

CURRICULUM VITAE

di GIOVANNI PIERO PEPE

Name: Giovanni Piero
Family Name: Pepe
Place and date of birth: Caracas, Venezuela - March 13th 1963
Present position: Professore Ordinario, Università di Napoli *Federico II*

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EDUCATION

- ‡ Degree in Physics (1988, University of Napoli-Italy)

EMPLOYMENT

- ‡ Professor of “Mathematics and Physics” and “Physcs” at Graduate Schools
- ‡ Researcher at Università di Napoli Federico II (Italy) Sett. 1993 – Nov. 2005
- ‡ Associate Professor, Università di Napoli Federico II (Italy), Nov. 2005 – 2019
- ‡ Full Professor, University di Napoli Federico II (Italy), April 2019 - present

HABILITATIONS

- ‡ Habilitation Full Professor for 02/B1 sector (*13.10.2014*)
- ‡ Habilitation Associate Professor (2003)

TEACHING EXPERIENCE

2019 – **present**: Full Professor at University of Napoli (Italy), Dept. Physics (Faculty of Engineering up to 2015) in charge of the courses titled “General Physics I and II”, “Elements of Thermodynamics” (undergraduate level), “Superconductivity”, “Materials for Nanotechnologies”, “Advanced Laboratory for nanomaterials and nanostructures characterization”, and of the courses “*Physics and Applications of superconductive and spintronic devices per il Dottorato di Fisica, Tecnologie Innovative per Materiali*” and “*Quantum Superconducting Technologies: Principles and Engineering - part 2*” within the Ph.D. Programs in “Physics” and “Quantum Technologies” at the University of Naples Federico II, respectively.

2005 – 2019: Associate Professor at University of Napoli (Italy), Dept. Physics (Faculty of Engineering up to 2015) in charge of the courses titled “General Physics I and II”, “Elements of Thermodynamics” (undergraduate level), “Superconductivity”, “Materials for Nanotechnologies”, and of the course “*Physics and Applications of superconductive and spintronic devices*” *Scuola Dottorato di Fisica, Tecnologie Innovative per Materiali*” (PhD level).

2017: Assistant Professor for “Advanced Laboratory for Nanotechnologies” in Material Science Engineering and Chemical Engineering.

2012 **present**: Assistant Professor at Accademia Aeronautica, Pozzuoli (Napoli) Formazione Ufficiali, in charge of the course of General Physics (Engineer channel)

1993 - 2005: Assistant Professor at University of Napoli “Federico II” (Italy) (Faculty of Engineering) in charge of courses titled “General Physics” (Physics 1 and 2).

1994-2005: Researcher for Experimental Physics at the Università di Napoli Federico II Dipartimento Scienze Fisiche, Via Cinthia Monte Sant'Angelo (Napoli) with courses on General Physics, Assistant Lecturer in “Struttura della Materia” and “Superconduttività” (Prof. A. Barone) for Electronic Engineering and Materials Engineering).

2000-2005: Assistant Professor at Accademia Aeronautica, Pozzuoli (Napoli) Formazione Ufficiali, in charge of the course of General Physics (Political Science channel)

1993-1994 Professor for *Mathematics and Physics* at Istituto Scuola Superiore A. Serra, Napoli, Corso Vittorio Emanuele (Scuola Secondaria Superiore)

1993-1994: Assistant Professor (ex art. 100) for “General Physics” within the Corso Universitario di Diploma in Ingegneria Informatica ed Automatica at the Engineering Faculty of the Università degli Studi di Napoli Federico II

TUTORING ACTIVITIES

- ‡ Advisor of more than 30 theses in Physics, Electronics Engineering, Material Engineering and Management Engineering, Aeronautical Science in Accademia from 1989 to present.
- ‡ Supervisor of 8 Ph. D. Theses in Physics and Electronic Engineering (Loredana Parlato 1999, Giuseppe Ammendola 2002, Rossana Scaldaferrì 2008, Antonio Ruotolo 2006, Nicola Marrocco 2008, Vito Pagliarulo 2010, Antonio Capretti 2012 with Prof. G. Miano, Umberto Nasti 2015, Roberta Caruso 2018, D. Salvoni PhD with Industries accepted by MIUR 2020), + 2 on going (Alessandro Miano PhD in Physics on superconducting electronics for qubit, R. Satariano on hybrid superconducting-ferromagnetic quantum systems)
- ‡ Supervisor for student internships in Material Engineering: M. De Rosa (2016), R. Satariano (2018)
- ‡ Supervisor for the following Post Doc in Physics: Loredana Parlato, Carmela Bonavolontà, Nicola Marrocco, G. Campagnano, R. Caruso, D. Salvoni
- ‡ GPP has hosted stages of students from abroad: from University of Urmia, Iran (3), Glasgow University (1 st. (1 month) within CNR SPIN), Saitama University (1 student for about 1 month), University of Rochester (1 student, 1 month)
- ‡ GPP has been several times Tutor for Post Doc students as granted by the Department of Physics of the University of Naples Federico II, CNR INFM and CNR SPIN. GPP has been member of Committees for the admission to the final examination of Ph.D. Physics, of Post Doc Grants, of both TI and TD Researcher positions, and of Ph.D. admission.
- ‡ In 2017 has been member of the National Committee for the assignment of n. 1TD Primo Ricercatore CNR position (Bando 367.141 PR)
- ‡ From 2018 member of the Executive Committee (16) of the Ph.D. Program on *Quantum Technologies*, a joint Ph.D. Course between Università di Napoli Federico II, CNR and Università di Camerino, coordinated by Prof. F. Tafuri (Uni.NA)

In 2019 GPP coordinated the activities of the Scuola Politecnica delle Scienze di Base (SPSB) within the edition of Futuro Remoto “Being 4.0”, collaborating to the development of an interactive walk through the ideas and applications of industry

4.0. able to move visitors in a multi-sensory space, characterized by virtual components and interactive exhibits.

From 2017 to 2019 GPP coordinated the activities of CNR SPIN Unit of Naples for *Dissemination and Outreach* Actions for transferring and promoting to a larger audience the scientific activities concerning the project “The Nanotechnologies and the Quantum Mechanics”. The activities have been successfully presented at several public events such as *The Researchers’ Night* 2017, *Futuro Remoto* 2017, within the formation *Alternanza Scuola Lavoro* 2017-2018 in collaboration with the Physics Dept of Univ. Napoli Federico II and the local INFN Sezione. In the future, the O&D activities will be also presented at *Festival della Scienza* (Genova, October 2018), *Futuro Remoto* (Naples, Nov 2018), *The Researchers Night* 2018, in the next 2018-2019 *Alternanza Scuola Lavoro*, and within the project *Science and Art* in collaboration with the INFN.

Within the Program “Materia Capitale della Cultura 2019” and within the MoU signed between Comune di Matera, Fondazione *Matera Capitale 2019* and Consiglio Nazionale delle Ricerche, GPP organized several scientific activities among which the promotion of Quantum Physics for Babies (guest prof C Ferrie) and the network of colours in Cultural Heritage (guest prof C Miliani and her MOLAB).

