

Antonio Gilardi

ACCELERATOR SCIENTIST · ELECTRONIC ENGINEER

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Energetic, motivated, and enthusiastic researcher. I am looking forward to expanding my knowledge and to contribute to the research development.

Education

US Particle Accelerator School (USPAS)

Texas, USA

ADVANCED COURSE

January 2022 - February 2022

- Texas A&M University - Optimization and Machine Learning for Accelerators.

University of Naples Federico II

Naples, Italy

PHD IN INFORMATION TECHNOLOGY

March 2018 - May 2021

- Thesis in Accelerator Physics, title: **"MEASUREMENTS OF WAKEFIELDS AND BUNCH LENGTH WITH BEAM IN LINEAR ELECTRON ACCELERATORS: A CASE STUDY AT THE CLEAR FACILITY"**.
- I developed, tested, and qualify new measurement systems for wakefield through the latest baseline prototype of CLIC accelerating structure and bunch length using Radio Frequency Deflector.
- Vote: **Excellent with honors**.

European Scientific Institute (ESI)

Archamps, France

ADVANCED COURSE

January 2018 - March 2018

- Joint Universities Accelerator School (JUAS) course 2 – The technology and applications of particle accelerators.
- Joint Universities Accelerator School (JUAS) course 1 – The science of particle accelerators.

University of Naples Federico II

Naples, Italy

MSC ELECTRONICS ENGINEERING

October 2015 - September 2017

- Thesis in Electromagnetism, title: **"INNOVATIVE WAY TO DAMP THE RESONANCES INTO THE CERN ACCELERATORS, USING HOM COUPLERS"**.
- A new method of damping the resonances in equipment to be installed on the beamline is proposed. It uses a well-known technique from RF-cavities, where Higher-Order Modes (HOM) are removed with HOM-couplers. This proposed technique was tested in the tank to accommodate the future crystal collimator installed in the SPS at CERN.
- Vote: **110/110 with honors**.

University of Naples Federico II

Naples, Italy

BSC ELECTRONICS ENGINEERING

October 2012 - July 2015

- Thesis in Optoelectronic, title: **"TRUE TIME DELAY IN OPTIC FIBER FOR PHASE ARRAY ANTENNAS (PAAS) WITH THE USE OF BRAGG GRATINGS AND PIEZOELECTRIC DEVICES"**.
- State of the art analysis and feasibility study for the realization of tunable directive antennas realized with the use of commercially available Bragg gratings and piezoelectric devices.
- Vote: **110/110 with honors**.

ITIS Alessandro Volta

Naples, Italy

INDUSTRIAL TECHNICAL HIGH SCHOOL DEGREE

September 2007 - June 2012

- Vote: **100/100 with honors**.

Work Experience

SLAC National Accelerator Laboratory

Menlo Park, United States

PostDoc

July 2022 - On-going

- Staff Engineering II.
- To be started soon
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Lawrence Berkeley National Laboratories (LBNL)

Berkeley, United States

PostDoc

July 2021 - July 2022

- On-going activity, focused on laser combining system (software and hardware development) with the final focus on advanced acceleration for particle physics applications. The aim is to use deep learning model to develop a feedback system acting on the laser mirror to stabilize a coherent beam combining in the center of the beam pattern.
- Developed solid experience with:

Python|EPICS|GitLab|Machine Learning|Keras|PyTorch|SKLearn

CERN - Doctoral Student Program

Geneva, Switzerland

PHD STUDENT

March 2018 - May 2021

- I got the international grant from the doctoral program at the BEam department, Lepton Accelerator and Facilities (BE-LAF), in collaboration with the University of Naples Federico II. The PhD journey was entirely spent abroad at CERN, mainly working at the CERN Linear Electron Accelerator for Research (CLEAR) LINAC.
- I actively participated in the machine's daily operation from the bunch generation to the experiment. I joined many experiments, supporting them with hardware setup, feasibility simulation, and post-processing analysis. With particular interest and effort, many medical-related studies were pursued.
- I performed many studies on my main research topic, the transverse field impacting the bunches in the accelerator. In particular: (i) the parasitic transverse wakefield in the new generation of high-gradient accelerating structure operating at high-frequency (X-band), and (ii) the transverse field used to measure the bunch length with a Radio Frequency Deflector (RFD).
- For both the above listed topics, all the results were supported by a solid theory, validated with simulations and measurements.
- In additions, I developed experience in laser operation; particularly with CO₂ lasers (used for cutting and engraving), Er:YAG (used for probing experiments Electro-Optical System), and Nd:YLF (used for electron generations).
- Developed solid experience with:
|MatLab|Python|JAPC|Git|Autodesk|CST|

