

Curriculum vitae

• PERSONAL INFORMATION

Family name, First name: Bisogni, Maria Giuseppina

Researcher unique identifier(s) (ORCID): 0000-0002-4886-8891

Nationality: Italian

Total number of publications in peer-review journals: 197 (scopus 7/7/2023)

Total number of citations: 2065

H index: 21

• EDUCATION

2000 Specialist in Medical Physics, Final grade: “50/50 cum Laude” specialization school in medical Physics, Dept. of Physics, Univ. of Pisa, Italy

1999 PhD in Physics, Dept. of Physics, Univ. of Pisa, Italy, PhD supervisor: Prof. Arnaldo Stefanini

1994 Master Sc in Physics, Final grade: “110/110 cum Laude”, Dept. of Physics, Univ. of Pisa, Italy

• CURRENT POSITIONS

2014 – to date Associate professor, Department of Physics, University of Pisa, Italy

2002 – to date National Institute for Nuclear Physics (INFN) associate researcher Italy

• PREVIOUS POSITIONS AND FELLOWSHIPS

2002-2014 Researcher with Tenure, Dept. of Physics, Univ. of Pisa, Italy

2001-2002 Post Doc in Medical Physics, Dept. of Physics, Univ. of Pisa, Italy

2000-2001 Professorship, Faculty of Science, Univ. of Sassari, Italy

1999-2000 Fellowship, Medical Physics School, Dept. of Physics, Univ. of Pisa, Italy

1995-1996 Fellowship, Medical Physics School, Dept. of Physics, Univ. of Pisa, Italy

• NATIONAL SCIENTIFIC QUALIFICATION

2020 - ASN Abilitazione I Fascia Bando D.D. 2175/2018 Settore Concorsuale 02/D1 Fisica Applicata, Didattica e Storia della Fisica

• TEACHING ACTIVITIES

2019 – to date Professor of Radiation Dosimetry, Dept. of Physics, University of Pisa, Italy

2014 – to date Professor, Medical Physics, Master Degree in Medicine and Surgery, University of Pisa, Italy

2004 – to date Professor, Laboratory of Medical Physics, Master Degree in Physics, University of Pisa

2015 – 2020 Professor, Applied Physics, Master Degree in Dentistry, University of Pisa, Italy

• SUPERVISION OF MASTER AND PhD STUDENTS AND POSTDOCTORAL FELLOWS

2008 – to date Number of Postdocs: **6**/ PhD: **4**/ Master Students: **18** at Department of Physics, University of Pisa, Italy

• INSTITUTIONAL RESPONSIBILITIES

2016 – to date vice-director of the specialization school in Medical Physics, University of Pisa, Italy

2015 – to date member of the council and of the teaching commission of the PhD school in Physics, University of Pisa, Italy

• COMMISSIONS OF TRUST

2022 – to date member elected of the executive board of the National FIS/07 Coordination

2021 – to date member of the scientific board of Centro Pisano Multidisciplinare sulla Ricerca e Implementazione Clinica della Flash Radiotherapy- CPFR, Pisa

2021 – to date member of the national scientific board of INFN for applications in Life Science - INFN4LS

2020 – to date member of the INFN National Scientific Committee 3 coordinating experimental research in Nuclear Physics at INFN.

2020 – to date member of the INFN Pisa executive board

2017– to date member of the Frontier Detectors for Frontier Physics board promoting cultural initiatives focused on particle detectors and their applications

2017 – 2020 member of the Scientific Committee for research funding - Physics area, University of Pisa, Italy

2016 – 2018 member of the reviewers panel of the INFN National Scientific Committee 5 calls for strategic research projects

2011-2015 member of the INFN Internal Evaluation Committee

2007-2015 member of the INFN National Scientific Committee coordinating research on accelerator, detector and Interdisciplinary applications.

