}\text{F}(\text{p},\text{a}){}^{15}\text{O}$ reaction using the R-matrix approach, to cast light on explosive nucleosynthesis in novae (APJ 846, 65 (2017))
3. Recently, the investigation of advanced burning stages in stars and of preexplosive conditions have triggered my interest in photodissociation reactions. In this framework, I have been P.I. of a research contract funded by the Extreme Light Infrastructure - Nuclear Physics (ELI-NP, project co-financed by the European Union with 180 million €) for the development, simulation and construction of a prototype of a high resolution, low-threshold 4pi silicon detector array. On this occasion, I led a team made up of seven collaborators (four from LNS and three from ELI-NP). The research program was

successfully completed and, in collaboration with the ELI-NP researchers the detector, named ELISSA, is under construction. The physics cases and the experimental setups are discussed in the review paper EPJA 51, 185 (2015)

Since 2001 I have been spokesperson of more than 20 experiments aiming at extracting cross sections of astrophysical importance using direct and indirect approaches. The experiments were carried out at Italian laboratories (in particular LNS and LNL) and at laboratories abroad such as RIKEN (Japan), Cyclotron Institute (Texas A&M University, USA), Institute for Structure and Nuclear Astrophysics (University of Notre Dame, USA), Florida State University (USA), Czech Academy of Sciences, ATOMKI (Hungary), RBI Zagreb (Croatia). On these occasions, I have lead experimental teams made up of Italian and foreign researchers, with a typical budget of 20-30 k€ and I have subsequently taken care of performing or supervising data analysis and results publication and dissemination.

Publications and talks

I have been author of 240 papers in international journals (first author of 47). I have collected a total of 2779 citations and my H-index is 36 (according to the Scopus database). Among the top ten cited papers, I am first author of five (third author of two and second author of another one), making it clear the pivotal personal contribution of my own work and ideas. Among the papers of which I am the first author, there are six letters in which I am the first/last author, demonstrating the impact and the novelty of my scientific production.

I have given 72 talks to national (10) and international (62) conferences. Among these 24 contributions are invited talks and one is a "Lectio Magistralis" given upon the receipt of the Zdzisaw Szymaski International Prize. In particular, I have been convener for the Nuclear Astrophysics session of the Third International SPES Workshop at INFN Laboratori Nazionali di Legnaro, outlining the astrophysics program to be carried out at the forthcoming Italian radioactive ion beam facility.

National and international recognitions

The impact of my scientific activity has determined a number of national and international recognitions. In detail, I have attained a positive judgment of eligibility as associate professor in the fields 02/A1 (Experimental Physics) and 02/C1 (Astronomy and Astrophysics), and as full professor in the field 02/A1 ("Abilitazione Scientifica Nazionale", 2012 and 2013 calls). In 2013 I have been recognized "outstanding scientist" by the Italian MIUR - Ministry of Education, University and Research ("Graduatoria Generale D.M. n. 828 del 17 ottobre 2013 - Riconoscimento e valorizzazione merito eccezionale").

From 1/2/2016 I am visiting scientist of the University of Texas at Austin (USA), focusing on the measurements of nuclear reactions occurring in laser-induced plasmas, and from 3/3/2017 I am visiting scientist at the Duke University (North Carolina, USA), working on photodissociation reactions in presupernova stages and during the big bang nucleosynthesis.

Institutional responsibilities

From 2010 to 2015 I was P.I. of the "FIRB-Futuro in Ricerca" project of the MIUR titled "Electron screening in fusion reactions", budget 816000 €. Two research units belonged to the project, one at LNS (13 researchers) and the other one at the Department of Physics and Astronomy of the University of Catania (4 researchers). From 2016 I am spokesperson of the ASFIN2 collaboration, an INFN group working in the field of nuclear astrophysics and made up of two units (LNS and Department of Physics and Geology of the University of Perugia) and 28 researchers in Italy.

The key role of the ASFIN2 collaboration in the field of nuclear astrophysics and of LNS is underscored by the award of a special grant by the MIUR ("progetto premiale") in 2012 of about 4.9 million €, to which I took part. Concerning EU funding, I am member of the working groups on the $^{22}\text{Na}(\text{a},\text{n})^{25}\text{Mg}$, $^{22}\text{Ne}(\text{a,g})^{26}\text{Mg}$ and $^{13}\text{C}(\text{a},\text{n})^{16}\text{O}$ reactions in the framework of the ChETEC COST action.

I have been member of the Local Organizing Committee of the "Fifth European Summer School on Experimental Nuclear Astrophysics" in 2009, of the National Nuclear Physics Conference in 2012 and scientific secretary of the "Sixth European Summer School on Experimental Nuclear Astrophysics" in 2011 (about 100 participants), of the "12th International Conference on Nucleus-Nucleus Collisions" in 2015 (about 300 participants) and of the "8th Nuclear Physics in Astrophysics" international conference in 2017 (about 200 participants). For the last three conferences, I was also editor of the conference proceedings.

Teaching activity

Even if I am research staff, I have also had special attention for teaching and training younger scientists. I have been adjunct professor of electromagnetism (Department of Engineering) from 2007 to 2010 and adjunct professor of applied physics (Department of Agriculture) from 2014 to 2016 at the University of Catania. I have been co-tutor of one diploma thesis and of one PhD thesis in the field of nuclear astrophysics at the University of Catania. In this University, I am presently member of the Scientific Board of the PhD program in Physics (from 2017).

Commissions of trust

I am referee of several international journals in the field of astrophysics and nuclear physics, in particular of "Nuclear Physics A" (Elsevier) of "Astrophysics and Space Science" (Springer), "The European Physical Journal A" (EDP, SIF and Springer) and "Research in Astronomy and Astrophysics" (IOP), and of international funding agencies: GAR (Grantová Agentura České Republiky) - Czech Science Foundation and "National Center of Science and Technology Evaluation" of the Ministry of Education and Science of Kazakhstan. I also am Review Editor of the Editorial Board of Nuclear Physics, a specialty of Frontiers in Physics open access journal series (www.frontiersin.org).

Outreach activity

From 2018, I am editor of the GIANTS newsletter and website devoted to the dissemination among the general public of the nuclear astrophysics activities and results by the Italian nuclear astrophysics groups.

National and international grants (as Principal Investigator)

I was principal investigator (PI) of the "FIRB Futuro in Ricerca" 2008 grant (see "Decreto Ministeriale 9 aprile 2010 n. 85/ric"), titled "Electron screening in fusion reactions" (CINECA code RBFR082838). The project received the maximum ranking by the international evaluation panel and in the following audition. The research team was organized in two units: the host institution and the main unit (of which I was responsible too) was INFN, made up of a total of 6 researchers. An associated unit was hosted by the University of Catania (8 researchers). The total budget of the project was 816 k€. The duration of the project was 60 months (1/12/2010-1/12/2015) and it was successfully completed by fulfilling all the milestones. The research program consisted in the measurement of 9 reactions, of the evaluation of the astrophysical impact and the development of the theoretical

framework. 87 publications, 6 talks at national conferences and 53 talks at international conferences represent the scientific outcome of the grant, besides outreach activities at local and national media as well as at schools and for the general public.

In the period 1/10/2014-31/7/2015 I was PI of the research contract: "Design of a large-area silicon array for nuclear astrophysics at ELI-NP" funded by the Horia Hulubei National Institute of Research (IFIN-HH) - Extreme Light Infrastructure - Nuclear Physics (ELI- NP), contract n. 4 (1/10/2014). Our purpose was the simulation, design and implementation of a 4pi silicon detector array and of the ancillary readout system, to be installed at the ELI-NP facility in Romania. Excluding hardware (supplied by ELI-NP) and manpower, the total budget of the project was 22.2 k€. The research team was made up of 4 Italian and 3 Romanian researchers. The project was successfully completed and a prototype was very positively tested at LNS.

National and international acknowledgments

Before the completion of my university and PhD courses, I received many prizes as outstanding student:

2002 - I was awarded the "Rosario Toscano Scuderi prize" as best student of the University of Catania
2005 - I received the "Prof. Renato Ricamo award" by the Italian Physical Society (SIF). The prize was awarded to young researches for their activity in the field of experimental physics. 2008 - I was given the Gioenia Academy prize. The prize was awarded to one young outstanding scientist for research in every field of Science.

2013 - I have been recognized Researcher of "outstanding merit" ("di merito eccezionale") according to the "Graduatoria Generale D.M. n. 828 del 17 ottobre 2013 - Riconoscimento e valorizzazione merito eccezionale", by the CEPR committee created by the Italian Ministry of Education, University and Research ("Nota del MIUR del 17 giugno 2014 n. 13484, come da deliberazione n. 13326 del Consiglio Direttivo dell'INFN").

2017 - I received the Zdzisaw Szymaski Prize. It is awarded every second year to one individual (no older than 41 in the year of the awarded Prize) for outstanding accomplishments in the area of theoretical or experimental studies of the properties of atomic nuclei, by the Dean of the Faculty of Physics of the Warsaw University, based on the recommendations of the Selection Committee of the Prize. Both participants and Selection Committee members belong to international nuclear physics Institutions. The Prize has been continuously assigned since 2002. In 2017, The Prize was awarded "in recognition of his contributions to the field of experimental studies of nuclear reactions of astrophysical relevance, in particular for developing extensions of the Trojan Horse Method to resonant reactions, including subthreshold resonances." On the occasion of the receipt of the prize, at the XXXV MAZURIAN LAKES CONFERENCE ON PHYSICS, I gave a Lectio Magistralis titled "Nuclear astrophysics and resonant reactions: exploring the threshold region with the Trojan Horse Method".