CERN - Technical Student Program

Geneva, Switzerland

TECHNICAL STUDENT

February 2017 - March 2018

- I got the international grant from the technical student program at the BEam department, Hadron Synchrotron Collective effects (BE-HSC).
- I investigated the phenomena of beam impedance and wakefields, starting from analytically studying simple geometry and later using numerical methods to solve the same problem in real accelerator components such as the crystal collimator and the beam gas ionization monitor.
- Besides, a new method to identify a resonance frequency of resonance modes was developed, using a sin fit approach using three parameters but in the frequency domain.
- Developed solid experience with:
|Vector Network Analyzer (VNA)| MatLab| Wolfram Mathematica|ANSYS|Oscilloscope|

University of Naples Federico II

Naples, Italy

STUDENT ASSISTANT

January 2012 - February 2017

- I provided academic support for High School and University students. About 8 students per year, for an amount of 8 hours/week.
- The main subjects covered were: mathematics, planar geometry, solid geometry, calculus, motion dynamics, introductory electromagnetism, computer science, database management, electric circuits, and logic gates.
- Developed solid experience with:
|MatLab|Oracle DB| Lego robotics|Eclipse|C++|LabVIEW|

Foto Art

Benevento, Italy

PHOTOGRAPHER ASSISTANT

July 2014 - January 2015

- I worked as a hardware and software maintainer in a photo lab.
- Developed solid experience with:
|Windows|MacOS|Linux|Office|Photoshop|Illustrator|Inkscape|

Telecom Italia- ELIS

Rome, Italy

APPRENTICESHIP

June 2012 - October 2012

- Worked with the largest telecommunication company in Italy, covering two main topics: (i) designing a network of UMTS and GSM antennas to cover urban areas and (ii) develop the network for optic fiber cabling.
- In particular, working in a team a full network for covering the city of Rome was developed.
- On the other hand, I deeply investigated the optic fiber used for telecommunications with diameters between 0.20 mm to 0.50 mm.
- Developed solid experience with:
AutoCAD|Fusion Splicers|E|X|

Collaboration

INFN - Sections of Naples

Naples, Italy

AFFILIATIONS

September 2020 - Exp. July 2021

- Collaboration with the INFN group in the framework of the Search for Hidden Particles (SHiP) project.
- I organized different experiments in a CLEAR facility studying the interaction between electrons at different energies and matter; investigating the different penetrations characteristics.
- I supervised three university master students.
- Developed solid experience with:
|Python|Geant4|MiniScatter|

ImpaLab

Naples, Italy

AFFILIATIONS

December 2016 - Exp. May 2021

- Joining the ImpaLab research group, I had the opportunity to approach meteorology science, particularly related to particle accelerators.
- In addition, joining many side projects at the university level, I developed microcontroller code related to the Arduino and ST environment.
- Developed solid experience with:
|Arduino|LabVIEW|STM32Cube|C|FPGA|

Research activity

INVITED SEMINARS

- 11/2019 **University Federico II of Naples**, Seminar title: "Main measurement on particle accelerator". *Naples, Italy*
09/2019 **Brookhaven National Laboratory**, Seminar title: "Wakefield measurement at CLEAR". *New York, US*

INVITED LESSONS

- 02/2020 **European Scientific Institute (ESI)**, Lesson title: "Have a chance to operate a real accelerator at CERN". *Archamp, France*
05/2019 **Macquarie University**, Lesson title: "Measurement on particle accelerator beam: the CERN CLEAR facility". *Sydney, Australia*
02/2019 **European Scientific Institute (ESI)**, Lesson title: "Have a chance to operate your own beam at CERN". *Archamp, France*

INVITED TALK

- 10/2019 **ITIS Alessandro Volta**, Talk title: "Introduction to CERN". *Naples, Italy*

