

Francesca Bellini

Associate Professor

Education

- 01/2010 – 03/2013 PhD in Physics, University of Bologna (Italy). Supervisor: L. Cifarelli.
10/2006 – 03/2009 MSc in Physics, University of Bologna (Italy). Final mark: 110/110 cum Laude.
10/2003 – 12/2006 BSc in Physics, University of Bologna (Italy). Final mark: 110/110 cum Laude.

Employment history

- 03/2021 – present Associate Professor at Alma Mater Studiorum University of Bologna (Italy) - Academic discipline: FIS/04 Nuclear and Subnuclear Physics.
07/2017 – 06/2020 Senior Research Fellow at CERN, and Marie Skłodowska-Curie Fellow, within the EU-funded COFUND project.
04/2013 – 03/2017 Postdoctoral Researcher at the University of Bologna (Italy) and scientist at CERN, Geneva as INFN-CERN Cooperative Associate Fellow (2014-2015).
01/2010 – 03/2013 Ph.D. student in Physics at the University of Bologna (Italy) with a grant supported by the Italian Ministry of University and Research

Research

I am an experimental physicist in **the field of high-energy nuclear physics**.

Since 2008, I have been contributing to the ALICE experiment at the CERN Large Hadron Collider. My research interest is to understand particle production mechanisms in elementary and heavy-ion collisions. My activity within ALICE is devoted to the **study of the properties of the Quark Gluon Plasma and the hadronic stage of heavy ion collisions** via measurements of light-flavoured hadron and resonance production. At present, my experimental and phenomenological research **focuses on the study of composite states of matter and antimatter and their formation mechanisms**.

I am the Principal Investigator of the *CosmicAntiNuclei* project funded with a Starting Grant of the European Research Council under the European Union's Horizon 2020 Framework Programme for Research and Innovation (Grant Agreement n.950692).

Awards and Fellowships

- 2017 – 2020 **Marie Skłodowska-Curie Fellowship, CERN COFUND project.**
2018 **Ettore Pancini prize** of the Italian Physical Society *"For the excellent contribution to measurements of the production of light flavours and strangeness in ultra-relativistic heavy-ion collisions and the characterisation of their hadronic phase."*
2014 – 2015 **INFN-CERN Cooperative Associate Fellowship** (two consecutive years).
2010 – 2013 **Italian Ministry of University and Research grant** for PhD studies.
2011 University of Bologna, **Marco Polo scholarship** for conducting research abroad.
2009 **INFN Scholarship** for newly graduated students.
2008 **University of Bologna Scholarship** for the preparation of the Master thesis abroad.

Leadership and coordination appointments

- 07/2021 – present Principal Investigator of the project *CosmicAntiNuclei* - Constraining cosmic antinuclei fluxes for indirect dark matter searches with precision measurements of rare antimatter cluster formation funded by the ERC under the Horizon 2020 Framework Programme (ERC-2020-STG, GA N. 950692)
- 11/2017 – 01/2019 Coordinator of the WG5 Light-Flavour group for the HL-LHC Yellow Report (≈ 20 people).
- 01/2016 – 01/2018 Convener of the Light-Flavour Physics Working Group of ALICE (≈ 120 people).
- 01/2014 – 12/2015 Coordinator of the ALICE Resonance Physics Analysis Group (≈ 30 people).
- 06/2013 – 06/2014 Coordinator of the Quality Assurance Physics Analysis Group (≈ 20 detector experts) within the ALICE Physics Performance Working Group.
- 01/2012 – 06/2018 Coordinator of Quality Assurance and performance studies for the ALICE TOF detector.
- 06/2011 – 03/2013 Deputy System Coordinator and on-call expert for the ALICE Data Quality Monitoring system (during LHC Run I).

Teaching

- Since 2021 Lecturer of the Course in General Physics T-A for the First cycle degree programme in Engineering Management at the University of Bologna.
- 2019 – 2021 Lecturer of the course “*QCD in extreme conditions*” (12 hours, 3 consecutive years) - PhD Programme in Physics at the University of Bologna.
- 04-05/2019 Lecturer of the course “*QCD at extreme conditions*” - PhD Programme in Physics at the University of Calabria (16 hours) and at the University of Salerno (20 hours).
- 2019 – 2021 Lecturer at the Summer Student Lecture Programme, CERN, Geneva: “*Heavy ions*” (online since 2020).
- 11/2019 Lecturer at the ISAPP school “LHC meets cosmic rays” at CERN: “*Highlights from A Large Ion Collider Experiment*”.
- 07/2018 Lecturer at the Heavy Ion Meeting of the Korean Physical Society, Seoul (South Korea): “*Hadron production in heavy-ion collisions and down to small systems*”.
- 08/2017 Discussion leader at the CERN-Fermilab Hadron Collider Physics Summer School.
- 05/2017 Lecturer at the Heavy Ion Meeting of the Korean Physical Society, Daejeon (South Korea): “*Light flavour hadron production in heavy-ion collisions*”.
- 02/2015 Lecturer at the “Frontiers in Nuclear and Hadronic Physics” school of the G. Galilei Institute for Theoretical Physics, Arcetri (Italy): “*Soft particle production in AA collisions*”.
- 2014 – 2020 Member of examining commissions for courses of the BSc and MSc in Physics (Introduction to Modern Physics, Subnuclear Physics, Laboratory of Electronics), University of Bologna.
- 2011 – 2013 Lecturer for the training course for the ALICE Data Quality Monitoring System shifters.

Student supervision and mentoring

- 11/2020 – present Giovanni Malfattore, PhD student at University of Bologna
- 10/2016 – 03/2019 Nicolo Jacazio, PhD student at University of Bologna - 2019 Best ALICE Thesis Award.
- 06/2017 – 03/2018 Alessandra Lorenzo, Master student at University of Bologna.
- 06/2013 – 03/2014 Lucia Leardini, Master student at University of Bologna.
- 07/2019 – 08/2019 Gerhard Huber (TUM, Germany), CERN summer student.
- 07/2018 – 08/2018 Kaede Kamano (Nara’s Women University, Japan) and Thomas Honig (Heidelberg University, Germany), CERN summer students.
- 07/2014 – 08/2014 Will Bergan (College of William and Mary, Williamsburg, USA), CERN summer student.

Scientific output and publications

Unique Researcher Identifier (ORCID): [0000-0003-3498-4661](https://orcid.org/0000-0003-3498-4661)

SCOPUS Author: [57190154519](https://scopus.com/authid/detail.url?authorID=57190154519), h-index = 78

Web Of Science: [T-5470-2017](https://www.webofscience.com/wos/author/uri/uri?authorURI=T-5470-2017), h-index = 71

INSPIRE-HEP Author: [INSPIRE-00244351](https://inspirehep.net/literature/author/INSPIRE-00244351)

I am author of more than 300 publications. I had a leading or significant contribution in more than 30 of the 310 ALICE peer-reviewed scientific publications that I co-authored since 2010. Non-ALICE peer-reviewed publications include few-authors papers on light (hyper)nuclei formation mechanisms and on the performance of the ALICE Time-Of-Flight detector.

Talks at international conferences

A selection of the most important talks at international conferences and workshops, in reverse chronological order, follows.

1. *Emergence of quark-gluon plasma phenomena*, [invited plenary]
European Physical Society conference on high energy physics EPS-HEP 2021 – online, July 2021
2. *Open experimental questions for the next SQM*, [invited plenary]
19th International conference on Strangeness in Quark Matter – online, May 2021
3. *Strangeness and light flavor hadron production at low baryon density*, [invited plenary]
18th International conference on Strangeness in Quark Matter – Bari (IT), Jun. 2019
4. *Antimatter measurements at the LHC and implications for indirect dark matter searches*, [invited plenary]
57th International Winter Meeting on Nuclear Physics – Bormio (IT), Jan. 2019
5. *Testing production scenarios for (anti-)(hyper-)nuclei with multiplicity-dependent measurements at the LHC*, [invited]
XXV Cracow EIPPHANY Conference on Advances in Heavy Ion Physics, Cracow (PL), Jan. 2019
6. *From small to large collision systems: lessons learned and future perspectives*, [invited plenary]
LHCP 2018, Sixth annual conference on Large Hadron Collider physics – Bologna (IT), Jun. 2018
7. *Testing the system size dependence of hydrodynamical expansion and thermal particle production via the measurement of π , K , p , and ϕ in Xe–Xe and Pb–Pb collisions with ALICE*,
27th International Conference on Ultra-relativistic Nucleus-Nucleus Collisions, Quark Matter 2018 – Venice (IT), May 2018
8. *Energy and multiplicity dependence of the strangeness enhancement in pp collisions*,
9th International Workshop on Multiple Partonic Interactions at the LHC - Shimla (India), Dec. 2017
9. *Physics of identified spectra and nuclei, net-charge fluctuations*,
Workshop on the physics of HL-LHC, and perspectives at HE-LHC – CERN (Geneva, CH), Oct. 2017
10. *Strangeness in ALICE at LHC*, [invited plenary]
16th International conference on Strangeness in Quark Matter – Berkeley (CA, USA), Jun. 2016
11. *Hadronic resonance production measured by ALICE at the LHC*
24th International Conference on Ultra-relativistic Nucleus-Nucleus Collisions, Quark Matter 2014 – Darmstadt (DE), May 2014
12. *Particle production in Pb-Pb collisions with the ALICE experiment at the LHC*,
36th International Conference on High Energy Physics – Melbourne (AUS), Jul. 2012
13. *Results on particle production in pp and Pb-Pb collisions with the ALICE experiment at the LHC*,
47th Rencontres de Moriond on QCD and high energy interactions – La Thuile (AO, Italy), Mar. 2012

Organisation of scientific meetings

- 06/2018 LIGHT UP! 2018 Workshop, CERN, Geneva. Main organizer.
- 07/2018 XXXIX International Conference on High Energy Physics - ICHEP 2018, Seoul (South Korea). Convener of the Heavy-Ion session.
- 10/2017 INFN Workshop "2nd meeting on the physics of heavy-ion collisions at the LHC", Torino (Italy). Convener of the "Soft physics" session.
- 04/2017 INFN "Incontri di Fisica delle Alte Energie", Trieste (Italy). Convener of the "Energy frontier" session.

Reviewing activities

- 01/2019 – present Member of the ALICE Editorial Board, acting as internal referee for publications and proceedings.
- 2017 – present Member of the Internal Review Committee of several ALICE papers, in charge of the review of the analysis and paper drafts.
- 2015 – present Referee for European Physical Journal A, European Physical Journal C, European Physical Journal Plus, Nuclear Physics A, Journal of Physics G, Advances in High Energy Physics.

