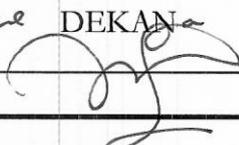


MENTORSTVO

Kandidat: Ime i prezime	Jelena Mijušković			
PREDLOŽENI MENTOR/I				
	Titula, ime i prezime	Ustanova i država	Naučna oblast	
Prvi mentor				
Drugi mentor	Dr Federico Ferri Istraživač sa HDR (habilitation à diriger des recherches)	Institut CEA- IRFU, Saclay, Pariz, Francuska	Fizika elementarnih čestica	
Sjednica Vijeća organizacione jedinice na kojoj je izvršeno predlaganje mentora				
KOMPETENCIJE MENTORA (pet objavljenih radova u relevantnim časopisima)				
Prvi mentor	1			
	2			
	3			
	4			
	5			
Drugi mentor	1	CMS Collaboration, "Observation of a New Boson at a Mass of 125 GeV with the CMS Experiment at the LHC," Phys. Lett. B, vol. 716, pp. 30–61, 2012.		
	2	CMS Collaboration, "Measurements of Higgs boson properties in the diphoton decay channel in proton-proton collisions at $s = 13$ TeV," JHEP, vol. 11, p. 185, 2018.		
	3	CMS Collaboration, "Observation of ttH production," Phys. Rev. Lett., vol. 120, no. 23, p. 231801, 2018.		
	4	CMS Collaboration, "Performance of Photon Reconstruction and Identification with the CMS Detector in Proton-Proton Collisions at $\sqrt{s} = 8$ TeV," JINST, vol. 10, no. 08, p. P08010, 2015.		
	5	CMS Collaboration, "Time Reconstruction and Performance of the CMS Electromagnetic Calorimeter," JINST, vol. 5, p. T03011, 2010.		
PODACI O MAGISTRANDIMA I DOKTORANDIMA				
	Broj magistranada		Broj doktoranada	
	trenutno	ukupno	trenutno	ukupno
Prvi mentor				
Drugi mentor	0	2	1	2
Datum i ovjera (pečat i potpis odgovorne osobe)				

U Podgorici,
28. 2. 2022.



28 DEKAN


R É P U B L I Q U E F R A N Ç A I S E

Ministère de l'enseignement supérieur, de la recherche et de l'innovation

SORBONNE UNIVERSITÉ

HABILITATION À DIRIGER DES RECHERCHES

Vu le code de l'éducation, et notamment son article L.613-1 ;

Vu les pièces justificatives produites par M. FEDERICO FERRI, né le 15 novembre 1978 à MILAN (ITALIE) en vue de son inscription pour le diplôme d'habilitation à diriger des recherches ;

Vu le procès-verbal du jury attestant que l'intéressé a présenté ses travaux le 4 octobre 2021 devant un jury présidé par BERTRAND LAFORGE et composé de FRANCO BEDESCHI, LOUIS FAYARD, MARCO PIERI, PARASKEVAS SPHICAS, ALESSANDRA TONAZZO ;

Vu la délibération du jury ;

Le diplôme d'HABILITATION À DIRIGER DES RECHERCHES en PHYSIQUE

est délivré à M. FEDERICO FERRI

pour en jouir avec les droits et prérogatives qui y sont attachés.

Fait le 10 novembre 2021

Le titulaire

L'administrateur provisoire



N° SORBONU 14524872

/2021202004865

Dominique PATERON



*Le Recteur d'Académie,
Chancelier des universités*

Christophe KERRERO

FEDERICO FERRI ~ CURRICULUM VITAE ET STUDIORUM

Personal details: born 15.11.1978 in Milano, Italy; italian nationality
Contact: federico.ferri@cern.ch

CAREER

- 2021 **Scientific Associate** at CERN
- 2008- **Staff** researcher at CEA Saclay, IRFU/DPhP
- 2007-2008 **Post-doctoral** researcher at CEA Saclay IRFU/DPhP
- 2005-2007 **Post-doctoral** researcher at Istituto Nazionale di Fisica Nucleare (INFN), Italy
- 2002-2005 **Ph.D.** in Physics and Astronomy, at the École Polytechnique Palaiseau and at the University of Milano-Bicocca. Thesis: "The CMS Electromagnetic Calorimeter for the Higgs Boson Search $H \rightarrow ZZ^{(*)} \rightarrow 4e$ at the LHC" (supervisors: T. Tabarelli de Fatis, Y. Sirois)
- 2002 **Fellow** researcher at Istituto Nazionale di Fisica Nucleare (4th in national-ranked admission)
- 2002 **Laurea** in Physics at the University of Milano-Bicocca, mark of 110/110 *cum laude*

