ANDREA MOSTACCI
Curriculum Vitae

Part I – General Information

Full Name	**Andrea Mostacci**
Date of Birth	May 11th, 1972
Place of Birth	Rome (Italy)
Citizenship	Italian
Permanent Address	Sapienza, University of Roma Department of Basic and Applied Science for Engineering (SBAI) Via Scarpa 16 00161 Roma (Italy)
E-mail	Andrea.Mostacci@uniroma1.it
Spoken Languages	Italian (mother tongue), English, French (basic knowledge)

Part II – Education

Type	Year	Institution	Notes (Degree, Experience …)
University graduation	1997	Sapienza University of Rome	**Electronic Engineering** degree with a dissertation on "Coupling impedance of pumping holes for LHC beam pipe" - **110/110 cum laude**
Post-graduate studies	1997	European Scientific Institute, Archamps (France)	Joint Universities Accelerator School, Course on **Particle Accelerator Physics**
Post-graduate studies	1999	CERN Accelerator School, Bénodet (France)	Course on **General Accelerator Physics**, Intermediate Level
PhD	2001	Sapienza University of Rome	Applied Electromagnetism and Electro-Physical Science, XIII cycle. Thesis on "**Beam wall interaction in the LHC liner**"
Licensure	1997	Sapienza University of Rome	Licensure for the profession of engineer
Licensure	2013	MIUR Ministry of Education, University and Research	National Academic Qualification as Associate Professor 2012 in Area 02-A1 **Experimental Physics of Fundamental Interactions**
Licensure	2013	MIUR Ministry of Education, University and Research	National Academic Qualification as Associate Professor 2012 in Area 02-B3 **Applied Physics**

Part III – Appointments

IIIA – Academic Appointments

Start	End	Institution	Position
11/2006	Today	Sapienza University of Rome	**Assistant Professor** (Ricercatore Universitario Confermato a tempo indeterminato) at the Department of Basic and Applied Science for Engineering (SBAI), former Energetics Department
04/2006	10/2006	Sapienza University of Rome	**Researcher** on Accelerator Physics (Co.Co.Co.) at the Department of Basic and Applied Science for Engineering (SBAI), former Energetics Department
04/2002	03/2006	Sapienza University of Rome	**Researcher** on Experimental techniques for accelerators and particle physics (Assegno di Ricerca) at the Department of Basic and Applied Science for Engineering (SBAI), former Energetics Department
04/2008	06/2008	Sapienza University of Rome	Member of the "Ricerca ed attività culturali" working group of the Faculty of Engineering
09/2015	09/2015	Sapienza University of Rome	**Member of the selection board** for the PhD in Accelerator Physics
		Sapienza University of Rome	**Supervisor** of theses in Electronic Engineering, Nuclear Engineering and **assistant supervisor of PhD thesis** in Applied Electromagnetism and Accelerator Physics
		Sapienza University of Rome	**Member of several boards for selection** of research and post-doc grants at the SBAI Department
2011	Today	Sapienza University of Rome	Member of the Professor Board (Consiglio di Area) of **Electronic Engineering**
2012	Today	Sapienza University of Rome	Member of the Professor Board (Consiglio di Area) of **Electrical Engineering**
2016	Today	Sapienza University of Rome	**Member of Professor Board of the PhD** in Sciences and Technologies for Complex Systems
2004	2009	Sapienza University of Rome	Member of the Professor Board (Consiglio di Area) of **Aerospace Engineering**

IIIB – Research Appointments

Coordination of national and international researcher teams

Start	End	Institution	Position
11/2015	Today	Sapienza, University of Rome	**Coordination of Work Package on "Accelerator prototyping and experiments at Test facilities"** (WP12) of the project "Compact European Plasma Accelerator with superior beam quality" (EUPRAXIA); Horizon 2020 grant agreement No 653782
01/2015	Today	INFN-Laboratori Nazionali di Frascati (LNF) Sapienza, University of Rome	**Coordination of diagnostics group** for the linear accelerator of the Compton Gamma Source being built in the Extreme Light Infrastructure for Nuclear Physics (ELI-NP), Magruele (Romania)
05/2002	Today	SBAI Department-Sapienza	**Coordination** of the activity in the **Accelerator Laboratory** (former Accelerator and Detector Lab. of the Energetic Dep.)
2012	2014	SBAI Department-Sapienza	**Coordination of the Work Package "Accelerators: Novel compact particle sources"** (WP6) of the project "Cluster of Research Infrastructures for Synergies in Physics" (CRISP) in the framework of FP7-INFRASTRUCTURES-2011-1
2006	2013	INFN-Laboratori Nazionali di Frascati (LNF)	**Coordination of the data analysis** of all the experiments executed on the SPARC photo injector at the LNF-INFN

Research activity in qualified international institutions

Start	End	Institution	Position
04/2014	07/2014	CERN-Geneva (CH)	**Visiting Scientist** (2 weeks)
07/2013	07/2013	CERN- Geneva (CH)	**Visiting Scientist** (1 month)
08/2002	08/2002	CERN- Geneva (CH)	**Visiting Scientist** (1 month)
05/2001	04/2001	CERN- Geneva (CH)	**Research Fellowship**

Research activity in qualified national institutions

Start	End	Institution	Position
2012	Today	INFN-Roma 1 Section	**Research appointment** renewed yearly on particle accelerators activities
2008	2011	INFN-Laboratori Nazionali di Frascati (LNF)	**Research appointment** renewed yearly on particle accelerators activities
1998	2007	INFN-Laboratori Nazionali di Frascati (LNF)	**Association appointment** renewed yearly on particle accelerators activities
		INFN-Laboratori Nazionali di Frascati (LNF)	**Member of various selection boards** for research and technologist in Accelerator Science

