Curriculum Vitae – Dott. Lorenzo Bonechi

- **PERSONAL INFORMATION**

Family name, First name: Bonechi, Lorenzo - Nationality: Italian - Date of birth: 20 June 1973

Researcher unique identifiers: Scopus author ID I3906982800, ORCID ID 0000-0001-6097-1181

- **EDUCATION**

2004 PhD in Physics, Physics Department of the University of Florence, Italy.
Final dissertation: "Measurements of Cosmic Rays at Earth with the Experiment ADAMO" (in italian); supervisor: prof. Oscar Adriani. http://inspirehep.net/record/670209

2000 Master in Physics (field: Nuclear and Subnuclear), University of Florence, Italy. Title: "Development of a magnetic spectrometer for the measurement of cosmic rays on earth and first results" (in italian) http://inspirehep.net/record/551246/

- **CURRENT POSITION**

2011 – now Permanent position as Researcher, National Institute for Nuclear Physics (INFN), Unit of Florence, Italy

- **PREVIOUS POSITIONS AND QUALIFICATIONS**

2014 National Scientific Qualification (ASN) in 2014 to function as Associate Professor for sector 02/A1 (Experimental Physics of Fundamental Interactions)

2010 Fellowship with University of Florence funded by Regione Toscana, Italy

2010 Post-Doc, Sicilian Centre for Nuclear Physics and Structure of Matter (CSFNSM), Dept. of Physics and Astronomy, Univ. of Catania, Italy

2007 – 2009 Post-Doctoral Research Scientist , Physics Department, University of Florence, Italy

2006 Post-Doctoral Research Scientist , INFN Unit of Florence, Italy

2005 Post-Doctoral Research Scientist , Physics Department, University of Florence, Italy

1998 Grant by CERN for the participation to the "Summer Student Programme"

- **SUPERVISION OF STUDENTS AND POSTDOCTORAL FELLOWS**

2013 – now 2 Postdoc, 1 PhD and 2 Master - Physics Department of the University of Florence, Italy

2011 – 2012 2 Bachelor students, Physics Department of the University of Florence, Italy

2011 1 Master, Faculty of Science of Education, University of Florence, Italy

- **TEACHING ACTIVITIES**

2011 – now Lecturer for the "Laboratory of Subnuclear Physics" course of the Master Degree in Physics and Astrophysics of the University of Florence, Italy

2010 – 2011 Lecturer for "Didactics of Physics" course for the degree in Science of Primary Education at the University of Florence, Italy

2007 – 2010 (for 3 years) Tutor for the students of the "Physics Experiments I" course (laboratory of classical mechanics) of the Degree in Physics at the University of Florence, Italy

2009 Course of "Physics Laboratory" for high school teachers at the Physics Department of the University of Florence, Italy

2008 – 2009 Lecturer for the "Fundamentals of Physics" and "Didactics of Physics" courses for the degree in Science of Primary Education of the University of Florence, Italy

2006 Lecturer on "Anti-Matter in Cosmic Rays" for the Senior University of Sesto Fiorentino, Florence, Italy

- **ORGANISATION OF CONFERENCES AND SYMPOSIA**

2012 Member of the Local Organizing Committee, Speaker and Responsible of the Lab. at the "III National Seminar on Innovative Detectors", INFN Florence, Italy (30 participants)

2004 Member of the Local Organizing Committee and Review Editor of the Proceedings of the "XIX European Cosmic Ray Symposium", Aug. 30 – Sep. 3, Florence, Italy (200 participants)

- **INSTITUTIONAL RESPONSIBILITIES**

2014 – now Elected representative of the Florence Unit's Researchers for the national INFN council.

2011 – now Faculty Board Member, degree in Physics and Astrophysics, Univ. of Florence, Italy.
2011 – now Member of the Steering Committee of OPENLAB (http://www.openlab.unifi.it), the centre of the Florence Univ. devoted to the science dissemination to the wider public and schools
2008 – 2011 Faculty Board Member, degree in Science of Primary Education, Univ. of Florence, Italy.

- **COMMISSIONS OF TRUST**

2013 – now Referee for the Ministry of Education, University and Research (MIUR) for the evaluation of research programs related to national calls for funding.