June 23, 2018

Curriculum Vitae – David Mascali

Personal Information

Name: **David Mascali**

Nationality: Italian

Date and place of birth: 23/07/1981, Catania - Italy;

Date of PhD: 12/02/2009

Email address: davidmascali@lns.infn.it

Residence: Via Felice Magrì 49, 95123 Santa Maria di Licodia (CT)

Professional record

01/02/2017 →	Full Staff Researcher (Ricercatore a Tempo Indeterminato) at Istituto Nazionale di Fisica Nucleare – Laboratori Nazionali del Sud
01/07/2015 – 31/01/2017	Temporary staff Researcher at INFN-LNS – RTD (until July 2017) at INFN-LNS, Catania in the framework of the ESS – European Spallation Source activities;
02/06/2013 – 01/06/2015	Temporary staff Researcher at INFN-LNS – RTD, Catania in the framework of the ESS – European Spallation Source activities;
03/09/2012 – 02/06/2013	Temporary staff Researcher at INFN-LNS – RTD, supported by EU funds in the framework of the European Collaboration ENSAR-ARES-JRA01; 01/01/2012
03/09/2010 – 02/09/2012	Post-Doctorate fellow at INFN-LNS, Catania, Italy
01/09/2009 – 31/08/2010	Post-Doctorate fellow at CSFNSM – Centro Siciliano di Fisica Nucleare e Struttura della Materia, Catania, Italy;
01/02/2006 – 11/02/2009	PhD fellow University of Catania;
24/01/2005 – 23/01/2006	Under-graduate fellow, supported by INFN;

Education

- **Feb. 2009** PhD in Physics “cum laude”, University of Catania. Tutor: Prof. S. Barbarino. Co-tutor: Dr. S. Gammino. Final dissertation title: “A new approach to the study of the ECR-Heating and Particle Dynamics in the plasma of Electron Cyclotron Resonance Ion Sources”.
- **Oct. 2005** Master Degree in Physics “cum laude”, University of Catania.

Research Topics

Plasma Based Ion sources; Microwave-plasma interaction; Electron Cyclotron Resonance Ion Sources; Plasma and ion beams diagnostics methods; laser-matter and laser plasma interaction, multidisciplinary applications of plasmas in nuclear physics, material analysis, energy. RF based plasma diagnostics methods, plasma immersed probes (Langmuir Probe) and plasma-emitted radiation diagnostics (OES, X/ γ ray detectors, interferometers). Simulation and modelling: plasma dynamics (heating, confinement) by MATLAB and FEM solvers, PIC/MC methods.

Prizes and Awards

- **2012** **International “Richard Geller Prize”, Sydney, Australia**, as the best young scientist (<41 years old) producing worldwide outstanding results in the field of ECR Ion Sources science and technology;
- **2010** **“Francesco Resmini National Prize”, Firenze, Italy**, awarded by the INFN to the best Italian PhD thesis in the Accelerator Physics and related technology;
- **2005** **Fellowship by CERN, Genève, Switzerland**, supporting the participation to the “CERN Accelerator School” held in Zeegse, The Netherlands, from 24/05/2005 to 02/06/2005.

Institutional Responsibilities

- **Jan. 2016 to now** **Head of the Ion Beams Production Service**
Accelerators Division of INFN-LNS. [Budget: ~200 k€/year]
- **2016** **Referee of the 5th INFN National Committee**, with responsibility about the experiment: PLASMA4BEAM.
- **2014** **Member of the Public Engagement group of INFN-LNS**, co-organizer of the European Research Night, Catania, Sept. 2014
- **2013-2014** **Referee of the 5th INFN National Committee**, with responsibility about the experiments: COOLBEAM and BEAM4FUSION.

Project Leadership

- **2017-2018** **National responsible of the PANDORA experiment** [~180 k€]
Supported by V Nat. Comm. INFN;
Status: Started in Jan. 2017.
- **2017 – 2018** **Local responsible at LNS of the AMICI European network**
Supported by European Commission;

- **2015-2016** National responsible of the VESPRI experiment [~50 k€]
Supported by V Nat. Comm. INFN;
Status: ongoing, to be completed by the end of 2016.
- **2011-2013** LNS local responsible of the ESOPO experiment [~11 of tot. 48 k€]
Supported by V Nat. Comm. INFN; *Status: completed.*

Detailed Funding ID

Institutional Responsibilities:

2016 **Ion Beam Production Service – INFN-LNS (Accelerator Division):** 200k€/year
Topic: *Responsible of the ion injectors of the LNS Tandem and Cyclotron Accelerators. Routine operations and R&D; ordinary maintenance; team organization.*

Experiments with Role as funds Responsible:

2016 – 2018 INFN, **PANDORA** national experiment (CSN-V) 180 k€
(under approval)
Topic: *Feasibility study of a high performance plasma trap for nuclear decays observation and interdisciplinary research in astrophysics and archaeometry.*

2015 – 2016 INFN, **VESPRI** national experiment (CSN-V) 55 k€
Topic: *Design and construction of an ad-hoc microwave interferometer for plasma density measurements in ion sources based on the “frequency swept” technique.*

2011 – 2013 INFN, **ESOPO** national experiment (CSN-V) – loc. Resp. 11 (48 total) k€
Topic: *impact of electron beams provided by CNT based guns on the plasma density in microwave discharge ion sources.*

Other grants in which I had a leadership or major role in writing the project include:

- **2012-2013** – INFN, RDH-Utopia national experiment (CSN-V) 66 k€
Topic: *electromagnetic wave interaction with plasma and preliminary studies about generation of plasma waves in compact size machines.*
- **2009-2011** – NTA/INFN, HELIOS national experiment 210 k€
Topic: *generation of hot electron layers in high density plasmas of Electron Cyclotron Resonance Ion Sources under different values of power and frequencies of the pumping electromagnetic wave.*

Other grants obtained as member of research groups include:

- **2009-2011** – INFN, CANTES national experiment (CSN-V) 30 k€
Topic: *electron guns based on CNT for the enhancement of plasma density in Electron Cyclotron Resonance Ion Sources.*
- **2006-2009** – INFN national experiment INES (CSN-V) 160 k€
Topic: *innovative methods of electromagnetic waves coupling to plasmas of Electron Cyclotron Resonance Ion Sources.*
- **2002-2005** – INFN national experiment EDIPO (CSN-V) 30 k€
Topic: *improvement of plasma density by means of passive electron donors.*

European Projects and/or Collaborations where I work as member/contact person of research groups include:

- **2013-2015 ESS – European Spallation Source** 500 k€*
Role: responsible at LNS of the magnetic and RF system design of the Proton Source (PS-ESS); responsible about plasma modelling and diagnostics; experimental tests.
*funded by Italian government under European contract – Italian Ministry of Education, University and Research.
- **ENSAR-ARES collaboration EU – FP7/2007–2013** 150 k€
Role: responsible at LNS of plasma modelling and correlation between X-ray diagnostics and plasma ionisation and ion beam formation (Task 2).

Other funds:

F.A.I. Funds provided by INFN for international collaboration and invitation of foreign scientists: 6 k€ (proponent and responsible)
The proposal for the grant has been done in October 2012, assigned in January 2013, until March 2014. Invitation of Prof. F. Volpe from Columbia University – New York, and Prof. K. Wiesemann, Emeritus at the Ruhr University in Bochum, Germany.

Invited Talks

- 2016 [I1] **The 2nd Sicily-East Asia Workshop on Low-energy Nuclear Physics, Tokyo (Wako) – RIKEN 26-28 June 2016.**
Title: *“Compact traps for dense and hot plasmas: from ion sources to multidisciplinary research”*
- 2014 [I2] **Società Italiana di Fisica, 100° Congresso Nazionale, Pisa 22-26 Settembre 2014;**
Title: *“Research and development about innovative high intensity proton sources: the INFN-LNS contribution to the construction of the European Spallation Source facility”*
- 2013 [I3] **ENSAR Town Meeting, June 17-20, 2013 - Warsaw, Poland;**
Title: *“Investigation of plasma heating and multi-charged ions build-up in ECR plasmas”*

[I4] **XXI CONGRESSO AIV, Catania, 15-17 May 2013;**
Title: *“Application of plasma techniques to Archeometry, Polymers technology and Nuclear Physics”*
- 2012 [I5] **20th ECRIS Workshop, Australia, Sydney, September 26th 2012;**
“Geller Prize Ceremony”
Title: *“A “simple” model of ECRIS plasma”*
- 2011 [I6] **14th International Conference on Ion Sources (ICIS2011), Giardini Naxos (ME), Italy, September 12-16 2011;**
Title: *“Towards a better comprehension of Plasma formation and heating in Electron Cyclotron Resonance Ion Sources”*

[I7] **19th Topical Conference on Radio Frequency Power in Plasmas and**

the US Japan RF Physics Workshop
June 1-3, 2011, Newport (RI), USA;
Title: "RF heating of Electron Cyclotron Resonance Ion Sources plasmas"