RESEARCH HIGHLIGHTS

PHYSICS ANALYSES

- **Discovery of the Higgs boson** with the CMS detector, in the diphoton decay channel
- Observation of **associated production of the Higgs boson with top quarks**
- Measurement of the **Higgs boson couplings, fiducial and differential production cross sections** with the diphoton decay channel - **Editor of** JHEP 1901(2019)183
- Measurement of the **Higgs boson mass** in the diphoton decay channel
- **Measurement** of the production cross section of pair of isolated photons in CMS
- **Study** and optimization of the electron and photon reconstruction in CMS

DETECTOR PERFORMANCE

- **Construction, commissioning, calibration, and performance optimization** of the CMS ECAL (electromagnetic calorimeter), from the installation in CMS to physics with collisions
- Preparation of the **upgrade of the CMS ECAL** for the High-Luminosity LHC, consisting in the replacement of the front-end and back-end electronics
- Study of **radiation-induced effects in PbWO₄** scintillating crystals
- Calibration and performance of the **HARP Time-of-Flight system**.
- Development and characterization of **glass-made Resistive Plate Chambers**

ROLES AND RESPONSIBILITIES WITHIN THE CMS EXPERIMENT

- 2019- *System Manager* of the CMS ECAL
- 2017-2019 *Deputy System Manager* of the CMS ECAL
- 2015-2016 *Convener* of the analysis group of the Higgs boson decaying into two photons
- 2013-2014 *Convener* of the Detector Performance Group of the CMS ECAL
- 2011-2012 *Responsible* of the CMS ECAL calibration
- 2011-2014 *Responsible* of the CMS ECAL laser monitoring system
- 2007-2010 *Responsible* of the CMS ECAL reconstruction software
- 2017- *Member* of the CMS Management Board
- 2013- *Member* of the CMS ECAL Editorial Board
- 2013- *Member* of the CMS ECAL Conference Committee

PUBLICATIONS

More than 1000 publications in international peer-reviewed journals, of which more than 20 among the primary contributors. Full up-to-date list available online.

PUBLICATIONS WITH MAIN CONTRIBUTIONS

- [1] CMS Collaboration, "Observation of a New Boson at a Mass of 125 GeV with the CMS Experiment at the LHC," *Phys. Lett. B*, vol. 716, pp. 30–61, 2012.
- [2] CMS Collaboration, "Observation of a New Boson with Mass Near 125 GeV in pp Collisions at $\sqrt{s} = 7$ and 8 TeV," *JHEP*, vol. 06, p. 081, 2013.
- [3] CMS Collaboration, "Observation of the Diphoton Decay of the Higgs Boson and Measurement of Its Properties," *Eur. Phys. J. C*, vol. 74, no. 10, p. 3076, 2014.
- [4] CMS Collaboration, "Measurements of Higgs boson properties in the diphoton decay channel in proton-proton collisions at $\sqrt{s} = 13$ TeV," *JHEP*, vol. 11, p. 185, 2018.
- [5] CMS Collaboration, "Measurement of inclusive and differential Higgs boson production cross sections in the diphoton decay channel in proton-proton collisions at $\sqrt{s} = 13$ TeV," *JHEP*, vol. 01, p. 183, 2019.
- [6] CMS Collaboration, "Performance of Photon Reconstruction and Identification with the CMS Detector in Proton-Proton Collisions at $\sqrt{s} = 8$ TeV," *JINST*, vol. 10, no. 08, p. P08010, 2015.
- [7] CMS Collaboration, "Performance of Electron Reconstruction and Selection with the CMS Detector in Proton-Proton Collisions at $\sqrt{s} = 8$ TeV," *JINST*, vol. 10, no. 06, p. P06005, 2015.
- [8] CMS Collaboration, "Observation of $t\bar{t}H$ production," *Phys. Rev. Lett.*, vol. 120, no. 23, p. 231801, 2018.
- [9] CMS Collaboration, "Measurement of the Production Cross Section for Pairs of Isolated Photons in pp collisions at $\sqrt{s} = 7$ TeV," *JHEP*, vol. 01, p. 133, 2012.
- [10] CMS Collaboration, "Search for a standard model-like Higgs boson in the mass range between 70 and 110 GeV in the diphoton final state in proton-proton collisions at $\sqrt{s} = 8$ and 13 TeV," *Phys. Lett. B*, vol. 793, pp. 320–347, 2019.
- [11] CMS Collaboration, "Time Reconstruction and Performance of the CMS Electromagnetic Calorimeter," *JINST*, vol. 5, p. T03011, 2010.
- [12] CMS Collaboration, "Radiation hardness qualification of $PbWO_4$ scintillation crystals for the CMS Electromagnetic Calorimeter," *JINST*, vol. 5, p. P03010, 2010.
- [13] P. Adzic *et al.*, "Intercalibration of the barrel electromagnetic calorimeter of the CMS experiment at start-up," *JINST*, vol. 3, p. P10007, 2008.

