

## **Curriculum Vitae**

### **Personal information**

Elena Pastorelli

Researcher unique identifier: <https://orcid.org/0000-0003-0682-1232>

### **Education**

2021 – PhD in Behavioural Neuroscience at Sapienza Università di Roma. Thesis: “Deep sleep and its cognitive effects – Slow wave activity and the learning and sleep cycle”

1997 – Master Degree in Physics at Sapienza Università di Roma. Thesis: “Uso di DSP (Digital Signal Processor) per selezione di eventi in linea al collider LHC”

### **Current position**

2021 – Researcher (staff) at Istituto Nazionale di Fisica Nucleare (INFN), Sezione di Roma

### **Previous positions**

2013 – 2021 - Researcher (fixed-term) at Istituto Nazionale di Fisica Nucleare (INFN), Sezione di Roma

2000 – 2010 – Manager at Atmel Roma s.r.l. (Roma) – Semiconductor Manufacturer

1997 – 2000 – Engineer at Nergal s.r.l. (Roma) – Information Technology

### **Research summary**

Researcher at the National Institute of Nuclear Physics (INFN), I’m currently working on projects in the computational neuroscience area. My research is focused in learning and cognition, and their interplay with the different brain states. I’m involved in the development of large-scale cortical spiking network models and bio-inspired learning algorithms for AI. In addition, I worked on the development of a multicompartment neuron model of biological inspiration, able to facilitate learning algorithms in spiking neural network models.

After my MSc in Physics at University of Rome “La Sapienza” (Italy), I worked for about fifteen years in electronic and semiconductors companies, mainly involved in R&D industrial projects. During these years I developed skills about numerical simulations on embedded systems and parallel and distributed architectures, hardware/software co-design of Digital Signal Processing, software programming and code optimization.

In 2013 I moved toward academic research at INFN, dealing with projects in-between computational science (numerical simulations, parallel architectures, optimization and accelerations of simulations) and neuroscience. I collaborated to the development and optimization of a code for the parallel and distributed simulation of spiking neural networks reproducing cortical behaviour and implementing also STDP synaptic plasticity. Later, using the developed simulator, I moved to large-scale simulations for the study of Slow Wave Activity (SWA) expressed by cerebral cortex during deep sleep phases and anaesthesia.

Since 2016 I joined the Human Brain Project, with the aim to study SWA and the transition toward the awake state, using a multiscale approach that spans from the study of spatio-temporal activation patterns in a single cortical column, to the phenomenological analysis on the cortical surface. Large-scale simulations contribute to this activity allowing a multiscale study of the theoretical models describing the phenomena.

Since 2020 my research activity refers to the following projects: European project HBP (grant agreement SGA3 n. 945539) that ended in September 2023, currently in the Italian projects PNRR FAIR (PE0000013) and PNRR EBRAINS\_Italy (IR00011).

## Publications

48 publications with 203 citations; h-index: 9 (data from: ISI Web of knowledge)

Recent works:

- Golosio B, Villamar J, Tiddia G, Pastorelli E, Stapmanns J, Fanti V, Paolucci P.S, Morrison A, Senk J. (2023) Runtime Construction of Large-Scale Spiking Neuronal Network Models on GPU Devices. *Appl. Sci.*, 13, 9598. <https://doi.org/10.3390/app13179598>
- Capone, C., et al. (2023) Simulations approaching data: cortical slow waves in inferred models of the whole hemisphere of mouse. *Commun Biol* 6, 266. <https://doi.org/10.1038/s42003-023-04580-0>
- Golosio B, De Luca C, Capone C, Pastorelli E, Stegel G, Tiddia G, et al. (2021) Thalamo-cortical spiking model of incremental learning combining perception, context and NREM-sleep. *PLoS Comput Biol* 17(6): e1009045. <https://doi.org/10.1371/journal.pcbi.1009045>
- Golosio B, Tiddia G, De Luca C, Pastorelli E, Simula F, Paolucci PS. (2021) Fast Simulations of Highly-Connected Spiking Cortical Models Using GPUs. *Front Comput Neurosci*. <https://doi.org/10.3389/fncom.2021.627620>
- Pastorelli E, Yegenoglu A, Kolodziej N, Wybo W, Simula F, Diaz S, Storm JF, Paolucci PS. (2023) Two-compartment neuronal spiking model expressing brain-state specific apical-amplification, -isolation and -drive regimes. *arXiv:2311.06074* <https://arxiv.org/abs/2311.06074>
- Tonielli L, De Luca C, Pastorelli E, Capone C, Simula F, Lupo C, Bernava I, De Bonis G, Tiddia G, Golosio B, Paolucci PS (2022) NREM and REM: cognitive and energetic effects in thalamo-cortical sleeping and awake spiking model. *arXiv:2211.06889* <https://arxiv.org/abs/2211.06889>
- A. Biagioni et al., "RED-SEA: Network Solution for Exascale Architectures," 2022 25th Euromicro Conference on Digital System Design (DSD), Maspalomas, Spain, 2022, pp. 712-719, <https://doi.org/10.1109/DSD57027.2022.00100>

## Patent

- Patent: "Complex domain floating point VLIW DSP with data/program bus multiplexer and microprocessor interface" - Patent # 7,437,540 (2008)
- Patent application: "Dual Processor Complex Domain Floating Point DSP System on Chip" - ATM-313,USSN 10/986, 528

# Curriculum Vitæ of Fabio Bellini

## Education

Type	Year	Institution	Thesis/Mark
PhD (XVI ciclo)	29.01.2004	“Sapienza” Univ. of Rome	“Measurement of $b \rightarrow s \gamma$ Branching Ratio Studying the Recoil of Fully Reconstructed B's with the BaBar Experiment”
Laurea in Fisica	19.07.2000	Univ. of Rome “Roma Tre”	“Misura della Sezione d'urto di rigenerazione di mesoni K neutri di impulso 110 MeV/c” 110/110 cum laude
High School Graduation	1995	Liceo Scientifico “A. Labriola”	60/60 cum laude

## Appointments

### Academic appointments

Start	End	Institution	Position
01.11.2021	present	“Sapienza” Univ. of Rome	Member of the scientific board of the Ph.D Program in Physics
01.10.2015	present	“Sapienza” Univ. of Rome	Associate Professor
01.01.2010	present	National Institute Nuclear Physics (INFN)	Incarico di Ricerca
30.12.2008	30-09-2015	“Sapienza” Univ. of Rome	Assistant Professor
07.11.2006	06.11.2008	INFN	Research Fellow (Assegno di Ricerca)
01.10.2006	31.10.2006	Univ. of Rome “Tor Vergata”	Contratto di Collaborazione
15.07.2006	30.09.2006	Univ. of Milano Bicocca	Contratto di Collaborazione
01.06.2004	31.05.2006	“Sapienza” Univ. of Rome	Research Fellow (Assegno di Ricerca)
02.2004	05.2004	Fondazione Angelo Della Riccia	Grant for research at Stanford Linear Accelerator Center Laboratory

### Abilitazioni

Start	End	Institution	Position
05.10.2018	05.10.2029	MIUR (Ministry of Education, Universities and Research)	ASN Prof. I fascia SC02/A1-SSD FIS/01
28.11.2014	28.11.2023	MIUR (Ministry of Education, Universities and Research)	ASN 2013 Prof. II fascia SC02/A1-SSD FIS/01
23.01.2014	23.01.2023	MIUR (Ministry of Education, Universities and Research)	ASN 2012 Prof. II fascia SC02/A1-SSD FIS/01

## Teaching experience

All courses refer to the Sapienza Physics Department unless otherwise specified.

Academic Year	Course
19/20,20/21,21/22	Mechanics (12 CFU=120 hours, 80-100 students)
20/21	Physics (Chemistry and Technology of Drugs Dep.) (Teaching Assistant: 2 CFU)
18/19,19/20,20/21,21/22	Particle Physics: Lecture on “AstroParticle Physics @ INFN Rome”
19/20	Laboratory of Mechanics ( Teaching Assistant 3 CFU, 80-100 students)
18/19	Mechanics (Teaching Assistant: 6 CFU)
18/19	Percorso di Eccellenza: Lectures on “Metodi statistici per l’analisi dei risultati sperimentali”
15/16,16/17,17/18,18/19	Laboratory of Mechanics (12 CFU, 80-100 students)
17/18,18/19	Detectors for Particle Physics (Master's degree): Lecture on “Detectors for Physics at Gran Sasso Laboratory” (Master's degree)
15/16,16/17	Nuclear Physics ((Master's degree): Lectures on “BBN & Stellar Nucleosynthesis and Neutrinoless Double Beta Decay Search” (Master's degree)
12/13,13/14, 14/15	Physics (Chemistry and Technology of Drugs Dep.) (8 CFU,80-100 students)
12/13,13/14,14/15,15/16, 16/17	Lectures for high School students for the preparation to the Physics Olympics
10/11,11/12,12/13,13/14,14/15	Elementary Particles Physics (Master's degree): Lectures on “Neutrino Physics”
11/12	Mechanics (Teaching Assistant)
11/12	PhD in Physics XXVII cycle: “Neutrino Physics” Course
10/11	Nuclear and SubNuclear Physics II (Master's degree): Lectures on “Neutrino Physics”
09/10,10/11,11/12	High Energy Physics Laboratory (Master's degree): Responsible for the experience “Scintillating crystals light yield vs temp”
08/09, 09/10,11/12	Physics (Chemistry & Pharmaceutical Technology Dep.): Teaching Assistant
09/10,10/11	Nuclear and SubNuclear Physics III: Tutor of short theses
09/10	Laboratory of Electromagnetism and Circuits: Teaching Assistant
04/05,06/07,07/08	Laboratory of Electromagnetism and Circuits: Teaching Assistant - lezioni di supporto alla didattica
05/06	Laboratory of Instruments and Measurement Methods (Engineering Dep.):Teaching Assistant -lezioni di supporto alla didattica
05/06	Computer Science Laboratory (Chemistry and Technology of Drugs Dep.): Teaching Assistant - lezioni di supporto alla didattica
02/03	Physics (Chemistry and Technology of Drugs Dep.): Teaching Assistant
01/02	General Physics I (Mathematics Dep.): Teaching Assistant
00/01	General Physics I (Physics Dep. Univ. of Roma Tre): Teaching Assistant

## Awards and Honours, Scientific and society membership

Year	Title
23.04.2018	Riconoscimento eccellente insegnamento universitario A.A. 2017/18 assigned to one of the three most voted teachers in the Physics Department (<5%)
2004	Grant "Fondazione Angelo Della Riccia" for research in a foreign laboratory (Stanford Linear Accelerator Center)
2000	Grant "Enrico Persico" , Accademia Nazionale dei Lincei
1998	Grant "Enrico Persico" , Accademia Nazionale dei Lincei

## Funding Information

Year	Role	Agency/Program	Grant Value (k€)
06.05.2019 -present	Coordinator of the INFN National Scientific Committee 2 in Rome	INFN	~200
2021	PI (Responsabile Nazionale)	INFN/CUORE_CUPID	651
2020	PI	Sapienza Univ. of Rome/Bolometers optimisation	12
2019-2020	PI (Responsabile Nazionale)	INFN/CUPID	643
2019	PI-Rome	MIUR/PRIN 2017: Advanced techniques for a next generation cryogenic Double Beta Decay experiment.	244
2016-2019	PI-Rome	INFN/CUPID-0	189
2018	PI	Sapienza Univ. of Rome/Cryogenic Calorimeter Characterisation	12
2014	PI	Sapienza Univ. of Rome/Grant for Equipments for Interdepartmental Researches: cryogenic setup	100
2014	PI	Sapienza Univ. of Rome/Thin film characterisation for light yield optimisation in cryogenic detectors	13
2013	PI	Sapienza Univ. of Rome/Intraoperative probe for brain tumour surgery	12
2013	PI	Sapienza Univ. of Rome/Assignment of "Assegno di Ricerca" for young coordinators of research projects (Intraoperative probe for brain tumour surgery)	22
21.03.2013 21.03-2017	PI-Rome	MIUR/FIRB 2012: Cryogenic light detector development	244
01.02.2013 01.02-2016	PI-Rome	MIUR/PRIN 2010-11: Low radioactivity detector R&D	142
2012	PI	Sapienza Univ. of Rome/Light characterisation of TeO <sub>2</sub> Cherenkov light	12
2011	PI	Sapienza Univ. of Rome/Optical properties study in crystals for the $0\nu\beta\beta$ search	15

2011-20162 013-2016	Rome PI National PI	INFN/LUCIFER-RD	89
2004	PI	Grant "Fondazione Angelo Della Riccia" for research in a foreign laboratory (SLAC)	6
<b>Total</b>			<b>~2.6M€</b>