2000-2003 University and INFN Pisa representative in the Project Management Board of MEDIPIXII international collaboration, CERN (European Center for Nuclear Research)

- **RECENT RESEARCH PROJECTS COORDINATION**

-2022 – 2025 FRIDA: FLASH Radiotherapy with hIgh Dose-rate particle beAms (INFN CSN5), research and development of instrumentation and methods for FLASH effect modelisation and clinical translation.

Partners: INFN Roma1, Catania, LNS, Milano, Pisa, Torino, Trento. Roles: local coordinator; WP Dosimetry and Beam monitoring leader

-2018-2020 PETRA PET monitoRing in Adroterapia – (regione Toscana POR FESR 2014 – 2020), Clinical validation of the INSIDE PET monitoring system at CNAO. Partners: INFN Pisa, CNAO – *Principal Investigator*

-2018-to Date INSIDE 2 Innovative solutions for Dosimetry in Hadrontherapy – (*Fondazione CNAO*), Clinical validation of the INSIDE bi-modal monitoring system at CNAO. Partners: University of Pisa, Sapienza University of Rome, INFN, CNAO – *Scientific coordinator*

-2018-2019 SPECTRON (University Of Pisa, bando Dimostratori Tecnologici)- Dimostratore In-beam PET in adroterapia- Role: *Principal Investigator*

-2017- to date FOOT Fragmentation Of target – (INFN CSN3). Nuclear Fragmentation cross section measurements in hadrontherapy and space radioprotection. International Collaboration among INFN, GSI, Nagoya University, Aachen University, University of Strasbourg. Role: *Representative of INFN Pisa In the Institutional Board*

-2016-2018 NEOLITE Nuove tecnologie elettroniche di alimentazione in ambiente ostile (Regional Funding POR FESR 2014 – 2020, 1.88 M€) Project coordinator: CAEN spa, Italy- *University of Pisa scientific coordinator*

-2013-2016 INSIDE Innovative solutions for Dosimetry in Hadrontherapy (National Funding –ministry of research, MIUR PRIN2010-2011, PN. 2010P98A75, 1M€) Collaboration: Uni Pisa, Uni Torino, Politecnico Bari, Uni Roma La Sapienza, INFN and CNAO – *Role: Principal Investigator*

-2011-2013 4DMPET "4D-MPET Four Dimension Magnetic Compatible PET module" (National Funding INFN, 120 k€) Collaboration: INFN di Pisa, Bari, Perugia, Torino *Principal Investigator*

- **SCIENTIFIC JOURNALS EDITOR AND REVIEWER**

-Bisogni M, Thirof P, Magrin G, “Special issue on particle therapy”, IEEE TRPMS vol. 4(2) (2020) DOI: 10.1109/TRPMS.2020.2976089

-Bisogni, M.G., Grassi, M., Incagli, M., Paoletti, R., Signorelli, G. Editorial (2016) Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 824, p. 1. DOI: 10.1016/j.nima.2016.04.042

-Bisogni, M., Rosso, V. “Radiation imaging detectors 2006” Editorial (2007) Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 576 (1), p. 5. DOI: 10.1016/j.nima.2007.01.107

-2019 - to date European Journal of Medical Physics – Physica Medica - Associate editor

-2018 - to date IEEE Transaction on Radiation and Plasma Medical Sciences – Associate editor

-Regular reviewer of Nuclear Instruments and Methods A, IEEE Transactions on Nuclear Sciences, IEEE Transactions on Radiation and Plasma Medical Sciences, Journal of Instrumentation, Medical Physics.

- **ORGANISATION OF SCIENTIFIC MEETINGS**

2018, 2015, 2012 member of the Organizing committee of “PET/MR and SPECT/MR: New Paradigms for Combined Modalities in Molecular Imaging Conference” La Biodola, ~200 participants, Isola d'Elba, Italy

2022, 2018, 2015, 2012, 2009 and 2003 member of the Organizing committee, ~400 participants La Biodola, Isola d'Elba, Italy

2014 member of the Organizing committee “100⁰ National Congress of the Italian Physics Society” (SIF), ~1000 participants, Pisa, Italy.

2013 member of the Organizing committee of “Status and future perspective of charged particle therapy workshop”, ~100 participants, CNAO, Pavia, Italy.

