

Curriculum Vitæ

Personal information

First name / Surname

Nationality

Date of birth

Giorgio De Simoni

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Research experience

November 2019 - Present

Staff Scientist (Ricercatore III livello) at the Istituto Nanoscienze of Consiglio Nazionale delle Ricerche, Piazza San Silvestro 12, I-56126 Pisa, Italia

March 2019 - November 2019

Scientist (Ricercatore T.D. III livello) at the Istituto Nanoscienze of Consiglio Nazionale delle Ricerche, Piazza San Silvestro 12, I-56126 Pisa, Italia

Main activities and responsibilities: Design, fabrication and measure of thermoelectric hybrid superconducting-ferromagnetic tunnel junction THz radiation sensors with reference to the H2020-EU.1.2.1.-FET Open research project *SUPERTEd: Thermoelectric detector based on superconductor-ferromagnet heterostructures*. (Grant agreement ID: 800923)

February 2017 - January 2019

Scientist (Ricercatore T.D. III livello) at the Istituto Nanoscienze of Consiglio Nazionale delle Ricerche, Piazza San Silvestro 12, I-56126 Pisa, Italia

Main activities and responsibilities: Design, fabrication and measure of superconducting proximity Josephson THz radiation sensors with reference to the FAR-FAS-2014 research project *SCIADRO: Utilizzo di flotte e sciame di droni dotati di sensori e tecnologie abilitanti innovative per la sicurezza del territorio e degli aeroporti*. (DE-CRETO N. 3506 28/07/2015, Numero Identificativo attribuito dalla fonte di finanziamento)

Reference number: prot. n. 0000383, 01/02/2017 and n. 0001339, 28/05/2018.

February 2016 - January 2017

Post-doctoral research position (Assegno di Ricerca) at the Istituto Nanoscienze of Consiglio Nazionale delle Ricerche, Piazza San Silvestro 12, I-56126 Pisa, Italia

Main activities and responsibilities: Development, fabrication and measurement of phase coherent photonic, caloritronic and superconductive nano-devices with reference to the ERC Comanche: *Coherent manipulation and control of heat in solid-state nanostructures: the era of coherent caloritronics*. (Ref. UE ERC- GA 615187)

Reference number: prot. n. 0000159, 21/01/2016.

February 2012 - January 2016

Post-doctoral research position (co.co.pro.) at the Center for Nanotechnology Innovation of Istituto Italiano di Tecnologia, Via Morego, 30 16163 Genova, Italy, Italia

Main activities and responsibilities: Development of novel MEMS sensors based on surface acoustic wave technology.