RESEARCH ACTIVITY

METRICS

All works fall in the field of Solid State Physics and in particular of Superconductivity, with a strong focus on the study of superconducting detectors, nonequilibrium physics and realization and characterization of superconducting devices. The concepts towards novel superconducting devices are driven by a special attention towards novel materials and nanophysics, and by notions oriented towards a hybrid architecture (see Allegato n.1 for a detailed description of the research activity).

Most of the work has been collected in almost 190 publications to the date of the application, while a few papers have been submitted. In particular:

Among those in refereed International Journals: 1 Advanced Materials, 1 Advances in Condensed Matter Physics, 1 Scientific Report, 1 Nanotechnology, 1 Nanoscale Research Letters, 10 Appl. Phys. Letters, 18 Phys. Rev. B Condensed Matter, 10 Europ. Phys. J B, 7 Supercond. Sci. Technology, 14 IEEE Transactions on Applied Superconductivity, 6 J. Appl. Physics, 3 Journal of Superconductivity, 4 Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, 2 Sensors and Actuators, A: Physical, 2 Journal of Magnetism and Magnetic Materials

HF is 21 (Isi-web), 22 (Scopus), 22 (Google Scholar) respectively.
i10-index: 52.

Citations are about 1600 (Scopus and Google Scholar).

Publications (Scopus):188 (140 publ, 44 conf, 2 review, 1 book chap, 1 in press)

The complete list updated to October 13th, 2020 is proposed at the end of this CV (see ANNEX 2)

GRANTS AS PI

- ‡ Principal investigator of the Progetto Ministero Affari Esteri Italia - Giappone Basic Sciences "Superconducting heterostructures for photon detection", 2007-2008
- ‡ Principal investigator of the Progetto Polo delle Scienze e della Tecnologia, Università di Napoli Federico II, titled "Materiali nanostrutturati da copolimeri a blocchi per applicazioni elettroniche ed ottiche avanzate" (Programma FARO 2010)
- ‡ 2010-2012 Progetto Europeo Matera+/ESM 1906- 2009, "Hybrid Organic-based Nanostructured Devices for Applications" (HONDA). (Responsabile Europeo del Progetto Prof. C. De Rosa, coordinatore scientifico per attività Dipartimento Scienze Fisiche Prof. G. P. Pepe)
- ‡ Local Scientific Coordinator (CNR SPIN Local PI) for Progetto PON 01_02782 "Nuove strategie tecnologiche per la messa a punto di farmaci e presidi diagnostici diretti verso cellule cancerose circolanti" 2011-2014
- ‡ Italian member of Management Committee (MC) Cost project: "Nanoscale Superconductivity: Novel Functionalities through Optimized Confinement of Condensate and Fields" (NanoSC -COST) (participating countries: Austria, Belgium, Switzerland, Czech Republic, Germany, Denmark, Estonia, Spain, Finland, France, Italy, Netherlands, Norway, Poland, Sweden, Slovakia, United Kingdom, collaboration, with Australia and Japan)
- ‡ Local Scientific coordinator of POR 2002/2006 Progetti Ricerca Industriale e di sviluppo precompetitivo-Misura 3.17, titled SIMOPEF 2012-2015
- ‡ CNR SPIN coordinator of the scientific activity in Progetto Premiale 2015 titled *Q-SecGroundSpace-Intermodal Secure Quantum Communication on Ground and Space* on the use of Superconducting Nanowires Single Photon Detectors in Quantum Key Distribution Systems (P.I. Dr Ivo de Giovanni, INRIM)
- ‡ 2012-2017 Local Scientific Coordinator Progetto CNR Bandiera NANOMAX, titled "Nanomax---integrable sensors for pathological biomarkers diagnosis" (N-CHEM) for the Task 6.4 (M13-M36) "Integration of magnetic probes in LOC readouts"
- ‡ Local Scientific Coordinator of Progetto Europeo FP7 Europa-Giappone G.A. N. 283141 36 titled *"Establishing the basic science and technology for Iron-based superconducting electronics applications"* (IRONSEA) (2011-2014)

- ‡ 2012-2014 CNR SPIN Coordinator of the POR Campania, FESR 2007-2013, Asse 2, Obiettivo Operativo 2.1 2.2, Progetti di Ricerca industriale e sviluppo sperimentale per la realizzazione del Campus dell'innovazione, "Controllo e health monitoring and Management di sistemi complessi e strutture miste metallo-composito operanti in ambienti ostili sottoposte a sollecitazioni gravose " (SiHM), in CRdC per OR on "Sviluppo di sensori innovativi". Leader Industry: Magnaghi Aeronautica.

- ‡ 2018-2020 Local scientific coordinator for Dept. University of Napoli Federico II of the Project "FORmation flying of CubSat assemblies for remote sensing (FORCE), P.I. Prof. A. Moccia (Aerospace EngDept, Univ. Napoli Federico II), approved after technical reviewing, DD n. 1735Del 13.07.2017 Avviso per la presentazione di progetti di ricerca industriale e sviluppo sperimentale nelle 12 aree di specializzazione individuate dal PNR 2015-2020. Since 2020 the role has been assumed by prof. S. Amoruso.

- ‡ 2018 (*approved for funding*) Principal Investigator of the National PON Project "Sistemi e tecnologie quantistiche per la sicurezza informatica in reti di comunicazione terrestri e spaziali (QUANCOM), presented by CNR SPIN, in DD n. 1735Del 13.07.2017 Avviso per la presentazione di progetti di ricerca industriale e sviluppo sperimentale nelle 12 aree di specializzazione individuate dal PNR 2015-2020. The project is waiting for definitive funding act by MUR after the final procedure of economical evaluation of the Consortium.

- ‡ 2018 CNR SPIN Coordinator of the project "SHARing Researchers' Passion for Evidences and Resilience" (SHARPER - European Researcher's Night), to make the researchers' passions accessible and comprehensible to everybody, starting from young generations, through engaging communication formats and activities that take place in unusual venues and make the researchers' life a shared experience with a large audience in Italy.

- ‡ 2019 CNR SPIN Coordinator of the project PON MIUR "OT4CLIMA" presented by CNR IMAA, in DD n. 1735Del 13.07.2017 Avviso per la presentazione di progetti di ricerca industriale e sviluppo sperimentale nelle 12 aree di specializzazione individuate dal PNR 2015-2020. for the development of SNSPDs detectors for innovative LIDAR applications.

and furthermore

- ‡ 1998 Scientific Coordinator of Programma Operativo Plurifondo '94-'99 della Regione Campania, Sottoprogramma 5, Misura 5.4, Azione 5.4.3, Annualità 1999 with COPROMA SUD srl.

