

CURRICULUM VITAE

Dr. Marco Silari

Nationality

Italian

Place of residence

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Languages

Italian (mother tongue), English (written and spoken), French (written and spoken)
Diploma of Proficiency in English obtained in London in 1986

Brief overview of the scientific and professional career

Throughout my professional life, my scientific and professional interests have been oriented towards the applications of nuclear physics to life sciences: medical physics, radiation protection, dosimetry of radiation fields, accelerator shielding, the applications of particle accelerators to biology and medicine, in particular radionuclide production and radiation therapy with photons and particle beams, instrumentation R&D.

Apart for the first two years after my graduation in physics (June 1982) – when I obtained the Specialisation Diploma in Health and Medical Physics (March 1985) working at the same time in the Health Physics department of the Brescia main hospital (Spedali Civili), and attended an IT course at the Milan branch of Sperry – as of 1984, year in which I obtained a position as researcher at the Italian National Research Council (CNR), my professional career can be divided in four periods.

In the first period (1984-1986) I worked on a project for a 40 MeV cyclotron for biomedical applications to be installed in a major hospital in Milan. During most of this period (from December 1984 to December 1986) I was seconded to the Medical Research Council, Hammersmith Hospital, in London.

The second period (1987-1991) began with my return to Italy from Hammersmith Hospital at the end of 1986. In these years my research activities mainly focussed on medical applications of nuclear physics, in collaboration with the Department of Physics and with the Institute of Applied Physics of the University of Milan, with the Polytechnic of Milan and with the Cyclotron Laboratory of the EU Joint Research Centre in Ispra, Italy, where I carried out most of the experimental work. Some of my experimental activities were undertaken at other European laboratories such as PTB in Germany and PSI in Switzerland. My scientific interests addressed the biomedical applications of ion beams up to a few tens of MeV, for experimental radionuclide production and elemental analyses, and the physics and dosimetry of the radiation fields around particle accelerators.

The third period (1991-1995) started when I met Prof. Ugo Amaldi at the very beginning of the Italian Hadron-therapy program. Maintaining my position as researcher at the CNR, in the framework of the Hadron-therapy project I was project leader of the National Centre for Oncological Hadrontherapy (CNAO), which is now routinely treating cancer patients since 2011. In these years I mostly had coordination responsibilities, managing funds and leading a group of a dozen physicists and engineers, working first on a feasibility study for CNAO and then on a more detailed design of the facility. Most of my scientific activities focussed on the use of protons and light ions for hadron therapy, but at the same time I participated in the

development of an extended-range rem counter for neutron monitoring (called LINUS): various commercial versions are now available and are in use at high-energy accelerator laboratories including CERN. I still have and use one of the original LINUS that we built when I worked in Milano.

The fourth period (1996 to present) started when I moved to CERN as staff member in the Radiation Protection group. I have been deputy group leader from 1999 until 2008, I am senior staff since 2001 and I have been leader of four different sections in the RP group. My responsibilities evolved over the years and included radiation protection of various CERN accelerators. I was the responsible RP physicist for several projects, such as GIF, n-TOF, LEP dismantling and LINAC4. In the years 1996-2001 I devoted a large effort to an extensive radiation measurement campaign in LEP following each energy upgrade, and to computational and experimental studies performed to estimate the induced radioactivity expected in LEP and in the four experiments in view of their dismantling. I contributed to INB studies and documents for the SPS and LHC.

In 2005 I obtained funding for 600,000 Euros from the European Union within the 6th Framework Program and I was then Project Coordinator of the Marie Curie RADENV project (2006-2009). All radiation protection studies for LINAC4 were done with one RADENV fellow.

From June 2008 to March 2009 I was on professional leave of absence from CERN to the European Institute of Oncology (IEO) in Milano, under a CERN-IEO agreement, as project leader for the design and construction of a large proton therapy facility. In December 2008 the worldwide economic recession forced IEO to put the 150 Million Euro project on stand-by for an indefinite period. The CERN-IEO agreement was terminated on 31 March 2009.

Upon returning to CERN, in 2009 I was member of the UA9 scientific collaboration participating in the Crystal Channeling experiment and I was technical coordinator for UA9 test.

In 2010 I rejoined CERN Radiation Protection group in the HSE unit, where I am member of RP management team representing the RP group and the Group Leader at the international level. I am leading a section mostly composed of young physicists (fellows, Marie Curie fellows, PhD students and Associates) working on instrument development and studies of induced radioactivity in accelerator materials. In the years 2011-2014 I led the “SC project”, the reconversion of the old 600 MeV synchrocyclotron (the first CERN accelerator) into a CERN Visit Point, a 3 Million CHF project completed on time and on budget.

In 2011 I obtained funding for 4 Million Euros from the European Union within the 7th Framework Program and in 2012-2016 I was Scientist-in-Charge of the Marie Curie ITN ARDENT (Advanced Radiation Dosimetry European Network Training initiative) project.

As HSE level, I have been MARS assessor and representative of the HSE head in the CCRB for the LD2IC procedure (award of indefinite CERN contracts) for five years (2010-2014), and since 2013 I am the HSE representative in CERN Technology Transfer and for Medical Applications. As CERN-wide responsibility I am the chairman of the Marie Curie Steering Group (MCSG) since the beginning of 2014, and member of CERN EU Steering Committee since 2016.

Since 2010 I and my team mostly work on developments of detectors for applications in radiation protection and in the medical field. In recent years this activity has produced 1) a radiation survey meter (called B-RAD) capable of operating in the presence of a strong magnetic field, which has been patented and licenced to a company for commercialisation; 2) GEMPIX, a novel detector designed by coupling two CERN technologies; 3) RaDoM (radon dose monitor), a radon detector capable of a direct measurement of the dose to the lung on top of the radon concentration in air; 4) an integrated system for QA measurements in hadron therapy. A project for a distributed and interconnected network of small radiation sensors (W-MON) is ongoing.

Together with two members of my team I also work on projects for the radiological characterization of material in view of their clearance from regulatory control.

Throughout the years my activities has involved the supervision of technical staff, fellows (physicists and engineers), master and doctoral students from various European universities, as well as university students participating in stages of shortest duration at CERN. I constantly developed scientific interests, carrying out research work in dosimetry, radiation protection and radiation physics in collaboration with several institutes and universities worldwide. Since many years I coordinate an experimental activity at CERF (CERN-EU reference radiation facility), a test area in the SPS North Experimental Hall providing a neutron field typical of high-energy accelerators and similar to that present at commercial flight altitudes; I act as CERN linkman in a European collaboration. I was chairman of a working group (WG8, Complex mixed radiation fields at workplaces) in the CONRAD (COordinated Network for RAdiation Dosimetry) project funded by the European Union within the 6th Framework Programme. Presently I am member of two EURADOS Working Groups (WG9 and WG11).

I am author or co-author of 190 scientific publications in international journals and in proceedings of international conferences and I hold two patents. I have been member of scientific and organising committees of more than 30 international conferences and workshops. I have given more than 50 invited lectures at international conferences, workshops and schools.

Since the end of the 1980s, along with my professional activity, I have maintained an academic activity, first teaching at the Como branch of the University of Milan. After arriving at CERN I taught at the Specialisation Diploma School in Health and Medical Physics of the University of Milan for more than 10 years, and at the Master in Nuclear and Ionizing Radiation Technologies (NIRT) at the University of Pavia. I have supervised about 30 master and doctoral students. I am regularly invited to give seminars and lectures both at CERN and at universities and institutions abroad.

Education

1977

Higher Scientific Diploma, Liceo Donatelli, Milan (Italy), grades 53/60.

1982

Graduated in Physics at the University of Milan, grade 110/110 with honours, with a thesis entitled: “Study of alpha particle emission in ^3He -induced nuclear reactions at low energies”. The subject was the study of the $^{25}\text{Mg}(^3\text{He},\alpha)$ and $^{27}\text{Al}(^3\text{He},\alpha)$ nuclear reactions by the “multi-step compound” model. The work consisted of an experimental part, with the data taking at the Van de Graaff 7 MV accelerator of the INFN National Laboratories in Legnaro (Italy), and the data analysis of the excitation functions of the nuclear levels of the emission spectrum at various angles.

1983

Attended a 3-month IT course at the Milan branch of Sperry, with a grant from the Lombardy Region.

1984

Teaching Certificate in Physics for Higher Education Institutes.