- **MAJOR COLLABORATIONS AND RESPONSIBILITIES**

2000 – now Responsible for the ADAMO experiment which measures cosmic rays at ground level. http://hep.fi.infn.it/ADAMO

2004 – now Member of the LHCf international collaboration (experiment at LHC for the study of neutral particles emitted along the beam line during proton-proton and proton-Nucleus interactions). http://directory.web.cern.ch/directory - http://www.stelab.nagoya-u.ac.jp/LHCf
- Coordinator and responsible for design, production and integration of silicon tracker
- Responsible for the Slow Control software
- Coordinator of the working group on data analysis for proton-Lead run at LHC in 2013
- Shift coordinator for the proton-Lead run at LHC in 2013
- Responsible for the management and use of funds at CERN for the experiment
- From 2015 local responsible for the experiment in Florence

2015 – now Member of the MURAVES collaboration (MUon RAdiography of VESuvius), a rewarding project financed by the Italian Ministry of University and Research (MIUR)
- Local responsible for this project in Florence

2012 – 2014 Member of the Mu-Ray international collaboration (MUon RAdiographY of volcanoes). http://mu-ray.fisica.unina.it/
- main activities:
  - characterization and optimization of new Silicon Photomultiplier (SiPM)
  - study of charge collection in scintillators readout by means of SiPM devices
  - study of detector's performance through smaller prototypes
  - analysis of data taken at the Puy de Dome volcano (France)

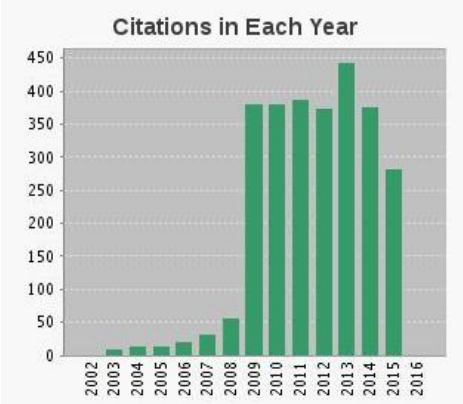
2013 – 2015 Scientific responsible for the SENSLUM project, financed by INFN and Regione Toscana (POR CRO FSE 2007-2013 Asse IV – Capitale Umano) for the characterization and development of optical sensors of new conception, concerning mainly the SiPM technology. I have been responsible for a post-doc contract, assigned to dr. Piergiulio Lenzi, for two years

2001 – 2011 Member of the Wizard-PAMELA international collaboration (space experiment for the study of antimatter in primary cosmic rays). http://pamela.roma2.infn.it/index.php
- Responsible for production, testing and assembling of microstrip silicon planes for the magnetic spectrometer.

2005 – 2010 Member of the CALET international collaboration (experiment on the International Space Station for the study of the high energy cosmic rays) http://www3.unisi.it/fisica/dip/ric/space/calet/

- **SCIENTIFIC OUTPUT (from ISI Web of Knowledege)**

Results found:	106
Sum of the Times Cited:	2778
Sum of Times Cited without self-citations:	2543
Citing Articles:	1790
Citing Articles without self-citations:	1698
Average Citations per Item:	26.21
h-index:	15



- **CONFERENCES**

17 participations at conferences and workshops, of which **14 invited talks at international conferences**

- **OUTREACH**

Since 2012 I actively contribute to the outreach initiatives organized by OPENLAB and INFN.