Integration in the Accelerator Physics international community

Start	End	Institution	Position
05/2014	Today	Sapienza, University of Rome	**Governing board of EuroGammaS**, the European Consortium for the delivery of a High Intensity Gamma Beam System to the Extreme Light Infrastructure for Nuclear Physics (ELI-NP)
2008	Today	American Physical Society	**Referee** of Physical Review - Accelerators and Beams (former PRST-AB)
2006	Today	Elsevier	**Referee** of Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment

IIIC – Other Appointments

Start	End	Institution	Position
06/1999	05/2001	CERN- Geneva (CH)	**Doctoral Student**
12/1997	07/1998	CERN- Geneva (CH)	**Technical Student**

Part IV – Teaching experience

IV A – Teaching experience at Sapienza University of Rome

Year	Faculty	Lecture/Course
2016-17	Electrical Engineering (Bachelor degree)	**Physics II** (9 CFU, about 80 students)
	Electronic Engineering (Master degree)	Multidisciplinary Electronic Laboratory (**RF measurement module**, 3 CFU, 40 students)
2015-16	Electrical Engineering (Bachelor degree)	**Physics II** (9 CFU, about 80 students)
	Electronic Engineering (Master degree)	Multidisciplinary Electronic Laboratory (**RF measurement module**, 3 CFU, 40 students)
2014-15	Electrical Engineering (Bachelor degree)	**Physics II** (9 CFU, about 80 students)
	Electronic Engineering (Master degree)	Multidisciplinary Electronic Laboratory (**RF measurement module**, 3 CFU, 30 students)
2013-14	Electrical Engineering (Bachelor degree)	**Physics II** (9 CFU, about 40 students)
	Electronic Engineering (Master degree)	**High Frequency measurement laboratory** (6 CFU, module of the course High Frequency system, 5 students)
2012-13	Electrical Engineering (Bachelor degree)	**Physics II** (9 CFU, about 40 students)
	Electronic Engineering (Master degree)	**High Frequency measurement laboratory** (6 CFU, module of the course High Frequency system, 5 students)
2011-12	Electronic Engineering (Master degree)	**High Frequency measurement laboratory** (6 CFU, module of the course High Frequency system, 5 students)
2009-10	Mechanical Engineering (Bachelor degree)	**Laboratory of Experimental Physics** (3 CFU, about 30 students)
2008-09	Aerospace Engineering (Bachelor degree)	**Laboratory of Experimental Physics** (4 CFU, about 90 students)
2007-08	Aerospace Engineering (Bachelor degree)	**Laboratory of Experimental Physics** (4 CFU, about 90 students)
	Clinical Engineering (Bachelor degree)	**Physics I** (5 CFU, about 80 students)
	Science for Engineering (Master Degree)	**Modern Physics Laboratory** (4 CFU, about 10 students)
2006-07	Aerospace Engineering (Bachelor degree)	**Laboratory of Experimental Physics** (4 CFU, about 90 students)
	Science for Engineering (Master Degree)	**Modern Physics Laboratory** (4 CFU, about 10 students)
2005-06	Aerospace Engineering (Bachelor degree)	**Laboratory of Experimental Physics** (60 hours, about 90 students)

2004-05	Aerospace Engineering (Bachelor degree)	**Laboratory of Experimental Physics** (60 hours, about 90 students)
2003-04	Environmental Engineering (Bachelor degree), Rieti site	**Physics II** (6 CFU, about 20 students)
2002-03	Transportation Engineering (Bachelor degree), Civitavecchia site	**Physics II** (6 CFU, about 10 students)
	Transportation Engineering (Bachelor degree), Civitavecchia site	**Physics I** (6 CFU, about 10 students)

IV B – International University level teaching experience

Year	Place	Lecture/Course
2017	ESI course, Joint University Accelerator School, Archamps (France)	**Introduction to RF**
2014	Accelerator Laboratory, SBAI Department, Sapienza University	**RF measurements**, 1 week intensive course for CERN researchers

Part V - Society memberships, Awards and Honours

Year	Title
From 2013	**Member of SIF** (Italian Physical Society) and EPS (European Physical Society)
September 2014	**Notice for oral communication** at Annual Meeting of the Italian Physical Society: “**Comb beam for particle driven plasma based accelerators**”.
May 2001 April 2002	Awarded of **Fellowship** by CERN, Geneva – CH
June 1999 April 2001	Awarded of **Doctoral Student grant** by CERN, Geneva – CH
December 1997 July1998	Awarded of **Technical Student grant** by CERN, Geneva – CH
January 1997	**Winner** (6th classified over 30 positions available) in the competition organized by the INFN for grants for undergraduates, for starting the research activity at the INFN – LNF.
June 2001	**APS/IEEE Student Travel Award** to join the Particle Accelerator Conference 2001, Chicago (USA).
June 2000	**Financial Support for Young Scientists** to join the European Particle Accelerator Conference 2000, Vienna.
March 2009	**Student Fellowship** to join the Particle Accelerator Conference 1999, New York (USA).