Outreach

- 2015, 2018, 2019 Moderator for the International Masterclasses - Hands on Particle Physics, organised by IPPOG.
- 09/2013 Volunteer at the CERN Open Days.
- 2013 – present Guide for the ALICE experiment.

Membership of Scientific Societies

- 2017 – present Member of the Marie Curie Alumni Association.
- 2017 – present Member of the CERN Alumni Network.
- 2010 – present Member of the Italian Physical Society.

Career breaks

- 08/2019 - 02/2020 Maternity.

Bologna, February 2021

LASAGNI MANGHI FEDERICO

01/03/2022

DETECTOR ACTIVITY

LUCID - ATLAS Luminosity detector

- *Activities* - Firmware, software, DCS development and maintenance
- *Responsibilities* - Responsabile Attività ATLAS Italia, Run Coordination, TDAQ expert, DCS Coordinator, Luminosity Operation Manager/Run Coordinator.

- 4 Conferences

- 4 Articles

ATLAS Muon detector (BIS78) - Upgrade RUN3

- *Activities* - TDAQ software development and hardware integration

- *Responsibilities* - BIS78 DAQ responsible

- 1 Conference

ANALYSIS ACTIVITY

ttH associated production at LHC

- *Activities* - Software development for background estimation, analysis of 2012, 2015 and 2016 data.

- 2 Conferences

- 4 Articles

Z → μμ at the LHC

- *Activities* - Analysis for cross section measurement and luminosity measurement

- 2 Conferences

- 1 Article

SIMULATION ACTIVITY

Fast digitization for ATLAS and ITk

- *Activities* - Software development for fast chain simulation and ITk performance using CMOS detectors

- 1 Conference

- 1 Article

TRIGGER ACTIVITY

Fast Tracker, FWD & MinBias trigger

- *Responsibilities*: MFBF Trigger coordinator
- *Activities* - Software development, electronic hardware and firmware testing

- 1 Conference

- 3 Articles

TEACHING ACTIVITY

Fisica generale II tutoring for civil engineers, 2017-2018

Fenomeni termici tutoring to physicists, 2017-2018

Birth and contacts:

ACADEMIC STUDIES

- B. Sc. & M. Sc. at the University of Bologna
- Ph. D. at the University of Bologna

CAREER

- Postdoctoral position in Bologna
- Qualified at the INFN national selection, "Bando 18221 / 2016"
- Permanent research position at INFN Bologna

GRANTS

- Simil-Fellow grant, with INFN and CERN
- Marco Polo grants with University of Bologna
- Funded PhD at the University of Bologna

OUTREACH

- *Scienza in Piazza* guide 2013 and 2015
- *Orientamento universitario* Reggio Emilia, 2017, 2018, 2019
- ATLAS Italia outreach group
- Q&A at *Il Senso della Bellezza* projection, Reggio Emilia, 2018
- Writer for *Libro Aperto* periodic

IT & LANGUAGES

Very high C/C++ expertise, good knowledge of VHDL, LabView, Python, WinCC OA
Extensive use of ROOT

English: *Excellent knowledge*, First Certificate in English, mark A, C1 (2007)

French: *Good knowledge*, DELF/DALF certificate in French, B1 (2007)

Career and Research Activity

Since the beginning of my scientific career, I have been involved in both analysis activities and experiment preparation in the Bologna ATLAS group. This was carried on both in Bologna and at CERN.

In the Bachelor thesis I stated my work on the ATLAS experiment, with the measurement of the $Z \rightarrow \mu\mu^+$ cross-section. For the Master I moved to the development of the Fast Tracker prototype Vertical Slice. Soon after, I started the Ph.D. by testing the prototype using the p-Pb 2013 collisions, I then moved to the study of luminosity systematics using $Z \rightarrow \mu\mu^+$, contributing to the corrections that were later applied to the official numbers. On the detector side I wrote the firmware for the LUCID luminosity monitor upgrade and supervised the detector installation at the beginning of the ATLAS Run 2. The main topic of my Ph.D. thesis consisted in providing background estimations in the ttH multileptonic analysis using advanced techniques that have strongly influenced the main ones used in the 2016 data analysis, that led to the first evidence paper.

In December 2016, after the end of the Ph.D. I have passed the INFN hiring eligibility national test, but did not make the hiring list.

On March, 1st, 2017 I won a post-doc position in Bologna for the duration of 2 years, with the title "Maintenance and development of data acquisition systems for the ATLAS experiment". In the ensuing period I have been LUCID Run coordinator at CERN and have often covered the TDAQ Expert and DCS Responsible roles. I also joined two upgrade activities: simulation of the impact of CMOS sensors in the Inner Tracker HL-LHC upgrade and TDAQ development for the LHC Phase 1 upgrade of the muon detector. The advancements I developed in the Fast Digitization techniques for the Inner Detector are now part of the main ATLAS Fast Chain Simulation.

Just after I had obtained a new INFN post-doc position in Bologna, I won a permanent research position at the INFN national selection, Bando 20012 / 2018, becoming a "Ricercatore di III° Livello". Since then I have continued working on the LUCID detector upgrade for Run 3 and on the BIS78 Detector and have been appointed Forward Detector and Minimum Bias trigger coordinator (ended October 2020).

Since 2020 I am the responsible for the LUCID Detector in ATLAS Italia. In the last year, in addition to developing the new DCS infrastructure for Run 3 LUCID, I have been leading the investigation of the radiation hardness properties of the LUCID fibre detector. On this topic I have acted as supervisor in the Master Thesis "LUCID fibre detector characterization" during which a test system comprising radiation hard fibers, test LED's and sensors, power distribution and acquisition electronics was developed. This test system was irradiated at the gamma facility ENEA Calliope.

Recent Activities and prospects

I am now finalizing the BIS78 TDAQ and the LUCID DCS and infrastructure for the ATLAS Run 3, as well as preparing monitoring and diagnostic tools for the data taking. Activities for the upgrades for HL-LHC have also begun for both projects. In December I was a member in the commission to hire a Level 6 INFN technician. Starting this year I have entered the SND@LHC collaboration and I plan to increase my engagement in the second half of the year. I have also taken an interest in the LUXE experiment at Desy, which I plan to engage with starting next year.

Bologna, 01/03/2022

Research interests and Expertise

Collider phenomenology: Standard Model, especially top-quark and Higgs physics, and BSM theories. Precise predictions, with a focus on electroweak corrections.

Radiative corrections: automation, fixed order calculations and matching to shower algorithms.

Teaching activities

Since November 2021: Adjunct Professor at the Department of Physics and Astronomy "Augusto Righi" of the Alma Mater Studiorum - Università di Bologna.

One module of 16 hours of the course "Theory of the Standard Model: Advanced Topics" in the academic year 2021/2022.

Lecturer at the FeynRules/Madgraph School on Collider Phenomenology 2018, Hefei, China, 19 - 23 November 2018.

Discussion Leader at the 2018 CERN-JINR European School of High-Energy Physics, Maratea, Italy, 20 June - 3 July 2018.

Tutorial of Relativistic Quantum Mechanics at the Université Catholique de Louvain from October to December 2014.

Tutorial of Theoretical Mechanics at the Technische Universität München from May to August 2011 and correction of the exams.

Additional activities

Referee for the Journal of High Energy Physics (JHEP) since 2015, Nuclear Physics B since 2017, the Journal of Physics G: Nuclear and Particle Physics since 2017, the European Physical Journal C (EPJ C) since 2019, and SciPost since 2021.

Convener for the Electroweak Parallel Session at the Ninth Annual Conference on Large Hadron Collider Physics (LHCP2021), Online, 7 - 12 June 2021.

Convener for the Parallel Session on Hadronic and Electroweak Observables at the XXVII International Workshop on Deep Inelastic Scattering (DIS19), Turin, Italy, 8 - 12 April 2019.

Convener for the Electroweak Parallel Session at the Sixth Annual Conference on Large Hadron Collider Physics (LHCP2018), Bologna, Italy, 3 - 9 June 2018.

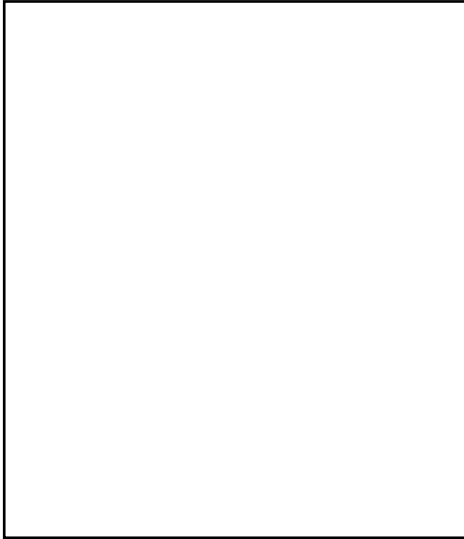
Coorganizer of the 2015-2016 seminars at the CP3, Université catholique de Louvain.

Outreach: External advisor for Khan Academy francophone, from January to December 2019.

Publications

The full and updated list of publications (with citations) can be found at this link: <http://inspirehep.net/author/profile/D.Pagani.1>.

CURRICULUM VITAE



INFORMAZIONI PERSONALI

Nome	PALADINO ANTONIO
E-mail	_____
Profilo Inspire HEP	https://inspirehep.net/authors/1424144
Profilo Scopus	https://www.scopus.com/authid/detail.uri?authorId=56572518100

ESPERIENZE LAVORATIVE

• Date (da – a)	1 luglio 2021 – in corso
• Nome e indirizzo del datore di lavoro	INFN - Sezione di Bologna,
• Tipo di azienda o settore	Ente pubblico di ricerca
• Tipo di impiego	Tecnologo III livello
• Date (da – a)	2 luglio 2019 – 30 Giugno 2021
• Nome e indirizzo del datore di lavoro	Università di Pisa, Largo Bruno Pontecorvo 3, 56127, Pisa (PI), Italy
• Tipo di azienda o settore	High energy physics
• Tipo di impiego	Assegnista di ricerca
• Principali mansioni e responsabilità	<ul style="list-style-type: none">• Valutazione del background di macchina indotto sul rivelatore Belle II e sul Silicon Vertex Detector attraverso simulazioni e misurazioni presso l'acceleratore SuperKEKB di KEK.• Operazione e presa dati del Silicon Vertex Detector dell'esperimento Belle II, organizzazione del relativo sistema di shift e documentazione.• Attività di outreach nell'ambito dell'esperimento Belle II.