1985

Specialisation Diploma in Health Physics (Radiation Protection and Medical Physics) (*Scuola di Specializzazione in Fisica Sanitaria e Ospedaliera*, equivalent to PhD) at the University of Milan, with 70/70 and honours, with a thesis entitled “Radiation protection of a hospital-based cyclotron” (*Aspetti radioprotezionistici connessi all’installazione di un ciclotrone in ambiente ospedaliero*). The thesis summarised the work done for the Safety Report submitted to the Ministry of Industry, for the project of a Cyclotron Laboratory for biomedical applications of the Italian National Research Council (*Consiglio Nazionale delle Ricerche*, CNR). The cyclotron was originally to be installed at the University Hospital “San Raffaele” in Milan.

Military service

July 1980 – June 1981.

Academic experience

1982 – 1983

Teaching Physics at the Technical School of Medical Radiology at the Main Hospital (Spedali Civili) in Brescia.

1988 to present

Supervisor of 30 Master and PhD students (as of 1996 within the CERN technical and doctoral student program) from the University of Milan, the Polytechnic of Milan, the University of Bologna, the University of Grenoble, the Specialisation Diploma School in Health and Medical Physics of the University of Milan, the Ecole Polytechnique (EPFL) of Lausanne, the Technische Universität of Vienna, the Slovak University of Technology, the National Technical University of Athens, the Master in nuclear and ionizing radiation technologies (NIRT) of the University of Pavia, the University of Bern, the University of Liverpool, the University of Wollongong (Australia), the University of Aachen (Germany),

the University of Paris (France), the University of Barcelona (Spain), of trainee physicists and engineers in the framework of the Swiss BNF program, and of CERN fellows and summer students. The list of Master and PhD thesis achieved so far is enclosed to the Curriculum Vitae.

1990 – 1994

Position as Assistant to the Professor for the Degree Course “Experimental Physics II” at the II Science Faculty of the University of Milan, Como branch.

1999 – 2011

Teaching (20 hours/year) radiation physics and accelerator shielding at the Specialisation Diploma School in Health and Medical Physics at the University of Milan, Italy (*Scuola di Specializzazione in Fisica Sanitaria e Ospedaliera*).

2009 – 2014

Teaching (8-10 hours/year) radiation physics and accelerator shielding at the NIRT Master of the University of Pavia.

2012 – 2013

Teaching (8 hours/year) radiation physics and accelerator shielding at the Master in Hadrontherapy of the University of Pavia.

Scientific and professional experience

1982 – 1983

Worked in the Health Physics Department of the Brescia Main Hospital (Spedali Civili). Responsibilities and achievements:

- writing FORTRAN application programmes for the Radiation Therapy Console software;
- measurements of surface contamination in the Hospital departments handling radioisotopes, identification of radionuclides and evaluation of their activities using a NaI(Tl) detector;
- verification of the purity of the radioisotopes used in the nuclear medicine department by gamma spectrometry with a Ge detector.

April 1984 – December 1995

Researcher at the *Istituto Tecnologie Biomediche Avanzate* (Institute for Advanced Biomedical Technologies, ITBA) of the Italian National Research Council (CNR). In the months preceding the appointment, started working on a CNR project for a Cyclotron Laboratory for biomedical applications to be built in a major hospital in Milan (see below), with a contract from the Department of Science and Technology of the University of Milan.

1984

Seconded from CNR to the Cyclotron Laboratory of the Department of Physics of the University of Milan, working under the supervision of Prof. C. Birattari. Contributed to the Safety Report, submitted to the Ministry of Industry, to request the authorisation for the construction of the CNR Cyclotron Laboratory, initially planned to be installed at the San Raffaele University Hospital in Milan. Main responsibilities and achievements:

- radiation shielding studies of the accelerator vault, beam transport system and target rooms;
- definition of various aspects of the plant, such as the characteristics of the vault ventilation system;

- assessment of the radioactivity induced in air by the neutrons generated during cyclotron operation, of the associated release of radioactive gases and of the dose delivered to the population living near the plant;
- evaluation of the radionuclides of biomedical interest producible with the Scanditronix MC40 cyclotron and preliminary study of the disposal system of the liquid radioactive waste.

1984

Association with INFN (the Italian National Institute of Nuclear Physics), Group V, at the Milan section (the INFN Association is similar to the CERN status of “unpaid associate” but it allows to access INFN funds for research activities and travel expenses).

1985 – 1986

Visiting scientist at the MRC (Medical Research Council) Cyclotron Unit at the Hammersmith Hospital in London (UK). Worked in the Engineering Section directed by Mr. Geoff Burton and collaborated with the Radiation Protection Section directed by Dr. John Parnell. These two years coincide with the last period of operation of the old Hammersmith cyclotron (the first hospital-based cyclotron that started operation in the mid-fifties), its decommissioning, and the installation and the acceptance tests of the new Scanditronix MC40 cyclotron. The aim of this period spent at the MRC was to acquire experience on to the design and operation of a middle-sized cyclotron laboratory. Main responsibilities and achievements:

- beam optics studies and design of the beam transport system for the CNR Cyclotron Laboratory. At the same time participated in the installation of the beam transport system of the new Hammersmith cyclotron;
- radiation protection studies for the CNR Cyclotron Laboratory: evaluation of the neutron field generated by beam losses inside the accelerator and shielding design;
- evaluation of the radioactivity induced in air by the neutron field produced during cyclotron operation, of the release of radioactive gases and the dose to the general public for the new MRC cyclotron;
- issues related to the medical uses of neutrons, in radiotherapy and for *in vivo* trace element analysis.

1987 – 1991

Carried out research work on applied nuclear physics and radiation physics for biomedical applications, in particular collaborating with the Physics Department and the Institute of Applied Physics of the University of Milan, the Polytechnic of Milan, the Cyclotron Laboratory of the EU Joint Research Centre in Ispra (Italy) and various European laboratories and research institutions, where most of the experimental work was performed. The main research activities focussed on:

- the biomedical applications of ion beams up to a few tens of MeV, in particular for experimental radionuclide production and for elemental analysis. These activities led to:
 - the development of an instrument for the absolute energy calibration of proton beams (patented);
 - the characterisation of a high-intensity monochromatic X-ray source, generated by protons and alpha particles with energy of up to some tens of MeV, and the design and construction of the related instrumentation for elemental analyses;
 - the development of a target for the cyclotron production of ^{18}F ;
- the physics and dosimetry of the radiation fields present around particle accelerators: high- and medium-energy proton accelerators for physics research, and electron linacs for cancer radiation therapy. These activities led to:
 - the development of an extended-range *rem counter* (called LINUS) for the measurement of the neutron ambient dose equivalent up to GeV energies, and a scanning system for the calibration of radiation detectors; the measurements were

carried out at CERN, at PTB (Braunschweig, Germany), at PSI (Villigen, Switzerland) and at the Svedberg Laboratory (Uppsala, Sweden);

- the measurement of the residual radioactivity at the 45 MeV proton cyclotron installed at the University of Milan for its decommissioning;
- calculations and experimental measurements of the neutron field present around medical electron linacs operating at energies above 10 MeV.

1988 – 1995

Association with INFN, Group V, at the Milan section.

1991 – 1995

Worked with Prof. Ugo Amaldi (CERN and University of Milan) on the Italian Hadrontherapy Project. Project leader for the design of the National Centre for Oncological Hadrontherapy (CNAO), a hospital-based facility equipped with a synchrotron for cancer therapy with hadron beams (60-250 MeV protons and 120-400 MeV/u light ions up to oxygen). The feasibility study, completed in mid-1994, is described in the volume “The TERA Project and the Centre for Oncological Hadrontherapy”, published by INFN (co-editor with Prof. Amaldi). The revisions made to the project in the period September 1994-March 1995 are described in the volume “The National Centre for Oncological Hadrontherapy - Updates and revisions”, published in June 1995 by INFN (co-editor with Dr. D. Campi, CERN). During these years led a group of a dozen physicists and engineers working on all aspects of the project. Responsibilities and achievements include:

- management and co-ordination of the project team;
- the financial management of INFN funds for several hundred millions of Lira annually (several hundred thousand Euros);
- the co-ordination of INFN activities at the national level, and international contacts with several research institutes in Europe, the USA, Russia and Japan;
- applying for special EU funding for Russian collaborating institutions (INTAS) as well as for special funding requested to the Italian Ministry of Foreign Affairs;
- assisting Prof. Amaldi in funding requests to University.

The responsibilities of the project team included all aspects of the CNAO project:

- the definition of the physical specifications of medical hadron beams;
- the conceptual design of the synchrotron, of the beam transport system and of the beam delivery system including the isocentric gantries, the dosimetry systems, the shielding design, the control and safety systems;
- the evaluation of the construction and operating costs of the facility, the time schedule and the staff planning.