## Commission of Trust

Years	Title
2023	<b>Referee (Peer Review Competition) for FLARE Grant for the Swiss National Science Foundation</b> (Project budget ~1 M€)
2022	<b>Referee (Peer Review Competition) for FLARE Grant for the Swiss National Science Foundation</b> (Project budget ~1 M€)
2021	Referee for Agenzia Nazionale per la Valutazione del sistema Universitario e della Ricerca(ANVUR) for the VQR 2015-2019 campaign
2020-present	<b>Referee for Journal of High Energy Physics</b>
2020	Member of the panel for “Evaluation proposal of Junior research fellow positions University of Insubria”
05-2020-present	Member of the “Universe MDPI” Editorial Board
2020	Guest Editor of the Special Issue “Neutrinoless Double Beta Decay” for Universe MDPI
2019	President of the committee of BANDO INFN N. 21121 “Concorso per titoli ed esami a due posti per il profilo professionale di Collaboratore di Amministrazione di VII livello professionale con contratto di lavoro a tempo indeterminato riservato alle categorie disabili di cui alla L. 68/99, art. 1”
2019	President of the committee for the bidding for “Fornitura del sistema di distribuzione gas con ricircolo e con recupero del gas in exhaust per l’esperimento CYGNO”
2019	Member of the committee “Concorso Bando n. 21364/2019 per il conferimento di n. 5 borse di studio per attività di formazione scientifica per studenti universitari da usufruire presso la Sezione di Roma”
2014-present	<b>Referee for the INFN</b> -DarkSide20K & DarkSide50 experiment (DarkSide20K total(INFN) budget ~75(40) M€)
2019-present	<b>Referee for the INFN</b> -Juno Experiment (total budget ~16 M€)
2019	<b>Referee (Peer Review Competition) for the European Research Council Starting Grant 2019</b> Call (Project budget ~2 M€)
2018	President of the committee for the bidding for “Acquisto di una Glove Box in polimetilmetacrilato”
2018	<b>Referee (Peer Review Competition) for French National Research Agency ANR</b> (generic call proposals 2018 (Project budget ~350 k€),
2018	Member of committee for INFN <b>National Award Bruno Rossi 2017 for the best Ph.D thesis in AstroParticle Physics</b>

2017	<b>Referee</b> (Peer Review Competition) for Ministero dell'Istruzione, Università e Ricerca progetti <b>FARE 2016</b> (Framework per l'attrazione e il rafforzamento delle eccellenze per la Ricerca in Italia) (Project budget ~250 k€),
2016	<b>Referee</b> (Peer Review Competition) for <b>Discovery Grants Referee for the Natural Sciences and Engineering Research Council of Canada NSERC</b> (Project budget ~3 M€)
2015-present	<b>Referee for Nature Scientific Reports</b>
2012-2014	<b>Chair</b> of the "Isotta" Measurement Coordination Panel (AstroParticle European Research Area Network)
2014	Referee for Agenzia Nazionale per la Valutazione del sistema Universitario e della Ricerca (ANVUR) for the VQR 2011-2014 campaign
2010	Member of the Editorial Board of the proceedings of the Conference "Incontri di Fisica delle Alte Energie", Italian Physics Society Editor
2008-present	<b>Referee for Nuclear Instruments and Methods in Physics Research, A</b>

### Institutional Committee coordination and membership

Years	Title
2022-present	President of the Committee for Postdoc Positions (Assegni di Ricerca) at INFN Rome
17.03.2022-present	Member of the Gender Equality Plan Committee
2022	Member of committee of research fellowship Assegno Salvini
2021	Member of the committee for "Procedura valutativa di chiamata Professore Associato" DD211/2021
2019-2021	Responsible of the Didactics/Research Activity (RADRL) of Laboratory of "Laboratorio delle basse temperature"
21.11.2018-present	Member of "Commissione di Gestione dell'Assicurazione Qualità del Dipartimento di Fisica"
2019	Member of the team selected by Physics Department during the "Accreditamento ANVUR" visit
25.01.2018-1.11.2021	<b>President</b> of the "Commissione della pianificazione didattica" for the Physics Department (~120 professors, ~220 courses in Sapienza) Academic years 18/19, 19/20, 20/21, 21/22
22.02.2017-present	Elected Member of the Commissione Coordinamento Area Didattica in "Scienze e Tecnologie Fisiche, Scienze Fisiche e Scienze dell'Universo"
2013-2021	2021: Member of the committee RTD-A Competition Milano Bicocca Univ (D.R. 47462021) 2021: Member of the committee RTD-A Competition Sapienza Univ. (Bando n.231/2021) 2019: Member of the committee RTD-A Competition Gran Sasso Science Institute (D.R 120/2019) 2017: Member of the committee RTD-A Competition Milano Bicocca Univ (D.R 15620) 2016: Member of the committee RTD-A Competition Padova Univ. (Dec.Pr. 1748/2016) 2013: President of the committee RTD-A Competition Sapienza Univ. (Bando n.19/2013)
2016-2019	Co-Responsible of the Didactics/Research Activity (RADRL) of "Laboratory of cryogenic detectors"
20.04.2015-20.05.2018	<b>Representative</b> of the Nuclear & Subnuclear Physics (now Particle and AstroParticle Physics) curriculum of the "Laura Magistrale LM-17" in the didactic planning committee Member of the committee for student teaching plan approval

20.04.2015- 20.05.2018	Member of the committee for student teaching plan approval
2015	Contact person for the VQR 2011-2014 & IRIS Database for the Physics Department
10.12.2014- 01.02.2018	<b>President</b> of the Research <u>Products</u> Committee & member of the Research Resources Committee for the Physics Department
01.12.14-31. 12.2018	Co-Responsible of the Didactics/Research Activity (RADRL) for the Laboratory MQC /Calder L012-S03
2014	Member of the Admission Competition Committee of the “Tirocinio Formativo Attivo” Classe A038
09.13-11.15	Elected Representative of Researchers in “Giunta di Facoltà SMFN-Sapienza”
04.13-11.15	Elected Representative of Researchers in “Giunta del Dipartimento di Fisica-Sapienza”
2013	Member of the committee for student fellowship, Bando 15931 Gran Sasso Science Institute
2012	Member of the Admission Competition Committee of the “Tirocinio Formativo Attivo” Classe A059
2011-2012	Contact person VQR2004-2010: “Sapienza” and INFN Rome
2009-2018	Atheneum Research Products Database Contact person
2009-present	Member of several (>20) committees of research fellowships (Assegni di Ricerca)

## Scientific and Research Committee membership and coordination

Years	Title
21.06.2022- present	<b>Elected Coordinator for Rome Division for the second mandate</b> in the INFN- CSN2 Astroparticle Physics Committee
28.05.2021- present	Member of the <b>CUPID EB &amp; Italy Chief Scientist/Project Director</b>
28.05.2021- present	<b>CUPID Italy Chief Scientist/Project Director</b>
10.11.2020- present	Member of the CUPID Speaker Board
14.07.2019- present	<b>National INFN PI</b> of the CUPID Experiment (INFN-CSN2)
01.07.2019- present	<b>Elected Coordinator for Rome Division</b> in the INFN- CSN2 Astroparticle Physics Committee
01.07.2019- present	<b>Observer</b> on behalf of the CSN2 in the INF-CSN1 Particle Physics Committee
10.11.2018-10-11 .2020	Member of the CUORE Speaker Board
2017-present	<b>Representative</b> of INFN in the CUPID-Mo Collaboration Board
28.02.2017-2020	Computing and networking <b>system administrator</b> for CUPID-0 at LNGS
26.03.2018-28.02 .2020	LNGS CUPID-0 <b>Site manager</b>
01.10.2015-28.02 .2020	<b>Technical Coordinator</b> of the CUPID-0 Experiment



01.10.2015-14.07 .2019	<b>PI</b> of the <b>CUPID-0</b> Rome group (INFN-CSN2)
2014-2021	Member of the CUORE-I(nverted)H(ierarchy)E(xplorer) <b>Steering Committee</b> (later CUPID)
2012-2014	<b>Chair</b> of the “Isotta” Measurement Coordination Panel (AstroParticle European Research Area Network)
2011-2015	<b>National INFN PI</b> (from 2013) and <b>Rome Unit PI</b> of LUCIFER-RD (INFN-CSN2)
2011-2015	<b>LUCIFER coordinator of data analysis</b>
2010-present	Internal reviewer for CUORE/CUPID publications
2011-present	<b>Representative</b> of the Sapienza/INFN-Roma group in the CUORE council
05.2012-10.2014	<b>Chair</b> of the CUORE Publication Board
09.2010-05.2012	Member of the CUORE Vetting Board
2009-2017	<b>Manager</b> of the CUORE Computing Cluster Center
2013	<b>Supervisor</b> of the simulation of the neutron shields for the TOP-IMPLART project
2010-2011	<b>Supervisor</b> of the analysis of the contaminations and bolometric performances of the first half (500-INFN funded) CUORE crystals
2009-2010	CUORICINO Data Production <b>Coordinator</b>
2007-2008	<b>In charge</b> of the CUORICINO data taking quality, integrity and prompt reconstruction.
2007-2008	<b>Coordinator</b> of the CUORE muon identification system
2006-2007	<b>In charge</b> of Monte Carlo simulation of muon and neutron induced background in CUORE
2005-2008	<b>Responsible</b> for Data Management of CUORICINO
2004	<b>Operation Manager</b> of the BaBar muon and neutral hadrons identification system
2001-2002	<b>In charge</b> of the development of algorithms for the $\gamma/\pi^0$ identification and reconstruction efficiencies in the BaBar calorimeter.

## PhD defence committee and referee

Years	Title
01.11.2021-present	Member of the scientific board (collegio dei docenti) of the Ph.D Program in Physics Sapienza Department
2021	Member of jury for final exam of Ph.D in Physics at Genova University (Ciclo XXXIII)
2021	Substitute Member of jury for final exam oh Ph.D in Physics at Padova University (Ciclo XXXIII)
2020	Referee of the Ph.D Thesis “Exploring the Inelastic Dark Matter frontier with the CRESST experiment” , M. Olmi GSSI (Gran Sasso Science Institute Ciclo XXXII)
2018	Member of jury for Doctoral School Université Paris Saclay en Physique de particules (2018) and examineur of the Ph.D Thesis “Study and selection of scintillating crystals for the bolometric search for neutrinoless double beta decay” A. Zolotarova
2018	Substitute Member of jury for final exam oh Ph.D in Physics at Genova University (Ciclo XXX) and Catania (Ciclo XXX)
2017	Member of jury for final exam of Ph.D in Physics at Sapienza University (Ciclo XXIX)

2016	Member of jury for final exam of Ph.D in Physics at Padova University (Ciclo XXVIII)
2016	Member of jury for final exam oh Ph.D in Physics at Padova University (Ciclo XXVIII)
2017	Member of the PhD admission committee in Physics Sapienza University(Cilco XXXIII )
2017	Referee(Examiner) of PhD thesis “Electronic Instrumentations for High Energy Particle Physics and Neutrino Physics” P.Carniti. Milano Bicocca University (Ciclo XXX)
2016	Rappporteur of the Ph.D Thesis “Development and optimization of scintillating bolometers and innovative light detectors for the search for neutrinoless double beta decay” M.Mancuo and member of jury for the Doctoral School (Particles, Hadrons, Energy, Nuclei, Instrumentation, Imaging, Cosmos et Simulation) Paris 11, Orsay

## Summary of Scientific Achievements

Numbers are from **ISI-WOS Core Collection (validi per abilitazione scientifica nazionale)**. Impact Factors are not available for publications in 2021, 2020-IF are used instead.