- ‡ 1995-2000 Participation to the Progetto SUD INFM "Analisi non distruttive con correnti parassite tramite dispositivi superconduttori" (Resp. Prof. G. Peluso, Università di Napoli, Università di Napoli Federico II)
- ‡ 2000-2004 Participation to the Progetto Strategico DM 20 ottobre 2000 "Progetti Strategici" Legge 449/97 "Analisi Non Distruttive su Materiali Compositi Strutturali per l'Industria Aeronautica" (Local coordinator INFM Napoli Unit, internal assignment)
- ‡ 2000-2003 Participation to the Progetto MURST (delibera CIPE): Potenziamento della struttura di realizzazione caratterizzazione e testing di dispositivi superconduttori basati su materiali ad alta temperatura critica, Unita' INFM Napoli.
- ‡ 2002-2006 Participation to the EU Project DIGISQUID "Digital high-Tc SQUID sensor for non destructive evaluation in un-shielded environment" (National P.I. Prof. A. Barone, INFM Napoli coordinator GPP)
- ‡ 2004-2006 Participation to MIUR-PRIN 2004: " Effetti Quantistici in Nanostrutture e Dispositivi Superconduttivi". (National P.I. Prof. A Barone)
- ‡ 2005-2007 Member of the Management Committee EU Project Network FONE "Spin-Dependent Transport and Electronic Correlations in Nanostructures" (National P.I. Prof. A. Tagliacozzo e G.P. Pepe)
- ‡ 2007-2008 Participation to the Progetto Distretto Materiali Polimerici named TRI.PO.DE in collaboration with STMicroelectronics, Divisione Elettronica Organica, Napoli on "Dispositivi di memoria a base di film attivi organici di materiali polimerici"
- ‡ 2012-2014 Participation to the Project funded by Polo delle Scienze e della Tecnologia, Università di Napoli Federico II, e da Banca Intesa San Paolo, titled "Sviluppo di Approcci innovativi e di nuove Conoscenze di base per la Sensoristica avanzata a base di materiali nanoStrutturati. (SACSES)" (Programma FARO annualità 2012), P.I. Prof. F.Auriemma, in collaborazione con Dipartimento Scienze Chimiche (responsabile Dip. Fisica Prof. G.P.Pepe)
- ‡ 2012 Participation to the Progetto PON 02_00654 GREEN, Settore/Ambito Materiali Avanzati, Soggetto Attuatore IMAST Distretto Materiali Polimerici Napoli, Scientific coordinator for the Dipartimento Scienze Fisiche dell'Università di Napoli on the characterization of transport properties in nanostructured materials for thermoelectrical applications
- ‡ Associated Research Member of the Istituto Nazionale di Fisica Nucleare on

several experiments within Group V (Detectors), the last active project being “Archimedes” (P.I. Prof. E. Calloni, Napoli)

- ‡ Associated Research Member of the Istituto Nazionale di Fisica della Materia (INFM) since its foundation until 2005
- ‡ Participation to European Science Foundation (ESF) Projects: "Novel Applications of Josephson Junctions in Quantum Digital Circuits" (PiShift, 2001-2006)

PARTICIPATION TO EDITORIAL BOARDS

- ‡ Associate Editor of Superconducting News Forum (Electronics: Particle/Radiation detectors, Josephson junctions and novel devices including unconventional superconductors, nanodevices) (2013-June 2018)
- ‡ Technical Editor of IEEE Transactions on Applied Superconductivity (TAS) (since June 2017)
- ‡ Editor of Proceedings of 6th European Applied Superconductivity Conference (2003), European Conference on Applied Superconductivity (more than 1000 participants), held in Sorrento, Italy, 14-18 September 2003, with A. Andreone, R. Cristiano, R. Masullo, edited by Institute of Physics (IOP)
- ‡ Technical Editor for the Special Issue of IEEE Trans. Appl. Superconductivity (for Electronics) - EUCAS 2017

‡ SPIN OFF

GPP participated with Proff. De Rosa C. F. Auriemma, G. Talarico e Odda ruiz de Ballesteros to the academic spin-off of the Università di Napoli Federico II named PLAST.EL. (PLASTic ELelectronics), approved by the Consiglio di Amministrazione of the Univeristy of Naples *Federico II* on Sept. 18t, 2012. the activity of the spin-off has been suspended waiting for fundings by the District of BioScience (Reg.Campania).

GPP participated with NetCom Industry, NetCom Engeneering, T.P.S. Srl, Prof. G. Acampora (Università di Napoli Federico II), Dr.ssa Autilia Vitiello (Università di Napoli Federico II) and Dr. Roberto Schiattarella to the start-up proposal named QUANTUMNET, submitted to Regione Campania on Sept. 10th, 2020. The core activity of the future start-up is related to the development of quantum codes for Sustainable mobility and energy efficiency.

‡ PATENTS

Participation to the patent "Proximity Josephson sensor", presented to The National Board of Patents and Registration of Finland (www.prh.fi) il 15.2.2008, nr FI20080124. Inventors : F. Giazotto (NEST CNR-INFM Pisa), G.P.Pepe (CNR-INFM Coherentia Napoli), T. Hekkila (TKK, LT Lab, Finlandia), P. Helistu (VTT IT, Finlandia) e A. Luukanen (VTT MilliLab Finlandia).

Participation to the patent "METHOD TO MAKE A FLEXIBLE THERMOELECTRIC GENERATOR DEVICE AND RELATED DEVICE", PCT international application number 14/814,660, inventors I. Pedaci (STMicroelectronics), A. Cimmino (STMicroelectronics), V. Casuscelli (STMicroelectronics), and GPP

AWARDS FOR SCIENTIFIC ACTIVITIES

- ‡ GPP was awarded by “Premio A. Corsicato” in 1989 for his thesis on YBCO bulk Josephson Junctions
- ‡ GPP has been awarded by the University of Naples Federico II for his Management Activities and for Research in 2011 (ex art. 29, c.19 L.240/2010)
- ‡ From 2019 GPP has been appointed as **Senior Member** of the IEEE

SEMINARS AND INVITED TALKS

- ‡ More than 20 invited talks at International Conferences, and several seminars at Electrotechnical Laboratories Tsukuba-Japan (1993, 1995); Saitama University Tokyo (2007), Technical University of Munich (1998), University of Rochester, Dept. Electronics Engineering (2005, 2007), Istituto Nazionale per la Ricerca Metrologica (2015), University of Urmia, Iran (2011), University of Twente NL (2008), Landau Institute at Chernogolovka, Russia (2005).

- ‡ The most important invited talks at international conferences are

2000 September, Plenary Communication at the Applied Superconductive Conference, Virginia Beach 2000 (ASC), Virginia Beach, USA (title “Quatratran: a new superconducting transistor”)

2000 September, “Invited talk” at the ASC 2000, Virginia Beach (USA) (title “The physics of Quatratran”)

2005 March “Invited talk” at Symposium of the Saitama University, Tokyo, title “Superconducting single Photon detectors”

2010 April “Invited talk” at the Conference “ICSM 2010- International Conference on Superconductivity and Magnetism” Antalya (Turkey) (title “The nonequilibrium properties of S/F nanostructures”)

2012 June “Invited talk” at the SUPERFOX, Como (title: “Superconductor/Ferromagnet hybrid structures for novel devices”)

2012 November Progress in Applied Surface, Interface and Thin Film Science Solar Renewable Energy News (SURFINT – SREN IV) Florence, Italy, title “Nanostructured superconducting materials”

2015 November Invited talk at Progress in Applied Surface, Interface and Thin Film Science Solar Renewable Energy News (SURFINT – SREN IV) Florence, Italy, title (Hybrid superconducting materials for single photon detectors”