PLENARY PRESENTATIONS

- 05/2021 **Lepton Accelerators and Facilities Meeting**, Presentation title: "Measurement of Wakefields and Bunch Length with Beams in Linear Electron Accelerators". *Geneva, Switzerland*
04/2021 **Beam Dynamics Meeting**, Presentation title: "Measurements of wakefields and bunch length". *Geneva, Switzerland*
03/2021 **ABP Group Information Meeting**, Presentation title: "Wakefields in CLIC". *Geneva, Switzerland*
10/2020 **RF Development Meeting**, Presentation title: "CLIC main beam accelerating structure wakefield kick measurements in CLEAR". *Geneva, Switzerland*
06/2020 **CLIC Project Meeting**, Presentation title: "CLEAR studies of Wakefield kicks". *Geneva, Switzerland*
04/2019 **CLIC Beam Physics**, Presentation title: "Wake-fields measurements on the CLIC structure at CLEAR". *Geneva, Switzerland*
01/2019 **CLIC Workshop**, Presentation title: "Wake-fields measurements on the CLIC structure". *Geneva, Switzerland*
02/2018 **Impedance meeting**, Presentation title: "An example of the new formula to calculate beam impedance for a circular vacuum chamber - in the classical thick wall regime". *Geneva, Switzerland*
07/2017 **Impedance meeting**, Presentation title: "Damping a resonances with the help of a loop connected to an external resistor". *Geneva, Switzerland*

CONFERENCE COMMITTEE

- 03/2022 **3rd Advanced material science world congress**, *London, United Kingdom*
10/2022 **Metrology for extended reality, artificial intelligence and neural engineering**, *Rome, Italy*

Honors & Awards

NATIONAL

- 2020 **Massimo D'Apuzzo**, Group of Electric and Electronic Measurement (GMEE) *Italy*
2012 **Letter to a far child**, Tauthema Edizioni *Naples, Italy*

INTERNATIONAL

- 2022 **Course grant**, USPAS - Optimization and Machine Learning for Accelerators *Texas A&M University, US*
2020 **Student grant**, IPAC20 *Caen, France*
2019 **Student grant**, I2MTC19 *Auckland, New Zealand*
2018 **Course grant**, JUAS - The science of particle accelerators *Archamps, France*
2018 **Course grant**, JUAS - The technology and applications of particle accelerators *Archamps, France*
2017 **Student grant**, ICFA mini-workshop Impedance and beam instabilities in particle accelerators *Benevento, Italy*
2017 **University grant**, High honor student MSc - University of Naples Federico II *Napoli, Italy*
2015 **University grant**, High honor student BSc - University of Naples Federico II *Napoli, Italy*
2015 **University grant**, Scholarship - Scuola Normale Superiore *Pisa, Italy*
2013 **The most interesting green project**, EnergyMed *Naples, Italy*

Skills

Programming	Python, MatLab, Wolfram Mathematica, C++, Java, LabVIEW, Visual Basic, Pascal
Hardware	Alignment tripod, Drill press, LASER cutter , Lathe, CNC, 3D Printer , Vacuum system, LASER system
Web and Databases	PHP, HTML5, Oracle Database, Microsoft SQL Server, MySQL
Development tools	Eclipse, Visual Studio
Circuit simulation	PSpice, Spectre, Eagle, CADENCE
Digital circuits design	VHDL, Verilog, Code Composer Studio, SystemVerilog
Microcontrollers programming	C, Arduino, Assembly, Mbed platform, ChibiStudio, IAR EWARM
Measurement instrumentation	Oscilloscope, Spectrum Analyzer, Signal Generator, VNA , Multimeter
Electromagnetic simulations	ANSYS, CST
Numerical solution method	FEM, Functional analysis
Others	Photoshop, 3D design software, LaTeX , JAPC , EPICS , UMTS, GMS

Languages

Italian	Mother tongue
Neapolitan	Mother tongue
English	Proficient
French	Intermediate
Spanish	Elementary

Extracurricular Activity

CERN Football Club

SOCIAL MEDIA MANAGER

Switzerland

November 2019 - March 2021

- Managing the CERN football club's social media channels and public relations; organizing, supporting, and sponsoring events.

Infineon

SUMMER SCHOOL

Austria

September 2017

- Test Development Engineering - Challenge the limits.

