

CV of Ettore Sarnelli

Education

1988 Master's degree in Physics, Laurea cum laude, University of Naples "Federico II", IT

Temporary Research Fellowships

1989-1991 Fellowship at CNR Istituto di Cibernetica "E. Caianiello" (CNR-ICIB)
1991-1992 Post Doc fellow at IBM T. J. Watson Research Center (NY – USA)
1992-1993 Fellowship at the National Institute of Physics of Matter (INFM)
1993-1994 Fellowship at CNR-ICIB
1994-1998 Temporary Researcher at CNR-ICIB

Positions

1998-2010 Permanent Researcher at CNR-ICIB
2010-2022 Senior Scientist at CNR-ICI (2010-2014) B, at CNR SPIN (2014-2022)
2023-present Research Director at CNR-SPIN

Institutional roles

2020-2021 Head of research area Naples 3
2021-present Deputy Director of the Naples section of the CNR-SPIN Institute

Other affiliations

2017-present Associate to INFN incarico di associazione scientifica

Teaching Activities

2001-2003 Physics I, BSc in Engineering, II University of Naples
2005 Medical Physics, BSc in Health Care Profession, II University of Naples
2006 and 2012 Medical Physics, BSc in Medical Radiology Techniques for Images and Radiotherapy, II University of Naples
2007-2010 Medical Physics, BSc in Biomedical Laboratory Techniques, II University of Naples
2011-2018 Physics Applied to Medicine, BSc in Biomedical Laboratory Techniques, II University of Naples
2019-2023 Physics Applied to Medicine, BSc in Biomedical Laboratory Techniques, II University of Naples

Coordination of Scientific Projects

1999-2001 Scientific coordinator (CNR-ICIB), project "Advanced Research Project PRA-JT3D-INFM: HTSC electronic devices" (30.000 €)
2000-2002 Scientific Coordinator (CNR-ICIB), project "Development of advanced superconductive electronics and its application to biomedical instrumentation" funded by MIUR (400.000 €)
2001 Scientific coordinator, project "Magnetometri superconduttori innovativi ad alta temperatura di transizione", funded by Regione Campania 31.12.94, n. 41- Art. 3 comma 1 (15.000 €)
2001-2005 Scientific Coordinator for Italy, ESF (European Science Foundation) project "Novel Applications of Josephson Junctions in Quantum Digital Circuits-PiShift"
2002-2005 Local Scientific Coordinator (CNR-ICIB), project "Centro Regionale di Competenza della Regione Campania per lo Sviluppo e il Trasferimento dell'Innovazione Applicata ai Beni Culturali e Ambientali" (588.000 €)
2002-2006 Scientific Coordinator (CNR-ICIB), MIUR project "Non-destructive analysis on composite structural materials for the Aeronautic industry" (318.000 €)
2002-2006 Scientific Coordinator for Italy, Research and Training Network European project "Quantum Complex Systems from nano-to macro-scales (QUACS)" (93.000 €)
2008-2011 Scientific Coordinator for Italy, Small or medium-scale focused research European project "Macroscopic Interference Devices for Atomic and Solid-State Systems (MIDAS)" (85.000 €)

- 2011-2014 Scientific Coordinator (CNR-ICIB and -SPIN), Europe-Japan project, 7th EU Programme “Establishing the basic science and technology for iron-based superconducting electronics applications (IRONSEA)” (80.000 €)
- 2017-2018 Local Scientific coordinator (INFN NA), project Gruppo V, “Flicker Noise Studies for Investigation of Detector Performance-INSIDE”, (about 40.000 €)
- 2019-2021 Local Scientific coordinator (INFN NA), National call project Gruppo V, “Flexible Organic Ionizing Radiation Detectors – FIRE” (about 220.000 euro)
- 2023-2025 Principal Investigator PRIN-PNRR 2022, “Development of flexible low-voltage organic phototransistors for visible light communication (OPTICS)” (227.000 €)

Quality-of-Research Evaluation Agencies:

- 2012-2013 Reviewer of the VQR 2004-2010 (Evaluation of the Quality of the Research) for the Italian Research and University Evaluation Agency (ANVUR);
- 2016-2017 Reviewer of the VQR 2011-2014 (ANVUR);
- 2018 Member of REPRISE: Register of Expert Peer Reviewers for Italian Scientific Evaluation, Italian Ministry of Education, University and Research;

Peer-reviewing

Regular reviewer for the Journals:

Physical Review Letters
 Applied Physics Letters
 Review Scientific Instruments
 Physical Review B
 Journal of Applied Physics
 Superconducting Science and Technology
 European Physics Journal
 Physica Status Solidi
 IEEE on Transaction on Superconductivity
 Journal of Superconductivity
 Physics Status Solidi-Rapid Research Letters