Oral Presentations

- 2016 **[O1] Intense and powerful accelerator beams for industrial and energy application (IPAB 2016)**
March 14- 15 2016, Laboratori Nazionali di Legnaro, Legnaro (PD)
Title: "*Perspectives about the production of multiply-charged ions at high intensities: Innovative schemes of microwave-to-plasma matching*"
- 2015 **[O2] 16th International Conference on Ion Sources (ICIS2015);**
August 23-28, 2015 New YorkNew York City – USA
Title: "*Investigation of plasma heating and multi-charged ions build-up in ECR plasmas*"

[O3] Mini-workshop on Accelerators;
17 February 2015, INFN Laboratori Nazionali di Legnaro, Italy
Title: "*INFN contribution to ESS project*"
- 2013 **[O4] XCIX Congress of the Italian Physical Society;**
Trieste (Italy) September, 23-27, 2013
Title: "*Innovative plasma heating methods in compact magnetic traps and expected applications in multidisciplinary fields: Archaeometry, Nuclear Physics, Polymers Chemistry*"

[O5] 15th International Conference on Ion Sources (ICIS2013);
Chiba-Tokyo, Japan, 9th-13th September 2013
Title: "*X-ray spectroscopy of warm and hot electron components in the CAPRICE source plasma at GSI testbench*"
- 2012 **[O6] European Conference on X-ray Spectroscopy (EXRS-2012);**
18-22 June 2012, Vienna
Title: "*Preliminary investigation of X-ray emission from an innovative trap based on Bernstein waves heating*"
- 2010 **[O7] 19th International Workshop on ECR Ion Sources;**
Grenoble, France, August 23-26, 2010
Title: "*Some considerations about frequency tuning effect in ECRIS plasmas*"
- 2009 **[O8] 4th Workshop Plasma Production by Laser Ablation (PPLA);**
18-20 June 2009, Messina, Italy
Title: "*Numerical simulations of the ion capture process for laser generated plasmas interacting with electron cyclotron resonance ion sources*"

[O9] Congress of the Italian Physical Society;

28 Sept.-03 Oct. 2009, Bari (Italy).
Title: "Alternative plasma heating methods in ECR ion sources"

- 2007 [O10] 34th European Physical Society Conference on Plasma Physics;
Warsaw, Poland, July 2007.
Title: "Enhancement of the electron confinement and temperature by means of the Two Frequency Heating in ECR Ion Sources plasmas"
- 2006 [O11] 22nd Symposium on Plasma Physics and Technology;
SPPT 2006. Prague, June 2006.
Title: "Microwave Technology for the boost of performances in ECR Ion Sources"

Invited Seminars/Lectures

- 2017 Telescopio Nazionale Galileo – La Palma (Canary Islands)
TNG/NOT SEMINAR
May 24th, 2015
Title: "The PANDORA project: Plasmas for Astrophysics, Nuclear Decays Observation and Radiation for Archaeometry"
- 2015 Goethe Universitat, Frankfurt (Germany)
November 20th, 2015
Title: "Non-invasive diagnostics tools for ECR plasmas: from microwave interferometry to X-ray spectroscopy and imaging"
- 2012 IX Seminar on Software for Nuclear, Subnuclear and Applied Physics
28 May to 01 June 2012, Porto Conte, Alghero
Title: "Some strategies for modeling magnetically confined plasmas"
- 2013 Università degli Studi di Catania, Electromagnetic Waves
Propagation course, Telecommunication Engineering;
January 2013
Title: "Plasma Physics bases in ECR Ion Sources and simulation strategies"
- 2009 Michigan State University – National Superconducting Cyclotron Laboratory (MSU-NSCL);
March 19th, 2009
Title: "A new approach to the study of the ECR heating and particle dynamics in the plasma of ECR Ion Sources"

Publications

- **84 publications in refereed international journals:**
 - 60 without PhD supervisor;
 - 17 without PhD supervisor and PhD co-tutor;
 - 17 as first author, 20 as second author;
 - over 420 citations ISI;
 - over 800 by Google Scholar.
- **70 contributions to conferences and workshop proceedings;**
- **h-index 13 according to SCOPUS, h-index 16 according to Google Scholar.**



* by SCOPUS

Committees Membership

- **2017** **Member of the International Scientific and Program Committee** at the **17th International Conference on Ion Sources, Geneva (Switzerland)** October 15th – 19th 2017
- **2015** **Member of the International Scientific and Program Committee** at the **16th International Conference on Ion Sources, New York City (USA)** August 24th – 28th 2015
Since Oct. 2015 → **Member of the European Spallation Source Editorial Board**;
- **2013** **Member of the International Scientific and Program Committee** at the **15th International Conference on Ion Sources, Chiba-Tokyo (Japan)**, September 9th – 13th
- **2011** **Scientific Secretariat** at the **14th International Conference on Ion Sources, Giardini Naxos (Italy)**, September 12th – 16th 2011, September 9th – 13th

Career Supervision

- Tutor of n. **4 PhD students in Physics**, University of Catania: 3 completed (n.2 in the AY 2010/2011, n.1 in the AY 2011/2012), n.1 started their activities in February 2014:
 - Nadia Gambino, now at ETH – Zurich;
 - Rosalba Miracoli, now at ESS – Bilbao;
 - Giuseppe Castro, now post-doc fellow at INFN-LNS;
 - Carmen Altana, in progress at INFN-LNS;
- Tutor of n. **1 PhD students in Telecommunication Engineer**, University of Reggio Calabria;
 - Giuseppe Torrisi, now post-doc fellow at INFN-LNS;
- Co-tutor of n. **9 Master degree Thesis in Physics**: Catania University, Faculty of Natural, Mathematical and Physical Sciences, Department of Physics and Astronomy, AY (since) 2006/2007 (to) 2015/2016.
- Co-tutor of n. **18 Bachelor (10)/Master(3) degree Thesis in Engineer** (Telecommunications (7), Mechanics (2), Electronics (3), Informatics (1), Authomation, Controls and Sensoring (2)): Catania University, Faculty of Engineer, AY (since) 2005/2006 (to) 2013/2014.

Stages & Training

- Tutor of N. **7 students of the Catania University for the 240 hours stages** (n. 2 from TLC Eng., n.1 from Mechanics and Industrial nng., n.1 from Management Eng., n.1 from Informatics Eng., n.2 from Sensoring and Autom. Eng.)

Teaching Activity:

- i) lecturer for the **class of “Electromagnetism”**, AY 2006/2007 in the framework of Degree Course in Physics, Catania University.
- ii) Lecturer at the **“Workshop Nazionale sul Calcolo Computazionale in Fisica Nucleare e Applicata”**, organized by INFN 31-May-2012, Alghero (Italy).
- iii) Lecturer at the **PhD school of the Messina University**, 23 Feb-2010, Physics Dpt., about Magnetically Confined plasmas.
- iv) Lecturer at the **“Accelerator Physics Course”**, Università degli Studi di Catania, 2014-2017.

International Cooperation [Contact Person]

The prominent role played by INFN-LNS in the field of Accelerator/Ion Sources physics and technology has permitted to activate a number of international collaborations with European and American partners. The ones in which I played a major role are:

- **ESS-Bilbao – INFN-LNS MoU** under approval (contact person at INFN-LNS D. Mascali, at ESS-Bilbao I. Bustinduy);
- **Goethe Universitat, Frankfurt**, Germany, for beam dynamics issues and beam diagnostics [*K. Schulte, O Meusek*];

- Within the **ESS – European Spallation Source collaboration**, frequent contacts with European partners from CEA-Saclay (France) [*R. Gobin, O. Tuske*], ESS-Bilbao (Spain) [*R. Miracoli*], ESS-Lund (Sweden) [*A. Ponton*].
- Member of the **ENSAR-ARES collaboration** in the frame of European Union – Seventh Framework Programme FP7/2007–2013. Principal partners: **GSI – Darmstadt** [*K. Tinschert, F. Maimone, P. Spaedke*], Germany, **ATOMKI Debrecen** [*S. Biri, R. Racz*] (Hungary), **Jyvaskyla University** (Finland) [*H. Koivisto, O. Tarvainen*], **INFN-LNL** [*A. Galatà*];
- **Max Planck Institute**, Institute of Plasma Physics, **Greifswald** (Germany) [*Prof. H. Laqua*];
- **Ruhr University in Bochum** (Germany) [*Prof. K. Wiesemann*];
- School of Physical Sciences and National Centre for Plasma Science and Technology, **Dublin City University, Glasnevin, Dublin 9, Ireland**;
- **Columbia University, Institute of Applied Physics and Applied Mathematics**;

Editorial Activity

Refereeing for international journals:

- *Physical Review Letters*;
- *Physical Review - Special Topics on Accelerators and Beams*;
- *Plasma Sources Science and Technology*;
- *Nuclear Instruments and Methods in Physics Research*;
- *Review of Scientific Instruments*;
- *Helion – Elsevier*;
- *Indian Journal of Physics*.

Track Record of the Research Activities

[*The 10 selected papers are cited in the activities description as P1, P2, Oral and Invited presentations listed above, are references as O1, O2..., I1, I2,...*]

General Overview

The scientific activity has been focused on the **investigation about a better coupling between electromagnetic waves and plasmas inside Electron Cyclotron Resonance Ion Sources in order to increase the Particles Accelerator Performances**. High-performance plasma based ion sources will play a role of increasing importance in the next future, for feeding particle accelerators devoted to Nuclear Physics and Applied Research. The goals have been oriented **to obtain larger plasma densities, more rapid electron heating, then a fast production of singly or multi-charged ions** [O1].