Database	Date	End
ISI	2001 (first publication)	2021
Total number of publications		479
Total citations		16999
Average citation for product		35.5
Total Impact Factor		2251
Average Impact Factor		4.7
Hirsch (H) index		83
Total number of publications in last 15 years		318
Total citations in last 15 years		9778
Average citation for product in last 15 years		30.8
Total Impact Factor in last 15 years		1359
Average Impact Factor in last 15 years		4.3
Hirsch (H) index in last 15 years		59

# Marco Bonvini

researcher in theoretical particle physics



## lingue

italiano madrelingua  
inglese fluente  
francese discorsivo  
tedesco base

## programming

C, C++, fortran, bash  
PHP, CSS, HTML  
LaTeX, gnuplot  
gsl, GiNaC, root  
Mathematica

## educazione

2009–2012	<b>Dottorato in Fisica</b> tesi: <i>Resummation of soft and hard gluon radiation in perturbative QCD</i> advisors: prof. Giovanni Ridolfi, prof. Stefano Forte	Università di Genova, Italy
2006–2008	<b>Laura Specialistica</b> in Fisica 110/110 cum laude	Università di Genova, Italy
2003–2006	<b>Laurea</b> in Fisica 110/110 cum laude	Università di Genova, Italy
1998–2003	<b>Diploma di Liceo Scientifico</b> 100/100	Liceo Scientifico Leonardo da Vinci, Genova, Italy

## esperienza

2019–oggi	<b>INFN, sezione di Roma 1</b> Ricercatore a tempo indeterminato (terzo livello)	Roma, Italy
2017–2019	<b>INFN, sezione di Roma 1</b> Marie Skłodowska-Curie grant, individual fellowship (due anni)	Roma, Italy
2016–2017	<b>Sapienza Università di Roma</b> Assegno di ricerca (un anno)	Roma, Italy
2014–2016	<b>University of Oxford</b> Post-Doctoral Research Assistant (due anni)	Oxford, United Kingdom
2012–2014	<b>Deutsches Elektronen-Synchrotron DESY</b> Post-Doctoral Research Fellow (tre anni)	Hamburg, Germany
2011	<b>CERN European Laboratory for Particle Physics</b> Unpaid Associate (otto mesi)	Geneva, Switzerland
2008	<b>Università di Genova</b> Contratto co.co.co di ricerca (due mesi)	Genova, Italy
2007	<b>CERN European Laboratory for Particle Physics</b> Summer student, all'esperimento ALICE (due mesi)	Geneva, Switzerland

## didattica

2020, 2021, 2022	<b>Meccanica Analitica e Relativistica</b> Corso obbligatorio per studenti di Fisica del secondo anno, 6 crediti	Sapienza Università di Roma, Rome, Italy
2018, 2019, 2020, 2022	<b>Advanced topics in QCD</b> Corso di Dottorato per dottorandi in Fisica	Università di Roma Tre, Rome, Italy
2017, 2018, 2019	<b>Esercitatore</b> Meccanica Classica (per studenti di Fisica del primo anno)	Sapienza Università di Roma, Rome, Italy
2009, 2010, 2011	<b>Tutor Didattico</b> Meccanica Classica, Elettromagnetismo, Analisi, Algebra (per studenti di Fisica del primo anno)	Università di Genova, Genova, Italy
2009–2010	<b>Esercitatore</b> Fisica Generale (Meccanica Classica ed Elettromagnetismo) (per studenti di Ingegneria Chimica ed Elettrica del primo anno)	Università di Genova, Genova, Italy

## ASN **terza missione**

**Abilitazione Scientifica Nazionale**  
livello:  
**Seconda Fascia**  
settore:  
**02/A2**  
validità:  
dal 24/11/2017  
al 24/11/2027

2022, 2023	<b>MasterClass Sapienza</b>	Sapienza Università di Roma, Rome, Italy
	una lezione sulla fisica delle particelle elementari a studenti delle superiori	
2021, 2022	<b>MasterClass LNF</b>	Laboratori Nazionali di Frascati, INFN, Italy
	tre lezioni sulla fisica delle particelle elementari a studenti delle superiori	
2019	<b>European Researchers' Night</b>	Università di Roma Tre, Roma, Italy
	"Il chioschetto dei tarocchi del fisico"	
2018	<b>European Researchers' Night</b>	Laboratori Nazionali di Frascati, INFN, Italy
	animatore scientifico	
2010	<b>Lezione</b>	Università di Genova, Genova, Italy
	introduzione ai fenomeni quantistici [slides] a studenti delle superiori	
2009, 2010	<b>Supervisor Scientifico</b>	Università di Genova, Genova, Italy
	per gli stage delle scuole superiori al Dipartimento di Fisica (4 settimane)	
2007	<b>Lezione e Dimostrazione in Laboratorio</b>	Università di Genova, Genova, Italy
	Fisica della Chitarra [note] durante OpenWeek al Dipartimento di Fisica	
2005-2008	<b>Tutor Orientatore</b>	Università di Genova, Genova, Italy
	aiuto per i futuri studenti a decidere la loro carriera accademica (tre anni)	
2005	<b>Animatore Scientifico al Festival della Scienza</b>	Genova, Italy
	mostra INFN su Particelle, Forze e Computing (due settimane)	

## riconoscimenti

2013	<b>DESY award</b>	Deutsches Elektronen-Synchrotron, Hamburg, Germany
	Per "Research in collider phenomenology, in particular precision calculations for Higgs production at the LHC"	
2012	<b>Premio Fubini - menzione speciale</b>	INFN Istituto Nazionale di Fisica Nucleare, Italy
	Menzione speciale per la tesi di dottorato "Resummation of soft and hard gluon radiation in perturbative QCD" (ma niente premio)	

## finanziamenti

2023-2025	<b>PRIN 2022</b>	MUR, Italy
	Responsabile locale e sostituto p.i.; titolo "Towards a systematics of QCD resummation", p.i. Stefano Forte, budget 300k€	
2017-2019	<b>Marie Skłodowska-Curie grant</b>	Horizon2020, Europe
	P.i.; individual fellowship, progetto HiPPiE@LHC, budget 180k€	
2014-2016	<b>ERC starting grant</b>	Horizon2020, Europe
	Partecipante; progetto PDF4BSM, p.i. Juan Rojo	
2012-2014	<b>DESY fellowship</b>	DESY Hamburg, Germany
	Fellowship del laboratorio DESY	
2010-2011	<b>PRIN 2008</b>	Italy
	Partecipante; titolo "Fisica di precisione del modello standard ai collider", p.i. Stefano Forte	

## media

28/12/2017	<b>After 40 years of studying the strong nuclear force, a revelation</b>	
	Articolo apparso su <i>The Guardian</i> sulla nostra scoperta della presenza di dinamica BFKL nei dati di HERA, presentata in Eur. Phys. J. C 78 (2018) no.4, 321 [arXiv:1710.05935]	

## mentoring

Sono attualmente supervisore di uno studente di dottorato (dal 2020), di due studenti di laurea magistrale (dal 2022)

Negli anni passati ho supervisionato 5 studenti di laurea magistrale, 3 studenti di laurea triennale e ho co-supervisionato uno studente di dottorato

Sono stato controrelatore di svariate tesi di laurea triennale, magistrale e referee di tesi di dottorato

## coordinamento

Coordinatore locale (sezione di Roma) dell'iniziativa specifica INFN "Exploring New Physics" per il triennio 2024-2026

Organizzatore (insieme a Giacomo Gradenigo e Maria Chiara Angelini) del ciclo di 13 seminari "The interdisciplinary contribution of Giorgio Parisi to theoretical physics", anno accademico 2022-2023, <https://l.infn.it/parisi>, da cui pubblicheremo anche un libro

Convener della sessione "Low x, PDFs and hadronic final states" della conferenza Diffraction and Low-x 2022 (Corigliano Calabro)

Convener della sessione "Frontiera Energia" della conferenza IFAE 2019 (Napoli)

Nel periodo 2014-2017 ho coordinato due progetti di ricerca nel contesto dell'ERC Starting Grant PDF4BSM di Juan Rojo riguardanti l'inclusione della risommazione di grande e piccolo x nella determinazione delle PDF

Ho coordinato l'attività del mio progetto di ricerca HiPPiE@LHC (2017-2019)

## servizio

Membro di commissione per Assegno di Ricerca "Nicola Cabibbo" 2022, LNF

Referee per *Physics Letters B* (PLB) dal 2017

Referee per *European Physical Journal C* (EPJC) dal 2015

Referee per *Journal of Modern Physics A* (JMPA) dal 2016

Referee per *Journal of High Energy Physics* (JHEP) dal 2022

Referee per la valutazione di un progetto di ricerca per il Department of Energy (DoE) americano nel 2014

RUP dal 2018

Membro del gruppo Smart Lab 2020, sezione di Roma

Membro del gruppo di lavoro della sezione di Roma su "interazioni sezione-dipartimento" dal 2022

Partecipazione ad attività della commissione placement di Sapienza dal 2022, in particolare coordinando la partecipazione dell'INFN al Career Day Sapienza del 18 maggio 2023

## collaborazioni

Ho collaborato occasionalmente con il gruppo di NNPDF e il gruppo di xFitter

Contributor del LHC Higgs working group (LHCHWG)

Contributor del future circular collider (FCC) physics working group

Contributor del Physics of the HL-LHC working group

Insieme a Simone Marzani (Università di Genova), sto coordinando un progetto su small-x resummation, con l'obiettivo di risommare varie osservabili rilevanti per la fenomenologia di LHC and FCC, e di estendere la risommazione a un ordine logaritmico più alto

## seminari

seminari su invito: 16

- 18/05/2022 **Probabilistic definition of the perturbative theoretical uncertainty from missing higher orders** remote  
PPT seminar, Higgs Centre, Edinburgh, UK
- 18/05/2021 **Probabilistic definition of the perturbative theoretical uncertainty from missing higher orders** remote  
Cambridge HEP seminar series, University of Cambridge, Cambridge, UK
- 14/12/2020 **Probabilistic definition of the perturbative theoretical uncertainty from missing higher orders** remote  
UZH and UTH seminar, Zürich, Switzerland
- 10/12/2020 **Probabilistic definition of the perturbative theoretical uncertainty from missing higher orders** remote  
Aachen University, Aachen, Germany
- 26/11/2020 **Probabilistic definition of the perturbative theoretical uncertainty from missing higher orders** remote  
Dalitz Seminar, University of Oxford, Oxford, UK
- 15/09/2020 **Probabilistic definition of the perturbative theoretical uncertainty from missing higher orders** remote  
ATLAS Physics Modelling Group, CERN, Switzerland
- 28/08/2020 **Probabilistic definition of the perturbative theoretical uncertainty from missing higher orders** remote  
QCD lunch, CERN, Switzerland
- 06/06/2019 **Uncertainties from missing higher orders in perturbative computations**  
Nikhef, Amsterdam, The Netherlands
- 11/10/2017 **Quantifying theoretical uncertainties**  
University of Genova, Genoa, Italy
- 16/06/2016 **Understanding theoretical uncertainties: the case of the inclusive Higgs cross section**  
University of Milano, Milan, Italy
- 11/11/2015 **Precision LHC phenomenology from resummation**  
INFN LNF, Frascati, Italy
- 21/10/2015 **Higgs production in association with bottom quarks**  
University of Edinburgh, Edinburgh, UK
- 21/05/2015 **Collinear factorization with heavy quarks**  
Particle Phenomenology Forum, University of Oxford, Oxford, UK
- 30/06/2014 **Precision phenomenology from resummations: the Higgs cross section**  
University of Rome La Sapienza, Rome, Italy
- 06/05/2013 **Threshold resummation in SCET vs pQCD: an analytic comparison**  
University of Münster, Germany
- 12/11/2012 **Precise determination of the Higgs production cross-section at the LHC**  
DESY, Hamburg, Germany
- 08/11/2012 **Threshold resummation in SCET vs pQCD: an analytic comparison**  
IPPP, Durham, United Kingdom

## talks

conf. internazionali: 33  
conf. nazionali: 2  
talks informali: vari

Selezione di talks su invito

- 26/09/2022 **Small-x resummation in PDF fits and future prospects**  
Diffraction and Low-x 2022, Corigliano Calabro, Italy
- 30/08/2022 **Phenomenology of small-x resummation**  
LFC22: Strong interactions from QCD to new strong dynamics at LHC and Future Colliders, ECT\*, Trento, Italy
- 03/05/2022 **Theory uncertainties from missing higher orders in PDF fits** remote  
26th International Workshop on DIS and Related Subjects, Santiago de Compostela, Spain
- 10/11/2020 **Resolving parton dynamics at small x at FCC-eh** remote  
4th FCC Physics and Experiments Workshop, CERN, Switzerland
- 29/11/2019 **Small-x resummation and its impact in PDF determination**  
Workshop on Resummation, Evolution, Factorization (REF 2019), Pavia, Italy
- 10/09/2019 **Parton Distribution Functions and LHC phenomenology**  
Towards accuracy at small x, University of Edinburgh, Edinburgh, UK
- 24/06/2019 **Overview of proton PDFs and small-x resummation**  
Initial Stages 2019, Columbia University, New York, US
- 19/12/2018 **New insights on the proton's structure**  
7th Rome Joint Workshop: Current topics in Particle Physics, LNF, Frascati, Italy
- 30/08/2018 **Recent developments in Small-x Resummation**  
Diffraction and Low-x 2018, Reggio Calabria, Italy
- 07/06/2018 **Recent progress in PDF theory**  
Sixth Annual Conference on Large Hadron Collider Physics (LHCP 2018), Bologna, Italy
- 15/01/2018 **Small-x issues at FCC**  
2nd FCC physics workshop, CERN, Switzerland
- 13/09/2017 **Small-x resummation in PDF fits and implications for high-energy colliders**  
LHeC and FCC-eh workshop, CERN, Switzerland
- 18/11/2016 **Theory uncertainty from missing higher orders**  
Challenges in Collider Physics, INFN LNF, Frascati, Italy
- 22/08/2016 **Resummation in PDF fits**
- 22/08/2016 **Theory precision for the  $ggH$  inclusive cross section**  
QCD@LHC 2016, University of Zürich, Switzerland
- 13/04/2016 **Resummations in PDF fits**  
24th International Workshop on DIS and Related Subjects, DESY Hamburg, Germany
- 04/09/2015 **Collinear factorization with Intrinsic Charm**
- 02/09/2015 **Approximate N<sup>3</sup>LO: Higgs and more**  
QCD@LHC 2015, Queen Mary, University of London, UK
- 25/06/2015 **N<sup>3</sup>LO: DIS prospects and Higgs in  $pp$**   
LHeC workshop 2015, CERN and Chavannes-de-Bogis, Switzerland
- 18/02/2015 **Non-perturbative charm and VFNS**
- 18/02/2015 **Large- and small-x resummations in PDF fits**  
Parton Distributions for the LHC, Benasque, Spain
- 10/06/2014 **Higgs production in gluon fusion beyond NNLO**  
Parton shower, event generators and resummation (PSR 2014), Münster, Germany
- 26/03/2014 **An EFT approach to initial-state heavy quarks**  
XIth Annual Workshop on Soft-Collinear Effective Theory (SCET 2014), Munich, Germany
- 05/09/2013 **Higgs production in gluon fusion at approximate N<sup>3</sup>LO**  
QCD@LHC 2013, DESY Hamburg, Germany

## codici

### THunc

approccio bayesiano per incertezze teoriche da missing higher orders

### HELL

risommazione di piccolo  $x$  di DGLAP splitting functions, heavy-quark matching conditions, e coefficient functions per DIS, Higgs, Drell-Yan, ...