National and International Acknowledgement

- 1991 appointment as scientific expert for three control committees for the contracts between CNR and TEMAV, PIRELLI CAVI, and EUROPA METALLI
- 1993 Invited to write an article for the first issue of the new international journal "Interface Science", S. E. Babcock and K. L. Merkle Eds.
- 1996-1998 Scientific responsible for the activity (CNR-ICIB) *“Development of magnetometer for non-destructive analysis using bicrystal junctions”*
- 1998-1999 Scientific responsible for the activity (CNR-ICIB) *“Fabrication and characterization of planar magnetometers with high sensitivity in presence of a residual magnetic field”*
- 2002 Scientific responsible for CNR-ICIB for *“Study of correlation between fabrication parameters and magnetic and electric signals”*
- 2002-2009 Designed representative member of researchers and technologists inside the CNR-ICIB Institute Council
- 2003 Scientific responsible for the activity *“Fabrication and characterization of high-critical temperature superconductive devices based on the bicrystal technique”*
- 2003-2004 Scientific responsible for the activity *“Fabrication of junctions and SQUIDS”*
- 2004 Scientific responsible for the activity *“Studies, processing and characterization of YBCO thin films to develop Josephson junctions and applications based in these kinds of structures”* in the framework of the European network “SCENET”
- 2005-2006 Scientific responsible for the activity *“Array of high-Tc Josephson junctions”*

- 2006-2007 Scientific responsible for the activity *“Design and characterization of $YB_2aCu_3O_{7-x}$ bicrystal SQUIDs e magnetometers by means of cryogenic, low-noise electronics”*
- 2007-2008 Scientific responsible for the activity *“Realization and test of superconductive magnetic devices, at high transition temperature”*
- 2008-2011 Scientific responsible for the activity *“High transition temperature Josephson junctions and SQUIDs for developing electronics in quantum regime”*
- 2009-2010 Scientific leader for CNR-ICIB for the sector *“Diagnostica avanzata per i Beni Culturali”*
- 2010-2012 Scientific leader for CNR-ICIB for the sector *“Advanced superconductive devices and sensors”*, inside the programme *“Electronics of oxydes and quantum transport in nano-devices”*
- 2011-2013 Scientific responsible for the activity *“Development, characterization, and utilization of thin film, non-conventional Josephson devices, by means of the bicrystal technique”*

Organizations of International Conferences

- 2002 *Chairman* of the International Workshop “Superconducting phase shift devices–materials, fabrication and measurements”, Nov 6-8 2002, San Feliu du Guoxols, Spain
- 2004 *Chairman* of the International Conference “Combined ESF Vortex and ESF PiShift Workshop”, May 15-19 2004 Badmunsterehifeld, Germany
- 2005 *Chairman* of the International Workshop “Physics of Superconducting Phase Shift Devices” April 2-5 2005, Jolly Hotel, Ischia, NA
- 2009 *Chairman* of the International Workshop ““Macroscopic Interference Devices for Atomic and Solid-State Systems: Quantum Control of Supercurrents”, Sept 30-Oct 2 2009, Hotel San Michele, Anacapri (NA), Italy
- 2017 *Local Organizer Committee Member of* “16th International Superconductive Electronic Conference, June 12-16 2017, Sorrento (NA), Italy”

Session Chairman

- 2006 International Applied Superconductivity Conference, Virginia Beach (VA-USA), “2EH Ramp-Type and Trilayer Workshop on Surfaces, Interfaces and Functionalization”
- 2017 International Superconductive Electronic Conference, Hotel Vesuvio, 12-16 June 2017, Sorrento (Italy), “Hybrids”

Bibliometric parameters

ORCID ID: 0000-0003-2739-0013

H-index : 19 (Scholar)

Total number of papers: 159

Total number of citations: 1492

Brief overview of research activities

Since 1988, my research activity has focused on the development and study of Josephson junctions and dc-SQUIDs. Since 1991, during my post-doc at IBM, I have studied superconducting devices with an unconventional parameters. In this sector, I have developed skills in the manufacture of thin films, in the design of superconducting devices (SQUIDs, magnetometers), in their characterization with low electromagnetic noise, and in the development of dedicated electronics for their study. As a result, I am actually one of the international experts on transport physics in high-temperature transition Josephson junctions.

From 2012 I started to study devices based on both conventional and organic semiconductors. I am currently in charge of the INSIDE project for the INFN Section of Naples. In this project we investigate the electric noise of the latest generation of Si-based photosensors (SPADs), under variation of both the temperature and the irradiation dose from protons. The aim is to evaluate precursor signals of the radiation damage of high-sensitivity photosensors, of interest for space applications and in the field of medical diagnostics.

Concerning the development of field effect transistors (OFETs) based on organic semiconductors, I have investigated the electrical transport in Metal-Base Vertical Organic Transistors by means of noise spectroscopy analysis. Moreover, by using electron beam lithography (EBL) techniques, I have fabricated nano-channels in planar OFETs. They have been characterized in vacuum conditions and at different temperatures. Very short-channel OFETs is a valid way to increase their operation speed, towards a real use in integrated organic electronics.