Invited Talks

Date	Conference	Title
11/2004	**Care-HHH Workshop** "Beam Dynamics in Future Hadron Colliders and Rapidly Cycling High-Intensity Synchrotrons", CERN, Geneva (Switzerland)	RF coupling impedance measurements versus simulations
06/2011	**China-Italy Bilateral Workshop** "New Advanced Coherent Light Sources'', Beejing (China)	SPARC/SPARX activity at LNF
09/2011	**International Particle Accelerator Conference** (IPAC 2011), San Sebastian (Spain)	Advanced Beam Manipulation Techniques at SPARC FEL Facility
10/2013	**International Seminar** "Advanced Accelerator and Radiation Physics", Adyge State University, Maykop (Russia)	Frontiers in modern accelerator physics
04/2014	**ICFA Workshop** on "Electromagnetic wake fields and impedances in particle accelerators'' Erice, Italy	History and development of bench measurement techniques for impedance evaluation
11/2014	1st Particle Accelerator Components Metrology and Alignment to the Nanometre scale (**PACMAN**) Workshop, CERN, Geneve (Switzerland)	Stretched wire measurements and impedance matching
04/2015	**Advances in X-ray Free-Electron Lasers Instrumentation**, SPIE Optics Optoelectronics, Prague (Czech Republic)	Operational experience on the generation and control of high brightness electron bunch trains at SPARC-LAB
11/2015	**EuCARD-2 XBEAM-XRING-XLINAC** Workshop "Beam Dynamics meets Diagnostics"	Measurements of small impedances
03/2016	**ICFA Workshop** "Physics and Applications of High Brightness Beams", Havana, Cuba	ELI: New frontiers of particle acceleration and radiation sources

Paper awards

The series of Virtual Journals in the physical science are designed by American Institute of Physics and the American Physical Society to highlight papers considered relevant to Nanoscience and Nanotechnology, Ultrafast Science, Biophysics, Quantum Information and Superconductivity.
A publication of A. Mostacci has been selected for Virtual Journal of Ultrafast Science:

> M. Ferrario, **A. Mostacci**, et al., "**Direct measurement of the double emittance minimum in the beam dynamics of the SPARC high-brightness photoinjector**", selected for Virtual Journal of Ultrafast Science, **January 2008** Vol. 7, Issue 1 - High Field Physics.

Part VI - Funding Information

VI A – Grants as **Principal Investigator**

Year	Title	Program	Grant Value
2017	Advanced beam position monitors for the Compton Gamma Source of the Extreme Light Infrastructure	**Sapienza Research Projects** (Medium Size)	About 40k€
2014-16	Plasma based acceleration at SPARC-LAB	**National Scientific Committee V** of INFN (research unit responsible)	About 40k€
2013-16	European FEL Design Study (EuroFEL project)	**National Scientific Committee V** of INFN (research unit responsible)	About 300k€
2012-15	Generation of high brightness electron beams from plasma-based accelerators	**FIRB**-Futuro in Ricerca 2012 (research unit responsible) RBFR12NK5K_002	About 180k€

VI B – Grants as **Investigator**

Year	Title	Program
11/2015	**EUPRAXIA** – Compact European Plasma Accelerator with superior beam quality	**Horizon 2020**
2013	Optimization of a plasma-based short pulse laser amplifier	**Sapienza** Research Projects
2012-14	Cluster of Research Infrastructures for Synergies in Physics (**CRISP** project)	**FP7**-INFRASTRUCTURES
2012	ELI-NP	MIUR-FOE-INFN
2012	EUROFEL	MIUR-FOE-INFN
2012	ELI-NP	MIUR-FOE
2010	Charged particle beams from laser-plasma sources for medical applications	**Sapienza** Research Projects
2008	Innovative nanomaterials and nanostructures for photo-emission and field emission based devices	**FIRB** – Futuro in Ricerca - MIUR
2006	SPARX (phase II)	**FIRB** - MIUR
2004	SPARX (phase I)	**FIRB** - MIUR
2002	SPARC	**FISR** - MIUR
Since 2001	Projects related to particle accelerator	**Sapienza** Research Projects
Since 2001	Projects related to particle accelerator	**National Scientific Committee V** of INFN
Since 2001	Projects related to particle accelerator	**New Techniques of Acceleration** NTA-INFN

Part VII – Research Activities

Keywords	Brief Description
Circular accelerators, Coupling impedance,	The electromagnetic interaction between the beam in a particle accelerator and its surrounding (beam pipe) in a circular accelerator is studied with the coupling impedance. Such interaction can lead to energy losses (longitudinal impedance) or transverse instability (transverse impedance). Applying Electromagnetic theory, A. Mostacci studied several potential impedance source relevant for modern particle accelerators.
LHC liner	The beam pipe foreseen for the Large Hadron Collider (LHC) is rather unconventional. To shield the magnets cold bore from the synchrotron radiation emitted by 7 TeV protons, a beam screen (the so called "liner") has been introduced practically along all the machine. The design of the liner is a compromise among the beam stability issues, the vacuum requirements, the heat load on the cold bore, the electron cloud effects and the realization constraints. Three main potential sources of beam energy losses in the actual LHC liner are important, namely the interaction with the pumping holes, the (saw tooth) surface corrugation and the effect of an azimuthally inhomogeneous metallic beam pipe.
LHC liner Pumping holes	The pumping slots in the beam screen couple the inside of the beam pipe with the external coaxial region, leading to RF power flow with possibly power dissipation on the cold bore. Interference effects between the slots have been studied in details [J75, J76] and analytical estimates for the power dissipated in the cold bore as a function of the slot dimensions (hole width and wall thickness) has been given [J74]. For the actual slots dimensions, the losses were still within the safe limits. Such studies are being revisited in the context the the Future Circular Collider (FCC) studies where the availability of analytical formulae can simplify the design phase.
LHC liner Surface roughness	The artificial roughness (saw tooth corrugation) of the surface foreseen in the final design of the LHC beam pipe allows the propagation of surface waves synchronous with the beam and thus potentially dangerous for its stability. Using a field matching technique and assuming a periodically rough surface, the frequency of such waves is found to be very high (out of the relevant bunch spectrum): it scales with the inverse of the square root of the depth of the corrugation, that is in the range of microns. The potential dangers have been investigated for the nominal LHC bunch intensity [J72, J73].
LHC liner azimuthally inhomogeneous metallic beam pipe	Based on the Green's function approach, the field excited by a beam traveling in a pipe whose resistivity varies with the azimuth (but is constant in the z-axis direction) can be found (semi)analytically for an ultra-relativistic beam by using some approximated boundary conditions (for conductors) [J67]. Even at relatively low frequencies (in the MHz range) it was found that the