- **TECHNOLOGY TRANSFER ACHIEVEMENTS**

-International industrial patent (Universita' di Pisa (80%) and INFN (20%), inventors sportelli giancarlo; bisogni Maria giuseppina; kostara eleftheria; morrocchi matteo; camarlinghi Niccolò), title: "Method and apparatus for the acquisition of data for positron emission tomography in hadrontherapy with beam on".

Italian n. 102018000000867 (A1) - 15.01.2018. International n. WO2019138384 (A1) 18/7/2019

-Co-Founder and member of board of the start-up IRIDAE

- **AWARDS**

-Winner of the "Premio di Operosita' Scientifica" of the Italian Physical Society (SIF). 23 september 1996 "LXXXII Congresso Nazionale della SIF" Verona, Italy.

-Winner of the the Italian Physical Society (SIF) prize for best oral communication at the 86o congress of the SIF, Palermo, Italy, September 2000. Title of the talk : « Simulazione delle Prestazioni Spettroscopiche di

rivelatori di raggi X a pixel di GaAs » (Spectroscopic Performance Simulation of GaAs X rays Pixel detectors).

- **RECENT PUBLICATIONS**

Kraan, A.C., Berti, A., Retico, ...Bisogni, M.G.

Localization of anatomical changes in patients during proton therapy with in-beam PET monitoring: A voxel-based morphometry approach exploiting Monte Carlo simulations (2022) *Medical Physics*, 49 (1), pp. 23-40. DOI: 10.1002/mp.15336

Kraan, A.C., Zarrella, ..., Bisogni, M.G.

Charge identification of nuclear fragments with the FOOT Time-Of-Flight system (2021) *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 1001, art. no. 165206, DOI: 10.1016/j.nima.2021.165206

Fiorina, E., Ferrero, ..., Bisogni, M.G.

Detection of Interfractional Morphological Changes in Proton Therapy: A Simulation and In Vivo Study With the INSIDE In-Beam PET (2021) *Frontiers in Physics*, 8, art. no. 578388, DOI: 10.3389/fphy.2020.578388

Ferrero, V., Fiorina, E., Morrocchi, M., Pennazio, ..., Bisogni, M.G.

Online proton therapy monitoring: Clinical test of a Silicon-photodetector-based in-beam PET (2018) *Scientific Reports*, 8 (1), art. no. 4100, DOI: 10.1038/s41598-018-22325-6

Bisogni M et al. "INSIDE In-Beam Positron Emission Tomography System for Particle Range

Monitoring in Hadrontherapy" (2017) *J Med Imaging*, 011005 pp 1-12 DOI:10.1117/1.JMI.4.1.011005

- **RECENT INVITED ORAL PRESENTATIONS**

- "The INSIDE system: a review of past and recent results", international workshop "Innovative Nuclear instrumentation and measurements in the imaging medical field" (N. 4), International ANIMMA Conference, Portorose, Slovenia, 17/6/2019

- "Un sistema multimodale per il monitoraggio in vivo del range delle particelle cariche in adroterapia", 105 congresso della Societa' Italiana di Fisica dal titolo: L'Aquila, 27/9/2019

- "Particle range monitoring and verification methods in hadrontherapy", International Workshop on Radiation Imaging Detectors, 4/6/2017, Krakow, Poland.

- **RESEARCH ACTIVITY**

My research activity has always been at the cross-border of fundamental research and application, having the characteristic trait of the study of radiation detectors and their application to medical physics. This allowed me, since the earliest years of my career, to receive funding and create a series of networks involving academia, medical centers and industries.

In 2006, I started a new research activity consisting on the development and application to medical imaging of a brand-new photodetector, the Silicon Photomultiplier (SiPM). I was one of the proponents of the INFN DASIPM (2006 -2010) experiment which was the first in our country to explore the application of SiPMs in astrophysics, high energy physics and medical imaging. I was coordinator of the medical imaging group and the major result achieved was the production and test of the first Italian SiPM devices. This has been done in collaboration with the research institute FBK-irst that, at the time, was among the leading manufacturers of SiPMs.

