Sabino Maggi

Curriculum Vitae

CNR-IIA Institute of Atmospheric Pollution Research
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Education

1987 **Master's degree in Physics**, *University of Turin, Italy*.
Master's degree in Physics at the University of Turin, Italy, final degree 110/110 cum laude and honor mention. The thesis work dealt with the analysis of phase-lock conditions of a parallel array of superconducting Josephson junctions in a radio frequency field.

1991 **PhD in Materials Science**, *University of Turin, Italy*.
PhD in Materials Science on the development of methods for the fabrication and characterization of all refractory Nb/Al-AlOx/Nb Josephson junctions for superconducting electronics applications.

Work experience

2019–today **Senior scientist**, *CNR-IIA Institute of Atmospheric Pollution Research*, Bari.
Analysis of remore sensing and environmental data. Development of software and hardware tools for environmental monitoring.

2012–2019 **Senior scientist**, *CNR-IRSA Water Research Institute*, Bari.
Simulation of hydraulic processes in porous materials. Application of ground penetrating radar to archaeological and environmental investigations. Development of geostatistics tools for environmental monitoring.

2008–2012 **Senior scientist**, *CNR-IC Institute of Crystallography*, Bari.
Experimental X-ray diffraction. Crystal structure solution and refinement. Development of software packages for crystallography.

2000–2008 **Senior scientist**, *IEN Istituto Elettrotecnico Nazionale "G. Ferraris"*, Turin.
Fabrication and characterization of superconducting devices for metrology and astrophysics.

1998–2002 **Adjunct Professor**, *Department of Material Science, University*, Turin.
Adjunct Professor in Thin Film Technology at the Department of Material Science of the University of Turin.

1991–2006 **Fellowship**, *INFN National Institute of Nuclear Physics*.
Superconducting strip position detectors for α and β particles.

1990–1999 **Scientist**, *IEN Istituto Elettrotecnico Nazionale "G. Ferraris"*, Turin.
Permanent position at the Electrical Metrology Department. Technology and characterization of superconducting electronic devices.

1989–1990 **Research grant**, *IEN Istituto Elettrotecnico Nazionale "G. Ferraris"*, Turin.
Superconducting Nb/Al-AlO$_x$/Nb Josephson tunnel junctions and their interaction with electromagnetic radiation.

1989 **Research grant**, *Physikalisch-Technische Bundesanstalt*, Braunschweig, Germany.
Development of a 35 GHz Josephson junction array.

1989 **Visiting scientist**, *Physical Department, University*, Salerno.
Implementation of the Nb/Al-AlO$_x$/Nb Josephson junction technology developed at PTB, Germany.

1987–1988 **European Union research grant**, *Physikalisch-Technische Bundesanstalt*, Braunschweig, Germany.
Development of the novel technology for the fabrication of Nb/Al-AlO_x/Nb Josephson junction devices.

Research activity

Superconducting electronics.
Development of the fabrication technology and characterization at cryogenic temperatures of Josephson devices for superconducting electronics for the voltage standard and as radiation detectors.

Structural characterization of thin films.
Analysis of the crystal structure of thin films and of the surface morphology of Josephson devices in order to optimize their electrical behavior at low temperatures, using several characterization techniques such as surface profilometry, anodic profilometry, atomic force microscopy (AFM), scanning electron microscopy (SEM), Auger electron spectroscopy (AES), X-ray diffraction (XRD, texture analysis).

Superconducting strip detectors.
Development of superconducting strip detectors for α and β particles. New superconducting strip detector composed of two overlapping proximized Nb and Al films. This activity lead to the experimental observation of weak Anderson localization – an important physical phenomenon for the quantum theory of materials – in non-atomically thin films.

Superconducting mixers.
Low noise superconducting mixers in the $70 - 100$ GHz band for astrophysical applications, in collaboration with the Politecnico of Turin and the CNR Institute of Cosmic Physics (CNR-IFC), Milan.

STJ detectors.
Development of Superconducting Tunnel Junction (STJ) single photon detectors, working in the UV and X-ray domain at temperatures of the order of hundreds of mK. The research has been done in collaboration with the Department of Optics of IEN, the Department of Physics of the University of Milan and the CNR of Milan. STJ detectors were fabricated with leakage currents, the main quality characteristic parameter of these detectors, of the order of a few tens of pA, much better than what was obtained by competing research groups.

Superconductivity and electromagnetics.
Experimental research on the interaction between microwave radiation at $10 - 100$ GHz and Josephson tunnel junctions. Simulation of the behavior of the junctions in the presence of a pulsed radio frequency field or a static magnetic field. Study of chaos effects in Josephson junctions as a function of the characteristic parameters of the device and the incident radiation.