	image currents do not avoid the low conductivity region (as you would expect in the limit of static solutions), thus implying potentially high power losses due to the longitudinal weldings in the LHC beam screen. Infact, the inner part of the beam screen is covered with a layer of copper (very good conductor) but the weldings have approximately the resistivity of stainless steel (bad conductor) which gives a big contribution to the losses. Numerical studies using the conventional electromagnetic CAD code confirmed such a conclusion. A prototype has been designed and built to experimentally verify the azimuthal distribution of the image currents, through very accurate Q-factor measurements in a coaxial resonator. The measured data confirmed the theoretical predictions.
Impedance studies	The theoretical environment built to study the LHC liner impedance issues has been subsequently applied to similar problem to give estimations of the impedance contribution in more complicated devices [J42, J52, J61, J65] in order to explain unexpected phenomena (e.g. heat load) suffered by the beam, particularly relevant in cryogenic machines.
RF devices, bead pull measurement,	In the "Accelerators" laboratory at the SBAI department, A. Mostacci designed, built and maintained a test bench to measure electromagnetic field inside closed RF structures (so called "bead-pull" method). Several devices installed in SPARC, the high brightness LINear Accelerator (linac) of Laboratori Nazionali di Frascati (LNF), have been tested in the laboratory [J68, J69]. Those measurements were calibrated to measure not only the field shape, but also the accelerating efficiency of the structure. Typical RF devices measured are deflector [J64, S20], electron gun and accelerating sections [J62] in the 3 to 12 GHz frequency range. The tuning procedure for 6GHz accelerating structures [J39] built at LNF have been defined and applied for the first time in the previously discussed test bench [J33]. The laboratory is equipped also with codes for electromagnetic CAD used both for designing novel devices [J56, J66] and for validating measurements on prototypes. A. Mostacci studied also on the bead-pull measurement theory for non-conventional RF structures.
Coupling impedance, bench measurements, coaxial wire method	Bench measurements nowadays represent an important tool to estimate the coupling impedance of any particle accelerator device. The well-known technique based on the coaxial wire method allows to excite in the device under test a field like the one generated by an ultra-relativistic point charge. The field of a relativistic point charge in the free space (or in a perfectly conducting beam pipe) is a Transverse Electric Magnetic (TEM) wave, namely it has only components transverse to the propagation direction. The amplitude scales inversely with the distance from the propagation axis and phase velocity is equal to the speed of light. The fundamental mode of a coaxial wave guide is a TEM wave as well, with the same amplitude dependence and the same propagation constant. Therefore, the excitation

	due to a relativistic beam in a given Device Under Test (DUT) can be "simulated" by exciting a TEM field by means of a conductor placed along the axis of the structure. With the coaxial wire method, A. Mostacci measured the coupling impedance of many particle accelerator devices of interest of CERN machines such as LHC and its injectors [J71]. A. Mostacci also performed beam experiments at CERN to compare bench measurement with direct beam measurement on the same devices. The coaxial line approach has also been used to bench measured the effect of coating in the secondary emission yield, relevant for LHC electron cloud issues [J70]. More recently the new generation of LHC collimators has been bench measured in order to estimate the coupling impedance and look for possible trapped modes in the moving jaws [J3].
SPARC, machine measurements Physics of high brightness beam Free Electron Laser	Since 2006, A. Mostacci joined SPARC commissioning and operation. SPARC is a high brightness linear accelerator initially conceived to drive proof-of-principle experiments in the generation of radiation with Free Electron Laser (FEL). Nowadays the SPARC accelerator has been upgraded to SPARC_LAB [J37, S06] with the installation of multi TW class lasers, allowing world-class, ground breaking experiments in accelerator and plasma physics as well as interdisciplinary research [J31]. Following the time line of the SPARC_LAB upgrades, the activity can be roughly divided in research on physics of high brightness electron beams, on FEL innovative schemes, on the generation of THz radiation, on novel plasma-based particle acceleration techniques and on Compton effect based radiation sources. Concerning the physics of high brightness electron beam, SPARC measured for the first time the emittance oscillation of beams generated by RF photocathodes [J60, S18], assessing the working point used world-wide in all the FELs based on RF guns. Such result has been possible due to a carefully conducted experiments [J55, S16] and data analysis [J57, S17]. In order to longitudinally compress the electron beam (to increase the bunch current), SPARC introduced and demonstrated the low energy compression (namely “velocity bunching”) properly tuning low energy focusing solenoids [J49, J54, S15], for the first time used there. Such velocity bunched beam exhibit non-negligible energy spread that must be considered in beam measurements [J47, S12] or exploited in to produce radiation [J53, S14] with non-conventional FEL configurations. SPARC high brightness beams are also used to propose and demonstrate novel concepts in beam diagnostics [J18, J20] or medical applications [J26] in electron based radiotherapy. SPARC contributed to develop and test innovative ideas on Free Electron Laser schemes which have been afterword applied in bigger FEL facilities; such results have possible also to extensive benchmarking of code against experiments [J51] and innovative diagnostics [J23]. For instance, SPARC introduced the undulator tapering to compensate energy spread [J45, S10,