The further development of these machines is nowadays limited by technological constraints (the use of microwave generators above 28 GHz for the plasma heating, and the design and construction of compact magnetic traps made of superconducting magnets). The idea of the entire research activity has been to increase the knowledge about the plasma physics underlying the ion beam generation mechanism, in order to make a significant step forward in terms of overall performances. This has allowed **to discover several interplays between the microscopical plasma parameters – especially the electron energy distribution function and the structural distribution of the plasma density – and the beam quality, namely the current, the average charge state, and the emittance**. The obtained results based on plasma diagnostics and plasma modeling are now allowing to optimize the performances of the existing devices (it is evident in the operations of the ion injectors of the LNS superconducting Cyclotron, where I'm serving as

ion beam production service responsible), and of the ones that will be designed and constructed in the next future.

The results obtained in the scientific carrier have constantly supported the **R&D activities of INFN-LNS ion sources group, which plays a worldwide leading role in the design, construction and characterization of ion injectors for particles accelerators, and in the framework of international collaborations and research projects, such as the ENSAR-ARES collaboration (in the frame of the FP7/2007–2013) and the European Spallation Source. The gained know-how will be valuable in the perspective of the Superconducting Cyclotron upgrade at LNS**, in terms of intense ion beams production for the expected, challenging experimental activities (e.g. the NUMEN project, etc.).

More specifically, the activities concern the following topics:

- **Intense Beam production for Accelerator Physics and Technology;**
- **Improvement of ion beam currents and average charge states extracted from plasma-based, highly performing ion sources (ECRIS-Electron Cyclotron Resonance Ion Sources);**
- **Improvement of beam quality (emittance, brightness) and reduction of beam ripple and halos; improvement of the ion sources reliability;**
- **Propagation of electromagnetic waves in the microwave range inside non-isotropic-nonhomogeneous media (strongly magnetized plasmas);**
- Study of **microwave-based devices** (cavities, generators, amplifiers) of interest in the field of R&D on plasma based Ion Sources;
- **Plasma diagnostics:** electrostatic, electromagnetic (interferometry), X-rays spectroscopy;
- Non-linear interaction of electromagnetic waves with high density plasmas;
- **Laser matter interaction, laser generated plasmas** and studies on nuclear fusion reactions at moderate ion energies;

The improvement of the ion beam formation mechanism from high density plasmas requires advanced plasma diagnostics tools explicitly designed for compact sources: among the others activities, this led to the VESPRI proposal – approved by the INFN 5th Nat. Comm. in 2014 – in which I served as PI, for the design and construction of the first microwave interferometer devoted to compact plasma-based ion sources.

The activities concerning the development of advanced plasma heating and confinement methods, and of plasma diagnostics for the on-line monitoring of density, temperature and charge state distribution, have triggered the idea of **an innovative scenario for studying nuclear decays, especially the ones governed by the electroweak interaction**. The proposal, called PANDORA (Plasma for Astrophysics, Nuclear Decays Observation and Radiation for Archaeometry), proposed as PI, has been evaluated very well by the INFN 3rd and 5th Nat. Comm. during 2016, and accepted by the 5th Nat. Comm. for the last evaluation step, in September 2016. PANDORA will be a feasibility study of a future facility based on a high performance magnetic trap, in which the plasmas become the environment for measuring for the first time **nuclear decays rates in stellar-like conditions, such as ^{7}Be decay and beta- decay** involved in s-process nucleosynthesis, as a function of the ionization state of the ions. These studies are of paramount importance in both stellar and primordial nucleosynthesis, e.g. **the determination of solar neutrino flux and ^{7}Li cosmological problem**. Several interesting results are expected in other field of research, following a multidisciplinary approach, and especially in Astrophysics – e.g. spectropolarimetric observations in the visible, UV and X-ray domains, offering breaking-through advancements in observational

astronomy –, and by making the plasma as an exceptional source of electromagnetic radiation, for applications in material science and Archaeometry.

In the following sections, the most representative and original contributions in these fields are described and commented.

The explanation of the Frequency Tuning Effect in ECR ion sources for the improvement of output current and charge states.

After the participation to the data analysis of the experiments performed in Catania during the period 2004/2005, and then at GSI in 2006, highlighting for the first time the Frequency Tuning Effect (FTE), **a model to explain the sensitivity of ECRIS plasma to the pumping frequency tuning was proposed in the PhD thesis**, including other innovative techniques for the optimization of plasma heating.

The explanation of the FTE – **a method that has for instance permitted to increase of a factor 1.5 to 3 the performances of any source**, e.g. CAESAR and SERSE at LNS, Supernanogan at the CNAO (the national handrontherapy facility), the sources of INFN-LNL, etc. – was based on a new model of the wave-to-plasma interaction in ECRIS, based on the persistence of standing waves inside the plasma chamber even in case of a dense plasma contained inside of it. This contribution was **recognised by INFN, awarding the Francesco Resmini national Prize** to the PhD thesis in Florence, February 2010. The main results were also presented to the scientific community at the EPS-Conference on Plasma Physics [O2] in 2007 and at the 19th ECRIS international workshop held in Grenoble in 2010 [O3].

Studies about innovative heating methods

In the meanwhile the studies about the coupling of microwaves with ECR heated plasma were progressing, **alternative heating schemes – based on the indirect excitation of plasma waves – were explored, starting from 2008**. This topic still represent an “unicum” in the ECRIS community, since never in the past the generation of the plasma via inner-plasma modal conversion has been attempted in these machines. The advantages would be huge, especially in the boost of the plasma density, then of the ion beam current intensity. This topic has a strict interplay with thermonuclear fusion research, since in that field the plasma density limitation is also an issue limiting the fulfillment of the Lawson criterion.

In September of 2008 I was visiting the Max Planck Institute in Greifswald, Institute of Plasma Physics, where the research group on plasma heating was attempting to establish a O-X-B modal conversion scenario. This technique consisted in the conversion of the incoming electromagnetic wave into a plasma (matter) wave named “Electron Bernstein Wave”, thus bypassing the intrinsic limit of the plasma density due to the well-known electromagnetic cutoff. The experiment was performed on the WEGA-Stellarator, a relatively small-size reactor for thermonuclear fusion research. During the joint activities, coordinated by prof. H. Laqua, it was possible to test the different emission of X-rays from the plasma when operating in ECR or EBW heating mode. In the years 2009-2010 a similar experiment was attempted at INFN-LNS, working with a small-size ECR ion source prototype called “Plasma Reactor” [P1]. The theoretical explanation of the frequency tuning effect, with particular regard to the influences on ions dynamics, as well as the correlation between the magnetic field profile and the generation of suprathermal electrons in third generation ECRIS, and finally the preliminary observation of EBW-heating in a small-size reactor at INFN-LNS, were the main topics of two invited talks [I1],

I2], in 2011, presented at the Joint Meeting of the 19th Topical Conference on Radio Frequency Power in Plasmas and the US Japan RF Physics Workshop, organized by the Princeton Plasma Physics Laboratories, and held in Newport (RI), USA, in June, and at the 14th International Conference on Ion Sources (ICIS2011), organized by INFN and held in Giardini Naxos (ME), Italy, in September. In this last occasion, an invited paper was published on Review of Scientific Instruments, highlighting the perspectives of plasma heating in ECR ion sources in the next future [P2].

Impact of the developed plasma modeling and diagnostics in ECRIS physics and technology

The experiments performed about FTE and plasma waves generations were supported by numerical modeling of the wave-to-plasma interaction, which started already during the Master Degree thesis, then continuing in the PhD phase and in the following years. The relevance of the scientific results were recognized in 2012 with the “International Richard Geller Prize”, assigned every two years to the best young scientist (<41 years old) who has produced an outstanding work for progresses in ECRIS science and technology. The prize was awarded in Sydney, Australia, during the 20th International Workshop on ECRIS (ECRIS’12), and a plenary lecture was given [I3]. In the prize motivations, the development of advanced numerical modeling of ion sources plasmas was explicitly mentioned.

The activity on plasma dynamics investigation was further carried out by working on both theoretical modeling and experiments performed by means of on-purpose developed diagnostics tools. In the framework of the ENSAR-ARES collaboration a strict synergy with European laboratories working in the field of plasma-based ion source was reinforced by joint experimental activities, in particular with GSI-Darmstadt (Germany) and ATOMKI-Debrecen (Hungary) groups. The results of the experiments proposed to both the laboratories, then accepted and performed in 2013 and 2014, were presented during the ENSAR-ARES town meeting [I4] in Warsaw (June 2013), and during the 15th and 16th International Conferences on Ion Sources held in Chiba (Tokyo) – Japan, during September 2013, and New York City, USA, in August 2015 [O2, O5]. For the first time, the plasma X-ray emission in the 2-30 keV energy domain, that is ascribed to the so-called “warm electrons” (the responsible of the stepwise ionization), was characterized as plasma volumetric emission (at GSI in 2013, [P3] and as space resolved emission by means of an X-ray pin-hole camera (at ATOMKI, Hungary, in late 2014) versus the pumping wave frequency, the magnetic field strength and the input RF power [P4].