Early achievements track-record

My research activity is focused on the study of the charged cosmic radiation. Since 1999 I actively contributed to the design and construction of the **ADAMO** magnetic spectrometer [15,16]. ADAMO was conceived mainly as a prototype of the magnetic spectrometer of the **PAMELA** satellite experiment [4]. During my PhD I was **responsible for the production, test and assembling of the microstrip silicon tracking modules** for PAMELA. This experiment is devoted to the study of antimatter in the Universe. PAMELA was launched on 2006 and it is still taking data and producing important results. The most famous one is the evidence of an unexpected overabundance of positrons with respect to the predictions by cosmic ray propagation models for energies beyond 20 GeV [1], the meaning of which is still at the centre of the scientific debate, for which PAMELA is currently one of the most successful cosmic-ray experiments on the international scene [1-6,10,12]. During the assembling of the PAMELA tracker **I found an important defect of implantation on many of the silicon microstrip sensors produced by Hamamatsu for the PAMELA flight model**. I prepared a report about electrical measurements at a probe station and submitted it to Hamamatsu. In consequence of this new high-quality sensors were successively obtained for free by the Japanese company. I worked in parallel to the ADAMO detector. After the first test phase, during which ADAMO was used as a test detector finalised to the PAMELA project, **I decided to modify the spectrometer in such a way to allow the study of the rare components of cosmic rays at earth**: protons and electrons. This modification brought the detector's acceptance from 1 cm^2sr to almost 7 cm^2sr, making it possible to study protons up to a few tens of GeV/c in one month data taking. I designed and produced also a new trigger system based on fast plastic scintillator and photomultipliers to be used as a Time of Flight system for low energy cosmic rays. Finally **I exploited the ADAMO detector for a preliminary measurement of the differential cosmic ray flux at ground** [15,16]. I measured the all-particle spectra of charged cosmic rays for momentum $0.1\ \mathrm{GeV}/c < p < 130\ \mathrm{GeV}/c$ and zenith angle $0° < \theta < 80°$. Particle identification was not possible in this wide momentum range. Since 2005 I obtained post-doc fellowships for five years at the Department of Physics and INFN in Florence. These positions allowed me to continue my hardware and software activities for PAMELA, working to the integration and test of the detector's flight model. I designed many mechanical supports for safe integration and cabling. In 2004 I joined the **LHCf** collaboration [7-9,17,18], actively contributing to the design of a calorimetric system made of two independent detectors, for the study of "forward physics" in the high energy particle interactions at LHC (CERN, Geneva). I am **responsible for the design and production of the silicon microstrip layers** that are installed in one of these detectors. I designed and assembled the tracking modules for the first run phase at LHC, started in 2009 and concluded in 2013, taking decisions on the silicon layers, geometries, materials and glues to be used. Although LHCf is an experiment at an accelerator, it is strictly connected to cosmic-ray physics. Its measurements allow in fact the calibration of Monte Carlo codes modeling the particle cascades produced by very high-energy cosmic rays entering the Earth atmosphere. **I wrote and I am responsible for the LHCf slow-control system**, the software used for setting-up and monitoring of the detectors. **I am responsible for the management and use of the LHCf funds at CERN**. **I was shift coordinator** for LHCf during the proton-Lead ion run at LHC in 2013 and **I coordinate a group of ten people in charge of data analysis for this run**. I contributed also to several tests with particle beams at the PS/SPS (CERN, Geneva) and GSI (Darmstadt) accelerators for the ADAMO, PAMELA and LHCf detectors.

Since January 3rd, 2011 I have a **permanent position as researcher at INFN Unit of Florence**. Currently I am working to the upgrade of the LHCf experiment. **I am responsible for the production of the new microstrip silicon layers and I am coordinating an INFN technician for this purpose**. From 2012 I have been involved in the **Mu-Ray experiment** [11,13,14] devoted to the muon-absorption radiography of volcanic structures, in collaboration with the INFN Unit of Naples and National Institute of Geophysics and Volcanology (INGV, Italy). This experiment is designed to measure the density profile of the Vesuvius volcano by using the muon absorption technique. Currently we have completed two preliminary measurements at the Vesuvius volcano [11] (Naples, Italy) and at the Puy de Dome volcano in France. Results will be published soon. **I have got funds with the SENSLUM project for a two years post-doc grant (assigned to dr. Piergiulio Lenzi) for the characterization of SiPM devices** in relation to the activity on muon radiography. **I have been the scientific responsible for SENSLUM**. I am currently **responsible in Florence for the MURAVES** (MUon RAdiography of VESuvius) project, that has been approved by the Italian Ministry of Education, University and Research (MIUR).

In parallel to the main research activities I have attended **several international conferences**, contributing with **eleven invited talks**, and several courses on high-energy and cosmic-ray physics and on the main particle interaction simulation tools. I have participated to **several dissemination activities** carried out both by Physics Department and INFN Unit of Florence and I have signed **more than 150 papers for conference proceedings** that are not included in the main on-line databases (INSPIRE, SCOPUS, Web of Science etc.)

- **REPRESENTATIVE PUBLICATIONS (citations: ISI Web of Knowledge)**
  1. O. Adriani et al., Nature, 458 (2009) 607-609 (898 citations)
  2. O. Adriani et al., Phys.Rev.Lett. 102 (2009) 051101 (330 citations)
  3. O. Adriani et al., Phys. Rev. Lett. 105 (2010) 121101 (176 citations)
  4. P. Picozza et al., Astropart. Phys., Vol. 27 (2007), pag. 296-315 (148 citations)
  5. O. Adriani et al., SCIENCE, vol. 332, p. 69-72 (114 citations)
  6. O. Adriani et al., Astropart. Phys. 34 (2010) 1–11 (67 citations)
  7. The LHCf Collaboration, 2008 JINST 3 S08006 (34 citations)
  8. O. Adriani et al., Phys. Lett. B 703 (2011) 128-134 (28 citations)
  9. O. Adriani et al., 2010 JINST 5 P01012 (10 citations)
  10. O. Adriani et al., Nucl. Instr. Meth. Phys. Res. A 511 (2003) 72-75 (32 citations)