	J53, S14] or demonstrated the generation of a super radiant pulse in the long radiator of a single stage cascaded FEL, by seeding the modulator with an external laser. Seeded FELs can operate either in the amplifier "direct seeding" scheme [J24, J48, S13], or in the high gain harmonic generation configuration [J44, S09], where the seed in a first undulator (modulator) is used to induce an energy-density modulation in the electron beam longitudinal phase space. This bunched beam then emits a higher order harmonics in a following undulator (radiator). This scheme can be repeated in a multiple stage cascade of modulators and radiators, extending the operation wavelength toward a range where seed sources are not available [J36, S05]. The versatility of the SPARC linac allowed also to send a train of bunches in the FEL undulator, resulting in a two colour FEL radiation [J32, S03], time modulated FEL radiation [J34, S04] and seeded two colours radiation [J21, S02]. Also, this scheme was pioneered at SPARC and it is now used in several other laboratories for pump-probe FEL experiments. The generation of THz radiation at SPARC relies on the usage of sub-ps high brightness electron bunches when a broadband radiation is needed [J41], while longitudinally modulated electron beams allow for tunable narrow-band radiation [J22]. The generation is quite efficient since the velocity bunching imposes a longitudinal phase space distortion, leading to asymmetric current profiles with sharp rising charge distribution at the bunch head; therefore, high frequency (THz) radiation can be emitted if the bunch goes across a radiator (coherent transition radiation) [J17]. The resulting THz radiation is more intense than other sources and it has been used for advanced material studies [J16, S01].
THz radiation	
Laser-plasma accelerators, CRISP project, FIRB project, Eupraxia project	Plasma-based accelerators represent the new frontier for the acceleration of high quality, i.e. high brightness, electron beams because of their capability to sustain extremely large accelerating gradients. In conventional Radio-Frequency (RF) linear accelerators, accelerating gradients are currently limited to ~100 MV/m, mainly due to breakdown occurring on the metallic walls of the devices. Ionized plasmas, however, can sustain electron plasma waves with electric fields three orders of magnitude higher than those achievable with actual RF technologies. Moreover, the accelerating field strength is tunable by adjusting the plasma density. Even though the principle of plasma-based acceleration has been proven by several groups, the so accelerated beams still suffer from large angular divergence, large energy spread [J40, S08], poor reproducibility, which prevent their use as an alternative to conventional RF accelerators which typically provide stable and high quality electron beams. A possible solution is to use innovative transport lines based on conventional technology, such quadrupole or solenoid based transport lines arranged in a clever way [J4, J46, S11]. Another approach towards plasma-accelerated high-brightness electron beams relies on the use of the plasma only as the active media, injecting electrons into a pre-formed plasma channel. A first scheme consists in injecting a witness electron

	bunch in a plasma where the plasma wave is excited by a high-power laser pulse, i.e. external injection in a Laser Wake Field Accelerator (LWFA) [J10, J27, J11]. The second scheme relies on the induction of coherent plasma oscillations with multiple electron bunches, that is a resonant Plasma Wake Field Accelerator (PWFA). Such idea relies on using a comb beam, i.e. a train of equidistant bunches, to increase the accelerating gradient. A scheme to produce comb-like beams was conceived at Laboratori Nazionali di Frascati and successfully tested at SPARC for the first time [J13, J25]. The additional benefit of resonant PWFA relies on the use of lower charge bunches in the train with respect to traditional PWFA, with the advantage of a better control of acceleration and transport [J6]. The proof of principle experiments of resonant wake field acceleration triggered improvements in the plasma generation schemes [J28], in active plasma lens for symmetric beam focusing [J2], in the SPARC synchronisation [J15], in standard bunch measurement [J8, J35] as well as in non-intercepting beam diagnostics [J29]; also, the betatron radiation emitted by electron moving in the plamsa channel can be used [J19]. Efforts are ongoing also in measurement the plasma channel properties with spectroscopic [J5, J9] and opto-acoustic [J14] methods. Moreover, to support the plasma source commissioning, simplified (but accurate) models are necessary to properly choose the machine working point. Those models, before being used, must be assessed against accurate Particle In Cell simulation [J30].
Compton Sources ELI-NP	High brightness linacs are used also in Gamma ray source based on Compton back scattering between electron and counter-propagating laser pulses. A possible design has been proposed in [J38, S07] investigating the bam dynamics as well as the issues due to the necessity of multi-bunch operation to increase the luminosity. A single bunch, proof of principle experiment has been done at SPARC_LAB [J12]. The Gamma Beam Source according to [J38, S07] is being built in Romania under the ELI-NP project supported by EU. One of the most relevant issues is the need of multi-bunch, high charge beams affecting the design and the operation of accelerating structures [J1] and diagnostics [J7].
Medical applications Hadroterapy, post-acceleration,	Hadroterapy protons are typically produced with Radio Frequency quadrupoles and then delivered to the patient with circular accelerators (even if recently hospital proton linacs are under construction). Few tens of MeV protons can also be produced with high energy laser pulse hitting a target; such scheme has interesting feature in terms of beam properties, versatility and compactness. In order to improve the beam properties up to medical requirements [J43, J50] proposed a post acceleration scheme based on modified hospital proton linac cavities. A. Mostacci has been involved in the design of particle detectors for

Montecarlo, FLUKA	biomedicine, joining the research on Treatment Planning Systems (TPS) for tumour hadroterapy with carbon ions [J59] using Monte Carlo techniques (FLUKA code, [J58]); he was involved in the FLUKA collaboration on the optics module in order to calibrate the simulations against measurements on Compton chamber for Single Photon Emission Computed Tomography [J63, S19].