### ggHiggs

sezione d'urto di Higgs in gluon fusion fino a  $N^3LO$

### TROLL

risommazione in soglia a  $N^3LL'$  per Higgs, Drell-Yan e DIS

### ReDY

distribuzione in massa invariante e rapidità per il processo di Drell-Yan a NNLO+NNLL

### bbX

produzione di Higgs con bottom quarks massivi risommando logaritmi collineari

### massiveDISsFunction

funzioni di struttura in DIS con quark entrante massivo

## ricerca

La mia attività di ricerca, iniziata nel 2007, è stata incentrata principalmente sulla fenomenologia della QCD ai collider adronici (LHC e oltre), e può essere riassunta come segue:

**Risommazione in soglia** Ho studiato la risommazione in soglia per vari processi, da produzione di coppie leptoniche di Drell-Yan a Higgs e  $t\bar{t}$ , e risommazione in Deep Inelastic Scattering (DIS). Il mio lavoro era incentrato principalmente su: estendere il formalismo della risommazione alle distribuzioni in rapidità, migliorare la risommazione per allargarne la regione di validità, studiare l'impatto della divergenza della serie perturbativa introducendo una nuova prescrizione per sommarla, determinare la regione di validità della risommazione in modo quantitativo. Inoltre, ho compiuto un confronto dettagliato tra il formalismo tradizionale direct-QCD (dQCD) e il recente formalismo basato su soft-collinear effective theory (SCET). Soprattutto, ho prodotto predizioni allo stato dell'arte per la sezione d'urto di produzione dell'Higgs a LHC alla massima accuratezza attualmente possibile ( $N^3LO+N^3LL$ ), documentate nell'ultimo yellow report dell'Higgs Cross Section Working Group.

**Risommazione di alta energia** Ho studiato e sviluppato la risommazione dei logaritmi di piccolo  $x$ , importanti ad alte energie, nel contesto del DIS e dei collider adronici. La risommazione di piccolo  $x$  riguarda anche l'evoluzione DGLAP delle funzioni di distribuzione partonica (PDF), ed è quindi importante per una precisa descrizione dei dati a piccolo  $x$  usati nei fit delle PDF. Ho proposto un nuovo approccio alla risommazione delle coefficient functions, particolarmente adatto per una efficiente implementazione numerica, e sviluppato un codice pubblico che fornisce splitting functions e coefficient functions risommate. L'inclusione della risommazione di piccolo  $x$  nei fit di PDF migliora drasticamente la descrizione dei dati di HERA a piccolo  $x$ , e predice PDF di gluone e quark-singlet piuttosto diverse dalla loro versione a ordine fisso, con importanti implicazioni per la fisica di precisione a LHC e a collider futuri ad alta energia. In un lavoro recente, ho mostrato che il rate di produzione di Higgs aumenta di molto includendo gli effetti della risommazione a piccolo  $x$ . Attualmente sto lavorando per estendere la risommazione ad altri processi (Drell-Yan e heavy-quark production) a livello multi-differenziale.

**$N^3LO$  approssimato** Ho usato la conoscenza combinata delle risommazioni di soglia e di alte energie per fare predizioni accurate per le sezioni d'urto a  $N^3LO$  della produzione di Higgs (scalare e pseudoscalare) in gluon fusion e di coppie di top quarks. Ho usato la risommazione di piccolo  $x$  per fare una predizione delle splitting functions a  $N^3LO$ .

**Fattorizzazione collineare** Ho proposto un nuovo approccio per costruire un cosiddetto variable flavor number factorization scheme, basato su un setup di teoria di campo effettiva, particolarmente conveniente per problemi multi-scala. L'approccio ha permesso la costruzione di un conteggio di potenze più adatto al caso in cui i logaritmi collineari da quark massivi vengano risommati. L'ho applicato alla produzione di Higgs in associazione con bottom quarks, dove ha portato a un risultato accurato e perturbativamente stabile, adottato come raccomandazione dall'Higgs Cross Section Working Group. Ho poi lavorato ad un'estensione della fattorizzazione collineare che ammetta una potenziale componente intrinseca della PDF del charm nel protone.

**Fit di PDF** Ho prodotto il primo fit globale di PDF con risommazione in soglia, nel contesto della tecnica NNPDF per i fit di PDF. Con la collaborazione NNPDF ho anche prodotto il primo fit unbiased della PDF del charm direttamente dai dati. Recentemente, ho prodotto i primi fit di PDF (nel contesto di NNPDF e di xFitter) che includono la risommazione di piccolo  $x$ . Ho proposto una nuova parametrizzazione per le PDF in xFitter.

**Incetrezze teoriche** Un mio interesse recente riguarda la stima affidabile delle incetrezze di predizioni teoriche. Nel contesto della produzione di Higgs a LHC, dove tecniche standard sottostimano significativamente l'incetrezza teorica, ho proposto nuovi metodi, basati su risommazione e accelerazione della convergenza della serie perturbativa, per stimare meglio la sezione d'urto a tutti gli ordini con una stima realistica e affidabile dell'incetrezza residua. Attualmente sto investigando ulteriormente questi metodi, cercando un modello efficiente e sensato statisticamente per definire le incetrezze teoriche, con anche l'obiettivo di usarlo per includere gli errori teorici nei fit delle PDF (che ad oggi sono ignorati).



# pubblicazioni

pubblicazioni totali: 49

paper pubblicati: 30  
(di cui PRL: 2)  
(di cui unico autore: 2)

in attesa di pubbl.: 1  
conference proceedings: 9  
working group reports: 9  
tesi: 1

source: inSPIRE HEP  
citazioni totali: 7700+  
a paper pubblicati: 1900+  
(citazioni/paper): ~63  
h-index: 34

Una lista completa delle mie pubblicazioni si trova nel database **inSPIRE HEP**, dove è anche disponibile il mio **Author Profile**.

## Manoscritti in attesa di pubblicazione

### **Analysis of HERA data with a PDF parametrization inspired by quantum statistical mechanics**

M. Bonvini, F. Buccella, F. Giuli, F. Silvetti

Submitted to EPJC arXiv:2311.08785

cit: 0

## Paper pubblicati in riviste peer-reviewed

### **On the approaches to threshold resummation of rapidity distributions for the Drell-Yan process**

M. Bonvini, G. Marinelli

Eur. Phys. J. C 83 (2023) no.10, 931 arXiv:2306.03568

cit: 2

### **Differential heavy quark pair production at small $x$**

F. Silvetti, M. Bonvini

Eur. Phys. J. C 83 (2023) no.4, 267 arXiv:2211.10142

cit: 8

### **Probabilistic definition of the perturbative theoretical uncertainty from missing higher orders**

M. Bonvini

Eur. Phys. J. C 80 (2020) no.10, 989 arXiv:2006.16293

cit: 40

### **A new simple PDF parametrization: improved description of the HERA data**

M. Bonvini, F. Giuli

Eur. Phys. J. Plus 134 (2019) no.10, 531 arXiv:1902.11125

cit: 32

### **Small- $x$ phenomenology at the LHC and beyond: HELL 3.0 and the case of the Higgs cross section**

M. Bonvini

Eur. Phys. J. C 78 (2018) no.10, 834 arXiv:1805.08785

cit: 37

### **Four-loop splitting functions at small $x$**

M. Bonvini, S. Marzani

JHEP 1806 (2018) 145 arXiv:1805.06460

cit: 16

### **Double resummation for Higgs production**

M. Bonvini, S. Marzani

Phys. Rev. Lett. 120 (2018) no.20, 202003 arXiv:1802.07758

cit: 46

### **Impact of low- $x$ resummation on QCD analysis of HERA data**

H. Abdolmaleki *et al.* [xFitter Developers' Team]

Eur. Phys. J. C 78 (2018) no.8, 621 arXiv:1802.00064

cit: 91

### **Parton distributions with small- $x$ resummation: evidence for BFKL dynamics in HERA data**

R. D. Ball, V. Bertone, M. Bonvini, S. Marzani, J. Rojo, L. Rottoli

Eur. Phys. J. C 78 (2018) no.4, 321 arXiv:1710.05935

cit: 194

### **Towards parton distribution functions with small- $x$ resummation: HELL 2.0**

M. Bonvini, S. Marzani, C. Muselli

JHEP 1712 (2017) 117 arXiv:1708.07510

cit: 45

### **Small- $x$ resummation from HELL**

M. Bonvini, S. Marzani, T. Peraro

Eur. Phys. J. C 76 (2016) no.11, 597 arXiv:1607.02153

cit: 57

### **Pseudo-scalar Higgs boson production at $N^3LO_A+N^3LL'$**

T. Ahmed, M. Bonvini, M. C. Kumar, P. Mathews, N. Rana, V. Ravindran, L. Rottoli

Eur. Phys. J. C 76 (2016) no.12, 663 arXiv:1606.00837

cit: 42

### **A Determination of the Charm Content of the Proton**

R. D. Ball *et al.* [NNPDF Collaboration]

Eur. Phys. J. C 76 (2016) no.11, 647 arXiv:1605.06515

cit: 114

### **Matched predictions for the $b\bar{b}H$ cross section at the 13 TeV LHC**

M. Bonvini, A. S. Papanastasiou, F. J. Tackmann

JHEP 1610 (2016) 053 arXiv:1605.01733

cit: 82

- On the Higgs cross section at  $N^3LO+N^3LL$  and its uncertainty**  
M. Bonvini, S. Marzani, C. Muselli, L. Rottoli  
JHEP 1608 (2016) 105 arXiv:1603.08000 cit: 78
- Charm in Deep-Inelastic Scattering**  
R. D. Ball, M. Bonvini, L. Rottoli  
JHEP 1511 (2015) 122 arXiv:1510.02491 cit: 44
- Intrinsic charm in a matched general-mass scheme**  
R. D. Ball, V. Bertone, M. Bonvini, S. Forte, P. Groth Merrild, J. Rojo, L. Rottoli  
Phys. Lett. B 754 (2016) 49 arXiv:1510.00009 cit: 59
- Resummation and matching of b-quark mass effects in  $b\bar{b}H$  production**  
M. Bonvini, A. S. Papanastasiou, F. J. Tackmann  
JHEP 1511 (2015) 196 arXiv:1508.03288 cit: 89
- Parton distributions with threshold resummation**  
M. Bonvini *et al.*  
JHEP 1509 (2015) 191 arXiv:1507.01006 cit: 81
- Top Quark Pair Production beyond NNLO**  
C. Muselli, M. Bonvini, S. Forte, S. Marzani, G. Ridolfi  
JHEP 1508 (2015) 076 arXiv:1505.02006 cit: 55
- Three loop soft function for  $N^3LL'$  gluon fusion Higgs production in soft-collinear effective theory**  
M. Bonvini, L. Rottoli  
Phys. Rev. D 91 (2015) no.5, 051301 arXiv:1412.3791 cit: 40
- Resummation prescriptions and ambiguities in SCET vs dQCD: Higgs production as a case study**  
M. Bonvini, S. Forte, G. Ridolfi, L. Rottoli  
JHEP 1501 (2015) 046 arXiv:1409.0864 cit: 53
- Resummed Higgs cross section at  $N^3LL$**   
M. Bonvini, S. Marzani  
JHEP 1409 (2014) 007 arXiv:1405.3654 cit: 116
- Updated Higgs cross section at approximate  $N^3LO$**   
M. Bonvini, R. D. Ball, S. Forte, S. Marzani, G. Ridolfi  
J. Phys. G 41 (2014) 095002 arXiv:1404.3204 cit: 68
- Signal-background interference effects for  $gg \rightarrow H \rightarrow W^+W^-$  beyond leading order**  
M. Bonvini, F. Caola, S. Forte, K. Melnikov, G. Ridolfi  
Phys. Rev. D 88 (2013) no.3, 034032 arXiv:1304.3053 cit: 116
- Higgs production in gluon fusion beyond NNLO**  
R. D. Ball, M. Bonvini, S. Forte, S. Marzani, G. Ridolfi  
Nucl. Phys. B 874 (2013) 746 arXiv:1303.3590 cit: 146
- The Threshold region for Higgs production in gluon fusion**  
M. Bonvini, S. Forte, G. Ridolfi  
Phys. Rev. Lett. 109 (2012) 102002 arXiv:1204.5473 cit: 35
- Threshold Resummation in SCET vs. Perturbative QCD: An Analytic Comparison**  
M. Bonvini, S. Forte, M. Ghezzi, G. Ridolfi  
Nucl. Phys. B 861 (2012) 337 arXiv:1201.6364 cit: 44
- Soft gluon resummation of Drell-Yan rapidity distributions: Theory and phenomenology**  
M. Bonvini, S. Forte, G. Ridolfi  
Nucl. Phys. B 847 (2011) 93 arXiv:1009.5691 cit: 66
- Borel resummation of transverse momentum distributions**  
M. Bonvini, S. Forte, G. Ridolfi  
Nucl. Phys. B 808 (2009) 347 arXiv:0807.3830 cit: 11
- Working group reports**
- The Forward Physics Facility at the High-Luminosity LHC**  
J. L. Feng *et al.*  
J.Phys.G 50 (2023) no.3, 030501 arXiv:2203.05090 cit: 173