• Date (da – a)	1 giugno 2018 – 30 Giugno 2019
• Nome e indirizzo del datore di lavoro	KEK, High Energy Accelerator Research Organization, 1-1 Oho, Tsukuba, Ibaraki 305-0801 Japan
• Tipo di azienda o settore	High energy physics
• Tipo di impiego	Ricercatore
• Principali mansioni e responsabilità	<ul style="list-style-type: none"> • Assemblaggio e commissioning del Silicon Vertex Detector dell'esperimento Belle II, nel ruolo di vice-coordinatore (gruppo di circa 20 persone). • Coordinatore delle operazioni del Silicon Vertex Detector per i primi nove mesi di presa dati (gruppo di circa 90 persone). • Valutazione del background di macchina indotto sul rivelatore Belle II e sul Silicon Vertex Detector attraverso simulazioni e misurazioni presso l'acceleratore SUPERKEKB di KEK. • Attività di outreach nell'ambito dell'esperimento Belle II e durante eventi organizzati dal laboratorio KEK (open day, concorsi fotografici).

• Date (da – a)	1 giugno 2017 – 31 maggio 2018
• Nome e indirizzo del datore di lavoro	Kavli IPMU Institute - 5-1-5 Kashiwanoha, Kashiwa, Chiba 277-8583, Japan
• Tipo di azienda o settore	The University of Tokyo Institutes for Advanced Study
• Tipo di impiego	Academic Support Specialist
• Principali mansioni e responsabilità	<ul style="list-style-type: none"> • Attività di ricerca sull'assemblaggio e sulla caratterizzazione di moduli di rivelatori al silicio per il Silicon Vertex Detector dell'esperimento Belle II. • Assemblaggio del Silicon Vertex Detector dell'esperimento Belle II. • Attività di outreach nell'ambito dell'esperimento Belle II e durante eventi organizzati dall'istituto Kavli IPMU (open day).

• Date (da – a)	1 giugno 2014 – 31 maggio 2017
• Nome e indirizzo del datore di lavoro	Università di Pisa & INFN Pisa, Largo Bruno Pontecorvo 3, 56127, Pisa (PI)
• Tipo di azienda o settore	Università degli studi di Pisa
• Tipo di impiego	Assegnista di ricerca
• Principali mansioni e responsabilità	<ul style="list-style-type: none"> • Attività di ricerca sull'assemblaggio e sulla caratterizzazione di moduli di rivelatori al silicio per il Silicon Vertex Detector dell'esperimento Belle II. • Attività di outreach nell'ambito dell'esperimento Belle II e durante gli eventi organizzati dall'Università di Pisa e dalla sezione INFN di Pisa (Notte dei ricercatori).

• Date (da – a)	16 aprile 2013 – 31 luglio 2013
• Nome e indirizzo del datore di lavoro	Alitec s.r.l. – via Giuntini 63, Navacchio, Pisa.
• Tipo di azienda o settore	Società di ricerca e sviluppo che opera nei campi della meccanica, dell'elettronica, della fotonica, dell'ottica e del software.
• Tipo di impiego	<ul style="list-style-type: none"> • Responsabile dello sviluppo e dei test di un sensore di integrità degli assi dei convogli ferroviari e della superficie di rotolamento delle ruote dei convogli ferroviari; • Supporto allo sviluppo, alla realizzazione e ai test di sistemi di tracking per impianti fotovoltaici a concentrazione.
• Principali mansioni e responsabilità	Programmazione di microcontrollori (STM32) e schede elettroniche usando linguaggio C, design, costruzione e test dei sensori, stesura della documentazione tecnica dei sensori.

• Date (da – a)	12 novembre 2012 – 15 aprile 2013
• Nome e indirizzo del datore di lavoro	I2T3 (Innovazione Industriale Tramite Trasferimento Tecnologico), Polo scientifico dell'Università degli Studi di Firenze. Esperienza svolta presso Alitec s.r.l. – via Giuntini 63, Navacchio, Pisa.
• Tipo di azienda o settore	Società di ricerca e sviluppo che opera nei campi della meccanica, dell'elettronica, della fotonica, dell'ottica e del software.

• Tipo di impiego	<ul style="list-style-type: none"> • Responsabile dello sviluppo e dei test di un sensore di integrità degli assi dei convogli ferroviari e della superficie di rotolamento delle ruote dei convogli ferroviari; • Supporto allo sviluppo di sensore per la misurazione di gas inquinanti; • Supporto allo sviluppo, alla realizzazione e ai test di sistemi di tracking per sistemi fotovoltaici a concentrazione.
• Principali mansioni e responsabilità	Programmazione di microcontrollori (STM32) e schede elettroniche usando linguaggio C, design, costruzione e test dei sensori, stesura della documentazione tecnica dei sensori.

TITOLI DI STUDIO

• Date (da – a)	Ottobre 2016 – Ottobre 2019
• Nome e tipo di istituto di istruzione o formazione	Università di Roma La Sapienza – Corso di dottorato in Fisica degli acceleratori
• Principali materie / abilità professionali oggetto dello studio	<p>Tesi su “Machine induced background study and simulation optimization during the commissioning run of the SuperKEKB accelerator”.</p> <p>- Longitudinal and transverse beam dynamics in circular accelerators - Physics of high brilliance accelerators</p>
• Qualifica conseguita	Dottore di ricerca in Fisica degli Acceleratori (titolo conseguito in data 19/02/2020) Qualifica: Molto buono

• Date (da – a)	Ottobre 2008 – Ottobre 2012
• Nome e tipo di istituto di istruzione o formazione	Università di Pisa – Facoltà di Scienze MM FF NN – Corso di laurea specialistica in Scienze Fisiche, curriculum di Interazioni fondamentali.
• Principali materie / abilità professionali oggetto dello studio	<p>Tesi svolta su sensori a pixel al silicio per la rivelazione di particelle cariche: caratterizzazione in laboratorio effettuata nelle camere pulite dell'INFN, sezione di Pisa; caratterizzazione su fascio di particelle effettuata presso il CERN di Ginevra; analisi dei dati raccolti.</p> <p>Acceleratori di particelle – Analisi statistica dei dati – Laboratorio di fisica delle interazioni fondamentali – Particelle elementari – Struttura della materia – Teoria quantistica di campo – Fisica ai collisionatori adronici – Relatività generale – Fisiopatologia e diagnostica biomedica – Storia della Fisica</p>
• Qualifica conseguita	Dottore magistrale in Fisica. Voto: 109/110
• Livello nella classificazione nazionale (se pertinente)	Laurea specialistica

• Date (da – a)	Ottobre 2003 – Marzo 2008
• Nome e tipo di istituto di istruzione o formazione	Università degli studi di Messina – Facoltà di Scienze MM FF NN – Corso di laurea in Fisica.
• Principali materie / abilità professionali oggetto dello studio	<p>Tesi compilativa sulla teoria di Yukawa e il modello standard delle interazioni fondamentali.</p> <p>Stage di criogenia, condotto presso il Dipartimento di Criogenia dell'Università di Messina.</p> <p>Principali materie studiate: Meccanica, Elettromagnetismo, Ottica, Fisica della materia, Fisica teorica, Fisica nucleare, Astrofisica, Meccanica quantistica, Relatività, Matematica, Elettronica, Statistica, Laboratorio, Chimica.</p>
• Qualifica conseguita	Dottore in Fisica. Voto: 110/110 e lode.
• Livello nella classificazione nazionale (se pertinente)	Laurea triennale

• Date (da – a)	Settembre 1998 – Luglio 2003
• Nome e tipo di istituto di istruzione o formazione	Liceo scientifico G. Seguenza – Messina
• Qualifica conseguita	Diploma di scuola media superiore. Voto: 100/100.

• Livello nella classificazione nazionale (se pertinente)	
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CONFERENZE E CONVEGNI

• Date (da – a)	10 luglio 2019 - 17 luglio 2019
• Nome e luogo della conferenza	European Physical Society Conference on High Energy Physics (EPS-HEP) 2019 - Ghent, Belgium
• Tipo di presentazione	Poster: Performance of the Belle II Silicon Vertex Detector

• Date (da – a)	24 settembre 2018 - 27 settembre 2018
• Nome e luogo della conferenza	62nd ICFA Advanced Beam Dynamics Workshop on High Luminosity Circular e+ e- colliders (eeFACT2018) - Hong Kong
• Tipo di presentazione	Presentazione orale in sessione parallela: Beam Background at SuperKEKB during Phase 2 operations

• Date (da – a)	3 agosto 2016 - 10 agosto 2016
• Nome e luogo della conferenza	ICHEP 2016 - 38th International Conference on High Energy Physics - Chicago
• Tipo di presentazione	Presentazione orale in sessione parallela: The Silicon Vertex Detector of the Belle II Experiment

• Date (da – a)	22 febbraio 2016 - 24 febbraio 2016
• Nome e luogo della conferenza	Trento Workshop on Advanced Silicon Radiation Detectors - Paris
• Tipo di presentazione	Presentazione orale in sessione plenaria: The Belle II SVD Origami modules

ALTRE ESPERIENZE FORMATIVE

• Date (da – a)	09/01/2017 - 10/02/2017
• Nome e tipo di istituto di istruzione o formazione	ESI - European Scientific institute
• Principali materie / abilità professionali oggetto dello studio	JUAS 2017 - Joint Universities Accelerator School Particle optics, Longitudinal beam dynamics, Transverse beam dynamics, Space charge, Instabilities, Synchrotron radiation, Linear imperfections, Non linear effects. Introduction to Accelerator design, Linacs, Cyclotrons, Introduction to MADX.

• Date (da – a)	23/03/2015 - 26/03/2015
• Nome e tipo di istituto di istruzione o formazione	Laboratori Nazionali di Legnaro
• Principali materie / abilità professionali oggetto dello studio	VI scuola nazionale su "Rivelatori ed elettronica per fisica delle alte energie, astrofisica, applicazioni spaziali e fisica medica".