2016 December Invited talk at Workshop on ‘Nanowire Superconducting Single Photon Detectors’, Lorentz Center, Leiden NL

2018 Invited talk at the Quantum Day Event, 11th Italian Quantum Information Science conference, Catania 17-20 September 2018

2018 Invited talk at the 10th Solid State Surfaces and Interfaces, SSSI X 19-22 November 2018, Smolenice (Slovakia)

VISITING SCIENTIST

- Visiting Scientist at Electro-Technical Laboratory, Tsukuba, Japan in 1993 (2 months), and in 1995 (1 month) (host Dr. S. Takada and Dr. H. Akoh))
- Technical University of Munich (1996), (host Prof. H. Kraus) within EU COST *Cryogenic Detectors*;
- Dept. Electrical Engineer, University of Rochester, Rochester NY USA in 2005 and 2007 (host Prof. R. Sobolewski)
- Dept. Physics University Urmia, Iran (2011) (Prof. A. Esmaeli);
- Saitama University, Dept. Engineering Japan (2010) (host Prof. H. Myoren)
- Short visits (from a few days to a couple of weeks): University of Twente, Enschede NL (Proff. H. Rogalla, A. Golubov), University of Leiden NL (Prof. J Aarts), Universität Erlangen-Nürnberg, Germany (Prof. A. Ustinov)

INSTITUTION ACTIVITIES- PARTICIPATION TO PEER REVIEWER COMMITTEES AND CONFERENCE BOARDS,

Casa delle Tecnologie Emergenti di Matera

2020-**present** Member of the Strategic Committee of the Casa delle Tecnologie Emergenti di Matera, a 15Meuro project funded by the Italian Ministry of Economic Development (MISE) concerning with the development of highly innovative technologies (i.e. IoT, AI, Blockchain and 5G)

2020-**present** GPP is “pro-tempore“ Scientific Advisor of the Casa delle Tecnologie Emergenti of Matera pending the conclusion of the procedure for the public selection activated by the Municipality of Matera

Consiglio Nazionale delle Ricerche

2020-**present** Member of the Executive Committee of the Inter-Department Center of CNR of Matera

University of Naples Federico II & See_QC

Within the MoU signed between the Dept. Of Physics, University of Naples Federico II and the innovative international start-up seeQC Srl (Superconducting Electronics for Energy Efficiency and Quantum Computing), leader in producing digital qubit control, readout and classical data processing functions, as well as being a platform for error correction, GPP is scientific reference of the collaboration for the Dept, and he will be appointed (waiting for the authorization of the University of Naples Federico II) as *business and technology board adviser for Seeqc*, being thus member of the seeqc Scientific Advisory Board.

University of Naples Federico II

2019-**present** Responsible and Scientific Coordinator of the Task Force of the University of Naples Federico II on Blue Italian Growth for the preparation of interdisciplinary projects between 12 Departments of the University. The TfdA is actually involved in cooperating with the National Cluster BIG for the preparation of proposals within the new phase *Restarting Blu and Green*;

2020-**present** Member of the Focus Group of University of Naples Federico II within the MedTech I4.0 Competence Center for physics and quantum technologies

2019-**present** President of the European Society for Applied Superconductivity (ESAS) as elected during the EUCAS 2019 Conference, Glasgow UK Sept. 2019. Within the Board GPP is also the official reference for Outreach and Dissemination activities concerning applied superconductivity in cooperation with many international Academies, Research Institutions and Companies.

2011- 2019

Consiglio Nazionale delle Ricerche

Deputy Director of Istituto CNR - SPIN Superconduttori, Materiali Innovativi e Dispositivi, Sede Secondaria, Napoli. GPP is responsible for administration management, personnel management, safety of laboratories, scientific relationships with other CNR Institutes, Universities, Technological Districts of Regione Campania.

2019 – chosen in the three competition for the position of Director of the CNR Institute ISASI

2017 – chosen in the three competition for the position of Director of the CNR Institute SPIN

2016 - present

GPP is member of the CNR Committee for implementing the Program RIS3 Campania – Smart Specialization, Strategy in Regione Campania

2016 - present

GPP is member of the Committee of the Dept. Physics of the University of Naples Federico II for Patents, Spin-Off and Technological Transfer

2018 –

GPP is member of the Executive Committee (16) of the Ph.D. Program on *Quantum Technologies*, a joint Ph.D. Course between Università di Napoli Federico II, CNR and Università di Camerino, coordinated by Prof. F. Tafuri (Uni.NA)

2015 - 2017

Member of the Board of Directors (CDA) of the Centro Regionale di Competenze *Nuove Tecnologie* Scarl representing University of Naples Federico II

2017 - present

Member of the Technical Scientific Committee (CTS) of the Centro Regionale di Competenze *Nuove Tecnologie* Scarl representing University of Naples Federico II

2010 - 2011

Member of the Consiglio di Istituto di CNR SPIN 2010-2011

2006 - 2010

Scientific leader of the CNR INFN-SPIN MDP_04_017 Project " Aspects of macroscopic quantum physics, superconducting and spintronics devices".

2002 - 2005

Member of the Giunta Esecutiva del Centro di Ricerca INFM denominato Coherentia (Director Prof. R. Vaglio)

2000 - 2003

Member of the Commissione Didattica of the Dipartimento Scienze Fisiche, Università di Napoli Federico II (Director prof. F. Cevenini)

2003 - 2005

Member of the Committee for the evaluation of the research products of the Engineering Faculty, Università di Napoli Federico II (Dean prof. V. Naso))

and furthermore:

- ‡ Peer Reviewer for a AFOSR project (USA) on superconducting three terminal devices.
- ‡ Reviewer of scientific journals, such as Phys. Rev. Lett., Phys. Rev. B, Appl. Phys. Lett., Europhys. Lett., J. Appl. Phys., Superconducting Science & Technology, Physica C, Journal of Physics: Condensed Matter, IEEE on Appl. Supercond., J. Supercond., Journal of Physics Communication,
- ‡ External reviewer for 'Researcher position' (Area disciplinare "Scienze Fisiche"), Università di Napoli Federico II RTDB (2016) Dip. Fisica.
- ‡ Participation in various Conference Program Committees and Editorial Boards (as for instance Applied Superconductivity Conference 2000 (Virginia Beach, USA); ICSM 2014-International Conference on Superconductivity and Magnetism 2014, Antalya (Turkey); Applied Superconductivity Conference Portland USA 2012, ISEC Boston USA 2013 and Nagoya Japan 2015, EUCAS Conference Genova 2013
- ‡ **Chair** of the 16th International Superconducting Electronics Conference (ISEC) held in Sorrento June 2017 (more than 300 participants)
- ‡ **Chair** of the 14th International Workshop on Low Temperature Electronics (WOLTE14) to be held in Matera April 2021
- ‡ **Chair** of the ESAS International Summer School on *New Trends with Superconducting Quantum Detectors*, Genova, CNR SPIN, 2013, satellite event of EUCAS 2013
- ‡ **Chair** of the Winter ESAS School on *Novel frontiers in superconducting electronics: from fundamental concepts and advanced materials towards future applications*, Pozzuoli (Italy), 12-16 December 2016 (<http://events.isec2017.org/>)