Reference number: prot. n. 0003192/14, 22/01/2014 e 0004596/12, 25/01/2012

March 2009 - February 2012	<p>Research fellow (co.co.pro.) at the NEST Laboratory, Scuola Normale Superiore di Pisa, Piazza dei Cavalieri 7, I-56126 Pisa, Italia</p> <p>Main activities and responsibilities: Analysis of the optical and acoustoelectric transport properties of semiconductor nanowires with reference to the FIRB project RBIN067A39_002 <i>Semiconduttori unidimensionali autoassemblati e loro applicazioni dispositivi</i>.</p> <p>Reference number: Contratto su progetto FIRBCANVP (Bando 2006 Internazionale) RBIN067A39</p>
January 2009 - March 2009	<p>Research fellow (Assegno di Ricerca) at the NEST Laboratory, Scuola Normale Superiore di Pisa, Piazza dei Cavalieri 7, I-56126 Pisa, Italia</p> <p>Main activities and responsibilities: Design, processing and measurement of semiconductor devices within the theme of single photon generation for quantum cryptography applications, under the responsibility of Prof. Fabio Beltram.</p>
Education and training	
January 2006 - December 2008	<p>PhD course in condensed matter physics (Perfezionamento in fisica della materia condensata) at the Scuola Normale Superiore di Pisa, Piazza dei Cavalieri 7, I-56126 Pisa, Research project: surface acoustic wave driven on-demand single-photon generation. Advisor: Prof. Fabio Beltram. Date of graduation: 16th May 2013. Final Mark 70/70.</p>
25 th October 2005	<p>Second level (Master) degree in Physical Science (ISCED5A) at the Università di Pisa. Thesis title: Acousto-electric transport in planar <i>nn</i> devices. Advisors: Prof. Fabio Beltram and Dr. Vincenzo Piazza. Final Mark 110/110 <i>cum laude</i>.</p>
31 st July 2003	<p>First level (Bachelor) degree in Physics (ISCED5A) at the Università di Pisa. Thesis title: Surface acoustic waves and planar light-emitting diodes. Advisors: Prof. Fabio Beltram. Final Mark 110/110.</p>
Teaching experience	
2023 -	PhD student supervisor (relatore di tesi di dottorato): Giacomo Trupiano, Scuola Normale Superiore di Pisa, Corso di Perfezionamento in Nanoscienze.
2017 - 2023	PhD student supervisor (relatore di tesi di dottorato): Claudio Puglia, XXXIII ciclo del Corso di dottorato in Fisica, Università di Pisa.
2023	Master degree student supervisor (relatore di laurea specialistica): Filippo Antola, Fisica, Università di Pisa, (110L/100).
2021	Master degree student supervisor (relatore di laurea specialistica): Lorenzo Cassola, Fisica, Università di Pisa, (110L/100).
2021	Master degree student supervisor (relatore di laurea specialistica): Sebastiano Battisti, Fisica, Università di Pisa, (110L/100).

2020

Master degree student supervisor (relatore di laurea specialistica): Davide degli Esposti, Fisica, Università di Pisa, (110L/100).

Student trainer for optical lithography, SEM-imaging and electron-beam lithography, metal thermal evaporation, wedge bonding.

Held lectures on optical lithography, as a part of the course Safety and scientific instrumentation for Ph.D. students of Scuola Normale Superiore, Pisa, Italy

Selected research Projects

May 2022 - present

Backup coordinator e contact coordinator of the european project HORIZON-EIC-2021-TRANSITION-OPEN-01 SPECTRUM: Superconducting radio-frequency switch for quantum technologies (G.A. 101057977). Total budget € 2.499.222. Project coordinator: dr. Francesco Giazotto, Istituto Nanoscienze sede di Pisa, CNR. Other nodes: Chalmers Tekniska Hogskola AB (Sweden), Intermodulation product AB (Sweden), Bilfinger Noell GMBH (Deutschland), DAY ONE s.r.l. (Italy).

March 2021 - present

Scientist in the european project H2020-FET SUPERGATE: Gate Tunable Superconducting Quantum Electronics (G.A. 964398). Total budget € 3.059.348,75. Project coordinatore: prof. Elke Scheer, Università di Costanza, Germania. Other Nodes: Università di Budapest (Ungheria); Delft Technische Universiteit (Paesi Bassi), Chalmers Tekniska Hogskola AB (Svezia), SEEQC-EU s.r.l. (Italia), Université de Geneve (Svizzera).

March 2021 - present

Scientist in the european project SUPERTED: Thermoelectric detector based on superconductor-ferromagnet heterostructures (G.A. 800923), Finanziamento Europeo sul programma H2020-EU.1.2.1. - FET Open. Total budget 2.944.728,75€. Project coordinator: prof. Tero Häkkinen, Università di Jyväskylä, Finlandia. Other nodes: Agencia estatal consejo superior de investigaciones científicas - CSIC (San Sebastian, Spagna); Centre national de la recherche scientifique - CNRS (Grenoble, Francia); Bihurcrystal SL (Spagna).

Member of selection board assignments

Member of selection board in tender procedure for the assignment of supply of a dilution cryostat.

Reference number: prot. n. 0003602, 19/09/2017

Member of selection board for the recruitment of a personal unit (Researcher III level CNR T.D.).