• Date (da – a)	14/07/2014 - 25/07/2014
• Nome e tipo di istituto di istruzione o formazione	Paris Diderot University, Parigi.
• Principali materie / abilità professionali oggetto dello studio	Il INFIERI summer school sul trattamento intelligente dei segnali per la ricerca e l'industria. Web: infieri2014summerschool.in2p3.fr

ALTRE ATTIVITÀ

• Date (da – a)	Febbraio 2015 - In corso
• Tipo di attività	Membro del gruppo di outreach dell'esperimento Belle II
• Descrizione	<ul style="list-style-type: none"> • Comunicazione delle attività dell'esperimento attraverso i principali social networks. • Realizzazione di video di outreach sul lavoro svolto nella realizzazione in laboratorio di moduli di rivelatore al silicio: https://www.youtube.com/watch?v=Vo4tvenA4rQ

• Date (da – a)	Febbraio 2019 - Maggio 2019
• Tipo di attività	Concorso fotografico #scattinfn organizzato dall'Istituto Nazionale di Fisica nucleare.
• Descrizione	Quinto posto al concorso #scattinfn. Foto utilizzata dall'INFN in occasione della giornata internazionale per le donne nella scienza. https://home.infn.it/it/comunicazione/eventi/3400-concorso-fotografico-scattinfn

CAPACITÀ E COMPETENZE PERSONALI

MADRELINGUA	ITALIANO
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ALTRE LINGUE

Autovalutazione <i>European level</i> (*)	Comprensione				Espressione orale				Scrittura	
	Ascolto		Lettura		Interazione		Esposizione			
English	C1	Independent	C1	Independent	C1	Independent	C1	Independent	C1	Independent
Spanish	A2	Basic	A1	Basic	A1	Basic	A1	Basic	A1	Basic

(*) According to the Common European Framework of Reference for Languages

CAPACITÀ E COMPETENZE TECNICHE	<ul style="list-style-type: none"> - Ottima conoscenza dei seguenti sistemi operativi: Mac OS X, Windows XP - Vista - 7 - 8 , Linux OpenSuse, Ubuntu. - iWork'09 – Pages, Keynote, Numbers: ottima conoscenza. - Microsoft Office – Word, Excel, Power Point: ottima conoscenza. - Adobe Photoshop: conoscenza base. - Linguaggi di composizione: LaTeX (ottima conoscenza). - Linguaggi di programmazione: C (buona conoscenza), C++ (buona conoscenza), Java (buona conoscenza), Python (conoscenza base), Visual Basic (conoscenza base). Programmi di gestione ed elaborazione dati: root (buona conoscenza). - Ambienti di sviluppo: Eclipse (buona conoscenza), Labview, Altium designer (conoscenza base). - Macchina di misura meccanica Mitutoyo (buona conoscenza). - Robot per deposizione colla (buona conoscenza).
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Autorizzo il trattamento dei miei dati personali ai sensi del D.lgs. 196 del 30 giugno 2003.

Bologna, li 11/02/2022

Antonio Paladino

Curriculum Vitae
Professor Silvia Pascoli

Personal Record

Name

SILVIA PASCOLI

Further/Higher Education

Sep 1992 – May 1999 Undergraduate studies in Physics at the University of Trieste (Italy)
Oct 1999 – Oct 2002 Ph.D. Student at SISSA-ISAS (Trieste, Italy)
Oct 2006 – Feb 2008 Postgraduate studies on Learning and Teaching in Higher Education, Durham University

Qualifications

31 May 1999 Degree in Physics at the University of Trieste (Italy) with mark 110/110 *cum laude* and *menzione* (special distinction).
08 October 2002 Ph.D. degree in the Elementary Particle Sector, SISSA, Trieste (Italy) under the supervision of Prof. Serguey Petcov (SISSA-ISAS, Trieste, Italy).
Feb 2008 PG Certificate in Learning and Teaching in Higher Education X9K214, Durham University (UK).

Membership of professional bodies

Since 22 May 2008 Fellow of the Higher Education Academy, Innovation Way, York Science Park, York YO10 5BR, United Kingdom

Past Positions

Mar 2011 – Aug 2014 Deputy Director of the Institute for Particle Physics Phenomenology, Durham (UK)
Oct 2010 – Apr 2012 Reader in Physics at Durham University (United Kingdom)
Oct 2005 – Sep 2010 Lecturer in Physics at Durham University (United Kingdom) and Member of the IPPP (01 Oct 2005 - present)
Oct 2004 – Sep 2006 Fellow at the Theory Division, Department of Physics, CERN, Geneva (Switzerland)
Oct 2002 – Oct 2004 Postdoctoral researcher at the Department of Physics & Astronomy, UCLA, Los Angeles CA (USA)

Present Position

Since 01 May 2012 Full Professor in Physics at Durham University (United Kingdom)
Since 01 August 2015 Band two Full Professor at Durham University. On unpaid leave from 01 Dec 2020 and resigned from 01 Dec 2021.
Since 01 December 2020 Professore Prima Fascia (Full Professor) at the University of Bologna (Italy) with *chiamata diretta* ERC (Direct call ERC by U. Bologna approved by the Italian Ministry of University and Research MIUR)
Since 01 September 2021 CERN Scientific Associate at TH Department, CERN, Geneva (Switzerland)

Awards

September 2013 2013 Occhialini Prize and Medal for my “major contributions to the study of, and leadership in, the field of neutrino phenomenology”.

The Occhialini Medal was instituted in 2007 to honour the memory of the physicist Giuseppe Occhialini and is jointly presented by the Institute of Physics and the Società Italiana di Fisica for leading work in physics carried out in the 10 years prior to the award.

In Oct 2016 I was awarded a Wolfson Research Merit Award by the Royal Society.

Career breaks

21 July - 20 November 2016 Maternity leave

OVERVIEW OF SCIENTIFIC ACTIVITIES AND MAIN ACHIEVEMENTS

Research

Research context. My main research area is neutrino physics and astroparticle physics, with some interests in cosmology. Neutrino physics has revolutionised our understanding of particle physics in the past twenty years. The discovery of neutrino oscillations implies that, contrary to what predicted by the Standard Model of particle physics, neutrinos have masses and mix. This poses compelling questions to complete our understanding of their properties and to unveil the physics beyond the Standard Model which is at the origin of the masses. A wide and ambitious experimental programme is underway. My work spans all relevant areas: Theory, Phenomenology, collaboration with experimentalists and Astroparticle physics. My major research achievements include:

- In 2009, together with collider experts including T. Han, the possibility to search for heavy neutral leptons in rare meson decay and at the LHC. This work has become a standard reference in this area and has already achieved more than 700 citations.
- Given the results of solar neutrino experiments in 2002, the realisation that the predictions for the decay rate in neutrinoless double beta decay differ depending on the neutrino mass spectrum and this process can be exploited as a test of neutrino masses. This approach is now widely used. My related papers have more than 1000 citations.
- study of dark sectors via the neutrino portal, identifying new searches for HNLs at upcoming neutrino facilities, a novel explanation for the MiniBooNE anomaly and the link between dark matter and neutrinos, carried out in the context of ERC NuMass, with over 1000 citations.
- relevant role in the development of an international programme in long baseline oscillation neutrino physics, writing several articles and collaborating with experimentalists, as leader of the physics WP in LAGUNA-LBNO and joining DUNE. In view of the discovery of large θ_{13} , the idea of a low energy neutrino factory, proposed with Geer and Mena, prompted several studies ultimately leading to the choice of a low energy setup for a possible neutrino factory by the international community.
- the link between low energy and high energy CP-violating phases in leptogenesis in see-saw models. This has been adopted as a main motivation for the next generation of long baseline neutrino experiments. I was invited to over 10 leading conferences, e.g. Neutrino 2014, to discuss this issue and recently to write a related article in Nature News and Views.
- collaboration with the worldleading Institute for Computational Cosmology, specifically Profs. Baugh, C. Frenk and B. Li, on cosmology, including the co-supervision of six PhD students. We study the interplay between particle physics and cosmology in the formation of large scale structures in the Universe. We have published together 22 papers obtaining nearly 1000 citations.

Since my appointment, at Durham University I have **led the research in my area, significantly expanding it into neutrino phenomenology and theory**. I have brought Durham University and the IPPP into major international collaborations and projects, such as DUNE, LAGUNA-LBNO, EUROnu, LAGUNA, and the International Design Study on a neutrino factory and I have led Durham contributions to these activities. I have significantly strengthened the links with the experimental neutrino community in UK and in Europe and USA, both by collaborating on topics of common interest and by contributing to networks and Design Studies.

Research outputs. Since 2001, I have published over 100 articles in leading refereed journals in my research area, including Nature, Physical Review Letters, Physical Review D, Physics Letters B, Nuclear Physics B, JHEP and JCAP. Of all these articles I am a main author and in many of them, most since 2005, I am the initiator or one of the initiators of the research project. Including conference proceedings, I have nearly 200 papers of which I am a main author, with a total of over 14000 citations (according to the INSPIRE Data system, <http://inspirehep.net/>, which is the search engine of choice in

my area of research). Of the refereed published articles, with over 10000 citations, 2 have more than 500 citations, 4 more than 250 citations, 22 more than 100 and 42 more than 50, with an average per paper of 85. My h-index is 58 (58 papers with more than 58 citations) and 67 including all publications.

International Prizes and Awards. In 2013 I was awarded the Occhialini Prize and Medal jointly by the Institute of Physics and the Societa' Italiana di Fisica (Italian Physical Society) for major contributions to the study of, and leadership in, the field of neutrino phenomenology. This prize and medal is awarded to scientists in all fields of physics for their achievements in the past ten years. In Oct 2016 I was awarded a Wolfson Research Merit Award by the Royal Society.

Grants. I have **successfully applied to nine large grants**, leading the involvement of Durham in large consortia and projects and in six of them playing a leading role. These include: 1) awarded in 2013 and started on May 1 2014, the FP7 ERC Consolidator Grant NuMass of which I was the PI. It focused on a novel approach to neutrino physics focussing on low energy extensions of the Standard Model. It was extended till February 2021. 2) started in October 2020, the Horizon2020 ITN HIDDEN on neutrinos and dark matter, with over 25 nodes worldwide and more than 200 scientists. I am the ITN Coordinator.

The amount of funding under my PIship at Durham exceeds 7M EUR. In addition to the projects mentioned above, I contributed to the activities of the STFC IPPP Grant till 2008, I was co-PI of the fEC IPPP grant (2008-2018) and of the IPPP Consolidated grant (2018-2020) and I am co-I on the new IPPP Consolidated Grant (2020-2023) with focus on the core activities in neutrino physics. I lead the UKIERI proposal "Neutrinos and the Fundamental laws of Nature", of which I was also PI till summer 2007. I am/was PI for Durham University in the EU Design Studies EUROnu, LAGUNA, LAGUNA-LBNO, EuITN Invisibles, ITN Elusives, RISE InvisiblesPlus, EuroNuNet.

