

Personal information

Name: Petrarca, Massimo

Date of birth: 03 January 1981, Roma

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- **Education**

2014 - conseguimento dell'Abilitazione Scientifica Nazionale alle funzioni di professore universitario di seconda fascia per il settore concorsuale 02/B3 – Fisica Applicata, indetta con D.D. n.161 del 28/1/2013.

11/2004-01/2008. Ph. D, University of Rome “Sapienza”. Thesis Title: *Shaped electron bunch generation by high power laser for the SPARC photoinjector*.

09/1999 - 07/2004 Laurea Magistralis in Physics at the University of Rome “Sapienza”.

- **Current position:**

Since Aprile 2014: Researcher RTDb at “Sapienza” University of Rome, in the physics section of the S.B.A.I. department. Study and applications of high power laser pulses for novel acceleration schemes, filamentation regime, plasma acceleration, THz generation.

I have been granted this position in 2013 as Winner of the Italian national competitive research program: Rita Levi Montalcini. Project title: “Boosting a high brightness electron beam by laser driven plasma acceleration in capillary gas-filled tubes”. 24 winners over 250 applicants. Granted funding 253.9 K€.

To develop this project, on April the 1st 2014, I start as RTDb at the SBAI department of University of Rome “Sapienza”.

- **Previous Positions**

04/2013 – 04/2014: Researcher at LNF-INFN. Study and applications of high power laser pulses: filamentation regime, plasma acceleration, THz generation by relativistic electron bunches and plasma based THz generation sources.

02/2011 - 04/2013: Senior Post Doc at Geneva University in Applied physics group GAP-Biophonics of Prof. J-P Wolf, (CH). High power laser propagation in gasses and their relative applications.

01/2008 - 12/2010: Post Doc Fellowship at CERN, EN/STI/LP, Switzerland Group leader Dr. R. Losito. Laser for accelerator and photoinjector studies.

- **Fellowships and awards:**

2013 Winner of the Italian national competitive research program: Rita Levi Montalcini. Project title: “Boosting a high brightness electron beam by laser driven plasma acceleration in capillary gas-filled tubes”. **24 winners over 250 applicants. Granted funding 275 K€. Duration 36 months, project leader.**

01/01/2008 -31/12/2010 Winner of Fellowships at CERN.

- **Research founds:**

~60k€ within the section Roma1 of the National Institute of Nuclear Physics (INFN), for the project I proposed about the generation of high intensity THz source in the framework of the “sigla THz_RD”.

- **Supervision of Ph. D. students**

Since October 2016: Ph.D. supervisor at “Sapienza” University of Rome of V. Dolci

Since Aprile 2015: PhD supervisor at “Sapienza” University of Rome of A. Curcio.

2011-2013: PhD supervisor at University of Geneva, of Stefano Henin.

- **Teaching Activity until 2014.**

2014-2016: Teaching Applied Physics module for: “ ...l’insegnamento di Basi Molecolari per i corsi di studio (presso Roma Azienda Policlinico Umberto I) con SSD: FIS/07 e Classe CdS: L/SNT2 : Terapia Occupazionale, Terapia della Neuro e Psicomotricità dell’Età Evolutiva, Ortottica e Assistenza Oftalmologica, Fisioterapia.

2014-2105: Teaching assistant of the course held by Prof. M. Piacentini: General Physics for Chemical Engineering.

2011-2013 Teaching assistant of the course held by Prof. J-P Wolf.: General Physics, Laboratory assistant of master and university students.

10-2012 M. Petrarca, Filamentation laser: de la physique aux applications, Journées du Réseau Optique et Photonique (JNROP) CNRS, Cargèse (Coarse).

2006-2008: Teaching activities for LNF-INFN summer students: Laser pulse shaping.

2010-2011: Teaching activities for CERN summer students on laser and laser diagnostic.

2005-2008: Teaching Assistant and Laboratory assistant of the course: Laboratory of Systems and Signal, Prof. M. C. Mattioli, University of Rome: “Sapienza”.

- **Participation and Collaboration**

2017: Collaboration with Prof. K. Cassou (Maître de Conférences / Associate Professor LAL - Université Paris-Sud / CNRS) and Prof.essa S. Kazamias (Sophie Kazamias Maître de conférences Université Paris Sud LPGP-LASERIX) for the experimental test regarding the high field THz generation technique for which I have obtained INFN funds under the THz_RD project.

2017: Collaboration with Dr. Daniil Kartashov (Institute for Optics and Quantum Electronics, Friedrich-Schiller University Jena, Max-Wien-Platz 1, 07743 Jena, Germany), to study plasma formation dynamic and THz generation under different focusing scheme of 30 TW laser system in air. The scientific program passed the peer review of the European consortium LaserLab and therefore we will receive dedicated European funds for the development of the experiment. I am the PI of the experiment.

2016-2017: Collaboration with CERN (Dr. Roberto Corsini head of BE-ABP-LAT section) for the scientific program about THz generation and THz based-acceleration to be performed on CLEAR (ex. CALIFES) facility.

2013: Main person in establishing collaboration between LNF-INFN and University of Geneva, Applied physics group GAP – Biophotonics of Prof J-P Wolf group. Studies of high power laser propagation in filamentation regime in air. 10 main persons involved. Collaboration still on-going.

2010: Main person in establishing collaboration between CERN (CTF3 project) and LAL-CNRS (Dr. A. Variola): Photocathodes studies. I established this collaboration during my last year of fellowship at CERN. Persons involved: 6.

2007-2008: Participant in the CERN, European Center for Nuclear Research, CLIC-collaboration for CLIC Test Facility (CTF3). Laser system to drive photoinjectors.