- The Large Hadron-Electron Collider at the HL-LHC**  
P. Agostini *et al.* [LHeC, FCC-he Study Group]  
J.Phys.G 48 (2021) no.11, 110501 arXiv:2007.14491 cit: 243
- HE-LHC: The High-Energy Large Hadron Collider : Future Circular Collider Conceptual Design Report Volume 4**  
A. Abada *et al.* [FCC]  
Eur. Phys. J. ST 228 (2019) no.5, 1109-1382 arXiv: cit: 234
- FCC-hh: The Hadron Collider: Future Circular Collider Conceptual Design Report Volume 3**  
A. Abada *et al.* [FCC]  
Eur. Phys. J. ST 228 (2019) no.4, 755-1107 arXiv: cit: 698
- FCC-ee: The Lepton Collider: Future Circular Collider Conceptual Design Report Volume 2**  
A. Abada *et al.* [FCC]  
Eur. Phys. J. ST 228 (2019) no.2, 261-623 arXiv: cit: 866
- FCC Physics Opportunities: Future Circular Collider Conceptual Design Report Volume 1**  
A. Abada *et al.* [FCC]  
Eur. Phys. J. C 79 (2019) no.6, 474 arXiv: cit: 708
- Report from Working Group 2: Higgs Physics at the HL-LHC and HE-LHC**  
M. Cepeda, S. Gori, P. Ilten, M. Kado, F. Riva *et al.*  
CERN Yellow Rep. Monogr. 7 (2019), 221-584 arXiv:1902.00134 cit: 649
- Handbook of LHC Higgs Cross Sections: 4. Deciphering the Nature of the Higgs Sector**  
D. de Florian *et al.* [LHC Higgs Cross Section Working Group]  
CERN Yellow Rep. Monogr. 2 (2017) arXiv:1610.07922 cit: 2035
- Physics at a 100 TeV pp Collider: Standard Model Processes**  
M. L. Mangano *et al.*  
CERN Yellow Report (2017) no.3, 1 arXiv:1607.01831 cit: 173

## Conference proceedings

- Small-x Resummation in PDF Fits and Future Prospects**  
M. Bonvini  
Acta Phys. Polon. Supp. 16 (2023) no.5, 28 arXiv:2212.14231 cit: 1
- Improved description of the HERA data with a new simple PDF parametrization**  
F. Giuli, M. Bonvini  
PoS DIS2019 (2019), 014 arXiv:1906.06573 cit: 1
- Recent developments in small-x resummation**  
M. Bonvini  
Acta Phys. Polon. Supp. 12 (2019) no.4, 873 arXiv:1812.01958 cit: 2
- Recent progress in PDF theory**  
M. Bonvini  
PoS LHCP 2018 (2018) 205 arXiv:1809.04924 cit: 0
- Towards small-x resummed parton distribution functions**  
L. Rottoli, M. Bonvini  
PoS DIS 2017 (2018) 207 arXiv:1707.01535 cit: 3
- Resummations in PDF fits**  
M. Bonvini  
PoS DIS 2016 (2016) 030 arXiv:1611.01925 cit: 1
- An approximate N<sup>3</sup>LO cross section for Higgs production in gluon fusion**  
M. Bonvini  
EPJ Web Conf. 60 (2013) 12008 arXiv:1306.6633 cit: 3
- The scale of soft resummation in SCET vs perturbative QCD**  
M. Bonvini, S. Forte, M. Ghezzi, G. Ridolfi  
Nucl. Phys. Proc. Suppl. 241-242 (2013) 121 arXiv:1301.4502 cit: 16
- Threshold resummation for Drell-Yan production: Theory and phenomenology**  
M. Bonvini  
PoS DIS 2010 (2010) 100 arXiv:1006.5918 cit: 5

**Tesi di dottorato**

Resummation of soft and hard gluon radiation in perturbative QCD

M. Bonvini

arXiv:1212.0480

cit: 18

**Dr. Barbara MELE**

**CURRICULUM VITAE (aprile 2023)**

**POSIZIONE ATTUALE**

dal 01/01/2021 Dirigente di Ricerca presso INFN, Sezione di Roma

**POSIZIONI PREGRESSE**

dal 31/12/1990 Ricercatore presso INFN, Sezione di Roma

dal 01/11/1999 Primo Ricercatore presso INFN, Sezione di Roma

**FORMAZIONE**

1983 – Laurea in Fisica (con Lode), Univ. di Roma La Sapienza, relatore Prof. G. Altarelli

1985 – Diploma di Perfezionamento in Fisica Nucleare e Subnucleare (con Lode) [corso biennale], Univ. di Roma La Sapienza, relatore Prof. G. Altarelli

1988 – Dottorato di Ricerca in Fisica Teorica, Univ. di Roma La Sapienza

In data 08/01/2014, ha ottenuto dal M.I.U.R. l'abilitazione scientifica nazionale alle funzioni di professore universitario di Prima Fascia nel settore 02/A2 - Fisica teorica delle interazioni fondamentali

**BORSE POST-DOC**

INFN, Sezione di Roma (novembre 1986 - ottobre 1988)

CERN, Ginevra (gennaio 1989 - dicembre 1990)

**PREMI E RICONOSCIMENTI PER L'ATTIVITA' SCIENTIFICA**

– Premio di operosità scientifica della Società Italiana di Fisica, 1984 (500.000 lire)

– Borsa di studio della Fondazione Angelo Della Riccia, Firenze, 1984 (6.000.000 lire, per visita di cinque mesi al CERN)

– Borsa di studio Bruno Rossi (INFN-MIT), 1995 (supporto per 3 settimane di visita al MIT, USA)

**VISITE ESTESE**

CERN, Ginevra, 1984 (cinque mesi)

CERN, Ginevra, 1988 (due mesi)

Università di Ginevra, 1991 (due mesi)

CERN, Ginevra, 1992 (due mesi)

CBPF, Rio de Janeiro, 1993 (un mese)

MIT, Cambridge, MA, USA, 1995 (un mese)

CBPF, Rio de Janeiro, 1997 (due settimane)

Università di Hue, Vietnam, 2010 (un mese e mezzo)

**AUTRICE DI 132 PUBBLICAZIONI (DAL 1983 AL 2023) SU INSPIRE  
CON CIRCA 11000 CITAZIONI E  $h_{HEP}$  INDEX 41**

## **CAMPI DI RICERCA PRINCIPALI**

- Studio teorico delle proprietà fenomenologiche delle teorie di gauge, nell'ambito del modello standard delle interazioni fondamentali e delle sue possibili estensioni.
- Fisica ai collider di alta energia (CERN  $p\bar{p}$ , HERA, LEP, Tevatron, LHC, HL-LHC, ILC, CLIC, FCC-ee, FCC-pp, CepC, Muon Collider).
- Applicazioni all'Astrofisica dei Raggi Cosmici.

## **ATTIVITA' IN WORKSHOP E GRUPPI DI LAVORO**

Coinvolgimento esteso, anche a livello organizzativo, in workshop organizzati dall'INFN, dal CERN (Ginevra), da DESY (Amburgo), dall'ECFA (il Comitato Europeo per gli Acceleratori Futuri) e dall'ICFA (il Comitato Internazionale per gli Acceleratori Futuri) per lo studio della fisica di interesse per gli acceleratori presenti e futuri.

## **INCARICHI RICOPERTI NELLE COMMISSIONI NAZIONALI DELL' INFN :**

- Osservatore della CSN4 in CSN1 (dal settembre 2016 a oggi)
- Coordinatore Gruppo IV della Sezione di Roma (da marzo a luglio 2003)

## **AGISCE COME REFEREE PER LE SEGUENTI RIVISTE INTERNAZIONALI :**

Journal of High Energy Physics,  
Nuclear Physics B, Physics Letters B,  
Physical Review Letters, Physical Review D,  
Eur.Phys.J. C (Particles and Fields)

## **ATTIVITA' DI VALUTAZIONE DI PROGETTI INTERNAZIONALI**

- Nel 2016-2017, ha agito come revisore per l' Austrian Science Fund (FWF) per la valutazione di un progetto di ricerca sottomesso per un finanziamento di 1.200.000 euro al Programma Internazionale START del FWF.
- Nel 2018 e 2019, è stata incaricata di agire come valutatore per il primo e il secondo bando MARIE-CURIE COFUND "FELLINI" per il reclutamento di ricercatori a tempo determinato presso l'INFN.

## **SUPERVISOR DEI SEGUENTI RICERCATORI POST-DOC INFN :**

Dr. Shaouly Bar-Shalom, 1999 - 2000  
Dr. Anyndia Datta, 2003 - 2005  
Dr. Sanjoy Biswas, 2011 - 2014

## **RESPONSABILE DELL' ORGANIZZAZIONE DEI SEMINARI DEL GRUPPO TEORICO DI ALTE ENERGIE**

**NEL DIPARTIMENTO DI FISICA DELL' UNIV. DI ROMA LA SAPIENZA (DAL 1991 AL 1998)**

## **ATTIVITA' DI COLLABORAZIONE CON LE UNIVERSITA' :**

In data 08/01/2014, ha ottenuto dal M.I.U.R. l'abilitazione scientifica nazionale alle funzioni di professore universitario di Prima Fascia nel settore 02/A2 - Fisica teorica delle interazioni fondamentali.

### **a) CORSI PER DOTTORATO DI RICERCA IN FISICA :**

- CBPF, Rio de Janeiro, Brasil, Introduction to the Standard Model, 1993
- Univ. La Sapienza, Roma, Fenomenologia delle Particelle Elementari, 1996
- Univ. di Pavia, Estensioni Supersimmetriche del Modello Standard, 1996
- Federal University of Espirito Santo, UFES-Vitoria, Brasil, Physics at LEP2, 1997
- Univ. La Sapienza, Roma, Introduzione alla Supersimmetria, 1997, 1998, 1999
- Univ. Tor Vergata, Roma, Fenomenologia delle particelle elementari, 2000
- Univ. La Sapienza, Roma, Beyond the Standard Model, 2001
- Univ. La Sapienza, Roma, Ricerca del bosone di Higgs e nuova fisica negli acceleratori presenti e futuri, 2002
- Univ. La Sapienza, Roma, Ricerca di SuSy ai colliders, 2003
- Univ. La Sapienza, Roma, Introduzione al Modello Standard e alle sue estensioni supersimmetriche, 2005,2006,2007,2008
- Univ. La Sapienza, Roma e Univ. Roma Tre, LHC e il settore di rottura elettrodebole del Modello Standard, 2009
- Univ. di Pavia, Introduzione alla Supersimmetria, 2010
- Univ. di Pavia, Fisica oltre il Modello Standard a LHC, 2010

### **b) CORSI PER LAUREA MAGISTRALE :**

- Univ. La Sapienza, Roma, contributi specialistici al corso Fisica Nucleare e Subnucleare II, 2007,2008,2009
- Hue University College of Education for the Advanced Physics Program, Vietnam, Introduction to Nuclear and Particle Physics, 2010 (corso di circa 40 ore)

### **c) E' STATA SUPERVISOR DEL LAVORO DI TESI DI LAUREANDI E DOTTORANDI DELL'UNIV. SAPIENZA DI ROMA**

### **d) HA AGITO COME REFEREE PER TESI DI DOTTORATO IN FISICA IN VARIE UNIVERSITA' E PER TESI DI LAUREA IN FISICA PRESSO L'UNIV. SAPIENZA DI ROMA**

e) Ha fatto parte della Commissione giudicatrice per l'esame finale del XV ciclo del corso di Dottorato in Fisica presso l'Univ. di Roma TRE, nella tematica della Fisica Nucleare e Subnucleare e Astrofisica, con nomina del 28-5-2003.

Formicola, Alba

### **Formazione**

2004 – Dr. rer. nat. Ruhr-Universität Bochum, Experimentalphysik III Bochum, Germania, “  
A new study of  $^{14}\text{N}(p,\gamma)^{15}\text{O}$  at low energy “

### **Attività scientifica: Produzione scientifica**

89 papers on international refereed journals and 1 review on Report on Progress in Physics

h-index: 38 (data from: Scopus)

### **Attività scientifica: Responsabilità in attività di ricerca in collaborazione internazionale 2022-2025 PRIN 2020WN3PBE**

ASBeST: A 7-Beryllium electron capture STudy for nuclear and solid state physics

PI Prof. L. Gialanella : Università Vanvitelli (Caserta)

Substitute Principal Investigator: Formicola Alba

**2021-2023** Co-Coordiatore della misura della sezione d'urto della  $^{13}\text{N}(p,g)^{15}\text{O}$  presso l'esperimento Bellotti Ion Beam Facility, LNGS

**2016-2020** Coordinatore della misura della sezione d'urto della  $^{13}\text{C}(\alpha,n)^{16}\text{O}$  presso l'esperimento LUNA400.