Several efforts were paid to the investigation of plasma heating under different magnetic field profiles and RF field configurations [P5] and to correlate the impact of the internal plasma structure with the properties of the ion beam, i.e. other than on the current and charge states, on the real space and phase space structure (the emittance, especially, *D. Mascali et al. Review of Scientific Instruments 81 (2), 02A334*).

With the aim to improve the performances in terms of output beam currents and overall reliability, innovative methods of electrons injection into the plasma [P6] developed in collaboration with INFN-Bologna and CNR-IMM Bologna colleagues have been studied. The underlying idea in the above-mentioned research activities is that any further development of ECR ion sources in the next future will be based on a significant boost of the plasma density that can be attained by a very precise characterization of the plasma structure and temperature distribution. The project VESPRI, led since early 2015, aimed just to measure in a non-invasive way the 1D profile of the plasma density. The first result worldwide of a plasma density measurement via microwave interferometry inside an ECR ion source has been obtained by VESPRI right in early 2016, and it is now under refereeing (*D. Mascali et al. Letter to the Editor of*

Rev. Sci. Instrum., submitted), while some papers have been already published by PhD students tutored in the frame of VESPRI, especially as concerns the conceptual and the design phase.

The expertise gained in the field of plasma modeling and plasma diagnostics in compact traps has additionally permitted to argue “non-classical” applications of these machines. In particular, the use of ECR heated plasmas in compact magnetic traps as environment for investigating nuclear decays of astrophysical and cosmological interest has been proposed, under the Grant PANDORA submitted to the 5th Nat. Comm. of INFN. The proposal has overcome the first selection phase.

Ideas concerning new diagnostics and perspectives beyond the current scheme of operations for ECR ion sources have been recently included in a review paper published by IEEE-Transactions on Nuclear Science [P7].

Additional impact of the plasma modeling and diagnostics: from Laser Generated Plasmas to Charge Breeding mechanism

The plasma modeling activity, coordinated by involving several MS and PhD students in Physics and Engineering, has continued along the years, providing valuable results on the basis of a self-consistent approach [P8]. The versatility of this approach, and the relevance of the obtained results, are demonstrated by the several contexts in which the method has been applied. The quasi-PIC (Particle-In-Cell) approach has been applied in laser generated plasmas also, investigating the early stage of the plasma plume generation in case of plasmas produced by ablation of solid (metallic) targets interacting with ns pulses at $10^{12} - 10^{14}$ W/cm². The results have been published in a letter [P9]. Diagnostics of these kind of plasmas has been published in other papers, giving valuable information on the plasma energy distribution function (e.g. L. Torrisi, D. Mascali et al. *Journal of Applied Physics* 107 (12), 123303).

In the same field of research, a collaboration was activated with the Dublin University (Dublin City Univ, Natl Ctr Plasma Sci & Technol, Dublin 9, Ireland) for investigating the dynamics of colliding plasma plumes expanding at supersonic velocities (N. Gambino; P. Hayden; D. Mascali; et al. *Applied Surface Science* 272(69-75), 2013). These plasmas have the potentiality to become an environment for investigating nuclear fusion reactions at extremely low temperatures (<1-2 keV) to be compared with stellar systems.

The ECR plasma modeled on the basis of these simulations has been used as a “plasma target” for reproducing numerically the charge breeding mechanism, such as the case of Rb¹⁺ ions interacting with the plasma of an ECR ion source in an ISOL-like facility for exotic nuclei production [P10]. These activities have been carried out in a strict synergy with INFN-LNL and in the framework of the European EMILIE collaboration. They are important for future developments of the SPES facility and also represent valuable results in the perspective of radioactive beams injection in magnetic traps such as the one we would like to develop in the framework of the PANDORA proposal.

Experiments on novel plasma heating schemes—especially focused on the production of intense beams of protons or other light ions—have shown for the first time the possibility to use EBW-heated plasmas as sources of electromagnetic radiation. Preliminary results have been presented at the European Conference on X-ray Spectrometry, EXRS-2012, held in Vienna (Austria), in June 2012 [O6]. Experimental techniques developed for plasma emitted radiation measurements have been preliminary applied for material characterization, in collaboration with the colleagues of INFN-LNS, CNR and Landis laboratory working on the application of X-ray

spectroscopic techniques to the Cultural Heritage Field (*P. Romano, C. Caliri, ..., D. Mascali, ... et al., published on Analytical Chemistry, 86 (21), 10892-10899, 2013.*)

Impact of the plasma studies on the production of intense beams of protons

Ideas concerning new diagnostics and perspectives beyond the current scheme of operations for ECR ion sources were important for the design of the high performing proton injector of the European Spallation Source. For the first time (as discussed during the invited talk [I2], at the SIF congress in 2014), I proposed the use of a flexible magnetic system for a microwave discharge ion source, based on three different configurations:

- Flat-B field for off-resonance plasma heating;
- Simple mirror for the optimization of the proton fraction;
- Magnetic-beach for the boosting of the modal conversion, then of the plasma density;

The same scheme was adopted for the design of the Flexible Plasma Trap, then becoming a test-bench of the ESS proton injector. The FPT was designed in the framework of the INFN 5th Nat. Comm. experiment named UTOPIA, in which I played a major role in the proposal writing and experimental activities coordination.

The modeling activities developed in parallel were very useful to explore the relative weight of the plasma heating parameters in the definition of the proton/H²⁺ abundances in the plasma.

These results were helpful also in the framework of the Daedalus collaboration, coordinated at LNS by Dr. Luciano Calabretta. The aim was to increase the intensity of beams accelerated by high intensity cyclotrons, using the H²⁺ molecule. A new plasma chamber was designed and tested by one of the coworkers in Canada, at the Best Company facility in Vancouver (*G. Castro et al., accepted for publication on Rev. Sci. Instrum.*).

Impact of the research activity in the future design of plasma based ion sources

The results obtained in the last five years especially, have opened the road to a new approach in the design of future ion sources. The single-pass RF energy absorption efficiency at the Electron Cyclotron Resonance Layer is rather poor, and it is still difficult to drive energy deposition to specific parts of electron population in the phase space. A "microwave absorption optimization-oriented" design, based on the control of the electromagnetic radiation by a dedicated RF launcher, must be implemented. One of these launchers has been designed by Telecommunication Engineering colleagues under my supervision for driving modal conversion for the first time in a compact ECR ion source, namely the Flexible Plasma Trap at LNS (*G. Torrisi et al. accepted for publication on Microwave Optical Letters*).

Along with new schemes of waves' launching, very innovative concepts of ion beams production from high temperature/high density plasmas have been explored. One of the tutored MS degree students in Physics moved in 2013 to **Columbia University in New York City, USA**, with a post-degree fellow. The collaborative activities were fruitfully dedicated to the conceptual design study of a toroidal ECR ion source as a new paradigm of multiply-charged ion production for particles accelerators. The beam extraction issues were also explored (*C. Caliri, D. Mascali, F. Volpe, NIM-A, 790 (57-63) – 2015.*).

Team coordination, Training of students, Tutoring

The several laboratory and modeling activities have involved a number of students in Physics and Engineering. I served as tutor or co-tutor of more than twenty Bachelor, MS, PhD thesis. The activities of VESPRI have been carried out with the valuable contribution of MS and PhD students from the Catania and Reggio Calabria University, Faculty of Telecommunication and Electronics Engineering.

The modeling efforts have been also supported by students coming from Computer Science and Informatics Faculty of the Catania University.

The mechanics and the control systems of the different designed devices have been supported by stages and training periods of students coming from Mechanics Engineering and Automation and Sensoring Engineering Faculty of the Catania University.

The main achievements of the valuable team-working activity have been presented during the last International Conference on Ion Sources, held in New York City in August 2015. A total of thirteen contribution were presented, most of them by PhD/post-doc students coordinated in the framework of the VESPRI Grant, then published after peer review on Rev. of Scientific Instruments. It is worth mentioning the multi-field approach with papers covering a variety of topics such as:

- **advanced X-ray plasma diagnostics** (*D. Mascali et al., Review of Scientific Instruments 87(2):02A510*), in collaboration with colleagues of the Hungarian Academy of Sciences;
- **microwave interferometry** (*G. Torrisi, D. Mascali et al., Review of Scientific Instruments 87(2):02B909*);
- **non linear wave-plasma interaction** (*G. Castro, D. Mascali et al. Review of Scientific Instruments 87(2):02A507*);
- **Ion beam diagnostics** (*D. Nicolosi, L. Cosentino, D. Mascali et al. Review of Scientific Instruments 87*);

Detailed Personal contribution to National or International Grants and Collaborations