Research esteem indicators. I have been invited to present **more than seventy plenary talks at major international conferences**. As recent highlights, I was invited to give a talk at Physics@Veldhoven 2021, a keynote talk at be.HEP 2020, online, the neutrino theory talk at the EPS-HEP 2019 conference, Ghent, Belgium, one of the two leading particle physics conferences in 2019, together with (Lepton Photon) and at the CERN Council Open Symposium on the Update of European Strategy for Particle Physics, May 2019, Granada, the key note talk at the Invisibles workshop in Sep 2018, a colloquium at the CERN Theoretical Department in Jan 2018, a plenary talk at the Aspen Winter conference 2016, at Neutrino 2014, the neutrino theory review at Lepton-Photon 2013, the most important conference in particle physics in 2013, at NeuTel 2015, Pheno 2015, COSMO 13, and I was the convener of the Neutrino Session (expert for theory) at the EPS-HEP 2011, Grenoble (France), the top conference, together with Lepton Photon 2011, in particle physics in 2011. I was also invited to give a Wine&Cheese talk at Fermilab and colloquia at the Aspen Center for Physics and Fermilab, to lecture at BUSSTEPP 2013, 2014 and 2015 and at INSS 2013, at the ICTP summer school 2017 and at the CERN-JINR school in June 2018. I was the only convener of the theoretical session of the European Strategy for Future Neutrino Physics meeting, which can be considered to be one of the most, if not the most, important neutrino meeting in 2009 and in which the scientific strategy for large neutrino facilities (few billion GBP scale) in Europe and worldwide for the next 20 years was reviewed and discussed at CERN. Just few days later, I was invited to give the only theoretical review talk at NNN09 in Estes Park (USA), the most important conference in the field of large neutrino detectors.

I was Severo Ochoa Visiting Professor at the Universidad Autonoma Madrid in 2014 and have held several short/medium term **visiting positions in leading research institutions** such as Fermilab (USA), SISSA (Italy), ICTP (Italy), CERN (Switzerland), Aspen Center for Physics (USA), KITP (USA), just to name a few. Since 2015 I am Associate Researcher at the IFT, UAM (by invitation).

Invitations to sit on international organisation committee of leading conferences. I have been invited to be a member of the Organising Committee of leading conferences, namely the Rencontres de Blois, INSS 2014, Invisibles meetings in 2012, 2014–2020, the UKHep Forum in 2013-2016 and 2019-2020, NeuTel 2021 and others. Since 2016 I am a member of the International Neutrino Committee, which oversees the organisation of the Neutrino conferences.

Invitations to sit on international review bodies. From Spring 2014 to Summer 2018, I sat on the Fermilab Physics Advisory Committee (PAC), which consists of 14 members from the particle physics community appointed by the Fermilab Director. The committee advises the Director on the current and future experimental program at the laboratory. Since 2016, I am a co-convenor of the CERN Neutrino Platform Theory Working group. We organise neutrino theory activities at CERN such as workshops, we advise the CERN TH Department on neutrino matters and we liaise with the experimentalists of the Neutrino Platform. In 2018, 2019 and 2020 I was on a Portuguese FCT Panel and I set twice on the Intertalentum programme panel at UAM. In 2016 I was a member of the Ramon y Cajal panel for the attribution of the 5-year Ramon y Cajal fellowships in Spain. In 2019-2020, I chaired the APPEC panel on neutrinoless double beta decay to coordinate the future European strategy in this area. Currently, I am deputy chair of the APPEC SAC, I sit on the Hyper-Kamiokande PAC, the LNGS Scientific Committee and the FIPs Centre Steering Committee.

Research Council Panels. At the UK level, I played a **leading role in shaping the scientific research in my area as member of STFC committees.** I was member of the STFC PPAP panel for 3 years till Oct 2021). Its role is to define the roadmap in particle physics in the UK and to serve as a link between the funding agency and the particle physics community. In 2019 I sat on the STFC Ernest Rutherford Fellowship panel and the Royal Society Research Grants for Research Fellows Panel. From the end of 2010 to September 2014, I was **Core member of the PPGP**, the particle physics grants panel, both for Theory and Experiments. The role is to review and allocate the Grants for STFC and advise the STFC executive on grants and related matters. As a Core member I was part of both the Theory and Experimental Grants Panels. Subsequently I was member of the Panel for the Consolidated Grant Implementation Review which considered their implementation across all STFC scientific areas. In 2012 and 2013 I was a member of the **Ernest Rutherford Fellowship Panel** which is responsible for the choice of the awards of the Ernest Rutherford five-year fellowships. I was also member of the UK DUNE/HK Oversight Committee. I was also member of the **PAAP**, the advisory committee on particle astrophysics, of which I was the only theorist. Finally I was part of the **PP2020**, which highlighted the vision for particle physics for the next decade.

Leadership in international projects. At the European level, I was **the leader of the WP5 on Physics and Performance of LAGUNA-LBNO**, coordinating the work of more than 100 scientists in 39 institutions (overall budget of LAGUNA-LBNO 5M EUR). I was **the deputy coordinator of the ITN Invisibles** on dark matter and neutrinos (overall budget 4M EUR), whose application I co-led, and which involves 11 full partners, 15 associated partners in Europe, US, South America and Asia. I was also the deputy coordinator of networking activities funded by the EU, BENE till end of 2008 and **NEU2012** since January 2009 till May 2014, which helped in coordinating the work of over 150 scientists in more than 10 European countries. Currently I am the deputy coordinator of the **ITN Elusives** and of the **RISE InvisiblesPlus**, both with around 30 institutions and 200 scientists. At the international level, I was member of the Physics and Performance Steering Committee of the International Design study on a neutrino factory which coordinated the theoretical research on this billion GBP future facility. I also sat on the Panel for the discussion at the ICFA Neutrino European Meeting, Paris (France), January 8-10, 2014.

PhD supervision and junior scientists mentorship. I have recruited to Durham **fifteen post-doctoral researchers** funded by the IPPP, LAGUNA, EUROnu, Invisibles and the ERC NuMass grants: Sergio Palomares-Ruiz (Oct 2006 - Sep 2008), Michael Schmidt (Oct 2008 - Sep 2011), Chris Orme (Oct 2009 - Mar 2010), Jacopo Lopez- Pavon (Oct 2010 - Sep 2012), Takashi Toma (Jan 2012 - Oct 2014), Manimala Mitra (Dec 2012 - Apr 2015), Ninetta Saviano (Dec 2013 - Nov 2015), Peter Ballet (Oct 2013 - Dec 2018), Ye-Ling Zhou (Sep 2015 - Sep 2018), Richard Ruiz (Oct 2015 - Sep 2018), Cedric Weiland (Oct 2015 - Sep 2018), Arsenii Titov (Jun 2017 - June 2019), Sabya Chatterjee (Oct 2018 - Sep 2021), Kris Moffat (Jun 2020 - Feb 2021), Tommaso Boschi (Dec 2020 - Feb 2021). All these postdocs have moved to prestigious positions in academia or industry, e.g. Ramon y Cajal position at Valencia, permanent position at IPPP Durham, U. Valencia, SISSA, U. Pittsburgh, INFN, U. Louvain.

I have mentored several junior colleagues at Durham Universities at the start of their appointments.

Due to the interest in neutrino physics and related activities, I have attracted **nineteen PhD students** who are supervised by me and funded by STFC (5 students), ICC-IPPP EU training activity grant (1 student), a private donor (3 student), a FCT Portuguese grant (1 student), the ITN Invisibles (1 student), the ERC Grant NuMass (4 students), the Brazilian grant (1 student), the ITN Elusives (1 student) and self-funded (2 students). Seven of these students are/were supervised together with Prof. Baugh, Dr. Li and/or Prof. Frenk of the ICC. Sixteen of them have already successfully completed their PhD: Chris Orme, Elise Jennings, Tracey Li, Chan-Fai Wong, Peter Ballett, Alexander Barreira, Jascha Schwetchenko, Mark Ross-Lonergan, Jessica Turner, Tse-Chun Wang, Matteo Leo, Andres Olivares, Julia Stadler, Matheus Hostert, Kris Moffat, Asli Abdullahi with a 100% completion rate, and moved to prestigious positions including the Simmons Fellowship at the U. of Chicago, MIT, U. Valencia, Fermilab, Minnesota/Perimeter, U. Columbia with a senior postdoc.

Leadership of Research Centres. From Mar 2011 to Sep 2014 I was the Deputy Director of the IPPP, I chaired the Management Board of the MSc in Particle, Strings and Cosmology and I was secretary of the Centre for Particle Theory. The IPPP was established in October 2000 as a joint venture between the University of Durham and the UK Particle Physics and Astronomy Research Council (PPARC; now STFC). The aim is to foster world-class research in particle physics phenomenology - the bridge between theory and experiment in the study of the building blocks of all matter in the universe and of the forces that operate between them. The IPPP is a vibrant scientific environment, with 15 members of academic staff, 15 research associates and 30 PhD students. It hosts an extensive visitor programme and provides training for the next generation of particle physicists through guidance in research, and dedicated graduate lectures and summer schools. It organises 15- 20 workshops and conferences yearly, with a number of participants ranging from 10 to 200. My role supported the Director in the running of the Institute deputizing for him in his absence, if necessary, and included coordination of IPPP contacts with experimental groups, organisation of the admission process of postgraduate students at the IPPP, of the annual hiring round of postdoctoral research associates, coordination of communication/knowledge exchange within the IPPP, of the IPPP Visitor Programme, of PDRA undergraduate teaching assignments, representation of the IPPP at the IPPP Steering Committee.

Workshop organization. I have organised more than **fifteen international workshops and schools**, with a total of more than 1500 participants, and for eight of these I was chair of the organising committee and major responsible for the scientific and organisational aspects of the meetings. In particular, I was co-Chair of the Organising Committee of Neutrino 2016, Royal Geographical Society, London, the most attended Neutrino conference to that date with over 700 participants. I also (co-)Chaired the organisation of the Invisibles Workshop 2013, NuPhys 2013-2019 and the Director of BUSSTEPP 2012 and Invisibles 2013 Schools.

Learning and Teaching Outputs.