**2014-2016** Responsabile della caratterizzazione dei bersagli di  $^{12}\text{C}$  in previsione dello studio della sezione d'urto  $^{12}\text{C}(\alpha,\gamma)^{16}\text{O}$ , presso la facility LNGS MV un nuovo acceleratore di 3.5MV installato presso i LNGS .

PI del progetto CARTA, CARbonTARget, presso l'acceleratore CN dei Laboratori Nazionali di Legnaro, dove utilizzando le macchine acceleratrici disponibili sono state effettuate prime misure per la caratterizzazione in termini di purezza e stabilità dei supporti e dei primi bersagli impiantati di  $^{12}\text{C}$ .

**2011-2013** Co-Coordiatore della misura  $^{17}\text{O}(p,\alpha)^{14}\text{N}$  con l'apparato di rivelazione di particelle  $\alpha$  nell'ambito dell'esperimento LUNA, finanziato dall'INFN.

**2010-2012** Coordinatore della misura  $^{17}\text{O}(p,\gamma)^{18}\text{F}$  con l'apparato di rivelazione  $\gamma$  ad alta risoluzione nell'ambito dell'esperimento LUNA, finanziato dall'INFN.

### **Posizione corrente e qualifica**

Dal 01-04-2019 in corso- Primo Ricercatore- presso i Laboratori Nazionali del Gran Sasso (LNGS) e dal 1 Settembre 2021 presso la Sezione di Roma1- Istituto Nazionale di Fisica Nucleare

Dal 20 gennaio 2014 al 01-04-2019 – Ricercatore a tempo indeterminato- presso i Laboratori Nazionali del Gran Sasso (LNGS) Istituto Nazionale di Fisica Nucleare

Anzianità nel profilo di Ricercatore di III livello, riconosciuta dall'INFN, pari a 9 anni e 6 mesi considerati anche i pregressi contratti da ricercatore INFN a TD.

2014 – Abilitazione Nazionale come professore di seconda Fascia nel settore “Experimental physics of fundamental interactions

### **Incarico di responsabilità**

- Componente del comitato scientifico del consorzio REDI dal 2021 in corso
- Responsabile della Divisione Ricerca dei Laboratori Nazionali del Gran Sasso, nomina Direttore LNGS, approvato da Giunta Esecutiva, dal 2015 al 2020.
- Coordinatore per i Laboratori Nazionali del Gran Sasso della Commissione Scientifica Nazionale III dal 2014 al 2020

### **Ruoli rivestiti in conferenze internazionali e workshops:**



- 17-22 Settembre 2023 **Membro dell'International Advisory and Program Committee** della Conferenza: 17<sup>th</sup> International Symposium on Nuclei in the Cosmos XVII - IBS Daejeon, Korea
- 9-11 Maggio 2022 **Co-Chair** della Conferenza: INFN 2022- Laboratori Nazionali del Gran Sasso Assergi, Italy
- 15-20 Giugno 2022 **Membro dell'International Advisory Committee** per la 13<sup>th</sup> International Spring Seminar on Nuclear Physics Perspectives and Challenges in Nuclear Structure after 70 Years of Shell Model - Sant'Angelo d'Ischia Italy .
- 21-25 Settembre 2021 **Membro dell'International Advisory Committee** per la Conferenza: 16<sup>th</sup> International Symposium on Nuclei in the Cosmos XV - Chengdu-China
- 17-24 Giugno 2020 IReNA virtual workshop on stellar burning – **coordinatore** della Sessione Underground- <https://exp-astro.de/meetings/irena-fal-virtual-seminar-2020/hprogram.php>
- 30 Maggio 2019-**Chair** of One-day IBS-INFN Workshop on Underground Physics- (per accordo Quadro IBS-INFN <https://home.infn.it/it/news-infn/news-infn-it-archivio/3596-firmato-accordo-quadro-per-sviluppo-tecnologico-e-formazione-tra-l-infn-e-la-sudcoreana-ibs?highlight=WyJpYnMiXQ>)
- 4-5 Novembre 2019 **Membro del Scientific Advisory Committee** per il workshop 2nd DULIA-bio, Laboratori Nazionali del Gran Sasso Assergi, Italy
- 24-29 Giugno 2018 **Chair** della Conferenza: 15<sup>th</sup> International Symposium on Nuclei in the Cosmos XV - Laboratori Nazionali del Gran Sasso Assergi, Italy .
- 13-14 Ottobre, 2015 - **Membro dell' International Advisory Committee: DULIA-** per il workshop Bio -Deep Underground Laboratories Integrated Activities in biology - Canfranc, Spain.
- 3-8 Aprile 2011 **Membro del International Programme Committee** per Nuclear Physics in Astrophysics V – NPAV XXIV International Nuclear Physics Divisional Conference of the EPS A Europhysics Conference - Eilat, Israel.  
8-12 Giugno, 2009 – **Co-chair: Nuclear Physics in Astrophysics IV – NPAIV- XXII** International Nuclear Physics Divisional Conference of the European Physical Society A Europhysics Conference - Laboratori Nazionali di Frascati e del Gran Sasso, Frascati, Italy.

# RICCARDO PARAMATTI

## *Curriculum vitae*

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### Education

- May 1998            **Laurea in Fisica** (110/110 cum laude), Sapienza Università di Roma
- January 2002        **PhD in Physics**, Sapienza Università di Roma  
Dissertation on “Misura dei parametri del bosone  $W$  in eventi adronici a quattro jet osservati nell'esperimento L3 del CERN”
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### Appointments

- **Associate Professor** (S.S.D. FIS/01), Sapienza Università di Roma (June 2019 – present)  
Abilitazione Scientifica Nazionale, tornata 2016, Prima Fascia, S.C. 02/A1 (until 5/10/2029)
- **Assistant Professor (RTD-b)**, Sapienza Università di Roma (June 2016 – May 2019)
- **INFN Staff Researcher** (December 2005 – May 2016)
- **CERN Scientific Associate** (February 2013 – January 2014)
- **CERN Associate reserved to INFN personnel** (July 2009 – June 2010)
- **Assistant Professor (Professore a contratto)** of “Idoneità Informatica”, Faculty of Philosophy (A.A. 2007/08 and 2008/09)
- **CERN Fellowship** (September 2004 – December 2005)
- **Post-doc** at the Physics Department of Sapienza Università di Roma (April 2002 – August 2004)

## Teaching experience for undergraduate student

A.A. 2023/24	Laboratorio di Calcolo (Laurea Triennale in Fisica)
from A.A. 2019/20 to A.A. 2023/24	Laboratorio di Meccanica (Laurea Triennale in Fisica)
from A.A. 2016/17 to A.A. 2019/20	Fisica (Laurea Magistrale a ciclo unico in Farmacia)
from A.A. 2007/08 to A.A. 2008/09	Idoneità Informatica (prof. a contratto, Facoltà di Filosofia)
from A.A. 2006/07 to A.A. 2010/11	problem-solving lectures in Fisica Nucleare e Subnucleare I (Laurea Triennale in Fisica); author of “Cinematica Relativistica” lecture notes used since more than 10 years ( <a href="http://cern.ch/ric/cinematica.pdf">http://cern.ch/ric/cinematica.pdf</a> )

## Teaching experience for graduate student

2021-2023	Chimica Nucleare, master in Scienza e Tecnologia dei Radiofarmaci, Università Sapienza di Roma
2020	Fisica delle Radiazioni, Scuola di Specializzazione in Fisica Medica, Università Cattolica del Sacro Cuore
2016	Lectures on Electromagnetic and Hadronic Calorimetry at LHC, 5 <sup>th</sup> International School on LHC Physics organized by the National Centre for Physics (NCP), Islamabad, Pakistan and the Abdus Salam International Centre for Theoretical Physics (AS-ICTP), Trieste, Italy
2014	Lectures on Electromagnetic and Hadronic Calorimetry at the Danube School on Instrumentation in Elementary Particle & Nuclear Physics
2014	Lectures on Electromagnetic and Hadronic Calorimetry at the Joint Belgian Dutch German Graduate School
2007	Lectures on Calorimetry, Università di Roma Tor Vergata (XXI ciclo)
2006	Lectures on Calorimetry, Università di Roma Tor Vergata (XX ciclo)

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## Supervisor of Ph.D. thesis

XXVI ciclo (2010/13)	S. Nourbakhsh “ <i>Search of the Higgs boson in the two photon final state</i> ”
XXII ciclo (2006/09)	A. Palma “ <i>Studies on the spectrum <math>e^+e^-</math> with the first data of the CMS experiment at the Large Hadron Collider</i> ”

## Supervisor of Master Degrees

ongoing	S. Akhtar “ <i>The upgrade of the CMS ECAL HV system</i> ”
A.A. 2019/20	B. D’Orsi “ <i>Study of the radiation resistance of LYSO:Ce crystal for the new timing detector of the CMS experiment</i> ”
A.A. 2018/19	M. Campana “ <i>Study of light output and characterization of LYSO crystals for the new timing detector of the CMS experiment</i> ”
A.A. 2018/19	A.M. Murdocco “ <i>PET: Tomografia ad Emissione di Positroni</i> ”, Corso di Laurea Magistrale a Ciclo Unico in Farmacia
A.A. 2016/17	M. d’Uffizi “ <i>Measurement of the electron charge asymmetry in inclusive <math>W</math> production with CMS data taken at <math>\sqrt{s}=13\text{TeV}</math></i> ”
A.A. 2016/17	V. Marè “ <i>Sviluppo di un algoritmo Random Forest per una analisi multivariata di parametri di texture in RMN per la stadiazione dei tumori</i> ”
A.A. 2013/14	A. Provenza “ <i>Studio del materiale del tracciatore con il flusso di energia attraverso il calorimetro elettromagnetico di CMS</i> ”
A.A. 2011/12	A. Russomando “ <i>Uso del preshower nella calibrazione con eventi <math>\pi\rightarrow\gamma\gamma</math> del calorimetro elettromagnetico di CMS</i> ”
A.A. 2009/10	S. Nourbakhsh “ <i>Study of <math>J/\psi</math> in two electrons events with first data at CMS experiment</i> ”
A.A. 2003/04	F. Santanastasio “ <i>Calibrazione di un calorimetro elettromagnetico tramite il flusso totale di energia</i> ”
A.A. 2003/04	G. di Giovanni “ <i>Studio della ricostruzione degli elettroni per la calibrazione del calorimetro elettromagnetico di CMS</i> ”
A.A. 2003/04	S. Venditti. Provenza “ <i>Studio del canale di decadimento <math>\eta\rightarrow\gamma\gamma</math> in due fotoni nel calorimetro elettromagnetico di CMS</i> ”

## Supervisor of Bachelor Degrees (Laurea Triennale)

More than 15 dissertations covering the following topics:

- Atmospheric neutrino oscillations.
- Solar neutrino oscillations.
- CP Violation in the neutral kaon system.
- Precise measurements on W and Z bosons at LEP.
- Higgs Boson observation at LHC.
- Measurement of the  $e^+e^-$  in hadrons and  $e^+e^-$  in muons cross section ratio and quark color evidence.

- Measurement of the charge asymmetry in cosmic muons.
- Measurement of the muon critical energy.
- Energy measurement in electromagnetic and hadronic calorimetry.
- Particle accelerators in Hadron Therapy.
- Dosimetry for Hadron Therapy with nuclear de-excitation.
- Dosimetry for Hadron Therapy with prompt photons.
- Use of Cherenkov radiation in medical physics.