Neapolis Innovation

SUMMER CAMPUS

Italy

September 2016

- STMicronics course for ST32F401 using ChibiOS.

Formula SAE - University of Naples

MEMBER

Italy

December 2014 - December 2016

- Participated to build the electronics and the mechanics in the university group for car racing.

MENSA

MEMBER

Italy

March 2011

- Participate to MENSA society activity.

Old Lions

VOLUNTEER

Italy

November 2009 - March 2012

- Volunteer with the association "Old Lions".

Hobbies

- Strong of side work micro-controller.
- Machining expertise.
- Passionate for travel and photography.
- Follower of strategy games.
- Strong interest in checkers and chess.
- Good feeling with many sports (football - rugby - tennis - table tennis - basket - car and motorcycle race).
- Italian driving license A and B (motorbike and cars).

Reference

- Pasquale Arpaia - University of Naples Federico II, Italy.
✉ pasquale.arpaia@unina.it
ImpaLab Laboratory Director
- Roberto Corsini - CERN Geneva, Switzerland.
✉ roberto.corsini@cern.ch
Former BE-ABP-LAF Section Leader
- Wilfrid Farabolini - CEA Saclay - Paris, France.
✉ farabolini@cea.fr
- Kyrre Ness Sjøbæk - University of Oslo, Norway.
✉ k.n.sjobak@fys.uio.no
- Thibaut Lefevre - CERN Geneva, Switzerland.
✉ Thibaut.Lefevre@cern.ch
Beam Instrumentation Group Leader

Journal paper:

- [1] G. Lerner, A. Coronetti, J. M. Kempf, R. G. Alía, F. Cerutti, D. Prelipcean, M. Cecchetto, A. Gilardi, W. Farabolini, and R. Corsini. "Analysis of the photoneutron field near the THz dump of the CLEAR accelerator at CERN with SEU measurements and simulations." *IEEE Transactions on Nuclear Science* (March 2022).
doi:0.1109/TNS.2022.3157404
- [2] Q. Du, D. Wang, T. Zhou, A. Gilardi, M. Kiran, B. Mohammed, D. Li, R. Wilcox. "Experimental beam combining stabilization using machine learning trained while parameters drift." *Optics Express* 30, no. 8 (2022)(January, 2022).
doi: 10.1364/OE.450255
- [3] D. Söderström, L.M. Luza, H. Kettunen, A. Javanainen, W. Farabolini, A. Gilardi, A. Coronetti, C. Poivey and L. Dilillo; "Electron-Induced Upsets and Stuck Bits in SDRAMs in the Jovian Environment." *IEEE Transactions on Nuclear Science* (March, 2021).
doi:10.1109/TNS.2021.3068186
- [4] K. Kokurewicz, E. Brunetti, A. Curcio, D. Gamba, L. Garolfi, A. Gilardi, E. Senes, K.N. Sjobak, W. Farabolini, R. Corsini, and D. Jaroszynski; "An experimental study of the dose distribution of focused very high energy electron (VHEE) beams for radiotherapy". *Nature Communications Physics*. 4, no. 33 (February, 2021).