In addition to the two volumes of the feasibility study, most of the scientific and technical work is described in approximately 20 TERA internal reports (see list enclosed to the Curriculum Vitae) and in about 20 publications in international journals and conference proceedings (see list of publications enclosed to the Curriculum Vitae). During this period the experimental activity was necessarily reduced and mainly consisted of:

- experimental measurements with the recently developed LINUS rem counter;
- participation in the design, construction and tests at the INFN Legnaro Laboratory (LNL) of a thermal neutron source for boron neutron capture therapy (BNCT), using deuteron and proton beams of around 10 MeV on a beryllium target and an appropriate moderator/reflector of heavy water and graphite.

September 1994 – October 1995

Part-time (50%) paid Scientific Associate at CERN in the ST Division, working on the CNAO project.

January 1996 to present

Staff member at CERN in the Radiation Protection (RP) Group, Deputy Group Leader from 1999 to 2008, senior staff since 2001, diplomatic status since 2015:

- 1996 – 2001: section leader of the RP-SL section, responsible for radiation protection of the Super Proton Synchrotron (SPS), of the SPS North and West experimental areas and of the Large Electron Positron collider (LEP).
- 2001 – 2002: section leader of the RP-PS section, responsible for radiation protection of the Proton Synchrotron (PS) complex (except ISOLDE).
- 2003 – 2008: section leader of the RP-PA section, responsible for radiation protection support for the LHC experiments and for various RP services (radioactive sources, radioactive shipping, gamma spectrometry, TLD dosimetry).
- 2012 to present: section leader of the RP-SP section, a section specifically created to deal with special projects in the Radiation Protection group.

1996 – 2001 (Section leader of the RP-SL section)

Main responsibilities and achievements:

- leading a team of technicians and technical engineers responsible for the radiological surveillance of the accelerators and experimental areas of the SPS-LEP complex;
- advising CERN departments on radiation protection matters (such as shielding design for new experiments, radiation measurements, procedures, etc.);
- in 1999 given the task to co-ordinate all RP actions following a fire on a uranium calorimeter which occurred in the North Experimental hall (building 867) of the SPS;
- RP physicist responsible for radiation protection for the following main projects:
 - the n-TOF facility, which uses the beam extracted from the PS for time-of-flight neutron experiments;
 - the Gamma Irradiation Facility (GIF, which uses a 740 GBq ^{137}Cs source) installed in the West Experimental Areas;
 - the feasibility study for a future muon collider and a neutrino factory;
 - LEP dismantling;
- in the years 1996 – 2000, responsible for an extensive radiation measurement campaign in LEP following each energy upgrade (from 45 to 105 GeV), according to the requirements set by the French authorities (*Installation Nucléaire de Base*, INB), as well as for the studies (Monte Carlo calculations and experimental measurements) performed to estimate the induced radioactivity expected in LEP in view of its dismantling. This work led to the *zonage* (zoning) of LEP for its decommissioning. The LEP dismantling project was successfully completed as planned, during which the RP-SL section had the overall responsibility for the radiological controls. The section had 15 additional technical staff from a contracting company during the 15 months of LEP dismantling (2000-2001);
- contributed to various CERN official documents and in particular to the INB reports (the safety reports to be submitted to the French nuclear authorities) for the LEP upgrade to 105 GeV, for LEP dismantling and to the Preliminary Report for the LHC (the Large Hadron Collider). From 1996 to 2002, one of the CERN contact persons for the INB inspections. Participated in the study group for the conversion of the SPS into an INB facility (INBOPS).

2001 – 2002 (Section leader of the RP-PS section)

Main responsibilities and achievements:

- leading a team of technicians and technical engineers responsible for the radiological surveillance of the accelerators and the experimental areas of the PS complex (except ISOLDE);
- advising CERN Departments on radiation protection matters.

2003 – 2008 (Section leader of the RP-PA section)

Main responsibilities and achievements:

- leading a team of technicians and technical engineers responsible for the RP services of gamma spectrometry, radioactive test sources, material shipping and TLD dosimetry. A comprehensive documentation system and informatics tools were introduced for gamma spectrometry and management of radioactive sources. Obtained special DG funds for the refurbishment of the radioactive laboratory of the RP group;
- RP physicist linking with the LHC experiments, in which role
 - contributed to the layout of the radiation monitoring system (RAMSES) for the experiments;
 - provided guidance for INB procedures;
 - contributed to the study of the radiological risk from the air sampling system in the LHC experiments;
 - participated in the study for the radiological impact of an accidental release of the liquid argon in ATLAS, and in the ATLAS zoning calculations for the INB waste study;
- responsible RP physicist for radiation protection studies of future CERN accelerators: the 160 MeV Linac4 and the 3.5 GeV Superconducting Proton Linac (SPL). Contributed to the Linac4 Technical Design Report and to the Conceptual Design Report of the SPL II;
- radiation protection study for the TT2A mercury target experiment;
- leading author in the revision of Safety Code F – Radiation Protection, adopted in 2006 after being endorsed by SAPOCO and by the French and Swiss authorities;
- designed a new half-day radiation protection training course to be attended by all CERN staff and users in possession of a personal dosimeter.

2005 – 2009

Successfully submitted a proposal to the EU Marie Curie program within the 6th Framework Program and obtained funding for the RADENV (*Radiation protection and environmental impact of future accelerators*) project (600,000 Euros over the four years of the project), which allowed recruiting three fellows for radiation protection studies of future CERN accelerators: Linac4, SPL, Beta-beams and CLIC. Project Coordinator for RADENV and supervisor of one fellow working on the Linac4 and SPL radiation protection studies.

1996 – 2003 and 2010 to present

Coordinator of the experimental activities at CERF (the CERN-EU reference radiation facility installed in the H6 beam line in the North Experimental Area of the SPS) and CERN linkman in the European Collaboration. CERF provides a neutron field similar to that present at commercial flight altitudes. An international collaboration (mainly composed of European institutes but which also includes institutes from USA, Canada and Japan) uses the facility to inter-compare the response of several types of radiation detectors and to perform a “field calibration” before their use on-board aircrafts or around particle accelerators. Coordinator of typically two measurement campaigns per year, for a total of about two weeks of beam time annually.

2005 – 2008

Chairman of a Working Group (WG8, *Complex mixed radiation fields at workplaces*) in the EU-funded CONRAD (*COordinated Network for RAdiation Dosimetry*) project within the European Radiation Dosimetry Group (EURADOS). The WG published an exhaustive review as CERN Yellow Report (Editor) on the monitoring of radiation fields around high-energy accelerators and fusion facilities. Coordinator of an experiment performed by the WG at GSI, Darmstadt (Germany), to inter-compare the response of several instruments in a mixed radiation field (including a comparison with Monte Carlo simulations). The results were published in three extensive articles in *Radiation Measurements*.

June 2008 – March 2009

On professional leave of absence (part-time June to August 2008, full-time from September 2008 to March 2009) to the European Institute of Oncology (IEO) in Milano, on the basis of a CERN-IEO agreement, with the position of project leader for the construction and launch of a hadron therapy centre called ARC (*Advanced Radiotherapy Centre*), equipped with a 250 MeV proton synchrotron, beam transfer lines, several treatment rooms provided with isocentric gantries and an experimental room. Unfortunately the 2008 economic recession worldwide put the project on stand-by for an indefinite period, as in December 2008 the IEO Board of Directors decided that the Board Members (mainly banks) were not ready to fund the 150 million Euro project at that moment. The CERN-IEO agreement was terminated on 31 March 2009.

April to December 2009

On detachment to the EN-STI group, joined the Crystal Channeling experiment as member of the UA9 collaboration, participating in data taking in the UA9 experimental set-up in the SPS and in test beams on the H8 beam line. Main tasks:

- assisting the spokesperson and the technical coordinator of UA9 with the overall coordination of the experiment;
- GLIMOS for both UA9 (in the SPS) and UA9 test (on the H4 and H8 test beams in the North Experimental Area);
- technical coordinator for UA9 test.