Part VIII – Summary of Scientific Achievements

The scientific activity quality parameters computed on the whole scientific production are:

Product Type	Number	Data Base	Start	End
Papers (Journals and conferences)	175	SCOPUS	1997	2017

Total Impact factor	**171** (on journals)
Total Citations	**978** (SCOPUS)
Average Citations per Product	**5.60** (SCOPUS)
Hirsch (H) index	**17** (SCOPUS)
Normalized H index*	**0.85** (SCOPUS)

*H index divided by the academic seniority (1997-2017).

VIIIA - Scientific activity quality parameters on subsets of the research products, as requested in the announcement of the selection.

Quality parameters on the last 10 years research activity

Product Type	Number	Data Base	Start	End
Papers (Journals and conferences)	153	SCOPUS	2006	2016

Total Impact factor	**157** (on journals)
Total Citations	**926** (SCOPUS)
Average Citations per Product	**6.05** (SCOPUS)
Hirsch (H) index	**17** (SCOPUS)

Quality indexes on the 20 selected publications on journals

Total Impact factor	**93**
Total Citations	**601** (SCOPUS)
Average Citations per Product	**30** (SCOPUS)
Hirsch (H) index	**17** (SCOPUS)

Invited Review Papers

The **International Committee for Future Accelerators (ICFA)** is the reference international panel in accelerator physics and it is chaired by Yong Ho Chin, (KEK, Japan). The ICFA Beam Dynamics Newsletter of December 2016 collects 26 articles on the "Collective Effects in Particle Accelerators", edited by E. Métral (CERN, Switzerland); among them, **A. Mostacci wrote the review contribution on "Beam-Coupling Impedance and Wake Field – Bench Measurements".**

List of peer reviewed papers on international Journals (total number 76)

[J1]. D. Alesini, **A. Mostacci**, et al, *Design of high gradient, high repetition rate damped C-band rf structures*, accepted for publication in Physical Review Accelerators and Beams (**2017**).

[J2]. R. Pompili, **A. Mostacci**, et al., *Experimental characterization of active plasma lensing for electron beams*, accepted for publication in Applied Physics Letters (**2017**).

[J3]. N. Biancacci, **A. Mostacci**, et al., *Impedance simulations and measurements on the LHC collimators with embedded beam position monitors*, Phys. Rev. ST Accel. Beams (**2017**); doi: 10.1103/PhysRevAccelBeams.20.011003.

[J4]. M. Scisciò, **A. Mostacci**, et al., *Parametric study of transport beam lines for electron beams accelerated by laser-plasma interaction*, Journal of Applied Physics (**2016**); doi: 10.1063/1.4942626.

[J5]. F. Filippi, **A. Mostacci**, et al., *Spectroscopic measurements of plasma emission light for plasma-based acceleration experiments*, Journal of Instrumentation (**2016**); doi: 10.1088/1748-0221/11/09/C09015.

[J6]. E. Chiadroni, **A. Mostacci**, et al., *Beam manipulation for resonant plasma wakefield acceleration*, Nucl. Instrum. Methods Phys. Res. A (**2016**); doi: 10.1016/j.nima.2017.01.017

[J7]. M. Marongiu, **A. Mostacci**, et al., *Thermal behavior of the optical transition radiation screens for the ELI-NP Compton Gamma source*, Nucl. Instrum. Methods Phys. Res. A (**2016**); doi: 10.1016/j.nima.2016.07.040.

[J8]. A. Cianchi, **A. Mostacci**, et al., *Transverse emittance diagnostics for high brightness electron beams*, Nucl. Instrum. Methods Phys. Res. A (**2016**); doi: 10.1016/j.nima.2016.11.063

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Part IX– Selected Publications (citations according to SCOPUS on 23/12/2017)