Since my appointment in Durham, I have taught five undergraduate courses at Level 3 on Theoretical physics (Quantum mechanics), with over 100 students each and eight PG courses on Neutrino Physics (typically with 15-20 students). I also supervised 27 Level 4 project students on various projects on neutrino physics. These projects focus on a research area for around 6 months and a talk and a dissertation are prepared by the students. Six of these students have moved to PhD in particle physics. I have also supervised eight students in the dissertation for their Taught MSc in Elementary Particle Theory. These dissertations focussed on neutrino physics and entailed one term of research on a specific topic under my supervision and guidance. Three of these students moved on to PhDs in physics. Since 2011, I have been on a partial teaching buyout due to the my role in the IPPP, the ERC Grant NuMass and other grants.

At the University of Bologna I have taught:

2020-2022: 2 Master courses on Theoretical Astroparticle Physics: $\tilde{20}$ students

2020-2022: 2 PhD courses on Theoretical Astroparticle Physics: $\tilde{20}$ students

2021/22: Master course on Advanced topic in the standard model: $\tilde{20}$ students 2021/2022: Master

course on Transferable skills.

I also supervised/supervising 3 Master thesis.

In 2008 I completed my PG Certificate in Learning and Teaching in Higher Education with very high marks in all modules. In general the comments of the students about my lectures are very good, and have improved constantly. In Oct 2009 - Sep 2013, I was the representative for Elementary Particles on the PG Committee and I was responsible for PhD admissions for the Elementary Particle Physics sector.

I was the examiner for a PhD student at Glasgow University, January 22, 2010, at the Universidad Autonoma Madrid, June 9, 2010, at IAP, Paris in Sep 2014, at Universite Paris Sud, Orsay, in Sep 2015, and at the Universite Pierre et Marie Curie, Paris, in 2015, at SISSA in Sep 2018, at Queen Mary University in Nov 2019, at UCL in Jul 2021, and internal examiner for several PhD students at Durham University and at the University of Bologna.

University Administration

From Oct 2006 to Sep 2011, I was Departmental Representative at the Library Users Committee, liaising for the Department of Physics with the Library. In academic years 2007-2008, 2008-2009 and 2009-2010 I was member of the Level 2 paper committee which checks the exam papers set for the May-Jun and Aug-Sep exams at Level 2 in Physics.

From Oct 2009 to Sep 2013, I was the PG representative for the Particle Physics Sector on the PG Committee and responsible for PhD admissions in Particle Physics. My role entailed the administrative management of PhD students and in particular I overviewed the smooth running of teaching and assessment activities for PhD students at the IPPP and I was in charge of PhD admissions for our group.

In academic year 2007-2008, I was checker for the exams in the Department of Physics. My responsibility was to check the marking done by colleagues. I was vetter for the exams of Level 4 courses.

From 2018 till the end of 2020 I sat on the Faculty Progression Committee which reviews the cases for promotion put forward and recommends progression for all academic, research and teaching staff. I am also on the Academic Progression Review Task and Finishing Group representing the Faculty of Science.

In Italy, I sat on the hiring committees for full professor (professore prima fascia, settore concorsuale 02/A2, settore scientifico disciplinare FIS/02) at the University of Parma in 2019 and University of Pisa in 2021 and associate professor (professore di seconda fascia, settore concorsuale 02/A2, settore scientifico disciplinare FIS/02) at the University of Padova in 2020.

At the University of Bologna I am member of the Working group on EDI at DIFA.

Outreach and Community

I am member of the **SCR of Grey College** and **University College**, Durham University. I regularly participate in activities and events and give my contribution to a lively academic environment. In 2009 I was invited to become **postgraduate tutor** for science students at Grey College, a role which I kept for two years. I had more than 15 tutees whom I met once a term, or more often if necessary.

In summer 2018, I co-led, together with Prof. Francesca di Lodovico at QMUL, the organisation of an exhibit at the Royal Society Summer Exhibition. In addition to attending the event and interacting with the public, at Durham we developed an App, Neutrinoscope, to help visualise neutrinos around us, videogame, NuOdyssey, on neutrinos traveling and interacting with matter around them and a mock version of the Super-Kamiokande detector.

I was the proponent and the chair of the organisation of the Invisibles Art Event as part of the outreach activities of the Invisibles 13 workshop. The Invisibles Art Group, constituted by artists from the North East. The resulting art pieces prepared by the artists were presented to the public in an event on July 18 2013 at Lumley Castle.

I was invited to provide a talk at the celebration ceremony of the opening of the Academic Year 2006-2007 at SISSA-ISAS, Trieste (Italy), Nov 27, 2006.

I was invited to sit on the examiners committee at the 30th International Physics Olympiad, Padua

(Italy), Jul 18-27, 1999, sponsored by the Ministry of Education, Universities and Scientific and Technological Research, Italy, and organised by the Association for the Teaching of Physics with the support of the Italian Physics Society and the Department of Physics of Padua University. International Physics Olympiad is an annual competition for secondary school students in Physics.

Selected publications

Twentyfive selected publications since 2001 follow. It is customary in my research field to put the authors in alphabetical order irrespective of their contribution to the project. Citations are reported according to the INSPIRE Data system (<http://inspirehep.net/>), which provides the most accurate and reliable list of papers and citations in theoretical particle physics and astrophysics.

1. A. Abdullahi, M. Hostert and S. Pascoli,
“A dark seesaw solution to low energy anomalies: MiniBooNE, the muon ($g-2$), and BaBar,”
Phys. Lett. B **820** (2021), 136531 [arXiv:2007.11813 [hep-ph]]. 17 citations.
We propose a unique explanation of low energy anomalies in terms of kinetic mixing.
2. S. F. King, S. Pascoli, J. Turner and Y.-Li. Zhou,
“Gravitational waves and proton decay: complementary windows into GUTs,”
Phys. Rev. Lett. 126 (2021) 2, 021802 [2005.13549 [hep-ph]] . 9 pp. 21 citations.
We highlight for the first time the interplay between gravitational wave detection and proton decay searches in unveiling physics at the highest scale, in particular discriminating GUT models.
3. P. Ballett, T. Boschi and S. Pascoli,
“Heavy Neutral Leptons from low-scale seesaws at the DUNE Near Detector,”
JHEP **03** (2020) 111 [1905.00284 [hep-ph]]. 53 pp. 50 citations.
We perform a detailed study of the capabilities of the DUNE near detector to search for MeV-scale heavy neutral leptons and we inscribe it in realistic models of neutrino masses.
4. P. Ballett, M. Hostert and S. Pascoli,
“Dark Neutrinos and a Three Portal Connection to the Standard Model,”
Phys. Rev. D **101** (2020) no.11, 115025 [arXiv:1903.07589 [hep-ph]]. 34 citations.
Going beyond minimality in dark sectors, this paper highlights the interplay between different portals to dark sectors and the unique phenomenology that can result from it.
5. P. Ballett, M. Hostert and S. Pascoli,
“Neutrino Masses from a Dark Neutrino Sector below the Electroweak Scale,”
Phys. Rev. D **99** (2019) no.9, 091701 [arXiv:1903.07590 [hep-ph]]. 6 pp. 28 citations.
We propose a new model of neutrino masses at the GeV scale with specific phenomenological signatures.
6. M. Blennow, E. Fernandez-Martinez, A. Olivares-Del Campo, S. Pascoli, S. Rosauero-Alcaraz and A. V. Titov,
“Neutrino Portals to Dark Matter,”
Eur. Phys. J. C **79** (2019) no.7, 555 [arXiv:1903.00006 [hep-ph]]. 46 citations.
Study of the possibility to embed neutrino-dark matter interactions in self-consistent theoretical frameworks.
7. S. Pascoli, R. Ruiz and C. Weiland,
“Heavy neutrinos with dynamic jet vetoes: multilepton searches at $\sqrt{s} = 14, 27, \text{ and } 100 \text{ TeV}$,”
JHEP **1906** (2019) 049 [arXiv:1812.08750 [hep-ph]]. 101 pp. 44 citations.
We propose searches for lepton flavour violation at present and future colliders. We find that, thanks to new search strategies, we obtain a much improved sensitivity.

8. P. Ballett, S. Pascoli and M. Ross-Lonergan,
 “U(1)’ mediated decays of heavy sterile neutrinos in MiniBooNE,”
 Phys. Rev. D **99** (2019) 071701 [arXiv:1808.02915 [hep-ph]]. 8 pp. Topcite 50+: 60 citations.
 We propose a novel explanation for the MiniBooNE excess which satisfy all present bounds, while providing a good fit to the energy and angular distribution of the events.
9. K. Moffat, S. Pascoli, S. T. Petcov, H. Schulz and J. Turner,
 “Three-flavored nonresonant leptogenesis at intermediate scales,”
 Phys. Rev. D **98** (2018) no.1, 015036 [arXiv:1804.05066 [hep-ph]]. 28 pp. 35 citations.
 We show that, contrary to common limits, the scale for leptogenesis in see-saw type I models can be lowered to intermediate scales, opening a new window for this type of physics BSM.
10. A. Olivares-Del Campo, C. Boehm, S. Palomares-Ruiz and S. Pascoli,
 “Dark matter-neutrino interactions through the lens of their cosmological implications,”
 Phys. Rev. D **97** (2018) no.7, 075039 [arXiv:1711.05283 [hep-ph]]. 23 pp. 43 citations.
 We study the connection between neutrinos and dark matter and their possible tests in cosmology and astroparticle experiments.
11. P. Ballett, S. Pascoli and J. Turner,
 “Mixing angle and phase correlations from A_5 with generalized CP and their prospects for discovery,”
 Phys. Rev. D **92** (2015) no.9, 093008 [arXiv:1503.07543 [hep-ph]]. 19 pp. Topcite 50+: 72 citations.
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12. C. Boehm, J. A. Schewtschenko, R. J. Wilkinson, C. M. Baugh and S. Pascoli,
 “Using the Milky Way satellites to study interactions between cold dark matter and radiation,”
 Mon. Not. Roy. Astron. Soc. **445** (2014) L31 [arXiv:1404.7012 [astro-ph.CO]]. 5 pp. Topcite 100+: 119 citations.
 First numerical study of the impact of interactions between dark matter and photons/neutrinos on the growth of cosmological structures, showing that they can ameliorate the missing satellite problem.
13. P. Ballett, S. F. King, C. Luhn, S. Pascoli and M. A. Schmidt,
 “Testing atmospheric mixing sum rules at precision neutrino facilities,”
 Phys. Rev. D **89** (2014) 1, 016016 [arXiv:1308.4314 [hep-ph]]. 15 pp. Topcite 50+: 72 citations.
 First study of the tests of sum rules predicted in leptonic flavour models, which can be achieved in future experimental facilities.
14. A. Barreira, B. Li, W. A. Hellwing, C. M. Baugh and S. Pascoli,
 “Nonlinear structure formation in the Cubic Galileon gravity model,”
 JCAP **1310** (2013) 027 [arXiv:1306.3219 [astro-ph.CO]]. 16 pp. Topcite 100+: 113 citations.
 One of the first studies of the non-linear growth of cosmological structures in galileon models.
15. J. Lopez-Pavon, S. Pascoli and C. f. Wong,
 “Can heavy neutrinos dominate neutrinoless double beta decay?,”
 Phys. Rev. D **87** (2013) no.9, 093007 [arXiv:1209.5342 [hep-ph]]. 13 pp. Topcite 50+: 83 citations.
 We have highlighted that loop corrections to neutrino masses are important and imply that in extensions of the see-saw type I neutrinoless double beta decay is dominated by light neutrino exchange.