- [14] CMS Collaboration, "The CMS Experiment at the CERN LHC," *JINST*, vol. 3, p. S08004, 2008.
- [15] CMS Collaboration, "CMS technical design report, volume II: Physics performance," *J. Phys. G*, vol. 34, no. 6, pp. 995–1579, 2007.
- [16] P. Adzic *et al.*, "Energy resolution of the barrel of the CMS electromagnetic calorimeter," *JINST*, vol. 2, p. P04004, 2007.
- [17] CMS Collaboration, "Results of the first performance tests of the CMS electromagnetic calorimeter," *Eur. Phys. J. C*, vol. 44S1, pp. 1–10, 2006.
- [18] P. Adzic *et al.*, "Reconstruction of the signal amplitude of the CMS electromagnetic calorimeter," *Eur. Phys. J. C*, vol. 46S1, pp. 23–35, 2006.
- [19] S. Baffioni, C. Charlot, F. Ferri, N. Godinovic, P. Meridiani, I. Puljak, R. Salerno, and Y. Sirois, "Discovery potential for the SM Higgs boson in the $H \rightarrow ZZ^{(*)} \rightarrow e^+e^-e^+e^-$ decay channel," *J. Phys. G*, vol. 34, pp. N23–N46, 2007.
- [20] S. Baffioni, C. Charlot, F. Ferri, D. Futyan, P. Meridiani, I. Puljak, C. Rovelli, R. Salerno, and Y. Sirois, "Electron reconstruction in CMS," *Eur. Phys. J. C*, vol. 49, pp. 1099–1116, 2007.
- [21] A. Calcaterra *et al.*, "Analysis and interpretation of the performance degradation of glass Resistive Plate Chambers operated in streamer mode," *JINST*, vol. 2, p. P10003, 2007.
- [22] HARP Collaboration, "The HARP detector at the CERN PS," *Nucl. Instrum. Meth. A*, vol. 571, pp. 527–561, 2007.
- [23] HARP Collaboration, "Measurement of the production cross-section of positive pions in p-Al collisions at 12.9-GeV/c," *Nucl. Phys. B*, vol. 732, pp. 1–45, 2006.
- [24] M. Baldo-Ceolin *et al.*, "The time-of-flight TOFW detector of the HARP experiment: Construction and performance," *Nucl. Instrum. Meth. A*, vol. 532, pp. 548–561, 2004.
- [25] M. Bonesini *et al.*, "Laser-based calibration for the HARP time of flight system," *IEEE Trans. Nucl. Sci.*, vol. 50, pp. 1053–1058, 2003.

CONFERENCES WITH PUBLISHED PROCEEDINGS

1. The CMS ECAL Phase-2 Upgrade for High Precision Timing and Energy Measurements, VCI2019: 15th Vienna Conference on Instrumentation, 18-22 Feb 2019, Vienna (Austria)
2. Role of the CMS electromagnetic calorimeter in the measurement of the Higgs boson properties and search for new physics, ICHEP 2014: 37th International Conference on High Energy Physics, 2-9 Jul 2014, Valencia (Spain)
3. Monitoring and Correcting for Response Changes in the CMS Lead-tungstate Electromagnetic Calorimeter, CALOR 2012: 15th International Conference on Calorimetry in High Energy Physics, 4-8 Jun 2012, Texas Tech University, Santa Fe, NM (United States)
4. Monitoring the stability of the CMS electromagnetic calorimeter, CALOR2010: 14th International Conference for Calorimetry in High Energy Physics, 10-14 May 2010, IHEP, Beijing (China)