		IF	Citations
S01	Giorgianni, F., Chiadroni, E., Rovere, A., Cestelli-Guidi, M., Perucchi, A., Bellaveglia, M., Castellano, M., Di Giovenale, D., Di Pirro, G., Ferrario, M., Pompili, R., Vaccarezza, C., Villa, F., Cianchi, A., **Mostacci, A.**, Petrarca, M., Brahlek, M., Koirala, N., Oh, S., Lupi, S., **Strong nonlinear terahertz response induced by Dirac surface states in Bi2Se3 topological insulator**, Nature Communications (**2016**), DOI: 10.1038/ncomms11421	**11.3**	**2**
S02	Petralia, A., Anania, M.P., Artioli, M., Bacci, A., Bellaveglia, M., Carpanese, M., Chiadroni, E., Cianchi, A., Ciocci, F., Dattoli, G., Di Giovenale, D., Di Palma, E., Di Pirro, G.P., Ferrario, M., Giannessi, L., Innocenti, L., **Mostacci, A.**, Petrillo, V., Pompili, R., Rau, J.V., Ronsivalle, C., Rossi, A.R., Sabia, E., Shpakov, V., Vaccarezza, C., Villa, F., **Two-Color Radiation Generated in a Seeded Free-Electron Laser with Two Electron Beams** Physical Review Letters (**2015**), DOI: 10.1103/PhysRevLett.115.014801	**7.65**	**5**
S03	Ronsivalle, C., Anania, M.P., Bacci, A., Bellaveglia, M., Chiadroni, E., Cianchi, A., Ciocci, F., Dattoli, G., Di Giovenale, D., Di Pirro, G., Ferrario, M., Gatti, G., Giannessi, L., **Mostacci, A.**, Musumeci, P., Palumbo, L., Petralia, A., Petrillo, V., Pompili, R., Rau, J.V., Rossi, A.R., Vaccarezza, C., Villa, F., **Large-bandwidth two-color free-electron laser driven by a comb-like electron beam** New Journal of Physics (**2014**), DOI: 10.1088/1367-2630/16/3/033018	**3.57**	**11**
S04	Petrillo, V., Anania, M.P., Artioli, M., Bacci, A., Bellaveglia, M., Chiadroni, E., Cianchi, A., Ciocci, F., Dattoli, G., Di Giovenale, D., Di Pirro, G., Ferrario, M., Gatti, G., Giannessi, L., **Mostacci, A.**, Musumeci, P., Petralia, A., Pompili, R., Quattromini, M., Rau, J.V., Ronsivalle, C., Rossi, A.R., Sabia, E., Vaccarezza, C., Villa, F., **Observation of time-domain modulation of free-electron-laser pulses by multipeaked electron-energy spectrum** Physical Review Letters (**2013**), DOI: 10.1103/PhysRevLett.111.114802	**7.65**	**38**

S05	Giannessi, L., Bellaveglia, M., Chiadroni, E., Cianchi, A., Couprie, M.E., Del Franco, M., Di Pirro, G., Ferrario, M., Gatti, G., Labat, M., Marcus, G., **Mostacci, A.**, Petralia, A., Petrillo, V., Quattromini, M., Rau, J.V., Spampinati, S., Surrenti, V., **Superradiant cascade in a seeded free-electron laser** Physical Review Letters (**2013**), DOI: 10.1103/PhysRevLett.110.044801	**7.65**	**15**
S06	Ferrario, M., Alesini, D., Anania, M., Bacci, A., Bellaveglia, M., Bogdanov, O., Boni, R., Castellano, M., Chiadroni, E., Cianchi, A., Dabagov, S.B., Martinis, C.D., Giovenale, D.D., Pirro, G.D., Dosselli, U., Drago, A., Esposito, A., Faccini, R., Gallo, A., Gambaccini, M., Gatti, C., Gatti, G., Ghigo, A., Giulietti, D., Ligidov, A., Londrillo, P., Lupi, S., **Mostacci, A.**, Pace, E., Palumbo, L., Petrillo, V., Pompili, R., Rossi, A.R., Serafini, L., Spataro, B., Tomassini, P., Turchetti, G., Vaccarezza, C., Villa, F., Dattoli, G., Palma, E.D., Giannessi, L., Petralia, A., Ronsivalle, C., Spassovsky, I., Surrenti, V., Gizzi, L., Labate, L., Levato, T., Rau, J.V., **SPARC-LAB present and future** Nucl. Instr. and Methods in Physics Research B (**2013**), DOI: 10.1016/j.nimb.2013.03.049	**1.39**	**53**
S07	Bacci, A., Alesini, D., Antici, P., Bellaveglia, M., Boni, R., Chiadroni, E., Cianchi, A., Curatolo, C., Di Pirro, G., Esposito, A., Ferrario, M., Gallo, A., Gatti, G., Ghigo, A., Migliorati, M., **Mostacci, A.**, Palumbo, L., Petrillo, V., Pompili, R., Ronsivalle, C., Rossi, A.R., Serafini, L., Spataro, B., Tomassini, P., Vaccarezza, C., **Electron Linac design to drive bright Compton back-scattering gamma-ray sources** Journal of Applied Physics (**2013**), DOI: 10.1063/1.4805071	**2.1**	**25**
S08	Migliorati, M., Bacci, A., Benedetti, C., Chiadroni, E., Ferrario, M., **Mostacci, A.**, Palumbo, L., Rossi, A.R., Serafini, L., Antici, P., **Intrinsic normalized emittance growth in laser-driven electron accelerators** Physical Review Special Topics - Accelerators and Beams (**2013**), DOI: 10.1103/PhysRevSTAB.16.011302	**1.5**	**20**
S09	Giannessi, L., Artioli, M., Bellaveglia, M., Briquez, F., Chiadroni, E., Cianchi, A., Couprie, M.E., Dattoli, G., Di Palma, E., Di Pirro, G., Ferrario, M., Filippetto, D., Frassetto, F., Gatti, G., Labat, M., Marcus, G., **Mostacci, A.**, Petralia, A., Petrillo, V., Poletto, L., Quattromini, M., Rau, J.V., Rosenzweig, J., Sabia, E., Serluca, M., Spassovsky, I., Surrenti, V., **High-order-harmonic generation and superradiance in a seeded free-electron laser** Physical Review Letters (**2012**), DOI: 10.1103/PhysRevLett.108.164801	**7.65**	**24**
S10	Marcus, G., Artioli, M., Bacci, A., Bellaveglia, M., Chiadroni, E., Cianchi, A., Ciocci, F., Del Franco, M., Di Pirro, G., Ferrario, M., Filippetto, D.,	**3.14**	**18**