2010 to present (from October 2012: section leader of the RP-SP section)

Member of the RP management team and leader of group-wide RP projects. Main responsibilities, activities and achievements:

- leading a team of physicists (fellows, Marie Curie fellows, PhD students and Associates) working on instrument development, studies of induced radioactivity in accelerator materials and shielding design;
- leader of the SC project, the radiological decommissioning of building 300 (the old CERN 600 MeV synchrocyclotron) and its reconversion into a Visit Point. The 3 Million CHF project consisted of three phases: radiological decommissioning, refurbishing of the building, and installation of the exhibition. It has been completed within 2 years as planned, from spring 2012 to spring 2014, and within budget. The project, which has involved more than 50 people from several CERN groups and various contracting companies, included the radiological decommissioning of the old ISOLDE2 in the underground of building 172;
- deputy project leader of the RP Calibration Laboratory (building 772 on the Prévessin site), laid down the facility specifications and co-supervised a PhD student performing the FLUKA calculations for the shielding design;
- Scientist-in-Charge of the Marie Curie ITN ARDENT (*Advanced Radiation Dosimetry European Network Training initiative*) project. Initiated, coordinated and submitted to EU FP7 Call 6 the proposal, which obtained a score of 95.60/100, one of the highest achieved by CERN with all its ITNs, and has been funded with 4 Million Euros. ARDENT involved 14 partner institutes worldwide and recruited 15 Early Stage Researches (ESR), four of them at CERN;
- testing of instrumentation of interest for CERN radiation monitoring system (RAMSES), at CERN and at external laboratories (Helmholtz-Zentrum in Berlin, PSI in Villigen). In particular a novel rem counter with excellent performance in pulsed neutron fields has been extensively tested under various conditions. An experiment at HiRadMat for testing radiation protection instrumentation (HRMT15-RPINST) has been designed and successfully accomplished
- contributed to the radiological waste study for LINAC4
- RP contact physicist for the LEP3 project
- radiological characterization of materials from CERN accelerators:

- measurements of activation of various CERN accelerator materials at 400 GeV/c (in H4IRRAD, North Area) for future characterization of radioactive waste, and of proton- and pion-induced spallation cross sections at 120 GeV/c (at CERF, North Area) for benchmarking Monte Carlo codes (e.g. FLUKA)
- Leader of several projects for the radiological characterization and clearance from regulatory control in Switzerland of materials, in particular the superconducting radiofrequency acceleration system and other equipment from the former CERN Large Positron Collider (LEP).
- detector R&D:
 - development of a system for the measurement of Fe-55 in radioactive waste, based on GEMPIX, a novel instrument (designed and built within the ARDENT project) by coupling two CERN technologies, a triple-GEM detector and the Medipix quad readout chip;
 - development of B-RAD, a radiation survey meter operating in strong magnetic field (as requested by the LHC experiments to the RP group) via a collaboration agreement established with the Polytechnic of Milano. A prototype and five units were successfully built and tested and a patent has been filed in May 2014. Obtained 75,000 CHF funding from CERN Technology Transfer and signed an agreement with an industrial partner for the industrialization of the instrument;
 - development of a distributed and interconnect network of radiation sensors for the remote monitoring of waste containers over the entire CERN site (project W-MON), with data logging and transmission towards CERN centralized radiation monitoring system (RAMSES). Set-up a tri-side collaboration between CERN and two Japanese institutions, the National Institute of Advanced Industrial Science and Technology (AIST) and a private enterprise (Chiyoda), with the aim of adapting a dosimeter designed for individual monitoring in the Fukushima area for W-MON. A prototype of the W-MON system is operational. Design of a new sensor is under way, whose IP will be fully owned by CERN. A number of additional applications are being investigated, such as environmental monitoring and personal dosimetry;
 - development of RaDoM (radon dose monitor), a radon detector capable of a direct measurement of the dose to the lung on top of the radon concentration in air. Obtained 135,000 CHF funding from the EU AIDA Proof-of-Concept program and CERN Technology Transfer in order to reach a pre-industrial version of the device. Various prototype detectors built and tested in various operational environments in Switzerland (schools, water reservoirs, HVAC systems). Detector technology ready for licensing to a CERN spin-off company;
 - development of an integrated system for QA measurements in hadron therapy, consisting of a water phantom with a GEMPix detector mounted on a remote-controlled 3D positioning system, reference ionization chamber and related hardware and software, for measuring the 3D energy deposition and Bragg curve. Funding of 30,000 € for material budget granted by CERN Medical Applications;
 - funding for 64,000 CHF material budget and salary for an engineer just obtained to start a project for building a version of GEMPix with large sensitive area, to be used for medical applications such as QA in radiation therapy and medical imaging.

Collaboration agreement recently established

- University of Bern
- Polytechnic of Milan (B-RAD project)
- Chiyoda and AIST, Japan (project W-MON for remote monitoring of waste containers)
- Polytechnic of Milan on joint doctoral student program

Recently submitted project proposals

- Marie Curie ITN proposal TYREX (Training Young Researchers in Europe in eXperimental detectors technologies) submitted in calls 2 and 3 of HORIZON2020 (2015-2016) – Obtained a high score (92/100) but not sufficient for funding

- Joint CERN-Korea project on radiation safety, funded by the Korean ministry of S&T (planned for 2016) – Not funded
- CERN-FCT project “Cooperation with CERN in Radiation Protection and Safety Issues” submitted to the Portuguese Foundation for Science and Technology – Waiting for outcome
- Marie Curie ITN proposal ENTERPRISE (European Training & Excellent Research to develop networks of Radiation Smart sensors) submitted in call 5 of HORIZON2020 (2018) – Not funded

Funding proposals in preparation

- Project proposal CASCADE to be submitted to the EURATOM call NFRP-2018 (Nuclear Fission, Fusion and Radiation Protection Research)
- A number of projects on detector R&D to be submitted to ATTRACT, a pan-EU initiative for R&D of high-performance detector and imaging technologies

During the more than 20 years spent at CERN, constantly maintained and developed scientific activities, carrying out research work in dosimetry and radiation physics in collaboration with colleagues from Institutes and Universities worldwide. In particular, a long-standing collaboration with the University of Milano and with the Polytechnic of Milano led to the development of an extended-range Bonner Sphere neutron spectrometer, to the improvement of the response of bubble detectors to high-energy neutrons, to several measurement campaigns of the radiation fields around CERN accelerators, to the development of a passive LINUS rem counter specifically designed for the CNAO, to the development of a survey meter operating in magnetic field, to the performance test of LUPIN, a novel neutron rem counter working in pulsed radiation fields that can be of use in a RAMSES upgrade. R&D activities with ARDENT aimed at the application of gas detectors (GEM) and solid state detectors (Medipix) in radiation dosimetry, radiation protection and medical physics. Other studies focus on induced radioactivity in accelerator materials and shielding design studies. The work accomplished is described in divisional reports, internal reports and technical memoranda (see list attached to the Curriculum Vitae), and in publications in international journals and in proceedings of international conferences (see list of publications attached to the Curriculum Vitae). Regularly invited to give seminars at universities and institutions worldwide.

Committees, Working Groups and Appointments

CERN

- 1996 – 2007** Scientific secretary of the Radiation Protection Committee (RPC)
- 1996 – 2000** Member of the SL Divisional Radiation Safety Committee
- 2002 – 2005** Member of the Associates and Fellows Committee (AFC)
- 2002 – 2008** Radiation Safety Officer for the Safety Commission (TIS and later SC) and member of the Radiation Safety Officer Committee (RSOC). In 2004 initiated the LHC RSO meetings and chaired them until 2008, during which period the RP issues and the layout of the monitoring system of the LHC experiments were discussed and implemented

- 2004 – 2009** Member of the Academic Training Committee (ATC), organised several Academic Training Lectures Series
- 2006 – 2009** Member of the Scientific Information Policy Board (SIPB)
- 2004 – 2009** Basic Nuclear Material Controller (*Contrôleur des Matières Nucléaires de Base*, MNB), following-up the storing and elimination of depleted uranium at CERN, maintaining contacts with the French and Swiss authorities and the IAEA (Vienna) and participating in the inspections on the CERN premises
- Since 2005** Member of the Marie Curie Steering Group (MCSG) for EU-funded projects
- 2006** Member of the MERIT Mercury Loop Safety Review
- 2010-2014** MARS assessor for the occupational Health & Safety and Environmental protection (HSE) unit and representative of the HSE head in the CCRB for the LD2IC procedure
- 2011** Member of the HiRadMat Review Panel
- Since 2013** National pilot for semi-VIP visits
- Since 2013** HSE representative in CERN Technology Transfer, member of the INET (Knowledge Transfer Internal Network) and ENET (Knowledge Transfer External Network)
- Since 2014** Chairman of the Marie Curie Steering Group (MCSG), which promotes and co-ordinates CERN Marie Curie proposals under the three programs: ITN, RISE and COFUND. Directly contributed to writing the 2014 COFUND proposal (co-funding of the CERN fellowship program), which was successfully funded with 6 Million Euros.
- Since 2014** Organizer and chairman of the annual HSE mini-workshop
- Since 2015** Member of the CERN Medical Application Study Group (CMASG), then (as of 2016) Medical Application Projects Forum (MAPF)
- Since 2016** Member of the European Union Steering Committee (EUSC)

International

- 1990** Member of a Committee of the National Research Council (CNR) mandated to define the installation of a 40 MeV medical Cyclotron Laboratory in the Research Area of Rome, Tor Vergata. The Committee proposed a new installation layout for the Cyclotron Laboratory

Representative of CERN's radiation protection group in international organizations and working groups