16. E. Jennings, C. M. Baugh and S. Pascoli,
Modelling redshift space distortions in hierarchical cosmologies,
Mon. Not. Roy. Astron. Soc. **410** (2011) 2081 [arXiv:1003.4282 [astro-ph.CO]]. Topcite 100+: 116 citations.
Study of the distortions in the redshift space power spectrum in different dark energy models, which highlighted the need of N-body simulations in extracting constraints on dark energy from future observations.
17. A. Atre, T. Han, S. Pascoli and B. Zhang,
The Search for Heavy Majorana Neutrinos,
JHEP **0905** (2009) 030 [arXiv:0901.3589 [hep-ph]]. 61 pp. Topcite 500+: 673 citations.
One of the very first papers on searches of lepton number violation at the LHC with a detailed analysis and in meson and tau decays. Since then a lot of interest has developed, leading to new searches at the LHC in ATLAS, CMS and LHC-b.
18. A. Melchiorri, O. Mena, S. Palomares-Ruiz, S. Pascoli, A. Slosar and M. Sorel,
Sterile Neutrinos in Light of Recent Cosmological and Oscillation Data: A Multi-Flavor Scheme Approach,
JCAP **0901** (2009) 036 [arXiv:0810.5133 [hep-ph]]. Topcite 50+: 89 citations.
Study of sterile neutrino constraints in cosmology and experiments. I developed the first analytical method to derive the sterile neutrino density in a multiflavour approach.
19. S. Palomares-Ruiz and S. Pascoli,
“Testing MeV dark matter with neutrino detectors,”
Phys. Rev. D **77** (2008), 025025 [arXiv:0710.5420 [astro-ph]]. 66 citations.
Novel strategy to search for MeV dark matter via their annihilations into monochromatic neutrinos in high density regions of the galaxy.
20. S. Geer, O. Mena and S. Pascoli,
A Low energy neutrino factory for large θ_{13} ,
Phys. Rev. D **75** (2007) 093001 [hep-ph/0701258 [HEP-PH]]. Topcite 50+: 90 citations.
First paper on the low energy neutrino factory which established it as an option for a future neutrino factory. Thanks to the discovery of large θ_{13} , the International Design Study on a neutrino factory adopted a low energy setup in April 2012.
21. C. Boehm, Y. Farzan, T. Hambye, S. Palomares-Ruiz and S. Pascoli,
“Is it possible to explain neutrino masses with scalar dark matter?,”
Phys. Rev. D **77** (2008), 043516 [arXiv:hep-ph/0612228 [hep-ph]]. 102 citations.
Connection between neutrinos and dark matter, showing that the same interaction can be responsible for the relic dark matter density and neutrino masses.
22. S. Pascoli, S. T. Petcov and A. Riotto,
Connecting low energy leptonic CP-violation to leptogenesis,
Phys. Rev. D **75** (2007) 083511 [hep-ph/0609125]. Topcite 100+: 209 citations.
We demonstrated for the first time that the low energy CP-violating phases enter directly in leptogenesis in the context of see-saw type I flavoured leptogenesis.

23. G. Gelmini, S. Palomares-Ruiz and S. Pascoli,
Low reheating temperature and the visible sterile neutrino,
Phys. Rev. Lett. **93** (2004) 081302 [astro-ph/0403323]. Topcite 100+: 161 citations.
We highlighted the fact that in non-standard cosmologies, e.g. with low reheating temperature, the production of sterile neutrino in the Early Universe can be suppressed.
24. G. M. Fuller, A. Kusenko, I. Mocioiu and S. Pascoli,
Pulsar kicks from a dark-matter sterile neutrino,
Phys. Rev. D **68** (2003) 103002 [astro-ph/0307267]. Topcite 100+: 193 citations.
We showed that keV sterile neutrino can at the same time be the dark matter of the Universe and explain the pulsar kicks.
25. S. M. Bilenky, S. Pascoli and S. T. Petcov,
Majorana neutrinos, neutrino mass spectrum, CP violation and neutrinoless double beta decay. 1. The Three neutrino mixing case,
Phys. Rev. D **64** (2001) 053010 [hep-ph/0102265]. Topcite 250+: 287 citations.
We showed that, thanks to the solar neutrino results of the solar mixing angle being non-maximal, neutrinoless double beta decay could be used to extract information on the neutrino mass hierarchy.

CURRICULUM VITAE E SCIENTIFICO DI MICHELE POZZATO

DATI PERSONALI

Nome e Cognome : Michele Pozzato

Luogo e Data di nascita :

Nazionalità

Indirizzo e-mail

TITOLI DI STUDIO

- Laurea quadriennale in Fisica conseguita il 15/07/2005 presso l'Università di Bologna con votazione 109/110, con tesi su: "*Test meccanici sui microscopi automatizzati di OPERA e localizzazione dei vertici di interazione*", realizzata presso la Cattedra di Astrofisica Nucleare e Subnucleare. Relatore: Prof. Giorgio Giacomelli.
- Dottorato in Fisica conseguito il 14/05/2009 presso l'Università di Bologna. Titolo della tesi: "*Reconstruction of CNGS neutrino events in the emulsions of the OPERA experiment*", realizzata presso la Cattedra di Astrofisica Nucleare e Subnucleare. Relatori: Prof. Giorgio Giacomelli e dott. Gianni Mandrioli.

ASSEGNI DI RICERCA E CONTRATTI

02/02/2009 – 01/02/2012

- Assegno di ricerca sul tema "Studio delle interazioni da neutrino con le emulsioni nucleari dell'esperimento OPERA".

02/02/2012 – 01/02/2014

- Assegno di ricerca sul tema "Ricerca di topologie da decadimento nelle emulsioni nucleari dell'esperimento OPERA".

07/2014 – 07/2015

- Assegno di ricerca sul tema "Sviluppo di un calorimetro per la misura di elettroni di bassa energia (3-100 MeV) e protoni di bassa energia (20-200 MeV)" – Università degli studi di Trento

07/2015 – 06/2016

- Assunto a tempo determinato con profilo di ricercatore INFN di III livello professionale per attività di ottimizzazione e calibrazione in laboratorio di un calorimetro spaziale a scintillatori plastici.

01/2017 – 12/2018

- Assunto a tempo determinato con profilo di ricercatore INFN di III livello professionale nell'ambito del progetto ENUBET.

01/2019 – 01/2020

- Collaborazione con università dell'Alberta per lo sviluppo di un sistema automatico di analisi dei rivelatori nucleari a tracce

04/2020 – 06/2020

- Incarico di Lavoro autonomo non occasionale per le esigenze del Dipartimento di Fisica e Astronomia sul tema "Sviluppo di un prototipo di un sistema di imaging basato su fotomoltiplicatori al silicio"

10/2020 – 06/2021

- Assunto a tempo determinato con profilo di ricercatore INFN di III livello professionale.

07/2021

- Assunto a tempo indeterminato con profilo di ricercatore INFN di III livello professionale.

COMPETENZE

Informatiche:

- *Linguaggi:* Fortran, C++, SQL.
- *Ambienti Operativi:* Windows 98/2000/2003 server/XP/Vista/10, Ms DOS, Linux – Unix.
- *Software / Tools normalmente utilizzati:* Microsoft Office, ROOT, Microsoft Visual Studio, ORACLE.

Linguistiche:

- Conoscenza molto buona della lingua inglese orale e scritta.

Altro:

- Caratterizzazione in criogenia di fotomoltiplicatori al silicio (SiPM);
- Caratterizzazione di fotomoltiplicatori per utilizzo in ambito spaziale;
- Sviluppo di sistemi di acquisizione basati su VME;
- Caratterizzazione di scintillatori / fibre WLS;
- Sviluppo simulazione MC in ambiente GEANT4

PARTECIPAZIONE A SCUOLE POST-LAUREA:

- "Neutrino Physics and Astrophysics" – Varenna 26 July - 5 August 2011.
- "Architectures, tools and methodologies for developing efficient large scale scientific computing application", Bertinoro 20-26 October 2013.

RUOLI DI RESPONSABILITÀ

- Coordinatore in OPERA del gruppo di lavoro di simulazione degli eventi di neutrino in emulsione dal 2011 al 2013;
- Coordinatore del Working Package 2 (dal 2015 ad oggi) del progetto "ENUBET" (ERC Consolidator Grant PI A. Longhin) il cui scopo è la costruzione di un dimostratore del rivelatore
- Nell'ambito del progetto LIMADOU-CSES, responsabile della caratterizzazione dei PMT di volo e della validazione in camera a vuoto dei circuiti per l'alimentazione ad alta tensione di fototubi (nel 2016 per CSES e nel 2020 per CSES-2).

ATTIVITÀ DIDATTICA

Correlatore delle tesi di Laurea Triennale:

- "Studio di scintillatori accoppiati a SiPM per un tracciatore di particelle cariche" presentata da Elisabetta Montagna nel 2015;
- "Studio di un tracciatore di particelle cariche realizzato con scintillatori e SiPM" presentata da Vlad Fabbri nel 2016.
- "Test in criogenia di SiPM per futuri esperimenti con neutrini" presentata da Chiara Bartolini nel 2019;

Correlatore delle tesi di Laurea Magistrale:

- "Study of a novel VUV-imaging system in liquid argon for neutrino oscillation experiments" presentata da Valerio Pia nel 2019;

ATTIVITÀ DI TERZA MISSIONE

Docente ai corsi-laboratorio per studenti delle scuole secondarie superiori ("progetto "Laboratori Aperti" del MIUR) presso il Dipartimento di Fisica di Bologna.