2006 - 2008 INES Experiment of the 5th Nat. Comm. of INFN.	I coordinated the activities about electromagnetic wave interaction with the strongly magnetized plasma of an Electron Cyclotron Resonance Ion Source. In particular, I promoted the development of a MATLAB based numerical code in order to investigate the impact of resonant modes established into the plasma chamber on the electron heating process . The major inputs to these activities came from the direct experience gathered in preparing lectures for "Electromagnetic Field", given at the Catania University Science Faculty, Degree course in Physics.
2009 - 2011 HELIOS Experiment, <i>in the framework of the Strategic Project NTA-INFN (Nuove Tecnologie di Accelerazione).</i>	I coordinated the task concerning experimental and theoretical activities about new mechanisms of plasma heating, based on the inner plasma conversion of an electromagnetic wave into a plasma wave. In this framework in September 2008 at the Max Planck Institute for Plasma Physics, Greifswald, Germany , I attended to the already mentioned joint experiment about microwave coupling to toroidal plasmas contained in a Stellarator-like machine named WEGA. Another experiment was carried out at the Michigan State University , National Superconducting Laboratory, in December 2009. The latter put the basis for a more deep understanding of non-linear wave-to-plasma interaction under specific profiles of the confining magnetic field. Another output of these activities, to be finalized within the UTOPIA experiment is the design of a complex setup of

	microwave amplifier to optimize the microwave to plasma coupling under the so-called TCFH - Two Close Frequency Heating scheme.
2009 - 2011 CANTES <i>Experiment of 5th Nat. Comm.</i>	The experiment aimed to plasma density increase inside ECRIS by means of auxiliary electrons launched by carbon nanotubes based electron guns. The activities concerning the modeling of electron capture and plasma diffusion modification due to the CNT emitted electron beams were under my responsibility. I proposed an original model to explain the plasma density increase and the damping of plasma turbulence (due to non-linear plasma-wave coupling) as a consequence of the anisotropic plasma diffusion rates modification under the effect of auxiliary electron currents flowing along the metallic walls of the plasma chamber [P6].
INFN-MED <i>Strategic Project of INFN</i>	This project supported my idea of an experiment at Michigan State University, National Superconducting Cyclotron Laboratory, about the investigation of the plasma X-ray emission under slightly different gradients of the magnetic field at the ECR layer. The results of such measurements were of paramount importance in the design of the AISHa – Advanced Ion Source for Hadrontherapy, supported by regional funds under the PO-FESR European Program.
2012-2015 UTOPIA (then, RDH) <i>National Experiment of the 5th Nat. Comm. of INFN.</i>	In this framework I coordinated the activities concerning the design of microwaves antennas able to improve the coupling of the incoming electromagnetic waves to high energy plasma waves which can sustain plasmas above the critical density. I also designed microwave diagnostics in order to electromagnetically characterize the resonant cavity working as plasma chamber, and to detect evidences of mode conversion via the introduction of small antennas inside the plasma.
2012-2014 ESOPO <i>National Experiment of the 5th Nat. Comm. of INFN</i> LNS Responsible	I served as the coordinator of the ESOPO experiment at INFN-LNS. The activity was specifically focused to the design of a plasma based "electrostatic lens" able to focalize high intensity ion beams along the so-called LEBT (Low Energy Beam Transport line). A collaboration was activated with Goethe University in Frankfurt, for the use of electron beams as boosters of the electron density in Gabor lenses. The idea that I proposed to the colleagues of the Goethe University was to inject such auxiliary electrons by breaking the azimuthal symmetry of the lens magnetic field. The test-phase has been completed and an experiment is expected soon in Frankfurt, funded by the Institute of Applied Physics of the Goethe University, under the EDEN activities. I'm now playing the role of contact person.
2014-2016 VESPRI - National Experiment of the 5th Nat. Comm. of INFN National Responsible	In this experiment I played the role of National Responsible (PI). The experiment was aimed to the design, simulation, installation and test of a novel microwave interferometer based on the "frequency sweep" method for the measurement of plasma density in ECR ion sources. The experiment has permitted to design and realize the first interferometer worldwide for plasma density measurements in compact Electron Cyclotron Resonance Ion Sources (D. Mascali et al. Letter to the Editor of Rev. Sci. Instrum, submitted).
2016-2018	The proposal, regarding the study of nuclear decays in magnetized

PANDORA - Nati Exp. of the 5th Nat. Comm. of INFN <i>National Responsible</i>	plasmas, with relevant impacts in stellar and primordial nucleosynthesis of light elements, has been approved by the V Nat. Comm. Activities started on Jan. 2017. The project involves INFN-LNS and LNL, and includes a strict synergy with INAF and European partners such as GANIL and Grenoble-LSPC in France, the Hungarian Academy of Science – ATOMKI laboratories in Debrecen, Hungary (which have already sent an official LoI), the PSI in Switzerland, the University of Michigan – USA, the University of Cambridge, UK.
ENSAR – ARES UE FP7 2007-2013 <i>European collaboration</i>	Activities were focused on Task 1: M-JRA01-1.1.1, in the frame of which I proposed and managed two experiments (in 2013 and 2014) in synergy with the European partners of GSI – Darmstadt, Germany, JYFL – University of Jyvaskyla, Finland, and Hungarian Academy of Science, ATOMKI – Debrecen, concerning the correlation of X-rays emission measurements and electron heating study and relationship between the data obtained and the charge state distributions inside the ECR ion sources.
2013 to now ESS – European Spallation Source.	The activities, supported by temporary staff (RTD) contracts, were focused on the theoretical and numerical modelling of magnetized plasmas in Microwave Discharge Ion Sources finalized to the design of high-performance proton sources (high currents, low emittance). I was in charge of the construction and commissioning of the ESS test-bench at LNS named FPT – Flexible Plasma Trap, devoted to the investigation of wave-plasma interaction by means of innovative waves' launching schemes, and to the development of advanced plasma diagnostics methods.
2013 to now AISHa – Advanced Ion Source for Hadrontherapy	The activities in this frame were devoted especially to the conceptual design of the magnetic trap, which presents a relevant flexibility for the tailoring of the electron energy distribution function. A contribution has been also given to the design of the RF system, which will be able to implement the heating schemes such as the Frequency Tuning and the Two Close Frequency Heating.
Institutional Responsibilities	
January 2016 to now Head of Ion Beams Production Service at INFN-LNS	Since January 2016 I was nominated as responsible of the LNS ion beams production service . The responsibilities cover the management of the two injectors of the Tandem-Van der Graff accelerator (two “sputtering” ion sources), and of the two ECR ion sources (named CAESAR – with room temperature coils, and SERSE – equipped with superconducting coils) feeding the K800 Superconducting Cyclotron. R&D activities have been also started, with the design of a compact proton source supporting the CS during eye cancer treatments (CATANA project) and, in perspective, for the development of noble gases negative ion beams (${}^3\text{He}^-$ and Ne^-) for the Tandem accelerator .

Selection of n.10 Peer Reviewed Papers

- [P1] **D. Mascali**, L. Celona, S. Gammino, R. Miracoli, G. Castro, N. Gambino, G. Ciavola, *Electrostatic wave heating and possible formation of self-generated high electric fields in a magnetized plasma*, Nucl. Instr. & Meth. A 653 (1) 11-16, 2011;
<http://dx.doi.org/10.1016/j.nima.2011.02.048>
- [P2] **D. Mascali**, S. Gammino, L. Celona, G. Ciavola, *Towards a better comprehension of plasma formation and heating in high performance ECRIS*, Rev. Sci. Instrum. **83**, 02A336 (2012);
<http://dx.doi.org/10.1063/1.3672107>
- [P3] **D. Mascali**, L. Celona, F. Maimone, J. Maeder, G. Castro, F.P. Romano, A. Musumarra, C. Altana, C. Caliri, G. Torrisi, L. Neri, S. Gammino, K. Tinschert, K. P. Spaedtke, J. Rossbach, R. Lang and G. Ciavola. *X-ray spectroscopy of warm and hot electron components in the CAPRICE source plasma at EIS testbench at GSI*. Rev. Sci. Instrum. **85**, 02A956 (2014);
<http://dx.doi.org/10.1063/1.4858115>
- [P4] **D. Mascali**, G. Castro, S. Biri, R. Racz, J. Palinkas, C. Caliri, L. Celona, L. Neri, F.P. Romano, G. Torrisi, S. Gammino *Electron cyclotron resonance ion source plasma characterization by X-ray spectroscopy and X-ray imaging*, Review of Scientific Instruments 87(2):02A510, Feb. 2016
<http://dx.doi.org/10.1063/1.4939201>
- [P5] **D. Mascali**, L. Celona, S. Gammino, G. Castro, R. Miracoli, L. Malferrari, F. Odorici, G. P. Veronese, R. Rizzoli, T. Serafino, *An investigation on the formation of suprathermal electrons in a B-min ECR machine and a novel method for their damping*, Plasma Sources Sci. Technol. 22 (2013) 065006;
doi:10.1088/0963-0252/22/6/065006
- [P6] S. Gammino, L. Celona, **D. Mascali** *Perspectives of Electron Cyclotron Resonance Ion Sources Beyond the Scaling Laws – Review Paper*, IEEE Transactions on Nuclear Science 63(2):1-9 · April 2016 DOI: 10.1109/TNS.2016.2514981
- [P7] **D. Mascali**, G. Torrisi, L. Neri, G. Sorbello, G. Castro, L. Celona, and S. Gammino. *3D-full wave and kinetics Numerical modelling of Electron Cyclotron Resonance Ion Sources plasma: steps towards self-consistency*, Eur. Phys. J. D (2015) 69: 27; doi:10.1140/epjd/e2014-50168-5
- [P8] **D. Mascali**, S. Tudisco, N. Gambino, A. Pluchino, A. Anzalone, F. Musumeci, A. Rapisarda, A. Spitaleri. *Prompt electrons driving ion acceleration and formation of a two temperatures plasma in nanosecond laser-ablation domain*. EuroPhysics Letters 100 (4), art. no. 45003.
<http://stacks.iop.org/0295-5075/100/i=4/a=45003>
0295-5075-100-4-45003
- [P9] A. Galatà, **D. Mascali**, L. Neri, L. Celona, *A new numerical description of the interaction of an ion beam with a magnetized plasma in an ECR-based charge breeding device*, Plasma Sources Science and Technology 25(4) · August 2016 DOI: 10.1088/0963-0252/25/4/045007
<http://dx.doi.org/10.1088/0963-0252/25/4/045007>
- [P10] **D. Mascali**, A. Musumarra, F. Leone, F. P. Romano, G. Galatà, S. Gammino, C. Massimi et al. Eur. Phys. J. A (2017) 53: 145 DOI: 10.1140/epja/i2017-12335-1

Catania, 19/07/2017

Signature¹:



A handwritten signature in black ink, appearing to read "David Mascali", is placed above a horizontal dotted line.