	Gatti, G., Giannessi, L., Labat, M., **Mostacci, A.**, Petralia, A., Petrillo, V., Quattromini, M., Rau, J.V., Rossi, A.R., Rosenzweig, J.B., **Time-domain measurement of a self-amplified spontaneous emission free-electron laser with an energy-chirped electron beam and undulator tapering** Applied Physics Letters (**2012**), DOI: 10.1063/1.4754612		
S11	Antici, P., Bacci, A., Benedetti, C., Chiadroni, E., Ferrario, M., Rossi, A.R., Lancia, L., Migliorati, M., **Mostacci, A.**, Palumbo, L., Serafini, L., **Laser-driven electron beamlines generated by coupling laser-plasma sources with conventional transport systems** Journal of Applied Physics (**2012**), DOI: 10.1063/1.4740456	**2.1**	**17**
S12	**Mostacci, A.**, Bellaveglia, M., Chiadroni, E., Cianchi, A., Ferrario, M., Filippetto, D., Gatti, G., Ronsivalle, C., **Chromatic effects in quadrupole scan emittance measurements** Physical Review Special Topics - Accelerators and Beams (**2012**), DOI: 10.1103/PhysRevSTAB.15.082802	**1.5**	**18**
S13	Labat, M., Bellaveglia, M., Bougeard, M., Carré, B., Ciocci, F., Chiadroni, E., Cianchi, A., Couprie, M.E., Cultrera, L., Del Franco, M., Di Pirro, G., Drago, A., Ferrario, M., Filippetto, D., Frassetto, F., Gallo, A., Garzella, D., Gatti, G., Giannessi, L., Lambert, G., **Mostacci, A.**, Petralia, A., Petrillo, V., Poletto, L., Quattromini, M., Rau, J.V., Ronsivalle, C., Sabia, E., Serluca, M., Spassovsky, I., Surrenti, V., Vaccarezza, C., Vicario, C., **High-gain harmonic-generation free-electron laser seeded by harmonics generated in gas** Physical Review Letters (**2011**), DOI: 10.1103/PhysRevLett.107.224801	**7.65**	**58**
S14	Giannessi, L., Bacci, A., Bellaveglia, M., Briquez, F., Castellano, M., Chiadroni, E., Cianchi, A., Ciocci, F., Couprie, M.E., Cultrera, L., Dattoli, G., Filippetto, D., Del Franco, M., Di Pirro, G., Ferrario, M., Ficcadenti, L., Frassetto, F., Gallo, A., Gatti, G., Labat, M., Marcus, G., Moreno, M., **Mostacci, A.**, Pace, E., Petralia, A., Petrillo, V., Poletto, L., Quattromini, M., Rau, J.V., Ronsivalle, C., Rosenzweig, J., Rossi, A.R., Rossi Albertini, V., Sabia, E., Serluca, M., Spampinati, S., Spassovsky, I., Spataro, B., Surrenti, V., Vaccarezza, C., Vicario, C., **Self-amplified spontaneous emission free-electron laser with an energy-chirped electron beam and undulator tapering** Physical Review Letters (**2011**), DOI: 10.1103/PhysRevLett.106.144801	**7.65**	**53**

S15	Ferrario, M., Alesini, D., Bacci, A., Bellaveglia, M., Boni, R., Boscolo, M., Castellano, M., Chiadroni, E., Cianchi, A., Cultrera, L., Di Pirro, G., Ficcadenti, L., Filippetto, D., Fusco, V., Gallo, A., Gatti, G., Giannessi, L., Labat, M., Marchetti, B., Marrelli, C., Migliorati, M., **Mostacci, A.**, Pace, E., Palumbo, L., Quattromini, M., Ronsivalle, C., Rossi, A.R., Rosenzweig, J., Serafini, L., Serluca, M., Spataro, B., Vaccarezza, C., Vicario, C., **Experimental demonstration of emittance compensation with velocity bunching** Physical Review Letters (**2010**), DOI: 10.1103/PhysRevLett.104.054801	**7,65**	**85**
S16	Cianchi, A., Alesini, D., Bacci, A., Bellaveglia, M., Boni, R., Boscolo, M., Castellano, M., Catani, L., Chiadroni, E., Cialdi, S., Clozza, A., Cultrera, L., Di Pirro, G., Drago, A., Esposito, A., Ferrario, M., Ficcadenti, L., Filippetto, D., Fusco, V., Gallo, A., Gatti, G., Ghigo, A., Giannessi, L., Ligi, C., Mattioli, M., Migliorati, M., **Mostacci, A.**, Musumeci, P., Pace, E., Palumbo, L., Pellegrino, L., Petrarca, M., Preger, M., Quattromini, M., Ricci, R., Ronsivalle, C., Rosenzweig, J., Rossi, A.R., Sanelli, C., Serafini, L., Serio, M., Sgamma, F., Spataro, B., Tazzioli, F., Tomassini, S., Vaccarezza, C., Vescovi, M., Vicario, C., **High brightness electron beam emittance evolution measurements in an rf photoinjector** Physical Review Special Topics - Accelerators and Beams (**2008**), DOI: 10.1103/PhysRevSTAB.11.032801	**1.5**	**32**
S17	**Mostacci, A.**, Bacci, A., Boscolo, M., Chiadroni, E., Cianchi, A., Filippetto, D., Migliorati, M., Musumeci, P., Ronsivalle, C., Rossi, A.R., **Analysis methodology of movable emittance-meter measurements for low energy electron beams** Review of Scientific Instruments (**2008**), DOI: 10.1063/1.2835715	**1.34**	**9**
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