Reference number: prot. n.0002168, 23/05/2017

Personal skills and competences

Mother tongue(s)

Other language(s)

*Self-assessment
European level^(*)*

Language

Technical skills and competences

Computer skills and competences

Patents

Member of selection board for the recruitment of a personal unit (Assegno di Ricerca Professionalizzante).

Reference number: prot. n. 371, 09/02/2021

Member of selection board for the recruitment of a personal unit (Assegno di Ricerca Post Dottorale).

Reference number: prot. n. 3499, 11/11/2022

Italian

English

Understanding		Speaking		Writing
Listening	Reading	Spoken interaction	Spoken production	
Proficient user (C1)	Proficient user (C1)	Proficient user (C1)	Proficient user (C1)	Proficient user (C1)

^(*) Common European Framework of Reference (CEF) level

- **III-V semiconductor/superconductor processing in a clean-room environment:** optical/e-beam lithography; scanning-electron-microscope imaging; wet and dry semiconductor etching; thin layer deposition by thermal and e-beam evaporation, atomic layer deposition and sputtering.
- **Electro-optical characterization of nanodevices** at cryogenic temperatures (below 10 mK) and high magnetic fields (8 T), RF-signal generation and detection, surface-acoustic-wave-based devices characterization, laser-doppler vibrometry, Hanbury-Brown and Twiss single-photon detection, spectrally/spatially/time-resolved optical measurements at near-infrared/visible wavelength.
- **Opto-electronic micro-/nano-device modeling and simulation:** Coupled Schrödinger and Poisson equations solving for 2D/3D calculation of band profile in semiconductor device. Finite-element-method (FEM) simulations: optical cavities for laser diodes, RF antennas, surface-acoustic-wave-based devices, frequency and electric response of mechanically and thermally stress/strained micro-electromechanical devices.
- **Operating systems:** Windows, Os X, Unix/Linux.
- **Development tools:** Python, C/C++, Labview.
- **Computational:** OriginPro, Comsol Multiphysics, Mathematica, Matlab.

Automatic passive control of liquid positioning in microfluidic chips (Controllo automatico passivo del posizionamento di liquidi in chip microfluidici), WO2013054265 A1, Priority Date: 10/10/2011.

Superconducting Logic Element (Elemento logico a superconduttori), WO2019038409A1, Priority Date: 24/08/2017

Superconducting Variable Inductance transistor (Transistor superconduttivo a induttanza variabile), WO2023073570A1, Priority Date: 26/10/2022

Superconducting Interferometer (Interferometro superconduttivo), Application number: PCT/IB2023/053830, Priority Date: 14/04/2022

Publications

L. Ruf, T. Elalaily, C. Puglia, Y. P. Ivanov, F. Joint, M. Berke, A. Iorio, P. Makk, G. De Simoni, S. Gasparinetti, G. Divitini, S. Csonka, F. Giazotto, E. Scheer, and A. Di Bernardo, "Effects of fabrication routes and material parameters on the control of superconducting currents by gate voltage," *APL Materials*, vol. 11, p. 091113, 09 2023

G. De Simoni and F. Giazotto, "Ultralinear magnetic-flux-to-voltage conversion in superconducting quantum interference proximity transistors," *Phys. Rev. Appl.*, vol. 19, p. 054021, May 2023

F. Paolucci, G. De Simoni, and F. Giazotto, "A gate- and flux-controlled supercurrent diode effect," *Applied Physics Letters*, vol. 122, 01 2023. 042601

G. De Simoni, L. Cassola, N. Ligato, G. C. Tettamanzi, and F. Giazotto, "Ultrahigh linearity of the magnetic-flux-to-voltage response of proximity-based mesoscopic bi-squids," *Phys. Rev. Appl.*, vol. 18, p. 014073, Jul 2022

M. Montorsi, G. Genchi, D. D. Pasquale, G. D. Simoni, E. Sinibaldi, and G. Ciofani, "Design, fabrication, and characterization of a multimodal reconfigurable bioreactor for bone tissue engineering," *Biotechnology and Bioengineering*, 2022