¹ Il sottoscritto dichiara di essere informato, ai sensi del decreto legislativo 196/2003, che i dati verranno utilizzati nell'ambito del procedimento per il quale la presente dichiarazione viene resa.

Full List of Peer Reviewed Papers

1. **D. Mascali**, A. Musumarra, F. Leone, F. P. Romano, A. Galatà, S. Gammino, C. Massimi: *PANDORA, a new facility for interdisciplinary in-plasma physics*. European Physical Journal A 03/2017; 53(7)., DOI:10.1140/epja/i2017-12335-1
2. **D Mascali**, A Musumarra, F Leone, A Galatà, F P Romano, S Gammino: *Plasmas in compact traps: From ion sources to multidisciplinary research*. Il Nuovo Cimento C 02/2017; 39(5)., DOI:10.1393/ncc/i2016-16365-y
3. A. Galatà, **D. Mascali**, G. Torrisi, L. Neri, L. Celona, J. Angot, *Influence of the injected beam parameters on the capture efficiency of an electron cyclotron resonance based charge breeder* Physical Review Accelerators and Beams 20(6), 2017 10.1103/PhysRevAccelBeams.20.063401
4. Richard Racz, **David Mascali**, Sandor Biri, Claudia Caliri, Giuseppe Castro, Alessio Galata, Santo Gammino, Lorenzo Neri, József Pálkás, Francesco Romano, Giuseppe Torrisi, *Electron Cyclotron Resonance Ion Source plasma characterization by energy dispersive X-ray imaging* Plasma Sources Science and Technology 26(7), 2017 10.1088/1361-6595/aa758f
5. G Castro, **D Mascali**, S Gammino, G Torrisi, F P Romano, L Celona, C Altana, C Caliri, N Gambino, D Lanaia, R Miracoli, L Neri, G Sorbello, *Overdense plasma generation in a compact ion source* 26(5) 055019, 2017, 10.1088/1361-6595/aa61c4
6. C. Altana, S. Tudisco, G. Lanzalone, **D. Mascali**, A. Muoio, F. Brandi, G. Cristoforetti, P. Ferrara, L. Fulgentini, P. Koester, L. Labate, D. Palla, L. Gizzi: *Experimental investigation of ion production and acceleration mechanism in laser-produced plasma at moderate intensity for nuclear studies @ ELI-NP*. Journal of Instrumentation 04/2017; 12(04):C04011-C04011., DOI:10.1088/1748-0221/12/04/C04011
7. D. Mascali, G. Torrisi, O. Leonardi, G. Sorbello, G. Castro, L. G. Celona, R. Miracoli, R. Agnello, S. Gammino: *The first measurement of plasma density in an ECRIS-like device by means of a frequency-sweep microwave interferometer*. Review of Scientific Instruments 09/2016; 87(9):095109., DOI:10.1063/1.4963710
8. A. Muoio, C. Altana, M. Frassetto, G. Lanzalone, L. Malferrari, **D. Mascali**, F. Odorici, S. Tudisco: *Nanostructured targets irradiation by ns-laser for nuclear astrophysics applications: first results*. Journal of Instrumentation 03/2017; 12(03):C03076-C03076., DOI:10.1088/1748-0221/12/03/C03076
9. G. Torrisi, G. Sorbello, O. Leonardi, **D. Mascali**, L. Celona, S. Gammino: *A new launching scheme for ECR plasma based on two-waveguides-array*. Microwave and Optical Technology Letters 11/2016; 58(11):2629-2634., DOI:10.1002/mop.30117
10. L.A. Gizzi, C. Altana, F. Brandi, P. Cirrone, G. Cristoforetti, A. Fazzi, P. Ferrara, L. Fulgentini, D. Giove, P. Koester L. Labate, G. Lanzalone, P. Londrillo, **D. Mascali**, A. Muoio, D. Palla, F. Schillaci, S. Sinigardi, S. Tudisco, G. Turchetti *Role of laser contrast and Foil thickness in target normal sheath acceleration*, Nucl.Instrum.Meth. A829 (2016) 144-148 (2016-09-01) DOI: 10.1016/j.nima.2016.01.036
11. G. Torrisi, O. Leonardi, G. Sorbello, **D. Mascali**, G. Castro, L. Celona, R. Miracoli, S. Gammino *A Novel Microwave Frequency Sweep Interferometer for ECR Plasma Electron Density Measurements*, accepted for publication on IEEE-Xplore
12. A. Galatà, **D. Mascali**, L. Neri, L. Celona, *A new numerical description of the interaction of an ion beam with a magnetized plasma in an ECR-based charge breeding device*, Plasma Sources Science and Technology 25(4) · August 2016 DOI: 10.1088/0963-0252/25/4/045007
13. G. Castro, G. Torrisi, L. Celona, D. Mascali, L. Neri, G. Sorbello, O. Leonardi, G. Patti, G. Castorina, S. Gammino: *A new H₂+ source: Conceptual study and experimental test of an upgraded version of the VIS—Versatile ion source*. Review of Scientific Instruments 08/2016; 87(8):083303., DOI:10.1063/1.4960564

14. A. Muoio, S. Tudisco, C. Altana, G. Lanzalone, **D. Mascali**, G.A.P. Cirrone, F. Schillaci, A. Trifirò, *Mono-energetic ions emission by nanosecond laser solid target irradiation*, Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, Volume 829, 1 September 2016, Pages 141-143
15. Francesco Paolo Romano, Claudia Caliri, Luigi Cosentino, Santo Gammino, **David Mascali**, Lighea Pappalardo, Francesca Rizzo, Oliver Ulrich Heinz Paul Scharf, Hellen Cristine Santos: *Micro X-ray Fluorescence Imaging in a Tabletop Full Field-X-ray Fluorescence Instrument and in a Full Field-Particle Induced X-ray Emission End Station*. Analytical Chemistry 09/2016; 88(20)., DOI:10.1021/acs.analchem.6b02811
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17. O. Tarvainen, H. Koivisto A. Galatà, J. Angot, T. Lamy, and T. Thuillier, P. Delahaye and L. Maunoury, **D. Mascali** and L. Neri, Diagnostics of a charge breeder electron cyclotron resonance ion source helium plasma with the injection of 23Na¹⁺ ions. *PHYSICAL REVIEW ACCELERATORS AND BEAMS* 19,053402 (2016)
18. R. Racz, S. Biri, J. Palinkas, **D. Mascali** et al. *X-ray pinhole camera setups used in the Atomki ECR Laboratory for plasma diagnostics*, Review of Scientific Instruments 87(2):02A741 · February 2016
19. S. Gammino, L. Celona, **D. Mascali** *Perspectives of Electron Cyclotron Resonance Ion Sources Beyond the Scaling Laws*, IEEE Transactions on Nuclear Science 63(2):1-9 · April 2016 DOI: 10.1109/TNS.2016.2514981
20. L. Celona · S. Gammino · **D. Mascali** *High density plasmas and new diagnostics: An overview (invited)* Review of Scientific Instruments 87(2) · February 2016 DOI: 10.1063/1.4939200
21. **D. Mascali**, G. Castro, S. Biri et al. *Electron cyclotron resonance ion source plasma characterization by X-ray spectroscopy and X-ray imaging*, Review of Scientific Instruments 87(2):02A510 · February 2016
22. G. Lanzalone, C. Altana, **D. Mascali**, et al. *Effect of advanced nanowire-based targets in nanosecond laser-matter interaction (invited)*, Review of Scientific Instruments 87(2):02B324 · February 2016
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31. A. Galatà, G. Patti, L. Celona, **D. Mascali**, L. Neri and G. Torrisi *Electromagnetic analysis of the plasma chamber of an ECR-based charge breeder* The Review of scientific instruments 87(02B505) November 2015 DOI: 10.1063/1.4934209
32. D. Nicolosi, L. Cosentino, **D. Mascali**, A. Pappalardo, M. Castro, L. Celona, C. Marchetta, S. Marletta, A. Maugeri, D. Rifuggiato, A. Seminara and S. Gammino *Beam imaging in the injection line of the INFN-LNS superconducting cyclotron* Review of Scientific Instruments 87 · October 2015 DOI: 10.1063/1.4932128
33. G. Castro, **D. Mascali**, F. P. Romano, C. Altana, C. Caliri, L. Celona, R. Di Giugno, N. Gambino, D. Lania, R. Miracoli, A. Musumarra, L. Neri, G. Torrisi, S. Gammino. *Experimental characterization of an overdense plasma in a compact ion source* Acta Polytechnica 55(3):146–149, 2015;
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36. L. Neri, L. Celona, S. Gammino, **D. Mascali**, G. Castro, G. Torrisi, B. Cheymol, A. Ponton, A. Galatà, G. Patti, A. Gozzo, L. Lega, and G. Ciavola. *Improved Design of Proton Source and Low Energy Beam Transport Line for European Spallation Source*. Rev. Sci. Instrum. **85** , 02A723 (2014) ;
<http://dx.doi.org/10.1063/1.4832135>
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Il sottoscritto dichiara di essere informato, ai sensi del decreto legislativo 196/2003, che i dati verranno utilizzati nell'ambito del procedimento per il quale la presente dichiarazione viene resa.