2005-2006: Participant in the INFN-BNL for high brightness e-beam generation at BNL (Brookhaven National Laboratory), USA, facility DUV-FEL-Accelerator, Collaboration.

- **Invited Talks in meetings of international collaborations:**

10-2009, Photo injector PHIN results, CLIC Workshop, CERN

04-2009, The Two CTF3 photo injectors, Department EN seminar, CERN

07-2008, K. Elsner, Status of photoinjectors at CERN, CLIC Meeting

06-2008, M. Petrarca et al, CARE project coordinator meeting, CERN

12-1008, Status of CTF3 Laser system, Seventh PHIN Collaboration Meeting, CERN

07-2008, Status of CTF3 Laser system, Sixth PHIN Collaboration meeting

09-2008, Status of the laser system, CTF3 Committee meetings, CERN

- **Invited Talks in conferences and workshop**

04-2017, EMN 2017, to be held in April 2017, invited speaker

09-2016, CALIFES 2016, <https://indico.cern.ch/event/533052/>

07-2011, Laser-induced water condensation in air, LPHYS'11 conference, Sarajevo

10-2010, Lasers for polarize electron generation, IWLC, CERN

09-2010, Photo injector studies at CERN, PESP2010, Bonn.

- **Schematic summary of Scientific Outputs up to date**

2014 - conseguimento dell'Abilitazione Scientifica Nazionale alle funzioni di professore universitario di seconda fascia per il settore concorsuale 02/B3 – Fisica Applicata, indetta con D.D. n.161 del 28/1/2013.

H_index:10 (Scopus-30/01/2017)

Total number of published papers **81** with **2 IF > 9** journal (PNAS); Nat. Communications.

Below, the numbers of publications on peer review journals during the last years.

In 2017: 1 paper submitted to Scientific Report.

In 2016: 14 papers published on peer review journals. Total citations: 9 (Scopus)

In 2015: 4 papers published on peer review journals. Total citations: 3 (Scopus)

In 2014: 3 papers published on peer review journals. Total citations: 12 (Scopus)

In 2013: 9 papers published on peer review journals. Total citations: 61 (Scopus)

In 2012: 5 papers published on peer review journals. Total citations: 56 (Scopus)

In 2011: 8 papers published on peer review journals. Total citations: 63 (Scopus)

Summary of my research activities until 2014

PhD studies (11/2004–01/2008) University of Rome Sapienza. I worked in the SPARC project at the LNF-INFN devoted to the development of a Self Amplified Spontaneous Free Electron Laser (SASE-FEL).

My personal research activity concerned high power laser pulse shaping and diagnostic techniques of the Ti:Sa laser required to optimally drive the photoinjector. The main goal was to transform the Gaussian intensity shape of the UV laser pulses in a Flat-Top one with less than a picosecond rise/fall times. Two pulse shaping techniques, and a single shot diagnostic tool for the spectral and intensity UV pulse profile, have been developed. Another diagnostic tool for the temporal shape of UV pulses, a UV cross-correlator have been studied and developed. The development of these laser pulse shaping techniques allowed us to generate high brightness electron beams and to verify the oscillatory behaviour that is known as the “double minima”. This behaviour established the working point of many high brightness photoinjectors in Europe in use for many applications. I spent 2 months at CERN working on a complex laser system to drive the photoinjectors of the CTF3 (CLIC Test Facility) experiment. After this, I obtained the post-doc fellowship contract lasting 3 years.

PostDoc Fellowship at CERN (01/2008-31/12/2010). I worked in the CLIC collaboration in the group of Dr. R. Losito and project director Dr. JP Delahaye. I studied the generation of electron beams at high-integrated charge and complicated time structure. In particular, I developed my research activity on Nd:Ylf solid state laser required for the electron-charge generation. I studied the interaction between the photoinjector major components to optimize its performances and the physics of photocathodes and their generation through the process of co-evaporation, proposing to research materials capable of emitting at longer wavelengths compared to UV. To this end, I established a collaboration between CERN and the LAL-CNRS (Dr. A. Variola). This work has also been presented in different conferences and collaboration meetings. In the subsequent years, after my Fellowship, the work I initiated proved to produce relevant results not only on the DC test stand photoinjector but also on the main RF one.

At CERN, I had many official responsibilities within the CTF3 project and CLIC collaboration, including the coordination and management of the laser system for the maintenance of the run, and the coordination between the laser, photocathodes and photoinjector groups. I used to coordinate also the work of PhD and master students. Although I could not be officially responsible of any budget because of CERN internal rules, I was in charge of the funding required to keep the laser research program running, roughly 200 K€/year.

Senior PostDoc (02/2011-05/2013) at the University of Geneva. I was in the team of the FilAtmo ERC-AdG project of Prof. J-P Wolf to study the coherent control of High Order Kerr Effects in non-linear filamentation. I managed part of the group funds to develop the activity in the field of high-power laser pulses propagation in gases. These studies are of particular importance for many applications e.g.: water droplet nucleation in the atmosphere, lightning discharge triggering and THz generation. I proposed, organized and coordinate a campaign of experiments in collaboration between the University of Geneva and the LNF-INFN conducted in April 2013 at the LNF. I had also the responsibility for the management of the organizational aspects, including the nontrivial security issues connected with the propagation of pulses in the air. The sub-petawatt FLAME laser at the LNF, was propagated in the atmosphere above Frascati. The importance and interest of the arguments in brought the publishers of the magazine to a "Rapid Communication". This is the first experiment in Europe on the propagation of high power laser pulses in the atmosphere. *A INFN press release has been published: 24th of March 2014.*

30/01/2017

Massimo Petrarca