Progetto "10000 tetti fotovoltaici"

Nel periodo 2007-2008 M.P. si è dedicato anche alla caratterizzazione dei pannelli fotovoltaici (misure di insolazione, efficienza, ecc.) installati presso il dipartimento di Fisica nell'ambito del progetto "10000 tetti fotovoltaici" dell'ENEA. Tale progetto riguardava la realizzazione di 10.000 piccoli impianti fotovoltaici, da integrare negli edifici, connessi alla rete di bassa tensione per una potenza complessiva di 50 MWp.

Il sistema fotovoltaico sperimentale installato presso il dipartimento di fisica era costituito da 22 pannelli composti da 36 celle (di circa 12x12 cm²) produceva annualmente circa 2000 kWh.

RELAZIONI SU INVITO E PRESENTAZIONI A CONFERENZE:

- XCII Congresso Nazionale Società Italiana di Fisica, “**Scansione di emulsioni nucleari dell’esperimento OPERA tramite ottiche a secco**”, Torino, Settembre 2006
- XLVI Recontres de Moriond - Electroweak Interactions and Unified Theories, “**Recent results of the OPERA experiment**”, La Thuile, Marzo 2011
- XXI International Workshop - High Energy Physics and Quantum Field Theory, “**Search for muon-neutrino to tau-neutrino oscillations with the OPERA experiment**”, Repino - Saint Petersburg, June 2013
- XXVII International Conference on Neutrino Physics and Astrophysics “**High precision neutrino flux measurements with ENUBET**” – London 4-9 July 2016
- IFAE XVI Incontri di fisica delle alte energie, “**Longitudinally segmented shashlik calorimeters with embedded SiPM readout for the ENUBET Project**” (poster) – Trieste 19-21 April 2017
- Conference on Neutrino and Nuclear Physics (CNNP2017) “**The ENUBET project: high precision neutrino flux measurements in conventional neutrino beams**” – Catania 15-21 October 2017
- SiPM workshop: from fundamental research to industrial applications “**Silicon Photomultipliers for the decay tunnel instrumentation of the ENUBET neutrino beam**” – Bari 2-4 October 2019

M.P. è coautore di più di 50 lavori su riviste con referaggio.

ATTIVITÀ SCIENTIFICA

Esperimento OPERA

M.P. ha collaborato all’allestimento e alla messa a punto di microscopi automatizzati per la misura delle lastre di emulsioni nucleari occupandosi del controllo dei parametri di acquisizione delle immagini, della caratterizzazione meccanica dei tavolini motorizzati, della efficienza e riproducibilità delle misure. Inoltre si è occupato dell’installazione dell’infrastruttura di calcolo utilizzata, l’installazione e manutenzione di un DBMS ORACLE e di un dominio Microsoft Active Directory. Ha inoltre contribuito alla costruzione del rivelatore di OPERA, alla misura e analisi delle interazioni in emulsione per la conferma “quasi online” degli eventi selezionati dal trigger elettronico.

Ha contribuito in modo estremamente significativo allo sviluppo delle procedure di localizzazione, ricostruzione e analisi cinematica delle interazione di neutrino in emulsione

Dal 2011 ha coordinato il gruppo di lavoro per lo sviluppo e il test del software di simulazione degli eventi (in ambiente ROOT/C++).

R&D NESSiE

Dal 2012 al 2015 M.P. ha preso parte alla preparazione di una proposta di esperimento di “short baseline” per la ricerca del neutrino sterile alla scala di massa di 1 eV (esperimento NESSiE).

M.P. si è occupato dello sviluppo di un tracciatore in campo magnetico in grado di determinare il segno della carica dei muoni di momento 0.5 – 5 GeV/c con un errore inferiore al 3%. E' stato messo a punto un sistema multipiano di rivelatori a barre scintillanti a sezione triangolare (3 cm di base x 1.7 cm di altezza) con fibre WLS, accoppiate a Silicon Photo Multipliers (SiPM). L'idea chiave era determinare la posizione di una particella sfruttando la ripartizione dall'energia rilasciata in barre adiacenti. A questo scopo i segnali in uscita dai SiPM erano acquisiti in modalità analogica.

Esperimento Limadou-CSES

Dal 2014 M.P. partecipa al progetto italo-cinese Limadou-CSES. M.P. ha collaborato alla progettazione e realizzazione del primo satellite con a bordo un calorimetro a range, con scintillatori, per rivelare elettroni e protoni nell'intervallo ~5-100 MeV. Il suo contributo è stato relativo a:

- studio delle caratteristiche del segnale luminoso nello scintillatore
- ottimizzazione della raccolta della luce confrontando diversi sensori (APD, PMT e SiPM);
- confronto tra varie configurazioni di accoppiamento sensore-scintillatore (accoppiamento diretto, accoppiamento con WLS, etc.) sia tramite simulazione Monte Carlo che con raggi cosmici.

M.P. ha avuto un ruolo determinante relativamente a:

- validazione in camera a vuoto dei circuiti per l'alimentazione ad alta tensione di fototubi;
- montaggio del prototipo del rivelatore per i test meccanici vibrazionali;
- assemblaggio del “qualification model” (QM) del rivelatore e conduzione delle prove di vibrazione e di termo-vuoto effettuati presso il laboratorio SERMS Terni;
- verifica del funzionamento del calorimetro con elettroni di 30-150 MeV. presso la BTF ai LNF

Il satellite CSES-Limadou è stato lanciato il 02/02/2018 ed è attualmente in presa dati.

A partire dal 2019 la collaborazione CSES – Limadou sta lavorando ad un nuovo rivelatore, CSES-2, simile al precedente per quanto riguarda lo scopo scientifico ma con un nuovo disegno: M.P. si è occupato dello sviluppo di un prototipo di trigger costituito da scintillatori e guide di luce da installare sul nuovo modello di volo e si sta occupando della costruzione e test del calorimetro elettromagnetico.

Esperimento SCENTT/ENUBET :

Nel 2015 M.P. ha avviato la sua partecipazione al progetto SCENTT, approvato e finanziato dalla CN5, che si proponeva lo studio di fattibilità di un sistema per monitorare in tempo reale i positroni prodotti dal decadimento $K^+ \rightarrow e^+ \pi^0 \nu_e$ nel tunnel di decadimento di un fascio di neutrini. Lo scopo del progetto era ridurre di circa un ordine di grandezza le incertezze sistematiche sul flusso dei neutrini elettronici. Il rivelatore proposto per la separazione dei

positroni dai pioni carichi ad una rate di ~ 500 kHz/cm² è un calorimetro a ferro/scintillatore di tipo “shashlik”.

M.P. ha partecipato allo studio preliminare dell'accoppiamento ottico con i SiPM utilizzati per la lettura dei segnali, e alla realizzazione di un modulo del calorimetro per un test su fascio al PS del CERN.

Dal 2016 l'attività è diventata parte integrante del progetto ENUBET (ERC Consolidator Grant 2015, PI Andrea Longhin). Lo scopo dell'esperimento è la realizzazione di un dimostratore che permetta di ridurre di circa un ordine di grandezza le incertezze sistematiche sul flusso dei neutrini elettronici monitorando i leptoni prodotti a grande angolo. Nell'ambito di questo progetto M.P. ha la responsabilità del Working Package 2 la costruzione, entro il 2020, di un dimostratore del rivelatore lungo 3 m e una copertura di 180°.

Programma “Nu-at-FNAL”:

Dal 2017 M.P. partecipa al programma Nu-at-FNAL della CSN2. Esso include un esperimento “short baseline” sul fascio di neutrini del Booster per stabilire in modo definitivo la natura delle anomalie presenti nei risultati sperimentali sulle oscillazioni dei neutrini. M.P. ha partecipato alla realizzazione di un sistema (Cosmic Ray Tagger) da installare sul Far Detector dell'esperimento (ICARUS) per il “tagging” (tempo e direzione) dei muoni cosmici che attraversano ICARUS. M.P. ha preso parte al design dei moduli del CRT (piani incrociati di barre di scintillatori con WLS accoppiati a SiPM), di cui ha studiato la raccolta luce e misurato la risoluzione temporale.

M.P. ha partecipato alla costruzione del primo modulo del CRT e alle misure per verificarne la funzionalità in termini di efficienza e uniformità.

Nel 2019 M.P. si è occupato delle misure di risoluzione temporale delle schede CAEN utilizzate dall'esperimento e agli assemblaggi dei moduli C.R.T presso i Laboratori Nazionali di Frascati

Esperimento DUNE:

L'esperimento “long baseline” DUNE ha come scopo principale la determinazione della gerarchia di massa dei neutrini e dell'eventuale violazione della simmetria CP nel settore leptonic. Un fascio di neutrini muonici prodotti a Fermilab sarà inviato su rivelatori ad Argon liquido (TPC a singola e/o doppia fase) con massa fiduciale di 40 kton posti a 1300 km di distanza dalla sorgente di neutrini (Far Detector). Una ulteriore serie di rivelatori (Near Detector), a FNAL servirà per la caratterizzazione del fascio e per la misura di sezione d'urto di neutrini nella regione 1 – 10 GeV

Per quanto riguarda il Photodetection System del Far Detector si renderanno necessari circa 300,000 SiPM per instrumentare una TPC a LAr: dal 2019 M.P. ha partecipato alla definizione delle procedure di test da effettuare sui campioni ricevuti per la selezione dei dispositivi (provenienti da due fornitori FBK e Hamamatsu). Attualmente si sta occupando delle misure dei primi campioni ricevuti al fine di caratterizzarli elettricamente (con misure di breakdown e resistenza di quenching a temperatura ambiente e criogenica) e meccanicamente (studio della resistenza meccanica a cicli termici ripetuti) prima della loro installazione in PROTODUNE..

Per quanto riguarda il NEAR detector in DUNE, M.P. si sta occupando dello studio di fattibilità di un nuovo rivelatore basato sulla lettura ottica della luce di scintillazione in Argon liquido il cui obiettivo è quello di una ricostruzione spaziale e temporale delle interazioni dei

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neutrini in questo sottile bersaglio. Collabora alla simulazione di diverse soluzioni della raccolta di luce sia tramite lenti che con maschere multi-pinholes ("aperture codificate") accoppiate a matrici di SiPM. I risultati preliminari sono molto incoraggianti e tali da giustificare uno studio più completo, attualmente in corso in cui M.P. è coinvolto.

Bologna, 16/02/2022

In Fede
Michele Pozzato