Catania, 19/07/2017

Signature:



A handwritten signature in black ink, appearing to read "David Mascali". The signature is fluid and cursive, with a dotted line underneath it.

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• Posizione attualmente Ricoperta

2005-today Ricercatore (INFN, National Institute for Nuclear Physics), Italy

Responsabile Nazionale Esperimento ASFIN2 INFN (30 ricercatori)

• Borse, Contratti in Istituzioni Scientifiche Nazionali

Ott. 2012-2017 Professore a contratto di Fisica Medica, Facoltà Medicina, CDL Dietistica, University of Catania

Ott. 2014-Set 2015 Professore a contratto di Fisica Generale, Facoltà Agraria, University of Catania

Ott. 2005-Set 2009 Professore a contratto di Fisica Applicata, Facoltà Ingegneria, University of Catania

Nov 2002-Dec 2005 Assegno di Ricerca, INFN, Italy

Nov 2001-Nov. 2002 Post-doctoral Fellowship, CSFNSM, Italy

Nov.2001 vincitore Borsa PhD Università di Catania, Italy (vince anche Univ. Messina e Palermo)

Nov.1997-Nov.1998 Borsa per Laureandi (INFN) Nov.1998

Fellowship presso Istituzioni Estere di Ricerca:

March 2016 - oggi Visiting Research Scientist, University of Texas Austin, TX USA: work on reactions at astrophysical plasma induced by laser

May 2013 Visiting Research Scientist, Texas A&M University, Commerce, TX USA: work on primordial nucleosynthesis

February 2011 – June 2012 Visiting Research Scientist Texas A&M University, College Station, TX, USA (research and tutoring of undergraduate students): set-up, commissioning, experiments with TECSA detector Array and MarS exotic beams

Mar-Apr 2009 „Visiting Scientist Cyclotron Institute, Texas A&M University, College Station, TX, USA: DWBA calculation

Giu 2005-Lug 2005 Visiting Scientist CNS Riken, Tokyo Japan: CNS CRIB exotic beams test

Abilitazioni Nazionali

Nov. 2014: Abilitazione all'insegnamento universitario in fascia 1 Bando 2013 DD n.161/2013 per Fisica Sperimentale delle Interazioni fondamentali (settore 02/A1)

Dic 2013 Abilitazione all'insegnamento universitario in fascia 2 Bando 2012 DD n.222/2012 per Astrofisica (Settore 02/C1)

Dic 2013 Abilitazione all'insegnamento universitario in fascia 2 Bando 2012 DD n.222/2012 per Fisica Sperimentale delle Interazioni fondamentali (settore 02/A1)

Nov. 2014: Abilitazione all'insegnamento universitario in fascia 1 Bando 2013 DD n.161/2013 per Fisica Sperimentale delle Interazioni fondamentali (settore 02/A1)

Premi e Riconoscimenti

2002 SIF Premio per giovani fisici, 2001 Accademia Gioenia Premio per giovani Ricercatori , 2001 SIF Premio per giovani fisici

Attività DIDATTICA presso Istituzioni Nazionali

2012-2016 Professore a contratto e coordinamento del corso di Fisica Medica, CdL Dietistica, Facoltà di Medicina, Università di Catania (4 anni accademici, 4 CFU)

2014-2015 Professore a contratto e coordinamento del corso di Fisica, CDL Scienze e tecnologie alimentari, Fac. Agraria (1 anno accademico, 7 CFU)

2014 Tiene il modulo di nucleosintesi primordiale del corso di Astrofisica Nucleare, Facoltà Scienze MMFFNN, CDL Fisica, Università di Catania

2005 - 2009 Fisica Applicata – Onde ed Oscillazioni (Professore a contratto e coordinamento del corso), Facoltà di Ingegneria, Università di Catania (4 anni accademici, 4 CFU)

1998-2005 Svolge il corso di Esercitazioni di Fisica Generale ed assistenza agli esami per Ingegneria

Edile, Fac. Ingegneria, Università di Catania

Attività DIDATTICA presso Istituzioni Internazionali

2015 Lecturer (Invited) “European Summer School on Experimental Nuclear Astrophysics”

2013 Lecturer (Invited) at the Russbach school on nuclear astrophysics

2012 Lecturer (Invited) “Carpathian Summer on Nuclear and Particle Astrophysics”,

2011 Lecturer (Invited) “European Summer School on Experimental Nuclear Astrophysics”

2010 Lecturer (Invited) “Russbach school on nuclear astrophysics”

2007 Lecturer (Invited) “Carpathian Summer on Nuclear and Particle Astrophysics”,

Attività di Coordinamento Studenti e gestione tesi di laurea o dottorato

Tutor of a Post-doctoral fellowship for foreign researchers at INFN LNS (A. Cvetinovic)

Co-Supervisor of a PhD thesis on the “Measurement of the $^{19}\text{F}(\alpha, \text{p})^{20}\text{Ne}$ reaction by means of the THM”, by G. D’Agata, Department of Physics and Astronomy, University of Catania, Italy

Correlatore di due tesi di Laurea Magistrale, CdL Fisica, Facoltà Scienze MMFFNN, Univ. Catania

- A.A. 2007/2008 Studio dei canali di reazione $^3\text{H}(\text{d}, \text{p})^3\text{H}$ e $^3\text{H}(\text{d}, \text{n})^3\text{He}$ ad energie di interesse astrofisico attraverso il Metodo del Cavallo di Troia
- A.A. 2013/2014 Misura della sezione d’urto $^{19}\text{F}(\text{a}, \text{p})^{22}\text{Ne}$ con il metodo del Cavallo di Troia nel contesto astrofisico

2011 Responsabile per l’attività di uno borsista REU (REsearch for Undergraduate) presso Cyclotron Institute – Texas A&M University.

PUBBLICAZIONI

Pubblicati 222 articoli in riviste peer-reviewed (ISI), primo autore in 30 di essi. In NASA ADS database circa 260 articoli. h-index totale =38 (fonte ISI web of Science)

TALK su INVITO, SEMINARI E CONFERENZE

circa 40 contributi orali a conferenze Internazionali; 15 invited talks a conferenze e workshop (di cui 5 invited lecture presso scuole internazionali), 8 Seminari e “Colloquia” in istituzioni accademiche nazionali ed internazionali (e.g. Università di Pisa, Texas A&M University, University of Tokyo).

Organizzazione e coordinamento di conferenze, scuole ed eventi scientifici

2001-2009 Membro del Local Organizing Committee della European Summer school on Experimental nuclear Astrophysics -Italy

2009-2015 Chair del Local Organizing Committee della European Summer school on Experimental

nuclear Astrophysics -Italy

2009-2015 Membro dello Scientific Advisory Committee della Russbach school on Nuclear Astrophysics - Austria

2009 Member del Local Organizing Committee del First Eurisol topical Meeting , INFN LNS Catania

2010 Member del Local Organizing Committee del VII Meeting of Italian groups of Experimental and Theoretical Nuclear Astrophysics - Italy

2007 Responsabile Scientifico della "Settimana della Ricerca Scientifica" ai LNS

2014 Responsabile Scientifico della "European Researchers' night" ai LNS

Editor di pubblicazioni peer-review

2007 co-editor della EAS publications series n. 27, proceedings of the Third European Summer School on Experimental Nuclear Astrophysics, ed. M. Busso, R.G. Pizzone, C. Rolfs, C. Spitaleri, A. Tumino, EDP sciences,

2010 co-editor della AIP publication series n. 1213 of the Fifth European Summer School on Experimental Nuclear Astrophysics, ed. C. Spitaleri, C. Rolfs, R.G. Pizzone,AIP, 2010

2013 co-editor della AIP publication series n. 1595 of the Seventh European Summer School on Experimental Nuclear Astrophysics, ed. C. Spitaleri, L. Lamia, R.G. Pizzone,AIP, 2014

Attività di Referaggio su riviste Scientifiche, Enti Pubblici di Ricerca o Panel

Referee: European Journal of Physics A, Journal of Physics G, Journal of Environmental Radioactivity, International Journal of Phys. E , AIP publications of conference proceedings, Physical Science International Journal.

Referee of PEGASUS,FIRB grants for the Italian Science Ministry, VQR MIUR National Center of Science and Technology Evaluation (Rep. Kazakhstan).

Gestione e coordinamento Progetti di Ricerca:

2011- 2018 Responsabile Nazionale Esperimento Asfin2 INFN (responsabile locale 2011-2015) per LNS): gestione fondi ricerca per un totale di circa 600 k€ in tutto il periodo