- ‡ **Co-Chair** of the National Workshop on *Single Photon Devices: The italian perspectives*, organized within the DEPARTMENT OF PHYSICAL SCIENCES AND TECHNOLOGIES OF MATTER of CNR
- ‡ **Chair** of the Workshop on *Superconducting Electronics for Quantum Flagship: beyond the potential*, Sorrento 2017, satellite event within the ISEC 2017 Conference
- ‡ **Co-Chair** of the 13th International Workshop On Low Temperature Electronics (*WOLTE13*), Sorrento 11-13 September 2018, www.wolte13.org
- ‡ **Co-Chair** of the national round table event “*QTs - Quantum Technologies: verso una nuova rivoluzione industriale. Riflessioni e strumenti a confronto per ricerca, formazione e finanza. Buone pratiche*”, organized in collaboration with the Unione Industriali of Napoli (ref Dott.ssa Alessia Guarnaccia) on June 27th, 2018
- ‡ Member of the Local Committee of the "Vortices in Josephson systems and nanostructures" (Acquafredda di Maratea, 20-25 September 2002);
- ‡ Member of the local organizing committee of “Physics and Applications of Superconducting Hybrid Nano-Engineered Devices” (SHyNeD 2014) Santa Maria di Castellabate, Italy, 31 August to 4 September 2014 (<http://hyb2014.fisica.unina.it/Announcement.html>); 6) "Superconducting Nanocircuits – 2014", Maratea 7 Sept 2014-12 Sept 2014)
- ‡ Member of the European Society for Applied Superconductivity (ESAS) Board. Until 2021. Within the ESAS Board GPP is responsible for the organization of Schools and promotion of superconductivity in outreach initiatives.
- ‡ Member of the International Advisory Board of the International Superconductive Electronics Conference
- ‡ Member of the International Advisory Board della European Conference on Applied Superconductivity (EUCAS), Session Electronics
- ‡ Member of the National Committee of the Conferenza Nazionale SUPERFOX (Conference on Superconductivity and Functional Oxides)
- ‡ Member of the Scientific Committee of the 6th European Conference on Applied Superconductivity (Sorrento, Italy, 14-18 September 2003).

A general report on the management activity updated to October 13th, 2020 is proposed in the ANNEX 1 of this CV.

ANNEX 1

MANAGEMENT ACTIVITY

During his career, GPP has combined scientific and management activities through participation and responsibility in national and international projects and initiatives, covering roles that have allowed him to measure himself with the impact of his research in a management context, operating on issues such as superconductivity and its electronic applications, and the possible contributions within quantum technologies. For these reasons GPP has operated within a wide and articulated network of contacts with both national and international research groups, national and international companies operating in these sectors, with Research Centers, Consortia, Industrial Districts, Clusters, public institutions, always trying to convey new opportunities characterized by thematic coherence.

In particular, GPP has shown a good attitude to leadership, significant organizational and decision-making skills, within a recognized ability to build relationships with various interlocutors. His recent election as President of the European Society for Applied Superconductivity has certainly represented an important recognition of these aspects in the professional profile of GPP.

In setting up its research group related to applied superconductivity and in the development of related laboratories to support research activities, GPP has implemented scouting actions on human resources offered by the Academy, including Ph.D. programs, on technical and instrumental resources, working hard in testing and proof-of-concept development. Over time, he has contributed to the creation and development of the "Ultra-Fast Nonequilibrium Physics" and "Quantum Computing" Laboratories at the Physics Department of the University of Naples Federico II in collaboration with prof F Tafuri, and of the Superconducting Nanowire Detectors Laboratory for QKD and LIDAR applications, also in collaboration with the National Research Council, SPIN Institute, Naples.

In his research and management activity he has always given great importance to bringing industrial partners and private investors closer to innovative technologies, looking at the local and national business system: the experience of the PON QUANCOM, of which he is the Principal Investigator, which involves important companies such as Italtel and Exprivia, and more recently the management of the Casa delle Tecnologie Emergenti of Matera, with the strong support of the Ministry of Economic Development and of important companies active in the national digital landscape, are clear examples. In particular, together with Professor F Tafuri of the

University of Naples Federico II, GPP has favored the birth of an innovative start-up called seeQC Srl, currently one of the two companies opened in Europe by the American Hypres Inc, world leader in superconductors electronics, which in Naples, with an agreement signed with the University of Naples Federico II, intends to develop a business in the field of quantum computing based on superconducting technologies. GPP has been indicated as Scientific Director of seeQC srl and as a member of its International Scientific Committee. The same applies to other major companies such as eg. Netcom Spa, with the presentation at the Campania Region of an innovative start-up proposal - of which GPP is a minority private shareholder - on the use of quantum computing in the cybersecurity and automotive sectors.

In his role as Head of the CNR SPIN Secondary Office in Naples he has often had the opportunity to carry out representative functions in institutional offices with partners of project initiatives, professional organizations (e.g. Confindustria, Campania Region, ...). In the role of coordination carried out at his own University and at the CNR, he has also operated in the management of innovation activities between companies and research, linked to the above issues...but not only. Currently as Scientific Coordinator of the Blue Italian Growth (BIG) University Task Force of the University of Naples Federico II, he covers a role of coordination between twelve university departments engaged in the promotion of projects and activities related to different technological trajectories on the economy of mare, in synergy with the National Cluster Blu Growth, which has about fifty members between public and private sectors, including universities, research centers, companies. The experience has an important impact from a management point of view, especially for the construction of a network of skills that must be well positioned with respect to the needs of the market and macroeconomic development following the pandemic crisis and the needs of the sector relating to Recovery.

During its activity and in the context of the roles covered, GPP has also demonstrated a good knowledge of the regional, national and European programmatic and implementation framework of research policies, including industrial of technology transfer in research systems, of innovation in industrial districts, of the productive fabric and of the research system.

The activity developed in event organization experiences was also extensive: GPP was Chairman of important international conferences (international conference on superconducting electronics ISEC, Sorrento 2017, 350 participants), of international scientific workshops (WOLTE13 and WOLTE14), of various international doctoral schools and various public events for the study of scientific policy issues. Furthermore, the activity carried out by GPP in the field of scientific dissemination was also noteworthy, having curated events in the context of the most important

nazian scientific events (Futuro Remoto, Science Festival, Matera Capitale 2019, European Reserach Night since 2016) and international (Quantum Flagship stand, Wien, exhibition on IC new technologies). Even in these organizational moments, GPP has demonstrated its ability to lead and motivate multidisciplinary teams in high-tech contexts, using communication and public speaking skills, leadership skills and business development orientation.

ANNEX 2

RESEARCH ACTIVITY

All works fall in the field of Solid State Physics and in particular of Superconductivity, with a strong focus on the study of physics of superconducting detectors and on the realization and characterization of superconducting devices. The concepts towards novel superconducting devices are driven by a special attention towards novel materials and nanophysics, and by notions oriented towards hybrid architectures.