- Since 2005** Member of EURADOS, presently member of working groups WG9 and WG11. From 2005 to 2008 chairman of WG8 (CONRAD)
- Since 2009** Member of the Editorial Board of Radiation Measurements

- 2011** Member of the SLAC (Stanford, USA) review board for the Peer Review of the SLAC Material Release Program
- Since 2011** Member of the Expert Group on Radiation Transport and Shielding (EGRTS) of the NEA (Nuclear Energy Agency) Working Party on Scientific Issues of Reactor Systems (WPRS)
- 2011-2014** Member of the Advisory Board for the EU FP7 project “Modes SNM” (mobile system for the detection of Special Nuclear Material (SNM))
- Since 2012** Member of the Scientific Committee of the Master Course in Nuclear and Ionizing Radiation Technologies, University of Pavia, Italy
- 2013** Member of the Scientific Committee to evaluate the work of the unit of external dosimetry (SDE) of the *Institut de Radioprotection et Sûreté Nucléaire* (IRSN, France) in the field of external dosimetry and neutron metrology

Participation in international schools and training courses

- 1986** CERN Accelerator School - General Accelerator Physics, Aarhus (Denmark)
- 1987** CERN Accelerator School - Advanced Accelerator Physics, Berlin (Germany)
- 1998** CERN course: La communication polémique et persuasive
- 1998/99** CERN course: Module 6 LM, Managing a CERN Unit
- 2000** CERN course: Stress management
- 2006** CERN course: Préparation à l’habilitation électrique du personnel non électricien
- 2007** Course on FLUKA Monte Carlo code, Legnaro (Italy)

Organisation of conferences

- 1988** Member of the Scientific Committee of the Workshop on Cyclotron Radioisotopes, JRC-Ispra (Italy), 19 October 1988.
- Member of the Technical Programme Committee of the Fourth Workshop on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF 4), Knoxville, Tennessee (USA), 17-18 September 1998.
- 2000** Member of the Technical Programme Committee of the Fifth Workshop on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF 5), Paris (France), 18-21 July 2000.
- Member of the Scientific Committee of the conference Monte Carlo 2000, Lisbon (Portugal), 23-26 October 2000.
- 2002** Member of the Technical Programme Committee of the ANS Topical Meeting for the Radiation Protection and Shielding Division, Santa Fe, New Mexico (USA), 14-18 April 2002.

Member of the Technical Programme Committee of the Sixth Workshop on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF 6), Menlo Park, California (USA), 10-12 April 2002.

- 2004** Track Leader of the Tenth International Conference on Radiation Shielding (ICRS-10) and Thirteenth Topical Meeting on Radiation Protection and Shielding (RPS-2004), Madeira (Portugal), 9-14 May 2004.

Member of the Scientific and Executive Committees of the Seventh Workshop on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF 7), Lisbon (Portugal), 17-18 May 2004.

Member of the Scientific Committee of the 2004 IEEE Nuclear Science Symposium, Rome (Italy), 18-20 October 2004.

- 2005** Topic convener of the Seventh International Topical Meeting on Nuclear Applications of Accelerator Technology (AccApp05), Venice (Italy), 28 August-1 September 2005.

- 2006** Member of the Scientific and Executive Committees of the Eighth Workshop on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF 8), Pohang (Republic of Korea), 22-24 May 2006.

- 2008** Member of the Technical Program Committee of the 11th International Conference on Radiation Shielding (ICRS-11) and 15th Topical Meeting on the Radiation Protection and Shielding Division of ANS (RPSD 2008), Pine Mountain, Georgia (USA), 13-18 April 2008.

Member of the Scientific and Executive Committees of the Ninth Workshop on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF 9), Oak Ridge, Tennessee (USA), 21-23 April 2008.

- 2009** Member of the International Scientific Advisory Committee of the 11th Neutron and Ion Dosimetry Symposium (NEUDOS-11), Cape Town (South Africa), 12-16 October 2009.

- 2010** Member of the Scientific Committee of the Workshop “Accelerator radiation protection and shielding”, EURADOS Annual Meeting 2010, Rome and Frascati (Italy), 1-5 February 2010.

Member of the Scientific and Executive Committees and Chairman of the Tenth Workshop on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF 10), held at CERN, Geneva (Switzerland), 2-4 June 2010. The workshop was very successful and well attended by participants from all main accelerator laboratories worldwide, the proceedings were published by OECD NEA (Paris).

- 2012** Member of the Scientific Committee of the Workshop “Dosimetry for second cancer risk estimation in radiotherapy”, EURADOS Annual Meeting 2012, Vienna (Austria), 8 February 2012.

Member of the Program Committee of the 12th International Conference on Radiation Shielding (ICRS-12) and 17th Topical Meeting of the Radiation Protection and Shielding Division of the American Nuclear Society (RPSD-2012), Nara (Japan), 2-7 September 2012.

Member of the Scientific Committee of the Eleventh Workshop on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF 11), KEK, Tsukuba (Japan), 11-13 September 2012.

Chairman of the 1st ARDENT workshop, Vienna (Austria), 20-23 November 2012.

Member of the Scientific Advisory Committee of the Mini- Micro- Nano-Dosimetry (MMND 2012) and International Prostate Cancer Treatment (IPCT 2012) International Workshop, University of Wollongong (Australia), 6-9 December 2012.

2013 Chairman of the 2nd ARDENT workshop, Polytechnic of Milan (Italy), 14-18 October 2013.

Chairman of the Workshop “New Technologies in Radiation Dosimetry and its Applications”, IEEE NSS/MIC/RTSD conference, Seoul (Korea), 27 October 2013.

2014 Member of the Scientific Committee of the Twelfth Workshop on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF-12), Fermilab (USA), 28-30 April 2014.

Chairman of the 3rd ARDENT workshop, Schwarzenbruck (Germany), 29 September-2 October 2014.

Member of the International Advisory Committee of the Mini- Micro- Nano-Dosimetry International Workshop (MMND 2014), Port Douglas (Queensland, Australia), 20-25 October 2014.

2015 Chairman of the 4th ARDENT workshop, Prague (Czech Republic), 22-26 June 2015.

2016 Member of the International Advisory Committee (IAC) of the “COFI Advanced Instrumentation and Analysis Techniques Summer School”, San Juan (Puerto Rico), 11-19 July 2016

Member of the Scientific Committee of the Thirteen Workshop on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF-13), Dresden (Germany), 10-12 October 2016.

2018 Member of the International Advisory Committee of the Mini-Micro-Nano-Dosimetry (MMND) workshop, Mooloolaba (Queensland, Australia), 6-11 February 2018.

Member of the Scientific Program Committee of the First Biennial African Conference on Fundamental Physics and Applications, Windhoek (Namibia), 28 June-4 July 2018.

Member of the Scientific Committee of the Fourteen Workshop on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF-14), Gyeongju (Korea), 30 October-2 November 2018.

Scientific publications

Author or co-author of 140 scientific publications in international journals and 50 papers published in proceedings of international conferences (several peer-reviewed). The complete

list, which also includes contributions to CERN Yellow Reports, publications in national journals and in proceedings of national conferences, is enclosed to the Curriculum Vitae.

The activity carried out in the course of the Hadron-therapy Project (1991 – 1995) has been documented in about 20 TERA internal reports. The CERN activities (1996 to present) are documented in more than 110 CERN internal reports and technical notes. The work performed at IEO (2008 – 2009) has been summarised in a number of IEO internal notes. The full list is attached to the Curriculum Vitae

Patents

M. Silari and C. Birattari. Equipment and method for the absolute determination of the energy of ion beams. Italian Patent Application n. 19986 A/90 filed 11th April 1990; European Patent Application n. 91105636.4 (AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, NU, NL, SE) filed 10th April 1991; USA patent n. 5,149,966 granted 22nd September 1992; Canada Patent Application n. 2,040,207 – 5.

A. Fazzi and M. Silari. Portable Radiation Detection Device for Operation in Intense Magnetic Fields. CERN/Politecnico joint patent. Application number: EP14170108, filed on 27 May 2014.

Invited talks at conferences, workshops and schools

1991 “Dati per la protezione contro l’irradiazione esterna”. 22° Corso della Scuola Superiore di Radioprotezione “Carlo Polvani” dell’A.I.R.P., “Attuali orientamenti in radioprotezione”, Como (Italy), 11-15 November 1991.

1994 “Overview of newer and proposed accelerator facilities in Europe”. Specialists' Meeting on Shielding Aspects of Accelerators, Targets and Irradiation facilities, Arlington (Texas, USA), 28-29 April 1994.

“Basic design considerations for a national laboratory to support advanced clinical applications of ion beams”. Thirteenth International Conference on the Applications of Accelerators in Research and Industry, Denton (Texas, USA), 7-10 November 1994.