## Funding Information

2023	Rome CMS group, INFN grant: <b>257k euro + 245k euro budget for Phase2, Principal Investigator</b>
2022	Rome CMS group, INFN grant: <b>441k euro + 720k euro budget for Phase2, Principal Investigator</b>
2021	Rome CMS group, INFN grant: <b>266k euro + 641k euro budget for Phase2, Principal Investigator</b>
2020	Rome CMS group, INFN grant: <b>172k euro + 437k euro budget for Phase2, Principal Investigator</b>
2020	Progetto di ricerca d'Ateneo, " <i>Italiano e Matematica: diritti di cittadinanza</i> ", Sapienza: <b>11k euro</b>
2019	Progetto di ricerca d'Ateneo, " <i>LYSO crystal characterization for the Mip Timing Detector of CMS experiment</i> ", Sapienza: <b>15k euro, Principal Investigator</b>
2018	Progetto di ricerca d'Ateneo, " <i>Precision timing for the upgrade of the CMS experiment</i> " Sapienza: <b>12.5k euro</b>
2016-2018	CMS Electron and Photon Physics Object Group Coordination, INFN specific grant to support my role of coordinator: <b>28k euro</b>
2012-2013	CMS ECAL Detector Performance Group Coordination, INFN specific grant to support my role of coordinator: <b>28k euro</b>
2009-2011	CMS ECAL Calibration and Alignment Group, INFN specific grant to support my role of coordinator: <b>20k euro</b>

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## Scientific and Research Coordination Responsibilities

2023	<b>deputy System Manager of CMS ECAL</b> (Level 1 position in CMS organization – ECAL Collaboration consists of about 250 physicists)
2022 – present	<b>chair of the CMS ECAL Editorial Board</b> (Level 2 position)

2019 – present      **team leader of the CMS Rome group** (29 persons, 23.2 FTE – average annual budget of 800k euro in the last four years)

2019 – 2022      coordinator of the Rome center for the QA/QC of LYSO crystal production for the new timing detector of CMS experiment

2019 – present      member of the CMS Collaboration Board

2019 – present      member of the CMS MTD Institution Board

2019 – present      member of the CMS ECAL Institution Board

2016 – 2018      **convener of the *Electron and Photon Physics Object Group of the CMS experiment*** (Level 2 position – the group consists of about 50 physicists)

2016 – 2018      member of the CMS Physics Coordination group

2016 – 2018      member of the CMS Physics Performance and Dataset Coordination group

2014      convener of the *ECAL Upgrade Performance Group* of the CMS experiment

2013      member of the CMS ECAL Steering Committee

2012 – 2019      member of the CMS ECAL Editorial Board

2012 – 2019      member of the CMS ECAL Conference Committee

2012 – 2013      **convener of the *ECAL Detector Performance Group of the CMS experiment*** (Level 2 position – the group consists of about 80 physicists)

2012 – 2013      member of the CMS ECAL Management and Operation Board

2011 – 2015      member of the Consiglio di Sezione INFN Roma

2009 – 2020      member or chair of about 15 CMS Analysis Review Committee

2009 – 2011      convener of the *ECAL Calibration and Alignment Group* of the CMS experiment

2008      convener of the *CMS Computing, Software and Analysis challenge electron group*

2003      member of the CMS ECAL Technical Coordination Group

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## **Institutional and Academic Responsibilities**

2021 – present	Member of Collegio dei Docenti (Scientific Board) of the PhD program in Accelerator Physics
2021	Chair of the INFN Commission for CTER personnel selection.
2019 – present	member of the Physics Department “Commissione per la pianificazione della didattica della Fisica”
2019 – present	member of the CAD “Commissione per la verifica dei requisiti magistrali”
2018 – present	member of the CAD “Commissione per i percorsi formativi degli studenti”; contact person for the Particle and Astroparticle Physics curriculum of the LM-17
2018 – 2021	person in charge of the student admission test (Test On Line CISIA, TOLC-S and TOLC-B) for the Facoltà di Scienze Matematiche Fisiche e Naturali in Sapienza
2018 – 2020	member of the “Commissione Didattica del Consiglio di Corso di Studio in Farmacia”
2018	contact for the Rome International Scholars Program of the University of Notre Dame (Indiana - US) and supervisor of the student Sang Woo Kim
2017	member of the Advisory Committee of the 6 <sup>th</sup> NCP-ICTP LHC school
2016 – 2017	Co-Editor of the Physics Department Scientific Report 2014-2016 <a href="https://www.phys.uniroma1.it/fisica/sites/default/files/allegati/ScientificReport2014-2016.pdf">https://www.phys.uniroma1.it/fisica/sites/default/files/allegati/ScientificReport2014-2016.pdf</a>
2016	referee of JINST (Journal of Instrumentation)

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## **PhD defense examination board**

2023	Member of examination board for the final exam of Ph.D. in Fisica e Astronomia at the Università degli studi di Milano Bicocca (35° ciclo)
2021	Member of examination board for the final exam of Ph.D. in Fisica e Astronomia at the Università degli studi di Milano Bicocca (33° ciclo)
2020	Member of examination board for the final exam of Ph.D. in Fisica e Astrofisica at the Università degli studi di Torino (33° ciclo)
2015	Member of the examination board for the final exam of Ph.D. in Physics at the Université Libre de Bruxelles (ULB)

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## Outreach and third mission

2023	Tutor in the “ <b>INFN Kids</b> ” program devoted to the italian primary schools
2023	Tutor in the <b>INFN “Art&amp;Science”</b> program devoted to the italian high schools
2018 – 2023	Lectures for high school teachers in the “ <b>Master Class</b> ” program.
2018 – 2019	Tutor for the <b>LAB2GO</b> project. This Sapienza-INFN project takes place in the high schools in Rome and in Lazio and aims to restore the instrumentations of the school scientific laboratories and to document the physics experiences which can be performed in the laboratory.
2009 – 2011	Lectures for the high school students in the “ <b>Master Class</b> ”, in the “ <b>Olimpiadi della Fisica</b> ” and in the “ <b>Fisica in barca</b> ” programs

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## Awards

- Best Communication in Nuclear and Subnuclear Physics presented at the 2000 National Congress of the Italian Physical Society (SIF).
  - EPS 2013 High Energy and Particle Physics Prize: prize and medal, for an outstanding contribution to High Energy Physics, is awarded to the ATLAS and CMS collaborations, "for the discovery of a Higgs boson, as predicted by the Brout-Englert-Higgs mechanism".
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## Summary of Scientific Publications (updated July 2023)

**Author of more than 1300 publications in peer-reviewed international journals**; the full list is available on INSPIRE [at this link](#) and on ISI Web Of Science (authentication required) [here](#).

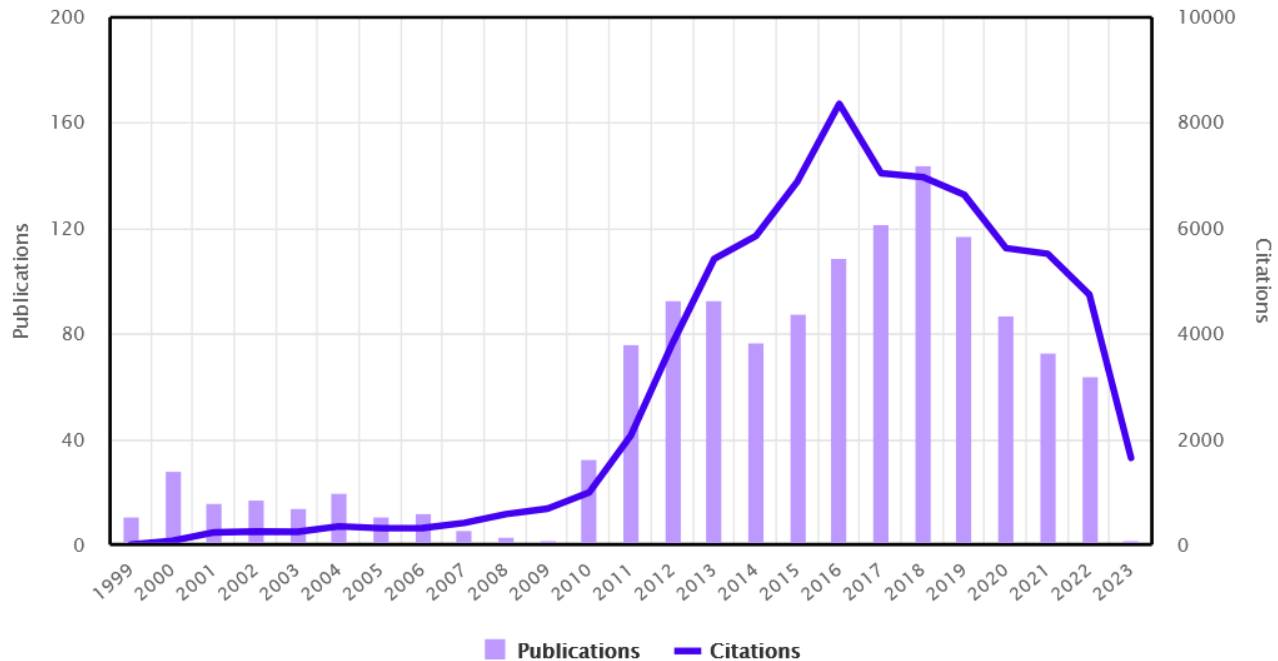
Author of 43 Internal Notes of the CMS Collaboration and 12 Internal Notes of the L3 Collaboration.

### Personal Citation Report (Date of first publication: October 1999. PhD in Physics: January 2002)

	<b>ISI</b>	<b>INSPIRE</b>
Total number of peer-reviewed publications	1339	1322
Citations	75011	172963
Average citations per publication		130.8
H-index	113	183



## Times Cited and Publications Over Time



## Talks at International Conferences and Workshop Seminars:

In the years 2020-2022 I have not attended a conference due to the pandemic.

I have a plenary talk at the 6th Technology and Instrumentation in Particle Physics (**TIPP 2023**) conference to be held in September: *“The CMS ECAL upgrade for precision timing measurements at the High-Luminosity LHC”*

- 2019      *“Precision Timing with the CMS MIP Timing Detector”*, XXXIX International Symposium on Physics in Collision – **PIC2019**, Taipei (Taiwan)
- 2018      *“Searches for new heavy resonances in final states with leptons and photons”*, 7th International Conference on High Energy Physics in the LHC Era – **HEP2018**, Valparaiso (Chile)
- 2016      *“Search for high mass resonances in the diphoton and Z+photon channels at LHC”*, Diphoton and Flavor Anomalies workshop – Univ. Sapienza, Roma
- 2016      *“Search for new physics in high mass diphoton events: CMS results.”*, 750 GeV Forum at DESY – Hamburg and Zeuthen (Germany).
- 2016      *“Performance in electron beams of a tungsten-CeF3 prototype for radiation-resistant high-energy physics calorimetry”*, 14th Vienna Conference on Instrumentation – **VCI 2016**, Vienna (Austria)
- 2015      *“Highlights on CMS tracker and calorimeter reconstruction improvements for Run II”*, 3<sup>rd</sup> Conference on Large Hadron Collider Physics – **LHCP 2015**, Saint Petersburg (Russia)
- 2014      *“Design options for the upgrade of the CMS electromagnetic calorimeter”*, 37<sup>th</sup> International Conference on High Energy Physics - **ICHEP 2014**, Valencia (Spain).

- 2013 “*Upgrade of the CMS Forward Calorimetry*”, **IPMLHC2013**: Second IPM Meeting on LHC Physics, Teheran (Iran).
- 2012 “*Performance of the CMS electromagnetic calorimeter at the LHC and role in the hunt for the Higgs boson*”, 36<sup>th</sup> International Conference on High Energy Physics - **ICHEP 2012**, Melbourne (Australia).
- 2011 “*Performance of the CMS Electromagnetic Calorimeter at the LHC*”, **13<sup>th</sup> ICATPP Conference** on Astroparticle, Particle, Space Physics, Detectors and Medical Physics Applications – Como.
- 2010 “*Calibration of CMS Electromagnetic Calorimeter at LHC startup*”, XIV International Conference on Calorimetry in High Energy Physics – **CALOR10**, Beijing (China).
- 2008 “*Inclusive W and Z production with CMS at LHC startup*” (poster), 34<sup>th</sup> International Conference on High Energy Physics - **ICHEP 2008**, Philadelphia (USA).
- 2006 “*Crystal Production and Properties in CMS - ECAL*”, XII International Conference on Calorimetry in High Energy Physics - **CALOR06**, Chicago (USA).
- 2003 “*Highlights from the 9th Pisa Meeting on Advanced Detectors*”, Detector Seminar – CERN.
- 2003 “*Calibration Strategy of CMS Electromagnetic Calorimeter*”, Frontier Detectors for Frontier Physics: **9th Pisa Meeting on Advanced Detectors** - Isola d'Elba.
- 2003 “*Calibration of CMS Electromagnetic Calorimeter*”, **8<sup>th</sup> ICATPP Conference** on Astroparticle, Particle, Space Physics, Detectors and Medical Physics Applications - Como.
- 2002 “*WW production at LEP2*”, **Lake Louise Winter Institute 2002** - Fundamental Interactions, Alberta (Canada)
- 2002 “*Calibration of CMS Electromagnetic Calorimeter*”, **8<sup>th</sup> Topical Seminar on Innovative Particle and Radiation Detectors** - Siena.
- 2001 “*Unfolding of W Mass Distribution at LEP*”, **WWMMI LEP WW Physics Workshop** – Cern.
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## RESEARCH ACTIVITIES IN THE CMS EXPERIMENT

The Compact Muon Solenoid (CMS) is one of the two multi-purpose experiment at the CERN Large Hadron Collider (LHC); it has a very broad physics program at an unprecedented energy scale: proton-proton collisions at 7, 8 and 13 TeV in the center of mass (13.6 TeV in 2022). The CMS collaboration is made up of about 3000 physicists, coming from more than 50 countries around the world. I entered in CMS twenty years ago and I am, since 2019, team leader of the CMS Rome group. In these years the group has grown by around 50% compared to 2019, reaching today 31 physicists and PhD students.