DESCRIPTION OF SCIENTIFIC ACTIVITIES

The main themes of the scientific production can be grouped according to the following Keywords:

1. *Josephson effect, fundamentals of weak superconductivity* (from tunnel spectroscopy to proximity effect, and Macroscopic Quantum Tunneling in moderately damped systems)
2. *Superconducting Radiation Detectors*
3. *Superconducting quantum electronics*: measurements and integration with superconducting electronics and novel low cabling technologies
4. *Physics of nonequilibrium superconductivity also in unconventional materials* (fundamental properties of LTS, unconventional and novel superconducting materials, from high critical temperature superconductors and interface superconductivity to pnictides; electron relaxation rates in nonequilibrium states)
5. *Nondestructive Testing by using Superconducting Quantum Interference Devices (SQUIDs)*
6. *Physics of nanoparticles and nanostructured devices*

These keywords transform into the following research activities:

1. *Josephson effect, fundamentals of weak superconductivity* The Josephson effect in both LTS and HTS junctions, hybrid and nano-systems with different barriers/electrodes composed of nanowires, and ferromagnets have been extensively studied. This activity is of very wide perspective touching the nano and the macro at the same time. This is due to the fact that the existence of a Josephson current through a potential barrier between two superconductors is a direct manifestation of their macroscopic quantum phase correlation. This correlation is often controlled by a variety of competing and coexisting nanoscale mechanisms occurring across the barriers. This enormous potential of using the nano and the macro at the same time is the inner reason of the relevance of the Josephson effect for a variety of fundamental experiments, from those on macroscopic quantum tunneling and coherence to the more recent frontiers on topological superconductivity. This activity has always been accompanied by some additional works, that aim at evaluating possible applicative implications for sensors, three-terminal

devices, the principles of the superconducting transistors, SQUIDs with their very sensitivity to magnetic fields.

In particular, the possibility to drive junctions in the moderately damped regime and a detailed account of dissipation can open novel perspectives in the design of quantum hybrid devices, integrating different types of Josephson junctions. Experiments have been performed on low critical temperature superconductor (LTS) JJs, used as a reference system for issues on dissipation and coherence in solid state systems, and experiments on simple nanostructured wires toward studies devoted to the understanding of vortex (quantum) behavior. This is one side of a wide international effort to reveal more about transitions from classical to quantum mechanical behavior in ultrasmall systems, also in view of quantum-state engineering. Fluctuations turn as an active imaging technique of the transport properties with potential to contribute to unravel key topics, as the presence of triplet superconductivity in junctions with ferromagnetic barriers, the presence of unique excitations in hybrid structures or signatures of topological superconductivity.

The development of three terminal superconducting devices showing transistor-like characteristics represents another fundamental aspect of the applied research in this frame. The search for cryogenic low noise amplifiers fully compatible with Rapid Single Flux Quantum superconducting logic is still an open issue for the community. The studies on the Quasi-Particle Trapping Transistor (QuaTraTran), which conjugates advanced technologies in fabrication of stacked Josephson Junctions with the nonequilibrium physics occurring in a proximized bilayer under electron injection is a milestone in this direction: it opened the way to other similar configurations involving Superconductor/Ferromagnet nanostructures with a potential use of superconducting phase.

These notions have applications on the long run for the development of novel concepts for quantum hybrids, partly based on Josephson junctions, and fully fall in the Quantum Manifesto for Horizon 2020.

2. *Superconducting Radiation Detectors.* Superconducting detectors based Josephson Junctions and superconducting nanowires represent a unique tool for achieving the highest possible energy sensitivity and quantum efficiency in single photon detection in the mid-IR wavelength range. To this aim both LTS (es. Nb, NbN, WSi) and unconventional superconductors (hybrids, complex oxides, etc.) are used since the role of material is crucial in determining the physical properties of the hot spot following the energy absorption. To what concerns the Superconducting Nanowire Single Photon Detectors (SNSPDs), they are based on the superconductor/normal state transition which takes place after the photon absorption in a nanosized structure. The origin of the signal is strictly related to creation and motion of vortices inside the nanowire in nonequilibrium conditions. The investigation of hybrid nanostructures based on the proximity effect between a superconductor (e.g. Nb, NbN, YBCO) and a normal and/or weak ferromagnet (e.g. NiCu, oxide manganite) or novel pnictides (Fe-based) superconductors is motivated by the possibility to improve the detectors performances in terms of quantum efficiency and very low dark counts in the mid-IR range where conventional single photon detectors show limits. Moreover, the interplay between superconductivity and ferromagnetism also in this context represents a wide and rich research field both for fundamental physics aspects and applied implications in superconducting spintronics. Recently, D. Santavicca (2018 Supercond. Sci. Technol. **31**, 040502) published “Prospects for faster, higher-temperature superconducting nanowire single-photon detectors”, in which he calls for the attention on the letter by M Ejmaes, GPP et al (2017 Supercond. Sci. Technol. **30** 12LT02 <https://doi.org/10.1088/1361-6668/aa94b9>) on YBCO nanowires as future single photon detectors.

The development of single photon detectors and their integration with advanced photonics is fully recognized as a key technology for quantum communication inside H2020 Quantum Flagship strategy. Moreover, SNSPDs represent a key technology toward the realization of novel approaches in Quantum Technologies for cyber-security, and in particular in QKD based protocols.

3. *Superconducting Quantum Electronics*. In the field of superconducting electronics and Quantum Technologies GPP has recently oriented his attention toward the investigation of superconducting qubit, macroscopic quantum phenomena in superconducting systems, and rf Josephson effect in hybrid devices. All these fields are of fundamental interest for searching along new roads to qubit fabrication and characterization, novel read-out circuitry compatible with quantum devices, quantum detectors, low dissipation cabling in ultra-low T cryostats, development of parametric amplifiers in hybrid architectures, qubit integration with traditional (semiconducting) low-T electronics.

In conjunction with prof Francesco Tafuri (University of Naples Federico II), and in collaboration with the seeQC EU Srl (<https://seeqc.com/>) GPP developed an ultra-low T (<10mK) cryogenic measurement set-up for superconducting qubit characterization and more generally quantum computation systems. Their team measured recently for the first time in Italy operating superconducting qubit, and t's the unique in Europe to use superconducting digital electronics for qubit read-out.

4. *Physics of nonequilibrium superconductivity also in unconventional materials*. The study of relaxation processes which take place after the absorption of an external energy in a superconductor are strongly influenced by material properties and temperature. They reflect the properties of the electron Density of States (DoS), and hence an experimental investigation of these relaxation channels can be a powerful tool for predicting the behaviour of superconductors in applications where a nonequilibrium state is approached (detectors, transistors, etc.). Due to very short time scale involved, an ultrafast (<100fs) spectroscopy pump-probe system able to produce a sampling of the nonequilibrium processes gives the possibility to investigate such an electron regime, and hence obtain information on various electron and photon scattering rates, the possible role of an unconventional order parameter on nonequilibrium mechanisms. This research demonstrated to be very useful both on material science and superconducting electronics side, due to its unique possibility to investigate nonequilibrium effects in electron DoS.
5. *Nondestructive Testing by using Superconducting Quantum Interference Devices (SQUIDs)*. SQUIDs are superconducting devices which allow the highest sensitivity in terms of detection of magnetic fields (down to fT range) in conjunction with ultralow noise and relatively high bandwidth (>MHz). The use of HTS materials (YBCO) gives the possibility to extend such properties also to high operation temperatures (77K) with large benefits in terms of applications. NDT SQUID-based systems have been successfully employed in material science studies on composites, aerospace and aeronautical applications, power devices tests: they offer unique possibilities to detect defects or damages under low energy impacts in poor conductivity materials such as composites which are the basis of novel structures.
6. *Physics of nanoparticles and nanostructured devices*. Nanostructured materials such as metal-polymer nanocomposites, *i.e.* metal nanoparticles which fill a polymer blend, represent an important way toward the artificial "engineering" of materials. Their characterization in terms of both electron transport and UV-vis optical absorption properties gives a fundamental support in understanding the role of electron excitations in these nanomaterials looking to many potential applications in drug delivery, optical filters, magneto-elastic nanocomposites, etc. Organic

electronics can benefit from these nanocomposites: the interplay between the large topological potentials offered by block-copolymers on the nanoscale and the metal nanoparticles used as functionalizing fillers has been investigated toward the development of novel composite organic two-electrode memories and innovative flexible thermo-electrical modules.