DIRECT SUPERVISION EXPERIENCE

1. Post-doctoral supervision of Chiara Amendola, for the work on timing reconstruction and calibration for the ECAL Phase2 upgrade, 2020-(2022)
The work consists in the study of the timing reconstruction for electrons and photons for HL-LHC. This implies the improvement of the current performance, understanding of its limitations, and plans for the upgraded electronics for HL-LHC, in terms of reconstruction and calibration methods. Also, the timing information will be fully integrated in the simulation of the CMS detector.
2. Ph.D. supervision of Giulia Negro, "Search for heavy neutrinos with the CMS experiment and studies for the upgrade of its electromagnetic calorimeter", 2015-2018
Heavy neutrinos, produced in the decay of a right-handed W boson, were searched in a fully reconstructed final state containing two same flavour leptons and two jets, with data from 2016 collisions (35.9 fb^{-1}). Limits were set, becoming the most stringent result at the time of the publication. The analysis work done for 50% in collaboration with another (small) group and for 50% completely alone. The thesis also comprised the supervision and participation of beam test studies for the Phase2 electronics prototypes.
3. Ph.D. supervision of Laurent Millisher, "Measurement of the inclusive production cross section of prompt photon pairs with the CMS detector at the LHC", 2008-2011
Events with two isolated photons have been analyzed from the early collisions of the LHC (7 TeV, 36 pb^{-1}). An important cross-section measurement preparatory to the search for the Higgs boson in its two photon decay. Comparison with several theoretical predictions have also been performed, providing useful input for theoreticians.
4. Supervision of the M2 stage of Francesco Bonacina, to work on the CMS ECAL laser monitoring system for channel alignment in time, 2017
Three month of supervision, from teaching the basis of ROOT and C++ to the data analysis to determine the feasibility of using the ECAL laser monitoring system to align channels in time
5. Supervision of M2 student Stefano Marelli, for the final year thesis (about 10 month of work), 2006
The work consisted in the feasibility study of the calibration of the CMS ECAL with minimum ionizing particles from collisions. This work was precursory for the ECAL calibration with cosmic rays prior installation in the detector, which has been done in the subsequent years.

TEACHING RESPONSIBILITIES

1. Laboratory assistant for the M2 physics laboratory, Paris-Sud University, for the years 2009, 2010, 2011
Particle physics laboratory (spectroscopy, muon life-time, etc.)
2. Laboratory assistant for the "Physics laboratory", Department of Physics, Milano-Bicocca University, 2006
Mechanics and optics experiments of the first year physics students
3. Laboratory assistant for the "Computer science laboratory", Department of Physics, Milano-Bicocca University, 2004
Linux, C, C++, ROOT
4. Laboratory assistant for the "Computer science for physics laboratory", Department of Physics, Milano-Bicocca University, 2004
Linux, C, numerical analyses
5. Assistant professor for the lectures "Physics", Department of Geological Sciences and Technologies, Milano-Bicocca University, 2004
Teaching and exercising for the first year physics course: motion, mechanics, stress tensors, fluids
6. Assistant professor for the lectures "Physics", Department of Geological Sciences and Technologies, Milano-Bicocca University, 2003
Teaching and exercising for the first year physics course: motion, mechanics, stress tensors, fluids
7. CERN official guide since 2002 and CMS guide since 2018, with related activities during periods at CERN
8. Didactic collaboration for the exposition "Toys, experiments, ideas (GEI)", realized by the "Centro Laboratorio per la Didattica della Fisica del CIRD dell'Università degli Studi di Udine" for the setup in the municipality of Bresso (Milano, Italy), 2000
Realization of toys and experiments for elementary school students and general public kids, with guided tours (isochronous pendula, shaped bubbles, water rockets, electrostatic experiments with Van-der-Graaf, etc.)
9. Didactic collaboration for the exposition "Toys and science", realized by the Physics Department of the Trento University, for the setup in the municipality of Bresso (Milano, Italy), 1999
Realization of toys and experiments for elementary school students and general public kids, with guided tours (isochronous pendula, shaped bubbles, water rockets, electrostatic experiments with Van-der-Graaf, etc.)