C. Puglia, G. D. Simoni, and F. Giazotto, "Phase slips dynamics in gated ti and v all-metallic supercurrent nano-transistors," *Journal of Physics D: Applied Physics*, vol. 55, p. 055301, 2022

C. Puglia, G. D. Simoni, and F. Giazotto, "Gate control of superconductivity in mesoscopic all-metallic devices," *Materials*, vol. 14, p. 1243, 3 2021

G. D. Simoni, S. Battisti, N. Ligato, M. T. Mercaldo, M. Cuoco, and F. Giazotto, "Gate control of the current-flux relation of a josephson quantum interferometer based on proximitized metallic nanojunctions," *ACS Applied Electronic Materials*, vol. 3, pp. 3927–3935, 9 2021

F. Paolucci, F. Crisá, G. D. Simoni, L. Bours, C. Puglia, E. Strambini, S. Roddaro, and F. Giazotto, "Electrostatic field-driven supercurrent suppression in ionic-gated metallic superconducting nanotransistors," *Nano Letters*, vol. 21, pp. 10309–10314, 12 2021

C. Puglia, G. D. Simoni, N. Ligato, and F. Giazotto, "Vanadium gate-controlled josephson half-wave nanorectifier," *Applied Physics Letters*, vol. 116, p. 252601, 6 2020

C. Puglia, G. D. Simoni, and F. Giazotto, "Electrostatic control of phase slips in ti josephson nanotransistors," *Physical Review Applied*, vol. 13, p. 054026, 5 2020

G. D. Simoni, C. Puglia, and F. Giazotto, "Niobium dayem nano-bridge josephson gate-controlled transistors," *Applied Physics Letters*, vol. 116, p. 242601, 6 2020

M. Rocci, G. D. Simoni, C. Puglia, D. D. Esposti, E. Strambini, V. Zannier, L. Sorba, and F. Giazotto, "Gate-controlled suspended titanium nanobridge supercurrent transistor," *ACS Nano*, vol. 14, pp. 12621–12628, 10 2020