doi:10.1038/s42005-021-00536-0
- [5] K.L. Small, N.T. Henthorn, D. Angal-Kalinin, A.L. Chadwick, R.C. Morris, E. Santina, A. Aitkenhead, K.J. Kirkby, R.J. Smith, M. Surman, J. Jones, W. Farabolini, R. Corsini, D. Gamba, A. Gilardi, M.J. Merchant, and R.M. Jones. "Evaluating Very High Energy Electron RBE from nanodosimetric pBR322 plasmid DNA damage". *Scientific Reports* 11, no. 3341 (February, 2021).
doi:10.1038/s41598-021-82772-6
- [6] D. Poppinga, R. Kranzer, W. Farabolini, A. Gilardi, R. Corsini, V. Wyrwoll, H.K. Looe, B. Delfs, L. Gabrisch and B. Poppe; "VHEE Beam Dosimetry at CERN Linear Electron Accelerator for Research Under Ultra-High Dose Rate Conditions." *Biomedical Physics & Engineering Express* 7, no. 1 (December, 2020).
doi:10.1088/2057-1976/abcae5.
- [7] F. Romano, A. Subiel, A. McManus, N.D. Lee, H. Palmans, R. Thomas, S. McCallum, G. Milluzzo, M. Borghesi, A. McIlvenny, H. Ahmed, W. Farabolini, A. Gilardi, and A. Schüller; "Challenges in Dosimetry of Particle Beams with Ultra-High Pulse Dose Rates." *Journal of Physics: Conference Series* 1662 (October, 2020).
doi:10.1088/1742-6596/1662/1/012028.
- [8] L. Sabato, P. Arpaia, A. Gilardi, A. Mostacci, L. Palumbo, and A. Variola; "A Measurement Method Based on RF Deflector for Particle Bunch Longitudinal Parameters in Linear Accelerators." *IEEE Transactions on Instrumentation and Measurement* 70 (July, 2021).
doi:10.1109/tim.2020.3009342.
- [9] P. Arpaia, R. Corsini, A. Gilardi, A. Mostacci, L. Sabato, and K.N. Sjobak; "Enhancing Particle Bunch-Length Measurements Based on Radio Frequency Deflector by the Use of Focusing Elements." *Scientific Reports* 10, no. 1 (July, 2020).
doi:10.1038/s41598-020-67997-1.
- [10] M. McManus, F. Romano, N.D. Lee, W. Farabolini, A. Gilardi, G. Royle, H. Palmans, and A. Subiel; "The Challenge of Ionisation Chamber Dosimetry in Ultra-Short Pulsed High Dose-Rate Very High Energy Electron Beams." *Scientific Reports* 10, no. 1 (June, 2020).
doi:10.1038/s41598-020-65819-y.
- [11] A. Curcio, M. Bergamaschi, R. Corsini, W. Farabolini, D. Gamba, L. Garolfi, R. Kieffer, T. Lefevre, S. Mazzoni, K. Fedorov, J. Gardelle, A. Gilardi, P. Karataev, K. Lekomtsev, T. Pacey, Y. Saveliev, A. Potylitsyn, and E. Senes; "Noninvasive bunch length measurements exploiting Cherenkov diffraction radiation." *Physical Review Accelerators and Beams*, vol. 23, no. 2 (February, 2020).
doi:10.1103/physrevaccelbeams.23.022802.