In the following years (2011-2013) I have been principal investigator of the INFN 4DMPET project whose aim was the development of innovative PET detectors based on monolithic scintillator crystals and silicon-photomultipliers. The success of the experiment allowed me to propose the 4DMPET approach to other projects. Suitably adapted 4DMPET module versions are being used in a PET/MR scanner dedicated to investigations of neurological diseases (EU FP7 project TRIMAGE) and in the INSIDE project. Triggered by the request of MR compatible instrumentation from the TRIMAGE project, I have proposed and coordinated for UNIPI the project NEOLITE, funded by Tuscany region through EU funds for developing innovative power suppliers able to operate in magnetic fields of an MR scanner (up to 7 T). The project was carried out in collaboration with CAEN and AGE scientific, two Italian SMEs very active in nuclear instrumentation and digital electronics.

In the years 2013-2016, I have been principal investigator of the INSIDE (INnovative Solutions for dosImetry in hadrontherapy) project, funded (1M€) by the Italian Ministry for Research under a national program aimed at funding projects most relevant for the Italian research system (INSIDE MIUR PRIN2010-

2011 PN. 2010P98A75). Aim of INSIDE was the development of an imaging system based on PET and charged particle trackers to monitor the quality of the cancer treatments during hadrontherapy sessions. The project was carried out in collaboration among Universities of Pisa, Roma Sapienza, Bari Politecnico and Torino and INFN, Centro Fermi and CNAO. The system INSIDE is currently in operation at CNAO, the largest hadrontherapy facility in Italy, and I am responsible for the follow-up and clinical validation of the system with the projects PETRA and INSIDE2. A trial is currently underway on 40 cancer patients treated at CNAO with protontherapy and carbon ion therapy to verify INSIDE's performance in a clinical environment. In 2017 I have joined the FOOT (Fragmentation of Target) international collaboration aimed at measuring nuclear fragmentation cross section of biological targets for hadrontherapy and space radioprotection. In the FOOT experiment I have been coordinator of the INFN Pisa unit that is responsible of the Time of Flight (TOF) Wall, a plastic scintillator based detector devoted to the charge identification of the nuclear fragments. Since 2022 I am serving as deputy spokesperson.

Since 2021 I have been involved in the creation and establishment of the first Italian center for FLASH Radiotherapy, **the Centro Pisano Multidisciplinare sulla Ricerca e Attuazione Clinica della Flash Radiotherapy (CPFR)** which synergistically gathers a multidisciplinary team of scientific and clinical excellence. The center is coordinated by the University of Pisa, the Azienda Ospedaliero-Universitaria Pisana, the CNR – Istituto Neuroscienze, and INFN Istituto Nazionale di Fisica Nucleare. I am sitting in the scientific board of the center as representative of INFN. Since 2022 I am INFN local coordinator and WP (dosimetry and Beam monitoring) leader of FRIDA: FLASH Radiotherapy with hIgh Dose-rate particle beAms funded by INFN CSN5. The project is focused research and development of instrumentation and methods for FLASH effect modelisation and clinical translation.

- **RECENT OUTREACH ACTIVITIES**

Bisogni M et al.: SiPM Technology Increases the Safety of Charged Particle Therapy through Improved Beam Range Verification , Application Report, Hamamatsu news 2020/1

“Observe the real-time radiation to make the oncological therapies even more precise” INFN Press Release, 3 September 2019

“Hadrontherapy”, Interview for INFN facebook web direct,

<https://www.facebook.com/IstitutoFisicaNucleare/videos/10155130883727579>

“Virtual Man - physics explores the body”, exhibition, <http://home.infn.it/en/media-outreach/mostre/exhibitions/2095-virtual-man-physics-explores-the-body>, member of the organizing committee, March – June 2017, Palazzo Blu, Pisa, Italy, 4000 visitors.

Pisa, 7/7/2023

Maria Giuseppina Bisogni