“A compact source of intense 1-100 keV monochromatic X-rays from low energy protons”. Thirteenth International Conference on the Applications of Accelerators in Research and Industry, Denton (Texas, USA), 7-10 November 1994.

“Present status of the Progetto Adroterapia”. NIRS International Seminar on the Application of Heavy Ion Accelerator to Radiation Therapy of Cancer, Chiba (Japan), 14-16 November 1994.

“Hadron accelerators for cancer radiation therapy”. Round table: Utilizzo di acceleratori e sorgenti gamma in Italia: applicazioni e prospettive d'uso in campo industriale e medico, Pisa (Italy), 25 November 1994.

1995 “Gli acceleratori ad adroni in radioterapia oncologica”. Corso di specializzazione in giornalismo scientifico, VIII Incontro: Acceleratori e loro applicazioni, Trieste (Italy), 9-10 June 1995.

“Hadrontherapy”. Four Seas Conference, Trieste (Italy), 25 June-1 July 1995.

- Operational aspects of the future National Centre for Oncological Hadrontherapy. XXIII PTCOG Meeting, Cape Town (South Africa), 17-19 October 1995.
- 1996** “Hadron accelerators in medicine”. 7e Journées d’Etudes SATURNE, Ramatuelle (France), 29 January-2 February 1996.
- “Dosimetria individuale nei campi di radiazione di alta energia”. 29° Corso della Scuola Superiore di Radioprotezione “Carlo Polvani” dell’A.I.R.P., “Misura e valutazione della dose individuale”, Como (Italy), 3-6 June 1996.
- “Radiation monitoring and safeguard at CERN SPS/LEP complex”. International Advanced School “Leonardo da Vinci”, Summer course 1996 on “New detectors for radiation measurements and related applications”, Bologna (Italy), 1-12 July 1996.
- 1997** “Les accélérateurs de hadrons dans la thérapie du cancer”. 19^e Congrès A.T.S.R., Grenoble (France), 8-10 October 1997.
- 1999** Radiation shielding and safety criteria for high-intensity linacs. Workshop on Radiation Protection Aspects of High Intensity Proton/Deuteron Accelerators, Legnaro (Italy), 27-29 September 1999.
- “New designs for high energy neutron rem-meters”. Workshop on Radiation Protection Aspects of High Intensity Proton/Deuteron Accelerators, Legnaro (Italy), 27-29 September 1999.
- “Predicting induced radioactivity at high-energy electron accelerators”. Ninth International Conference on Radiation Shielding, Tsukuba (Japan), 17-22 October 1999.
- 2001** “Radiation protection at high energy proton accelerators”. International School of Radiation Damage and Protection, 10th Course: Accelerator Radiation Protection, Erice (Italy), 2-9 October 2001.
- “Special radiation protection aspects of medical accelerators”. International School of Radiation Damage and Protection, 10th Course: Accelerator Radiation Protection, Erice (Italy), 2-9 October 2001.
- 2004** “Measurements of radiation fields around high-energy proton accelerators”. Tenth International Conference on Radiation Shielding (ICRS-10) and Thirteenth Topical Meeting on Radiation Protection and Shielding (RPS-2004), Madeira (Portugal), 9-14 May 2004.
- 2005** “Misura di neutroni attorno ad acceleratori di alta energia”. Convegno Nazionale di Radioprotezione, Catania (Italy), 15-17 September 2005.
- 2007** “Workplace characterization in mixed neutron-gamma fields. Specific requirements and available methods at high-energy accelerators”. EURADOS Scientific Symposium, Madrid (Spain), 23 January 2007.
- “Radiation protection of electron and hadron medical accelerators”. Annual meeting of the Danish Society of Medical Physics, Odense (Denmark), 23-24 March 2007.
- “Dosimetry in radiation fields around high-energy proton accelerators”. Solid State Dosimetry SSD15, Delft (The Netherlands), 8-13 July 2007.

- “Introduction to medical physics”. Summer student lecture, CERN, 18 July 2007.
- “Radiation protection”. CERN Accelerator School (CAS) – Intermediate Accelerator Physics Course, Daresbury (UK), 21 September 2007.
- 2008** “A (CERN) history of accelerator shielding”. 11th International Conference on Radiation Shielding (ICRS-11) and 15th Topical Meeting of the Radiation Protection and Shielding Division of ANS (RPSD-2008), Pine Mountain (Georgia, USA), 13-18 April 2008.
- “Introduction to medical physics”. Summer student lecture, CERN, 1 August 2008.
- “The use of Monte Carlo codes at high-energy accelerators”. Workshop nazionale della rete di collaborazione MARS (Metodi numerici per Applicazioni Radioprotezionistiche e Sanitarie), Bologna (Italy), 3-4 December 2008.
- 2009** “Radiation monitoring at high-energy accelerators”. 5th International Workshop on Individual Monitoring of Ionizing Radiation, Oarai (Ibaraki, Japan), 28-29 November 2009.
- “Radiation protection of electron and hadron medical accelerators”. 8th Annual Congress of the Japanese Society of Radiation Safety Management, Nagasaki (Japan), 3 December 2009.
- 2010** “Applications of particle accelerators in medicine”. Workshop “Accelerator radiation protection and shielding”, EURADOS Annual Meeting 2010, Rome and Frascati (Italy), 1-5 February 2010.
- “Shielding of proton accelerators”. Workshop “Accelerator radiation protection and shielding”, EURADOS Annual Meeting 2010, Rome and Frascati (Italy), 1-5 February 2010.
- “Instrumentation for radiation measurements”. African School of Physics (ASP2010), Stellenbosch (South Africa), 1-21 August 2010.
- “Introduction to medical cyclotrons”. African School of Physics (ASP2010), Stellenbosch (South Africa), 1-21 August 2010.
- “Radionuclide production”. African School of Physics (ASP2010), Stellenbosch (South Africa), 1-21 August 2010.
- “Bonner Sphere Spectrometry for the characterization of neutron fields”. 6th International Workshop on Individual Monitoring of Ionizing Radiation, Oarai (Ibaraki, Japan), 29-30 November 2010.
- 2011** “Cyclotrons for radioisotope production”. First Bern Cyclotron Symposium, Bern (Switzerland), 6-7 June 2011.
- “Managing the End-Of-Life (EOL) of an accelerator”. Geneva International Product Lifecycle Management (PLM) Conference and Exhibition, CERN, Geneva (Switzerland), 6-7 September 2011.
- “Radiation protection at CERN”. European School of Medical Physics (ESMP), CERN, 19 November 2011.

- “Medipix and Timepix hybrid pixel detectors”. 7th International Workshop on Ionizing Radiation Monitoring, Oarai (Ibaraki, Japan), 3-4 December 2011.
- 2013** “Detector development within the ARDENT project (Advanced Radiation Dosimetry European Network Training)”. 9th International Workshop on Ionizing Radiation Monitoring, Oarai (Ibaraki, Japan), 30 November-1 December 2013.
- 2014** “Radiation measurements and dosimetry”. 3rd African School for Fundamental Physics and its Applications (ASP2014), University Cheikh Anta Diop, Dakar (Senegal), 3-23 August 2014.
- “Isotope production and radiation therapy”. 3rd African School for Fundamental Physics and its Applications (ASP2014), University Cheikh Anta Diop, Dakar (Senegal), 3-23 August 2014.
- “Medical applications of particle physics. The present and the future”. 17^o Pan Cretan Medical Congress, Heraklion (Crete, Greece), 1 November 2014.
- 2015** “Radiation measurements in pulsed neutron fields”. 10th International Workshop on Ionizing Radiation Monitoring, Oarai (Ibaraki, Japan), 28 February-2 March 2015.
- “A novel radiation survey meter operating in strong magnetic field”. 11th International Workshop on Ionizing Radiation Monitoring, Oarai (Ibaraki, Japan), 5-6 December 2015.
- 2016** “Radiation shielding of proton accelerators”, “Radiation shielding of medical proton accelerators” and “Induced radioactivity in accelerators”, Radiation Protection Expert course “Blok 3 Opleiding ACD in de SB 2016: Stralingsfysica”, Oegstgeest, The Netherlands, 3 June 2016
- Chair of splinter session 5 at the ESA Innovation Workshop “When space meets health”, Noordwijk, The Netherlands, 8 November 2016.
- “W-MON: Remote radiation monitoring of waste containers”. 12th International Workshop on Ionizing Radiation Monitoring, Oarai (Ibaraki, Japan), 3-4 December 2016.
- “A distributed network of radiation sensors for environmental monitoring and future applications”. 15th annual meeting of the Japanese Society of Radiation Safety Management (JRSM), Okayama (Japan), 1 December 2016.
- 2017** “A distributed network of sensors for real-time remote control of radioactivity and radiation”. European Summer School “Radiochemistry and Nuclear Instrumentation (Low Level Radioactivity)”, Strasbourg (France), 21-25 August 2017.
- “Réhabilitation du site du SC au CERN”, ARRAD Association romande de radioprotection, Journée thématique, Lausanne (Switzerland), 11 November 2017.
- “RadoNet: a real-time radon monitoring network”, 13th International Workshop on Ionizing Radiation Monitoring, Oarai (Ibaraki, Japan), 2-3 December 2017.
- 2018** “GEM detectors for use in particle therapy”, MMND ITRO International workshop, Mooloolaba (Queensland, Australia), 6-11 February 2018.
- “Medical accelerators”, First Biennial African Conference on Fundamental Physics and Applications, Windhoek (Namibia), 28 June-4 July 2018.