- F. Paolucci, F. Vischi, G. De Simoni, C. Guarcello, P. Solinas, and F. Giazotto, "Field-Effect Controllable Metallic Josephson Interferometer," *Nano Lett.*, p. <https://doi.org/10.1021/acs.nanolett.9b02369>, sep 2019
- G. De Simoni, F. Paolucci, C. Puglia, and F. Giazotto, "Josephson Field-Effect Transistors Based on All-Metallic Al/Cu/Al Proximity Nanojunctions," *ACS Nano*, vol. 13, pp. 7871–7876, jul 2019
- F. Paolucci, G. De Simoni, P. Solinas, E. Strambini, N. Ligato, P. Virtanen, A. Braggio, and F. Giazotto, "Magnetotransport Experiments on Fully Metallic Superconducting Dayem-Bridge Field-Effect Transistors," *Phys. Rev. Appl.*, vol. 11, p. 024061, feb 2019
- G. G. Genchi, E. Sinibaldi, L. Ceseracciu, M. Labardi, A. Marino, S. Marras, G. De Simoni, V. Mattoli, and G. Ciofani, "Ultrasound-activated piezoelectric P(VDF-TrFE)/boron nitride nanotube composite films promote differentiation of human SaOS-2 osteoblast-like cells," *Nanomedicine: Nanotechnology, Biology and Medicine*, vol. 18, no. 10, pp. 6369–6374, 2018
- G. De Simoni, E. Strambini, J. S. Moodera, F. S. Bergeret, and F. Giazotto, "Toward the Absolute Spin-Valve Effect in Superconducting Tunnel Junctions," *Nano Letters*, vol. 18, no. 14, pp. 2421–2432, 2018
- F. Paolucci, G. De Simoni, E. Strambini, P. Solinas, and F. Giazotto, "Ultra-Efficient Superconducting Dayem Bridge Field-Effect Transistor," *Nano Letters*, vol. 18, no. 7, pp. 4195–4199, 2018
- G. De Simoni, F. Paolucci, P. Solinas, E. Strambini, and F. Giazotto, "Metallic super-current field-effect transistor," *Nature Nanotechnology*, vol. 13, no. 9, pp. 802–805, 2018
- E. Strambini, V. N. Golovach, G. De Simoni, J. S. Moodera, F. S. Bergeret, and F. Giazotto, "Revealing the magnetic proximity effect in EuS/Al bilayers through superconducting tunneling spectroscopy," *Physical Review Materials*, vol. 1, no. 5, p. 054402, 2017
- G. De Simoni, G. Signore, M. Agostini, F. Beltram, and V. Piazza, "A surface-acoustic-wave-based cantilever bio-sensor," *Biosensors & bioelectronics*, vol. 68, pp. 570–576, 2015
- A. Pitanti, D. Coquillat, D. Ercolani, L. Sorba, F. Teppe, W. Knap, G. De Simoni, F. Beltram, A. Tredicucci, and M. S. Vitiello, "Terahertz detection by heterostructured InAs/InSb nanowire based field effect transistors," *Applied Physics Letters*, vol. 101, no. 14, p. 141103, 2012
- M. Travaglini, G. De Simoni, C. M. Lazzarini, V. Piazza, F. Beltram, and M. Cecchini, "Interaction-free, automatic, on-chip fluid routing by surface acoustic waves," *Lab on a chip*, vol. 12, no. 15, pp. 2621–4, 2012
- G. De Simoni, L. Mahler, V. Piazza, A. Tredicucci, C. A. Nicoll, and F. Beltram, "Lasing in planar semiconductor diodes Lasing in planar semiconductor diodes," *Applied Physics Letters*, vol. 99, p. 261110, 2011
- T. Lunghi, G. De Simoni, V. Piazza, C. A. Nicoll, H. E. Beere, D. A. Ritchie, and F. Beltram, "Anti-bunched photons from a lateral light-emitting diode," *Applied Physics Letters*, vol. 99, no. 13, p. 131103, 2011
- G. De Simoni, a. Singha, M. Gibertini, B. Karmakar, M. Polini, V. Piazza, L. N. Pfeiffer, K. W. West, F. Beltram, and V. Pellegrini, "Delocalized-localized transition in a semiconductor two-dimensional honeycomb lattice," *Applied Physics Letters*, vol. 97, no. 13, p. 132113, 2010

G. De Simoni, V. Piazza, L. Sorba, G. Biasiol, and F. Beltram, "Acoustoelectric luminescence from a field-effect n-i-p lateral junction," *Applied Physics Letters*, vol. 94, no. 12, p. 121103, 2009

G. De Simoni, M. Cecchini, V. Piazza, F. Beltram, H. E. Beere, and D. A. Ritchie, "Acoustic charge transport in a n-i-n three terminal device," *AIP Conference Proceedings*, vol. 1, pp. 691–692, 2007

M. Cecchini, G. De Simoni, V. Piazza, F. Beltram, H. E. Beere, and D. A. Ritchie, "Acoustic charge transport in a n-i-n three terminal device," *Applied Physics Letters*, vol. 88, no. 21, p. 212101, 2006

M. Cecchini, G. De Simoni, V. Piazza, F. Beltram, H. E. Beere, and D. A. Ritchie, "Surface acoustic wave-driven planar light-emitting device," *Applied Physics Letters*, vol. 85, no. 15, p. 3020, 2004

April 3, 2024

Giorgio De Simoni

Autorizzo il trattamento dei dati personali contenuti nel mio curriculum vitae in base

Ai sensi dell'art.38 del DPR 445/2000: si allega fotocopia della carta di identità del sottoscrittore (C.I. 0275539AA) in corso di validità.

April 3, 2024

Giorgio De Simoni