- **PUBLICATIONS WITHOUT MY PHD SUPERVISOR**
  11. F. Ambrosino et al, JINST 9 (2014) C02029, DOI:10.1088/1748-0221/9/02/C02029
  12. D. Campana et al., Nucl. Instrum. Meth. A 598 (2009) 696-701, DOI: 10.1016/j.nima.2008.10.014
  13. A. Anastasio et al., Nucl. Instrum. Meth. A 732 (2013) 423–426, DOI: 10.1016/j.nima.2013.05.159
  14. A. Anastasio et al., Nucl. Instrum. Meth. A 718 (2013) 134–137, DOI: 10.1016/j.nima.2012.08.065
  15. L. Bonechi et al., Proc. of XXVIII ICRC, Tsukuba (Japan), session SH1.5 pag. 3485-3488, 2003
  16. L. Bonechi et al., Proc. of XXIX ICRC, Pune (India), session HE2.4, Vol. 9, pag. 283-286, 2005 WOS:000243523100072
  17. L. Bonechi, Nucl. Phys. B (Proc. Suppl.) 177-178 (2008) pag. 263-264 DOI: 10.1016/j.nuclphysbps.2007.11.122
  18. L. Bonechi on behalf of the LHCf collab., Il Nuovo Cimento, Vol. 32 C, N. 3-4 DOI 10.1393/ncc/i2009-10439-y
  19. L. Bonechi et al., "Projective reconstruction of underground structures from atmospheric muons absorption data", submitted to JINST
  20. S. Straulino and L. Bonechi, Phys. Educ. 45 (2010), 329-330 DOI:10.1088/0031-9120/45/4/F05
  21. S. Straulino and L. Bonechi, Phys. Educ. 46 (2011) 583-586 DOI: 10.1088/0031-9120/46/5/011

- **INVITED TALKS AT INTERNATIONAL CONFERENCES**
  - Oct. 2002: 8th Topical Seminar on Innovative Particle and Radiation Detectors, Siena (Italy). *A powerful detector for cosmic rays: the magnetic spectrometer of the PAMELA satellite experiment*.
  - Oct. 2005: 7th Int. Conf. on Large Scale Applications and Radiation Hardness of Semiconductor Detectors, Florence (Italy). *Status of the PAMELA silicon tracker*.
  - Jun. 2006: XII International Conference on Calorimetry in High Energy Physics (CALOR 2006), Chicago (USA). *The LHCf experiment at LHC.*
  - Jun. 2007: 8th Int. Conf. on Large Scale Applications and Radiation Hardness of Semiconductor Detectors, Florence (Italy). *Production and test of the LHCf microstrip silicon system*.
  - Oct. 2008: 11th Topical Seminar on Innovative Particle and Radiation Detectors, Siena (Italy). *Status of the LHCf experimental apparatus at LHC.*
  - Apr. 2009: Incontri di Fisica delle Alte Energie – VIII edition, Bari (Italy). *Study of the forward emission of neutral particles in proton-proton interactions with the LHCf experiment*.
  - Oct. 2009: ICATPP 2009, Como (Italy). *NEUCAL: a prototype detector for electron/hadron discrimination through neutron measurement.*
  - Sept. 2010: XL International Symposium on Multiparticle Dynamics (ISMD 2010), Antwerp (Belgium). *Forward energy and particle flow with the LHCf experiment*.
  - Oct. 2011: Prospects of p-Pb collisions during the 2012 LHC HI run, CERN. *LHCf physics and requirements for p-Pb interactions at 3.5 TeV proton energy*.
  - Dec. 2011: Council-Hundred-and-sixty-first Session, CERN Coucil meeting. *LHCf 2011 - Christmas Report.*
  - Aug. 2013: International Conference on New Frontieres in Physics, Kolymbari, Crete (Greece). *Forward physics with the LHCf experiment: a LHC contribution to cosmic-ray physics*
  - Aug. 2014: International Conference on New Frontieres in Physics, Kolymbari, Crete (Greece).

Forward physics at LHC for cosmic ray studies with the LHCf experiment

- Nov. 2014: Muographers 2014, Tokyo (Japan). *Intersections between Muon-Absorption Radiography and Archaeology: the case of the Tharros Phoenician-Roman remains*
- Apr. 2015: NPQCD 2015, Cortona (Italy). *Results from forward detectors at LHC and their impact in the study of High Energy Cosmic Rays*