“Radiation Measurement and Dosimetry”, 5thAfrican School of Fundamental Physics and its Applications (ASP2018), University of Namibia, Windhoek (Namibia), 24 June-14 July 2018.

Professional organisations

Since 1987 Qualified Expert in Radiation Protection in Italy with a Diploma Grade III, no. 229 (*Esperto Qualificato di III grado*). Grade III is the highest grade and include qualification to take formal responsibility of projects of any size (up to nuclear power plants and high energy accelerators)

Since 1989 Member of the Italian Physics Society (Società Italiana di Fisica, SIF)

1992-1995 Member of the Board of Directors of the TERA Foundation (President U. Amaldi), sited in Novara (Italy).

For a number of years, Member of the Italian Association of Biomedical Physics (Associazione Italiana Fisica Biomedica, AIFB).

Sports and hobbies

Sports and hobbies Karate, sailing, photography, film making

Translation of texts W. Atkins, *Il secondo principio* (The second law), Zanichelli (1988)
P. Davies, *Il cosmo intelligente* (The cosmic blueprint), Mondadori (1989).

Paola Fattibene

Nata a

Cittadinanza italiana

Residenza

Posizione attuale primo ricercatore ISS

Campo di ricerca Effetti delle radiazioni ionizzanti: radioprotezione, effetti sanitari, dosimetria delle radiazioni ionizzanti, *biomarker* di esposizione, radioterapia, emergenze radiologiche, analisi del rischio.

Risonanza paramagnetica elettronica (EPR): ricerca in applicazioni rivolte alla salute pubblica, sviluppo tecnologico, radicali radioindotti, stress ossidativo.

CURRICULUM SCOLASTICO E TITOLI DI STUDIO

1989 diploma di laurea in fisica presso l'Università "La Sapienza" di Roma (110/110)

1984 diploma di maturità scientifica (60/60)

POSIZIONI PROFESSIONALI

2017-tutt'oggi: primo ricercatore presso il Servizio di Grandi Strumentazioni e Core Facilities

2009 - 2016: Direttore del Reparto di Dosimetria delle Radiazioni e Difetti Radioindotti, Dipartimento di Tecnologie e Salute, ISS

2007 - tutt'oggi: primo ricercatore presso il reparto di Dosimetria delle Radiazioni Ionizzanti e Difetti Radio-indotti del Dipartimento di Tecnologie e Salute (ISS)

1992-1993: visiting scientist presso il National Institute of Standards and Technologies, Gaithersburg (MD -USA) (8 mesi)

1990-2004: ricercatore presso il Reparto di Fisica degli stati aggregati del Laboratorio di Fisica (ISS)

1989 -1990: Borsa di studio Esacontrol S.p.A presso l'Università "La Sapienza" di Roma

PROGETTI CON RUOLI DI RESPONSABILITÀ SCIENTIFICA (periodo 2015 - tutt'oggi)

Unione Europea

(2017- tutt'oggi (termine previsto marzo 2020): H2020 EURATOM Project SHAMISEN-SINGS: Nuclear Emergency Situations - Stakeholder Involvement in Generating Science. Ruolo: Responsabile ISS e Leader del WP2.

2015-tutt'oggi (termine previsto maggio 2020): CONCERT (European Joint Program for the Integration of Radiation Protection Research). HORIZON2020. Ruolo: Contact person ISS.

2015-2017: SHAMISEN (Nuclear Emergency Situations - Improvement of Medical And Health Surveillance). VII PQ EURATOM-NFS. Ruoli: Leader Task Group 3.1 e Responsabile ISS

2013-2017: OPERRA (Open Project for European Radiation Research Area) VII PQ EURATOM-NFS: Ruolo: Referente per EURADOS

Istituto Nazionale Assicurazione Infortuni sul Lavoro (INAIL)

2020-2021: SIREN: Sviluppo di un Sistema Real time per la segnalazione e per la raccolta di dati utili alla ricostruzione della dose all'operatore in Eventi anomali nella terapia con medicina Nucleare. INAIL, Piano attività di ricerca 2019/2021 - Ricerca scientifica.

Istituto Nazionale di Fisica Nucleare (INFN)

2016-2017: X-band resonator for non destructive EPR measurements (XBANDE). Ruolo: Responsabile nazionale.

National Institutes of Health (NIH)

2014-2016. Fingernail as radiation marker: hardening treatments influence on assessed dose. Finanziatore: National Institute of Health (NIH-USA). Ruolo: Principal Investigator

COORDINAMENTO E PARTECIPAZIONE A COMITATI E GRUPPI DI LAVORO

2015-tut'oggi: membro dell'International Committee on Radiation Units (ICRU, Bethesda, MD, USA) Report Committee 29, Retrospective Assessment of Individual Doses for Acute Exposures to Ionizing Radiation.

2015-2016: co-convenor del gruppo ISO SC2/TC85/WG18, progetto 13304-2, Radiological Protection-Minimum criteria for Electron Paramagnetic Resonance (EPR) spectroscopy for retrospective dosimetry of ionizing radiation- Part2: ex vivo human tooth enamel dosimetry

2012-tutt'oggi: membro eletto del Council della piattaforma Europea EURADOS (European Radiation Dosimetry Group)

2009-2013: co-convenor del gruppo ISO SC2/TC85/WG18, progetto 13304-1, Radiological protection — Minimum criteria for electron paramagnetic resonance (EPR) spectroscopy for retrospective dosimetry of ionizing radiation — Part 1: General principles.

2009-2013: chairperson del WG10 EURADOS "Retrospective dosimetry"

2009-tutt'oggi: membro della rete WHO Biological Dosimetry Network (BIODOSENET)

Dal 1991: Incarico di associazione presso l'INFN (1991-1999 Sezione Sanità; 1999-2012 e 2015-2017 Sezione Roma1).

COMITATI DI SOCIETÀ SCIENTIFICHE

2013 – tutt'oggi: membro eletto dello Steering Committee della International Association of Biodosimetry and EPR dosimetry (IABERD)

2019 – tutt'oggi: presidente del Gruppo Italiano di Risonanza di Spin Elettronico (GIRSE)

2009-2013 e 2015-2016: membro eletto del Comitato Esecutivo del Gruppo Italiano di Risonanza di Spin Elettronico (GIRSE)

ATTIVITÀ DI VALUTAZIONE

Revisore abituale per riviste indicizzate: *Applied Radiation and Isotopes, Physics in Medicine and Biology, Radiation Measurements, Radiation and Environmental Biophysics, Nuclear Instruments and Methods, Radiation Protection Dosimetry, International Journal of Radiation Biology, Health Physics, Journal Radiation Protection, Medical Physics.*

Revisore di progetti scientifici per istituzioni internazionali (Public Health England, Didcot, UK; PAZY Foundation, Israel)

ATTIVITÀ DI RAPPRESENTANZA

2015-tutt'oggi: Esperto nel Comitato Scientifico dell'ISS eletto dai ricercatori e tecnologi dell'ISS

Dal marzo 2002 a gennaio 2004 rappresentante dei ricercatori nel Consiglio di Laboratorio di Fisica dell'Iss

Da gennaio 2004 a aprile 2007 rappresentante del personale nel Consiglio di Dipartimento Tecnologie e salute dell'Iss

ATTIVITÀ DI FORMAZIONE E DIDATTICA

Didattica post-universitaria

Dall'A.A. 2009-10 all'A.A. 2013-2014: docente del corso: "Metodi di dosimetria delle radiazioni ionizzanti" della Scuola specializzazione in Fisica Sanitaria presso l'Università degli Studi di Roma "La Sapienza".

A.A. 2011-12 e 2012-13: parte del corpo docenti del Master di secondo livello in "Protezione da eventi CBRN" c/o la Facoltà di Medicina e Chirurgia e la Facoltà di Ingegneria dell'Università degli Studi di Roma "Tor Vergata".