GPP has largely participated to the conception and design of all experiments and its realization (from sample fabrication and patterning to transport and measurements) as primary actor.

GPP is research group coordinator for activity 2. *Superconducting Radiation Detectors* which involves also CNR researchers. For more than ten years together with Prof. A. Barone GPP coordinated researches of activity 4 *Nondestructive Testing by using Superconducting Quantum Interference Devices (SQUIDS)*.

From 2002 with Prof. De Lisio GPP have jointly coordinated the researches concerning ultrafast (<100fs) spectroscopy pump-probe experiment within activity *Physics of nonequilibrium superconductivity also in unconventional materials*.

Recently with Prof Tafuri GPP jointly promote researches concerning ultralow temperature system and superconducting hybrid technologies within activity *Josephson effect, fundamentals of weak superconductivity*.

To each of the above mentioned research activities, the **following highlights** can be associated:

Josephson effect, and the fundamentals of weak superconductivity.

Original contributions to understand transport properties in Josephson junctions (JJs): the concept of a pi-junction in S/F based tunnel devices, proximity effects in LTS JJs, study of high quality JJs for high transparency tunneling effects, development of an optically integrated platform including polymeric waveguides and high quality Nb-based superconducting tunnel junctions.

In particular, the use of JJs in a stacked configuration (e.g two JJs a three terminal configuration) led to the demonstration of a transistor-like behavior (QUAsi-particle TRApping TRANsistor - QUATRATRAN) opening the way to novel approaches in superconducting electronics by combining the proximity effect, the nonequilibrium physics and the material science. Of great perspectives is the work on SF-based junctions. This is the basis for new opto-magneto superconducting devices and quantum memories. GPP and Prof. Francesco Tafuri are working with Dr. Oleg Mukhanov, Chief Technology Officer, Senior Executive Vice President of Hypres, within the new Italian company “Hypres-Italy” named *SeeQC* srl (Superconducting devices for Energy-Efficiency and Quantum Computation). This is going to be an ideal industrial partner also for European calls within the framework of Horizon 2020 and the just signed “Quantum” Flagship. Of similar great perspective are the measurements on nano-hybrids Josephson junctions with barriers of topological insulators or graphene. These structures pave the way to a hybrid semiconductor/superconductor technology and incidentally seem to have a key role in isolating Majorana fermions. Of great importance is also the growing activity of characterizing new oxide materials at the lowest temperatures, with possibly new insights on the emergence of novel quantum phases in low-dimensional materials. All these activities reinforce the main drive towards the studies of new principles of macroscopic quantum phenomena and their application for innovative devices in view of the more and more emergent “Quantum Technologies”.

Changes in the layout of the junctions and a better control of junction parameters have allowed a detailed study of phase dynamics in the phase diffusion regime, providing an accurate methodology to estimate dissipation in the moderately damped regime. SF-based junctions are now object of joint efforts with several relevant European groups to create new families of dissipation-less devices

because of the superconductor, but at the same time controlled through the magnetic action on the ferromagnetic barrier further assisted by the light. In particular, the RF controlled magnetic Josephson junctions (MJJs) are good candidates for the realization of fast, scalable cryogenic memories compatible with Single Flux Quantum logic: the combination of microwaves and magnetic field pulses can improve the performances MJJs devices, increasing the separation between the critical current levels corresponding to logical “0” and “1”, and furnishing an additional tool to manipulate the memory states, following an approach which may lead to the development of new methods of manipulating their states in memory arrays for various applications including a new generation of transmon qubits. These activities are supported by SeeQC, too. Opto-magneto superconducting devices compatible with quantum SF-based memories and digital RSFQ devices are the basic platform for SeeQC in Napoli.

Unique perspectives for building a platform with quantum circuits and memories are opened by these experiments which should configure laboratories of University of Naples Federico II as a reference for low noise measurements at low temperatures for several groups in Europe and USA.

Superconducting Radiation Detectors.

Original contributions on the investigation of the *linear regime in a Superconducting Tunnel Junction Detector* used as a proportional energy counter (a theoretical collaboration with Prof. B. Ivlev, Landau Institute Moscow, Russia), subsequently demonstrated by the group of ETH Zurich CH; on the *role of geometry (annular shape) in Josephson Junctions Detectors* for avoiding contributions from quasi-particle trapping following the application of a magnetic field in weak superconductor order parameter regions; on the *role of proximity effect in the charge signal after the absorption of a x-ray* in a STJ; on the *possible use of a SNS Josephson Junction* as THz detector involving the unconventional phase-dependence of the Josephson current in the low temperature limit (in collaboration with F. Giazotto, CNR NANO and Scuola Normale di Pisa); more recently, on the *role of proximity effect in novel Superconducting Nanowires Single Photon Detectors (SNSPDs)* for the enhancement of the superconducting critical current I_c (and hence of photon signal amplitude), the reduction of dark counts and for supporting theoretical investigations about the physics of the signal formation mechanism based on quantum vortices. GPP has largely participated to the conception and design of all experiments and their realization (from sample fabrication and nanopatterning to optical detection measurements and data analysis) as primary actor. The contribution of GPP has mostly focused on the conception and the design of experiments and data analysis, and on the writing of the manuscripts. In collaboration with his students and researchers from CNR SPIN in the last years GPP set up both an Electron Beam Litography facility for nanopatterning and a competitive low temperature cryogen free laboratory for SNSDs testing. Standard and homemade low-noise electronics allow a wide range of complementary transport measurements on superconductors in moderate magnetic fields, including measurements of switching current distributions in Josephson junctions.

Superconducting Quantum Electronics. Macroscopic Quantum Phenomena in Josephson Junctions (JJs) also in unconventional configurations are affected by some intrinsic dissipation channels induced by the presence of low energy quasi-particles and the magnetic nature of the electrode/barrier. The possibility to drive junctions in the moderately damped regime, and a detailed account of dissipation can open novel perspectives in the design of quantum hybrid devices, integrating different types of Josephson junctions. Changes in the layout of the junctions and a better control of junction parameters have allowed a detailed study of phase dynamics in the phase diffusion regime, providing an accurate methodology to estimate dissipation in the moderately damped regime. An articulate understanding of dissipation in a variety of moderately damped junctions has been achieved. SFS and SISFS junctions are now object of joint efforts with several relevant European groups to create new families of dissipation-less devices, digital superconducting memories, inductive non-linear components in quantum electronics, and in perspectives controlled

by the magnetic degree of freedom possibly assisted by the light. These activities are supported by seeQC EU srl, a SME company gemmed by the American Hypres Inc leader in superconducting electronics, which has established in Naples, within the Dept of Physics, University of Naples Federico II, one of its two European sites.