### Research activities in 2002-2007

Since 2002 I've been involved in the construction of the Electromagnetic Calorimeter (ECAL) of CMS, as Sapienza post-doc and later as Cern fellow, coordinating the analysis of the measurements for the characterization of lead tungstate crystals in the INFN-ENEA regional center in Casaccia and later in the CERN regional center. Since 2004, during the years prior to taking data at LHC, I have actively participated in the calorimeter pre-calibration campaign with crystal Light Yield measurements, with electron beam tests and cosmic tests.

I also took part to the installation of the ECAL High Voltage system, and I've been responsible for the calibration and stability measurements of the power supply boards during the winter shutdowns. This calibration is crucial to the stability of the system, which directly affect the photodetector gain, and consequently the constant term of the calorimeter energy resolution. I developed the HV database finalized to the management of all the activities and tests of the system.

Finally, I participated to the installation and performance monitoring of the Rome Tier2.

### **Research activities in 2008-2013**

Thanks to the experience gained in the previous years, I have been called, since 2008, to coordinate various working groups in the Collaboration, oriented both to the detector and to the physics, covering several positions of L2 and L3 in the management chart of CMS.

The most relevant part of my work in this period applies to the activities focused on the improvement of the Electromagnetic Calorimeter (ECAL) performance, which played a central role in the discovery of the Higgs Boson in July 2012, in the decay channels with photons in the final state.

I have been convener of the Detector Performance Group (with about 80 CMS collaborators actively involved) from January 2012 to December 2013 when the full LHC Run1 set of data have been analysed to measure the Higgs properties (mass, spin, couplings). The DPG achievements brought to a remarkable improvement in the calorimeter energy resolution allowing the observation of the Higgs boson with a significance greater than 5 sigma in the two photons decay channel alone with the Run1 Data. In the context of this work, I gave at the ICHEP2012 Conference at Melbourne a talk on the *“Performance of the CMS electromagnetic calorimeter at the LHC and role in the hunt for the Higgs boson”*.

- **Electron Computing, Software and Analysis group.**

In 2008, I have been the convener of this group with the mandate of preparing the CMS analyses with final state electrons. The setup of trigger paths and offline selections and the measurements of reconstruction, selection and trigger efficiencies optimized to the very first data with start-up conditions – detector not yet aligned and calibrated – were the main tasks performed by this group.

- **ECAL Calibration and Alignment group.**

I have been convener of this group since the beginning of 2009 to the end of 2011. The calibration effort is documented the publication and in the CMS Physics Analysis Summary “Electromagnetic Calorimeter Calibration with 7 TeV data” of which I was the editor. I also presented the calibration results at the CALOR10 and other international conferences. In addition, I personally developed a new iterative method to inter-calibrate a calorimeter with a very large number of channels using resonances as  $Z \rightarrow e^+e^-$  and  $\pi \rightarrow \gamma\gamma$ ; since then, this

method is currently used in CMS.

- **Optimization of Electromagnetic Calorimeter performance.**

I was the convener of the ECAL Detector Performance Group in the years 2012-13. The task of the group includes all the activities finalized to obtain the best stability and efficiency of the detector during the data taking and at the same time the best energy, position, and time resolution of reconstructed electrons and photons. Besides the general coordination of all the group activities, I personally contributed on the detector calibration, on the determination of the amount of material in front of the calorimeter with the Run1 data, comparing the energy flux in Minimum Bias events taken with and without magnetic field and also to the study on the gain stability of the Avalanche Photodiodes (APDs), capable to effectively convert the crystal scintillation light in electrical signal in a high magnetic field environment.

- **Higgs Boson search in the two-photon decay channel**

My personal contribution in this analysis is the optimization and evaluation of photon energy resolution and energy scale with original data-driven techniques. The important time variation of the transparency of Lead Tungstate crystals and all the other sources of systematic error have been deeply investigated. All the CMS published analyses on the  $H \rightarrow \gamma\gamma$  decay channel make use of the results obtained with this method.

## **Research activities in 2014-2018**

Since 2014 I moved to the R&D activities for the CMS upgrade for LHC phase2 (High Luminosity LHC) in two different areas: future calorimeters and timing detectors. During the LHC run2 data taking (2016-2018) I've been convener of the Electron and Photon Physics Object Group. Finally, my commitments to data analysis, in the same years, have expanded to the search of narrow resonances at high mass in the di-photon channel.

- **Upgrade of the electromagnetic calorimeter for the High Luminosity LHC.**

In 2014, I was the coordinator of the group on the performance evaluation of the calorimeter for the HL-LHC. Due to the very high radiation dose in the forward region, and to the resulting crystal light transmission loss, the CMS ECAL endcaps should be replaced with a new sampling calorimeter. I reported on the ECAL upgrade state of the art at the ICHEP2014 conference.

- **Test beam on CeF3 crystals and Micro-Channel-Plates for HL-LHC.**

In 2014-2015 I took part to the tests of two prototypes of detector for HL-LHC with beam of electrons at the BTF facility in Frascati and at the H4 facility at Cern. The first one is a sampling calorimeter of CeF3 crystals and tungstate absorber for energy measurement. The second is a timing detector made of Micro-Channel-Plates tested in two different configurations: PMT-MCP and ionization-MCP without the photocathode. I also developed the database for both the test beam and participated to the data analysis.

- **Optimization of electron and photon reconstruction and identification for Run2 analyses.**  
During Run2 of LHC (2016-2018) I was coordinator of the Electron and Photon Physics Object Group, made up of about 50 CMS physicists. The group is responsible for the trigger and reconstruction algorithms of electrons and photons and for the identification strategies, based on both standard selections and multivariate analyzes, of these particles. The results obtained by this group has been a key ingredient in several analyses on the properties of the Higgs boson and several searches beyond the Standard Model. The supervision and approval of reconstruction algorithms optimized for alternative scenarios, such as those used in collisions between lead ions, is another task of the group that I coordinated. At the same time, I have also worked on new procedures for the selection of photons of energies of the TeV scale, aimed at the search for new physics, which make use of machine learning techniques.
- **Search of narrow resonances at high mass in the di-photon channel.**  
Several “*Beyond the Standard Model*” theories postulate the presence of heavy particles with mass in the TeV region (e.g. extra-dimension Randall-Sundrum model). Di-photon decay is a golden channel in the search of new physics and at the beginning of LHC Run2, with a much higher center-of-mass energy, I started to work in this analysis with the focus on signal model and on experimental aspects as the electromagnetic shower longitudinal leakage and the electronic saturation, arising with very high-energy photons. I’ve been invited to give seminars on this “hot” topic (in Sapienza and in DESY) when both ATLAS and CMS observed an excess in the diphoton invariant mass region of 750 GeV.

## Research activities in 2019-2023

In the last four years, I’ve been fully involved in the management of the CMS Rome group and in the experimental activities connected to the upgrade of the CMS detector. CMS is in fact undergoing an extensive Phase 2 upgrade program to prepare for the challenging conditions of the High-Luminosity LHC. The Rome group is working both on the ECAL upgrade and in the MIP Timing Detector (MTD) construction. As group leader, I manage the preparatory activities and the connections with the companies for the tender of the following projects: construction on the ECAL Enfourneur (precision mechanical tool for the extraction and insertion of ECAL crystal modules in the detector – 430 kEuro), production of the boards (~ 200 kEuro) and the cables (~ 250 kEuro) for the new ECAL HV system, production of the LYSO crystals for the new MTD detector (~ 1400 kEuro).

- **The CMS ECAL upgrade for precision timing measurements at the High-Luminosity LHC**

The High Luminosity upgrade of the LHC at CERN will provide unprecedented instantaneous and integrated luminosities of around  $5 \cdot 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$  and 3000/fb, respectively. An average of 140 to 200 collisions per bunch-crossing (pileup) is expected. In the barrel region of CMS electromagnetic calorimeter, the lead tungstate crystals and avalanche photodiodes (APDs) will continue to perform well, while the entire readout and trigger electronics will be replaced.

A dual gain trans-impedance amplifier and an ASIC providing two 160 MHz ADC channels, gain selection, and data compression will be installed. The noise increase in the APDs, due to radiation-induced dark current, will be mitigated by reducing the ECAL operating

temperature. The trigger primitive formation will be moved off-detector and performed by powerful and flexible FPGA processors.

The upgraded ECAL will greatly improve on the time resolution for photons and electrons with energies above 10 GeV.

I have been recently appointed ECAL Deputy System Manager by the CMS Management Board and the ECAL Institution Board. This role (a L1 position in the CMS organization) consists of coordinating, together with the new System Manager (former deputy), all the activities related to the ECAL upgrade. Moreover, I have to take part in the management of the ECAL Collaboration (about 250 physicists) also involved in the ongoing data taking, the LHC run3. I think all this represents a great challenge for me.

- **LYSO crystal characterization for the Mip Timing Detector**

As part of its upgrade, CMS is planning to build the Mip Timing Detector (MTD), a novel sub-detector with the capability of tagging charged particles with a time resolution of 30-60 ps. In the barrel part of the MTD detector, called the Barrel Timing Layer (BTL), scintillating LYSO:Ce crystals coupled to Silicon Photomultipliers (SiPMs) will be used as active elements. LYSO was found to be the optimal choice in terms of performance (high light yield and fast scintillation kinetics), cost and mass production capability.

Starting from 2019, a comprehensive characterization campaign of LYSO crystal samples from different vendors has been carried out in CMS Laboratory in Sapienza. The purpose of this campaign was the qualification of potential manufactures for the BTL detector and the establishment of experimental methods and technical requirements for the QA/QC process in the production stage. I'm in charge of the coordination of this activity since the beginning and I also obtaining a university grant (Fondi d'Ateneo), as Principal Investigator, on the LYSO crystal characterization. After a detailed comparison of crystal optical properties, as light yield, decay time and time resolution, from different producers, after the full investigation of the uniformity among samples and the temperature dependence of the crystal properties, we finally tested the radiation tolerance of crystal samples in an irradiation campaign with Co60 photons and neutrons at the Enea-Casaccia facility. This large number of results has been documented in two internal reports (confidential until the opening of the tender) and allowed to qualify few manufactures for the full oncoming production.

Recently few sensor prototypes, previously characterized in the Rome laboratory, have been tested also with proton beams, demonstrating that these sensors can provide a time response with a time resolution better than 30 ps as expected.

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## RESEARCH ACTIVITIES IN THE L3 EXPERIMENT

I actively participated, during my Ph.D. in 1998-2001, to the measurements of the  $W$  mass and the  $e^+e^- \rightarrow W^+W^-$  cross-section with the data collected by L3 experiment at the LEP accelerator at CERN. In this period, the center of mass energy of LEP exceeded the threshold for the production of a pair of  $W$  boson, rising up to 209 GeV, opening the exploration to a new energy regime and allowing the extension of precision tests to a new sector of the Standard Model.

Personal contributions:

- **Measurements of the  $W^+W^- \rightarrow q\bar{q}q\bar{q}$  cross section and hadronic W Branching Ratio**  
In the last years of LEP data taking, I was the contact person of the fully hadronic decay channel, with both the Ws decaying in a quark-antiquark pair. The cross section measurement confirmed, for the first time, the presence of triple gauge boson couplings  $\gamma WW$  and  $ZWW$ . The measurement of hadronic branching ratio, together with the other BRs, represented a very crucial test of the lepton universality in this electro-weak sector. In these analyzes I was a forerunner of the use of neural networks for the selection of signal events. At the LXXXVI Congresso Nazionale della Società Italiana di Fisica I got the award as best Communication in Nuclear and Subnuclear Physics showing the results of this analysis.
- **Unfolding of the W boson invariant mass distribution**  
I developed an original method to unfold the W mass distribution reconstructed in hadronic ( $W^+W^- \rightarrow q\bar{q}q\bar{q}$ ) and semileptonic ( $W^+W^- \rightarrow q\bar{q}l\nu$ ) final states. This method, assuming the real distribution being compatible with a linear combination of B-Splines, has brought to the first representation of the unfolded W mass distribution, without the bias introduced by the detector acceptance and resolution.
- **W mass and width measurements**  
The measurements of the W mass and width can be directly performed starting from the unfolded mass distribution, which is common to the different decay channels. The improvement in the  $M_W$  error implied a more stringent test on the Standard Model indirect measurements. I presented this analysis in the Fundamental Interactions - Lake Louise Winter Institute conference in 2002.

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## RESEARCH ACTIVITIES IN THE SAPIENZA APPLIED RADIATION PHYSICS GROUP

In the recent years I entered in the Applied Radiation Physics Group (ARPG), a collaboration between researchers of the Physics and the Scienze di Base e Applicate per l'Ingegneria (SBAI) Sapienza departments. In this context, I worked on the cross section measurements of ion beam (Helium, Carbon, Oxygen) fragmentation, aimed at reducing the uncertainties in the energy range characteristic of hadron therapy (100-500 MeV per nucleon) for the treatment of tumors. I also collaborated to a study of multivariate analysis algorithms on texture parameters in magnetic resonances for the tumor staging within a collaboration between Sapienza University and San Camillo Forlanini hospital. I'm co-author of about 10 publications in this field.