Supervisione e assistenza elaborazione tesi

Relatore di 3 tesi di Scuola di specializzazione in Fisica Medica e 2 tesi di master; supervisione (secondo revisore o valutatore) di diverse tesi italiane dell'Università La Sapienza, Roma e internazionali (University of Oslo; University of Durham).

COMITATI EDITORIALI E ASSISTENZA EDITORIALE

Dal 2008: Membro del comitato Editoriale degli annali dell'Iss

Dal 2008: Membro dell'Editorial board di Radiation Measurements

Dal 2013: Membro dell'International Editorial Board del Journal of Radiation Protection

Dal 2013: Curatrice della Newsletter dell'EURADOS

ATTIVITÀ DI CONSULENZA AL MINISTERO DELLA SALUTE E INCARICHI DELLA PRESIDENZA DELL'ISS

Dal 2014: su designazione del Presidente dell'Istituto Superiore di Sanità, membro del Gruppo di lavoro interministeriale per l'istruttoria per il recepimento delle Direttive 2013/59/Euratom sulle norme fondamentali di sicurezza per la protezione contro i pericoli derivanti dall'esposizione alle radiazioni ionizzanti.

Dal 2011: su designazione del Presidente dell'ISS, esperto dell'ISS per il Gruppo di coordinamento per la discussione sulla proposta di Direttiva sulle norme fondamentali di sicurezza per la protezione dalle radiazioni ionizzanti, per l'approvazione del Consiglio europeo.

Nel 2001: su designazione del Presidente dell'Iss è rappresentante dell'Iss nell'ambito del Gruppo di Lavoro per "Sorgenti di Tipo Riconosciuto" costituito dal Ministero della Sanità.

Dal 2001: presta consulenza al Ministero della Salute nel rilascio di pareri in relazione alle domande di conferimento della qualifica di "Sorgente Riconosciuta".

1998.2001: su designazione del Direttore di Laboratorio, referente del Laboratorio di Fisica nel Gruppo di lavoro dell'Iss per l'attuazione del Sistema di Assicurazione di Qualità (S.A.Q.).

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FORMATO EUROPEO
PER IL CURRICULUM
VITAE



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Nazionalità Italiana
Data di nascita

ESPERIENZA LAVORATIVA

- Date (da – a) **From 2012 to 2017-10-31 HEAD of INFN Section “ Health and Environment”**]
 - Nome e indirizzo del datore di lavoro INFN-AC Via Enrico Fermi 40 00044 Frascati Roma
 - Tipo di azienda o settore The National Institute for Nuclear Physics (INFN) is the Italian research agency dedicated to the study of the fundamental constituents of matter and the laws that govern them, under the supervision of the Ministry of Education, Universities and Research (MIUR)
 - Tipo di impiego Dirigente Tecnologo
 - Principali mansioni e responsabilità
 - The Health and Environment Section
 - Duties
 - provides for issuing of technical guidelines for all aspects of safety
 - industrial safety
 - industrial hygiene
 - environmental protection
 - fire safety
 - radiation safety
 - occupational medicine
 - provides for coordinating of INFN Qualified Experts (Radiation Protection Officers), Safety Officers , Occupational Physicians in order to obtain uniformity of application of the Health Physics Program in INFN Laboratories and Sections.
- From 1997 to 2017-10-31 Radiation Protection Group Head**
INFN-LNF Via Enrico Fermi 40 00044 Frascati Roma
- Dirigente Tecnologo
Duties:
Radiation protection around high energy particle accelerators (DAΦNE complex, SPARC, etc).
Radiation Protection Officer
Accelerators Facilities Designs
Technical documentation for licence request.

Last three Year Professional Activity Report

- License request of B category to licencing authority for the radioactive sources held by LNF-their use in buildings 24 and 48.
- Preventive communication of practices to licencing authorities – x-ray generator Moxtek mod. Magnum 50 kV, 0.29 mA, air cooled
- Preventive communication of practices to licencing authorities – x-ray generator OXFORD Series 5000 50 kV, 1 mA, air cooled.
- Agreement between INFN and ENEA for the purpose of disposal, at the end of its use, of a high activity radioactive source held by LNF.
- Operation of the synchrotron radiation line source PLUS on DAFNE-response to the request of licencing authorities
- Preventive communication of practices to licencing authorities -different use of the x-ray generator Moxtek mod. Magnum 50 kV,0.29 mA, air cooled
- FLAME Laser – communication to licencing authorities of the requested documentation
- Star facility
 - Shielding and dumps design
 - Safety Interlock system specification
 - Access control system specification
 - Radiation alarm system
 - Radioprotection procedures
 - Licence request to licencing authorities
- ELI NP GBS
 - Shielding and dumps design
 - Safety Interlock system specification
 - Access control system specification
 - Radiation alarm system
 - Tender specification for the previous
 - Relationship with Romanian licencing authorities.
 - Technical Specifications for Supplying Dosimetry Service for the ELI Commissioning Phase
 - Radioprotection procedures

In 2017 in the field of Open-Sesame activity he spent a week at SESAME facility

- To assist the Safety Sesame staff with recommendation and or advice on all Radiation Safety aspect posed by the operation of the Sesame facility as below specified:
- Preparation of the Radiation Protection Safety management at Sesame to be submitted to Energy and Mineral Regulatory Commission, in charge of Sesame authorization.
- To produce a final report with recommendations concerning the advice, if any, concerning the improvement of Radiation Safety at Sesame.
- Discussion, recommendation and advice on Sesame PSS and Sesame PSS procedures.
- Discussion on radiation shielding and commissioning plan for bending magnet, XAFS, XRF beam lines (optical and experimental Hutches)
- Discussion on the radiation protection for infrared lines.

In 2017 he field of Eupraxia activities he has been involved in the EuPRAXIA@SPARC_LAB project as radiation protection and qualified expert.

From 1981 to 2017-10-31 LNF Radiation Protection Officer

INFN-LNF Via Enrico Fermi 40 00044 Frascati Roma

The National Institute for Nuclear Physics (INFN)

Radiation Protection Officer

Radiation protection around high energy particle accelerators Adone complex (decommissioned in 1993), DAΦNE, SPARC and FLAME presently in operation;

Accelerators facilities design;

Technical documentation for license request.

From 2005 to 2017-10-31 is a member of EURADOS (European Radiation Dosimetry Group)

Eurados is a non-profit association for promoting research and development and European cooperation in the field of the dosimetry of ionizing radiation

Duties

Member and INFN representative on the general assembly

Research activity in the working group WP11 (High energy radiation field)

From 2014 to 2017-10-31 is a member of ISO/TC 85/SC2 Radiation Protection.

ISO International Standard organization

Duties

Standardization in the field “ Dosimetry for exposure to cosmic radiation in civilian aircraft”

From 2015 to 2017-10-31

INFN-LNF Via Enrico Fermi 40 00044 Frascati Roma

Radiation Protection Project Responsible

European Collaboration for the proposal for the ELI_NP Gamma beam System

Duties

The whole radiation protection project

Relationships with the Romanian Licence Authorities

Technical Specifications for Supplying Dosimetry Service for the ELI Commissioning Phase

Radiation Protection Expert during the commissioning phase

ISTRUZIONE E FORMAZIONE

1970-1976

Universita' degli Studi di Roma

Physic degree with a score of 110/110, with an experimental thesis on *"Misure di dose prodotta da fasci di alta energia incidenti su bersagli pesanti"*.

1969

Liceo Classico Statale "Virgilio" di Roma

Diploma di maturita' classica

CAPACITÀ E COMPETENZE

PERSONALI

Acquisite nel corso della vita e della carriera ma non necessariamente riconosciute da certificati e diplomi ufficiali.

List the specialization in which I consider myself qualified

Accelerators facility design (criteria for siting accelerator facility, source terms, other radiation sources, shielding design, interlock and warning devices, control of radioactivation and contamination, radioactive waste management, radiation damage, instruments and measurements, personal dosimetry, dismantling and decommissioning).

Gamma and neutron spectrometry.

Solid state dosimetry (termoluminescence, CR 39).

Radon.

XRF.

Teaching and Training in the radiation protection field

MADRELINGUA

ITALIANO

ALTRE LINGUA

INGLESE

- | | |
|---------------------------------|------|
| • Capacità di lettura | GOOD |
| • Capacità di scrittura | GOOD |
| • Capacità di espressione orale | GOOD |

FRANCESE

- | | |
|---------------------------------|-----------|
| • Capacità di lettura | EXCELLENT |
| • Capacità di scrittura | GOOD |
| • Capacità di espressione orale | GOOD |

(Adolfo Esposito)

Si dichiara che le informazioni contenute nel presente curriculum corrispondono al vero ai sensi dell'art.47 del DPR 445/2000

(Adolfo Esposito)