Physics of nonequilibrium superconductivity also in unconventional materials. Original contributions on the ultrafast optical characterization of HTS thin film superconductors, YBCO/LSMO hybrid bilayers, disorder sensitive experiments in NdCeCuO thin films, Fe-based and Co-based novel pnictide superconductors, ultrafast spectroscopy on conventional superconductors such as Nb and NbN, LTS/weak-Ferromagnet hybrids. From 2002 GPP contributed to the development of the Ultrafast Quantum Phenomena Laboratory within the Dept. Of Physics of the University of Naples Federico II and the CNR SPIN, Unit of Naples, in collaboration with Prof. C. De Lisio. A pump-probe time-resolved system has been set-up, based on a Ti:sapphire laser source with pulse duration <100fs, which can work both in reflectivity and polarization modes. The cryogenics allows to measure down to 2K also in the presence of external magnetic fields (<1T). The Ultrafast Quantum Phenomena Laboratory allowed experiments in the areas of solid-state and quantum electronics as previously evidenced, a truly interdisciplinary effort, which overlaps such different disciplines as optics, micro- and nano-electronics, cryogenics, materials science, condensed matter physics, and electrodynamics. Specific research topics include physics of ultrafast phenomena in condensed matter, single-photon detection, ultrafast optoelectronic photodetectors, sub-picosecond electro-optic and magneto-optic characterization of high-performance superconducting devices, femtosecond spectroscopy of HTS and unconventional superconducting films.

Nondestructive Testing by using Superconducting Quantum Interference Devices. Original contributions in NDT SQUID-based measurements on aeronautical structures including depth profiles (down to tenths mm at low frequencies close to 100Hz) of defects and rivets, low-velocity impact and fatigue images in reinforced Carbon Fiber Composites (CRFCP) structures, fiber glass/aluminum laminates and GLARE, development of second order gradiometers techniques by using GMR sensors, SQUID-based spatial resolved magnetic images of defects in metallic samples. From 1996 within the Progetto SUD INFM “Analisi non distruttive con sensori superconduttivi SQUID” GPP contributed to the development of the NDE Laboratory within the Dept. Physics of University of Naples Federico II and the CNR SPIN, Unit of Naples, in collaboration with Prof. A. Barone, G. Peluso and Dr. M. Valentino. The Lab has been mainly devoted to the optimization of a HTS SQUID-based eddy-current test system for various types of samples basically of interest for aeronautical and aerospace industries. The NDE Laboratory has been also equipped with all conventional sensors operating in this context for comparative tests in view of results certification: in particular, ultrasound probes, fluxgates sensors, conventional eddy-current high frequency coils, Giant Magneto-Resistance Sensors. The NDE Laboratory allowed experiments in the areas of solid-state physics and engineering in a truly interdisciplinary effort combining diverse disciplines as superconducting electronics, non-magnetic low-cost cryogenics, and materials science.

Physics of nanoparticles and their use in nanostructured devices. Original contributions in physical (transport and optical) characterization of Carbon nano-scrolls, Carbon nanoparticles from laminar premixed flames, magnetic and magnetoelastic properties of Ni-nanoparticle/Silicon matrix composites, nanostructured metamaterials from Block-

Copolymers composites, current fluctuations in polystyrene nanocomposites, and on the investigation of optical plasmonic properties of metallic and bimetallic nanoparticles. In particular, *Block Co-Polymer nanocomposites functionalized by Au nanoparticles* have demonstrated their importance in organic memories with a high W/R efficiency based on the electron transport within highly controlled nanosized polymeric channels (diameter <30nm) through few metallic nanoparticles. The properties of nanoparticles and the unique possibilities offered by Block Co-Polymers in determining the 3D topology of the hosting matrix by self-assembly up to macroscale (up to cm²) make these nanocomposites quite promising for both future nanolithography and engineered plasmonics.

The complete list of publications and its internal consistency confirm a high quality and independent research, which is accompanied by several additional coherent activities ranging from responsibilities in projects to invited talks at international conferences. The whole body of work stands as an original and autonomous contribution, internationally widely acknowledged. The impact can be also measured through the number of papers published in highly ranked journals and through the high profile and the variety of the external collaborators and their Institutions (see below), which give a flavor of the international level of the research activity. On the main themes of weak superconductivity and the Josephson effect, a strong interest in materials science and novel materials and in nanophysics applied to superconductors has promoted quite innovative insights in the study of transport properties and of their possible applications in solid state devices. These can be of high relevance and inspiration for hybrid architectures to be used for emergent quantum technologies.

Apart from leading the scientific policy, the contribution of GPP has mostly focused on the conception and the design of experiments and data analysis, and on the writing of the manuscripts. In the last years GPP has collaborated with prof Francesco Tafuri to set up a highly competitive low temperature laboratory, consisting of a He3 system (300 mK), of a dilution fridge (base temperature 15 mK), and cryogen free fridge (base temperature 6 mK) at the Dept. Physics of the Università di Napoli Federico II, respectively. Standard and homemade low-noise electronics allow a wide range of complementary transport measurements on superconductors in moderate magnetic fields, including measurements of switching current distributions in Josephson junctions. These aim at studying macroscopic quantum phenomena in Josephson systems, optical and microwave characterization at very low temperatures, and they are the necessary basis for any further advance for the use of superconductors as fundamental cells in “qu-bits”. This is a very relevant and pertinent field of the emerging “quantum technologies”. The recent acquisition of the cryogen free cryostat allowed a more systematic approach for the measurement of superconducting qubits (already done for the first time in Italy) and their architectures.

Collaborations with joint papers

Graduate School for Physics and Engineering, Saitama University; Electro-technical Laboratory Tsukuba (Japan); Oxford University, Dept. Nuclear Physics UK; Technical

University of Munchen, Dept. Physics; Landau Institute Moscow (Russia); Universidad de Potosi, Potosi (Mexico); University of Leiden, NL; Hypres Inc (USA); Chalmers University of Technology, Goteborg, Sweden; University of Cambridge UK; University of Twente, Enschede, Netherlands; Scuola Normale Superiore di Pisa, Università di Roma Tor Vergata e Sapienza, Università di Genova Italy, Istituti CNR SPIN, IFN, NANO and IPCB, Italy; STMicroelectronics, Arzano (NA), Italy.

For recent developments on nanoscale superconductors and hybrid devices, GPP together with Prof. F. Tafuri keep collaborating with the group of Prof. F. Lombardi in Chalmers, with a unique European facility for nano-fabrication, Cambridge UK University Dept. Physics, Twente University NL, Dept. Low Temperature Physics, Hypres Inc USA, Saitama University Tokyo Japan, Moscow University.