- [12] P. Arpaia, O.E. Berrig, L. De Vito, and A. Gilardi; "Reducing Parasitic Resonances in Particle Accelerators Components by Broadband Higher-Order-Mode Couplers." *Measurement* 146: 938–947 (November, 2019). doi:10.1016/j.measurement.2019.07.034.

Conference paper:

- [1] R. Wilcox, T. Zhou, Q. Du, D. Wang, and A. Gilardi. "Diffractive combining and control of femtosecond pulse beam arrays." *Proc. SPIE 11981, Fiber Lasers XIX: Technology and Systems*, 119810G (March 2022). doi: 10.1117/12.2614781
- [2] E. Senes, P.N. Burrows, R. Corsini, W. Farabolini, T. Lefevre, A. Gilardi, M. Krupa, S. Mazzoni, C. Pakuza, and M. Wendt. "Beam position detection of a short electron bunch in presence of a longer and more intense proton bunch for the AWAKE Experiment." *10th International Beam Instrumentation Conference (IBIC)* (May 2021). doi:10.18429/JACoW-IBIC2021-MOPP17
- [3] L.A. Dyks, P. Burrows, P. Korysko, R. Corsini, S. Curt, W. Farabolini, D. Gamba, L. Garolfi, A. Gilardi, E. Granados, G. McMonagle, H. Panuganti, and K.N. Sjobak. "Consolidation and future upgrades to the CLEAR user facility at CERN." *International Particle Accelerator Conference (IPAC21)*, Campinas, SP, Brazil (May, 2021). doi:10.18429/JACoW-IPAC2021-WEPAB043
- [4] R. Corsini, L.A. Dyks, W. Farabolini, A. Gilardi, K.N. Sjobak, and P. Korysko. "Status of VHEE Radiotherapy Related Studies at the CLEAR User Facility at CERN." *International Particle Accelerator Conference (IPAC21)*, Campinas, SP, Brazil (May, 2021). doi:10.18429/JACoW-IPAC2021-WEPAB044
- [5] S. Benitez Berrocal, P. Korysko, E. Lima, A. Gilardi, W. Farabolini, E. Effinger, W. Viganò, . Salvachua, and P. Lane. "Development and Testing of a Cherenkov Beam Loss Monitor in CLEAR Facility." *International Particle Accelerator Conference (IPAC21)*, Campinas, SP, Brazil (May, 2021). doi:10.18429/JACoW-IPAC2021-WEPAB021
- [6] D. Soderstrom, L.M. Luza, H. Kettunen, A. Javanainen, W. Farabolini, A. Gilardi, A. Coronetti, C. Poivey, and L. Dilillo; "Electron-Induced Upsets and Stuck Bits in SDRAMs in the Jovian Environment." *IEEE Nuclear and Space Radiation Effects Conference (NSREC)* (November, 2020). Available at: <https://hal-lirmm.ccsd.cnrs.fr/lirmm-03028881>.
- [7] F. Wilfrid, A. Gilardi, B. Gkotse, A. Mapelli, I. Mateu, V. Meskova, G. Pezzullo, F. Ravotti, and O. Sidiropoulou; "A beam profile monitor for high energy proton beams using microfabrication techniques." *9th International Beam Instrumentation Conference (IBIC)* (September, 2020). doi:10.18429/JACoW-IBIC2020-TUPP37
- [8] V. Meskova, D. Bouvet, W. Farabolini, A. Gilardi, B. Gkotse, I. Mateu, G. Pezzullo, F. Ravotti, M. Ritala; J.M. Sallese, and O. Sidiropoulou; "Ultra high-level Radiation Monitoring with Thin Metal Nano-Layers (NanoRad-Met)." *ATTRACT Final Conference* (September, 2020). Available at: <https://attract-eu.com/wp-content/uploads/2019/05/NanoRadMet.pdf>.
- [9] P. Arpaia, R. Corsini, A. Gilardi, and K.N. Sjobak; "Beam-based Alignment of the CLIC High-Gradient X-Band Accelerating Structure Using Beam-Screen"; *IEEE International Instrumentation and Measurement Technology Conference (I2MTC)* (May, 2019). doi:10.1109/i2mtc.2019.8827121.
- [10] K. Sjobak, E. Adli, M. Bergamaschi, S. Burger, R. Corsini, A. Curcio, S. Curt, S. Döbert, W. Farabolini, D. Gamba, L. Garolfi, A. Gilardi, I. Gorgisyan, E. Granados, H. Guerin, R. Kieffer, M. Krupa, T. Lefevre, C. Lindstrøm, A. Lyapin, S. Mazzoni, G. McMonagle, J. Nadenau, H. Panuganti, S. Pitman, V. Rude, A. Schlogelhofer, P. Skowroński, M. Wendt, and A. Zemanek; "Status of the CLEAR electron beam user facility at CERN." *10th International Particle Accelerator Conference (IPAC'19)*, Melbourne, Australia (May, 2019). doi: 10.18429/JACoW-IPAC2019-MOPTS054.
- [11] P. Arpaia, O.B. Berrig, L. De Vito, and A. Gilardi; "Experimental Analysis for the Optimal Choice of High-Order Modes Couplers Design Parameters for Resonance Damping." *IEEE International Instrumentation and Measurement Technology Conference (I2MTC)* (May, 2018). doi:10.1109/i2mtc.2018.8409858.

Book:

- [1] CLIC collaborations. "The Compact Linear e⁺-e⁻ Collider (CLIC): Physics Potential." CERN Yellow Reports: Monographs (December, 2018) - CLICdpNote-2018-010.
Available at: <https://cds.cern.ch/record/2652257>.
- [2] CLIC collaborations. The Compact Linear e⁺-e⁻ Collider (CLIC): Accelerator and Detector. CERN Yellow Reports: Monographs (December, 2018) arXiv:1812.07987.
Available at: <https://cds.cern.ch/record/2652846>.
- [3] CLIC collaborations. "The Compact Linear e⁺-e⁻ Collider (CLIC) - 2018 Summary Report." CERN Yellow Reports: Monographs (December, 2018) - arXiv: 1812.06018.
doi: 10.23731/CYRM-2018-002.