Recently, we have analyzed the quantum interference of the transport current in single-molecule FETs with superconductive electrodes. These studies aim at a drastic reduction of the contact resistance in OFETs, that in such devices has a inferior limit due to the quantum conductance. Single molecule superconductive FETs may overcome this limit and, as a consequence, represent the last step towards electronic circuits miniaturization. Moreover, Organic Phototransistors, fabricated onto plastic foils, have been demonstrated to be good ionizing particle detectors for medical applications, principally as detectors in cancer treatments. Very recently, a PRIN-PNRR project, in which I am the principal investigator, has been financed for the development of organic Phototransistor for Visible Light Communication.

List of recent publications

1. Flexible fully organic indirect detector for megaelectronvolts proton beams
S Calvi, L Basiricò, SM Carturan, A Quaranta, B Fraboni, npj Flexible Electronics, 2023, 7(1), 5
2. Radiation Damage in Polyethylene Naphthalate Thin-Film Scintillators
M Campajola, F Di Capua, P Casolaro, E Sarnelli, A Aloisio, Materials, 2022, 15(19), 6530
3. Investigation of random telegraph signal in two junction layouts of proton irradiated CMOS SPADs
FD Capua, M Campajola, D Fiore, E Sarnelli, A Aloisio, Scientific Reports, 2021, 11(1), 8580
4. Resistive switching phenomenon observed in self-assembled films of flame-formed carbon-tio2 nanoparticles
M Commodo, G De Falco, E Sarnelli, ..., A D'anna, P Minutolo, Materials, 2021, 14(16), 4672
5. Electronic properties of one-dimensional pentacene crystals
C Nappi, F Romeo, E Sarnelli, Nano Express, 2020, 1(3), 030002
6. Radiation induced degradation in a 150-nm CMOS SPADs device
M Campajola, F Di Capua, L Gasparini, E Sarnelli, Journal of Instrumentation, 2020, 15(8), C08017
7. Raman investigation of Fe-based chalcogenide films
C Camerlingo, E Bellingeri, C Nappi, E Sarnelli, C Ferdeghini, Physica B: Condensed Matter, 2020, 586, 411966
8. Proton induced dark count rate degradation in 150-nm CMOS single-photon avalanche diodes
M Campajola, FD Capua, D Fiore, E Sarnelli, A Aloisio, Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 2019, 947, 162722
9. Quantum Interference in Single-Molecule Superconducting Field Effect Transistors,
C Nappi, F Romeo, L Parlato, F Di Capua, A Aloisio, E Sarnelli, The Journal of Physical Chemistry C, 2018 (in press)
10. Improving the electrical performance of PDI8-CN2 bottom-gate coplanar organic thin-film transistors
L Parlato, E Sarnelli, A Cassinese, F Chianese, F Chiarella, C Nappi, ..., M Barra, Applied Physics A 124, 1-6
11. Andreev Spectroscopy of Molecular States in Resonant and Charge Accumulation Regime, F Romeo, C Nappi, L Parlato, and E Sarnelli, IEEE on Appl. Supercond. 2018 (in press)
12. Random Telegraph Signal in Proton Irradiated Single-Photon Avalanche Diodes, F Di Capua, M Campajola, L Campajola, C Nappi, E Sarnelli, L Gasparini, H. Xu, IEEE Transactions on Nuclear Science 64, 4260 (2018)

13. Investigation on the Conduction Mechanisms in Metal-Base Vertical Organic Transistors by DC and LF-Noise Measurements, G Giusi, E Sarnelli, M Barra, A Cassinese, G Scandurra, K Nakayama, and C. Ciofi, *IEEE Transactions on Electron Devices* 64 (10), 4260-4265
14. Fabrication and characterization of nanoscale n-channel (PDI8-CN2) organic two-terminal planar devices, L Parlato, E Sarnelli, V La Ferrara, M Barra, F Chiarella, F Chianese, P. Delli Veneri, A. Cassinese, *Applied Physics A* 123 (9), 584 (2017)
15. Current Induced Resistive State in Fe (Se, Te) Superconducting Nanostrips, C Nappi, C Camerlingo, E Enrico, E Bellingeri, V Braccini, C Ferdeghini, and E. Sarnelli, *Scientific Reports* 7, 4115 (2017)
16. Fe (Se, Te) superconducting quantum interference devices, E Sarnelli, C Nappi, A Leveratto, E Bellingeri, V Braccini, C Ferdeghini, *Superconductor Science and Technology* 30 (6), 065003 (2017)
17. Contact-resistance effects in PDI8-CN2 n-type thin-film transistors investigated by Kelvin-probe potentiometry, F Chiarella, M Barra, A Carella, L Parlato, E Sarnelli, A Cassinese, *Organic Electronics* 28, 299-305 (2016)
18. Probing transport mechanisms of BaFe₂As₂ superconducting films and grain boundary junctions by noise spectroscopy, C Barone, F Romeo, S Pagano, M Adamo, C Nappi, E Sarnelli, F Kurth, and K. Iida, *Scientific reports* 4, 6163 (2014)
19. Properties of high-angle Fe (Se, Te) bicrystal grain boundary junctions, E Sarnelli, M Adamo, C Nappi, V Braccini, S Kawale, E Bellingeri, and C. Ferdeghini, *Applied Physics Letters* 104, 162601 (2014)