OTHER MAIN RESPONSIBILITIES

1. System Manager of the CMS Electromagnetic Calorimeter

The work consists in managing the electromagnetic calorimeter of CMS (ECAL), a detector composed of PbWO_4 crystals (75k channels) with two layers of a silicon/lead "preshower" (138k channels) in front of the two forward parts. The ECAL collaboration consists of approximately 150 physicists from 40 Institutes from 15 countries, with a total budget of about 600 kEUR/year. The responsibility includes the maintenance and operations of the existing detector, the optimization of its performance, from event triggering to particle reconstruction, the preparation of the new electronics for the High Luminosity LHC upgrade. It also includes the approval of results, whose publication is supervised with the help of an editorial board, and their submission to conferences.

2. Convener of the analysis group of the Higgs boson decay into two photons

This responsibility was taken during the first collision of the LHC at 13 TeV, a crucial moment of the machine. The Higgs boson was "rediscovered" at the new collider energy and the era of precision measurements started. The work consisted in participating to and supervising the analyses of the Higgs boson decaying into two photons: total and differential cross-sections, simplified template cross-sections, low mass analysis, Dalitz decays. About 40 people worked on these analyses.

3. Convener of the CMS ECAL Detector Performance group

The responsibility consisted in coordinating the work on the detector to reach the ultimate performance for electron and photon reconstruction. Calibration, pile-up and detector effect mitigation, amplitude and time reconstruction. This has been carried out after the laser monitoring and then calibration responsibilities, which were at the time of the Higgs boson discovery, when the calibration and resolution have been fundamental.

4. Evolution of computing tools at IRFU for the LHC experiments

This is a shared responsibility that has been given to myself, a physicist of the Department of Particle Physics (DPhP) and an computer engineer from the Detector Department (Dedip), by the head of the Irfu of CEA/Saclay, upon proposal from the head of the DPhP and Dedip. It mainly consists in establishing the status of the computing at Irfu; estimating the evolution of the needs, in term of computing and human resources; representing the LHC experiments within the Irfu and outside the institute, also in the context of CEA-IN2P3 collaborations. It is closely related to the computing Grid for LHC and the development of High Parallel Computing (HPC) and new technologies such as usage of Graphics Processor Units (GPUs).

Amendment to the agreement on joint international supervision of doctoral thesis

Preamble

Université Paris-Saclay, located at 3 rue Joliot Curie, Bâtiment Breguet, 91190 Gif-sur-Yvette, France, represented by its President, Prof. Sylvie RETAILLEAU, hereinafter referred to as “UPSaclay”,

and

Commissariat à l’Energie Atomique et aux Energies Alternatives, located at, 25 rue Leblanc - Paris 15ème (France) represented by Mr Vincent BERGER, Director of the Fundamental research division, (hereinafter referred to as the “CEA”).

and

The University of Montenegro (Univerzitet Crne Gore), located at Cetinjska 2, 81000 Podgorica, Crna Gora, Montenegro, represented by its Rector, PhD Danilo NIKOLIC,

have signed on 04/11/2019 an agreement on joint international supervision of doctoral thesis, related to the PhD student Mrs. Jelena MIJUSKOVIC, supervised by Dr. Marc DEJARDIN, who is member of the laboratory Institut de recherche sur les lois fondamentales de l’Univers (IRFU) DRF/CEA Paris-Saclay, and by Prof. Natasa RAICEVIC, who is member of the research unit Department of Physics, University of Montenegro.

The Agreement stipulates that the doctorate degrees will indicate the joint international supervision by Université Paris-Saclay and by the University of Montenegro, and that the doctorate degrees will be awarded by these two institutions.

The following changes are hereby introduced to the Agreement:

Article 7 : Mentors/Thesis director

The doctoral candidate carries out schooling and research work under the joint responsibility of:

In France, a thesis director at Université Paris-Saclay : Dr Federico FERRI, Institut de recherche sur les lois fondamentales de l’Univers (IRFU) DRF/CEA Paris-Saclay

And

In Montenegro a mentor at the University of Montenegro : Prof. Natasa RAICEVIC, research unit Department of Physics, University of Montenegro.

Both thesis directors undertake to jointly assume the scientific supervision of the doctoral project and the responsibilities of a thesis director as defined by each of the Establishment. A regular joint monitoring of the work will be ensured according to appropriate modalities.

When signing the present Agreement, the signatories acknowledge to be fully acquainted with its content and undertake to comply with its provisions.