Nanometric junctions.
Development of fabrication technology of step-edge and ramp junctions, to overcome the physical limits of optical photolithography and fabricate nanometer-sized Nb/Al Josephson junctions. Development of low-temperature electrical characterization methods for these devices. Development and electrical characterization of FIB-modeled nanoconstrictions acting as planar Josephson junctions.

X-ray diffraction.
Structure solution and refinement by x-ray diffraction on single crystals and microcrystalline powders of organometallic crystals and organic compounds for pharmaceuticals. Development of software packages for crystal structure solution and for 3D graphical visualization of complex molecules and proteins (SIR, JAV).

Geophysics.
Mapping of underground characteristics by resistive measurements of deep geological structures for geothermal applications using Airborne Electro-Magnetic (AEM) or Helicopter-borne Time-domain Electro-Magnetic (HTEM) techniques.
Ground penetrating radar surveys for the detection of landfills and buried hazardous waste. Investigation of subsurface archaeological remains of the castle of Sicignano (Salerno) by ground penetrating radar.

Hydraulic properties of porous materials.
Optimization of experimental measurements of porous materials by evolution algorithms. Development of an online experimental measurements database.

Environmental monitoring.
Application of geostatistical techniques for the optimization of monitoring networks and the analysis of bioclimatic and environmental data. Development of autonomous environmental monitoring sensor networks.

Data acquisition.
Development of automatic control software of measurement systems and for experimental data acquisition, using several different tools, from QuickBasic and GPIB libraries in the '80s to C, Python and Labview today.

Memberships

IMEKO International Measurement Confederation
AGU American Geophysical Union
AIC Italian Crystallographic Association/Associazione Italiana di Cristallografia
INFN National Institute of Nuclear Physics/Istituto Nazionale di Fisica Nucleare
INFM National Institute for the Physics of Matter/Istituto Nazionale di Fisica della Materia
RNS National Superconductivity Network/Rete Nazionale Superconduttività

Referee for several international journals and conference proceedings, among which IEEE Transactions Applied Superconductivity, Journal of Low Temperature Physics, Thin Solid Films, American Journal of Physics, Measurements, Sensors.

Selected publications

Over 110 papers authored in refereed journals, conference proceedings and books. A selection of the 12 most significant publications is listed below.

Sources of bibliometric indexes: ISI Thomson Reuters Journal Citation Reports (JCR) and SJR Scimago Journal Rank. The impact factor refers, whenever possible, to the publication year. In all other cases, the latest available impact factor is reported.

2020 **G. Passarella, D. E. Bruno, A. Lay-Ekuakille, S. Maggi, R. Masciale and D. Zaccaria**, *Spatial and temporal classification of coastal regions using bioclimatic indices in a Mediterranean environment*, Science of the Total Environment, vol. 700, pp. 134415/1-16 (2020) doi 10.1016/j.scitotenv.2019.134415.
Impact factor: **5.59**, h-index: **205**, SJR quartile: **Q1**.

2017 **S. Maggi**, *Estimating water retention characteristic parameters using differential evolution*, Computers and Geotechnics, vol. 86, pp. 163-172 (2017), doi 10.1016/j.compgeo.2016.12.025.
Impact factor: **1.71**, h-index: **67**, SJR quartile: **Q1**.

2016 **N. De Leo, M. Fretto, V. Lacquaniti, C. Cassiago, L. D'Ortenzi, L. Boarino and S. Maggi**, *Thickness Modulated Niobium Nanoconstrictions by Focused Ion Beam and Anodization*, IEEE Transactions on Applied Superconductivity, vol. 26, pp. 7100305/1-5 (2016), doi 10.1109/TASC.2016.2542286.
Impact factor: **1.24**, h-index: **66**, SJR quartile: **Q2**.

2012 **B. Gabriele, L. Veltri, R. Mancuso, G. Salerno, S. Maggi and B. M. Aresta**, *A Palladium Iodide-Catalyzed Carbonylative Approach to Functionalized Pyrrole Derivatives*, Journal of Organic Chemistry, vol. 77, pp. 4005-4016 (2012), doi 10.1021/jo300365n.
Impact factor: **4.72**, h-index: **176**, SJR quartile: **Q1**.

2010 **M. Aresta, A. Dibenedetto, P. Stufano, B. M. Aresta, S. Maggi, I. Pàpai, T. A. Rokob and B. Gabrieli**, *The solid state structure and reactivity of $NbCl_5$·(N,N'-dicyclohexylurea) in solution: evidence for co-ordinated urea dehydration to the relevant carbodiimide*, Dalton Transactions, vol. 39, pp. 1-8 (2010), doi 10.1039/c001669a.
Impact factor: **4.20**, h-index: **112**, SJR quartile: **Q1**.

2009 **A. Altomare, C. Cuocci, C. Giacovazzo, S. Maggi, A. Moliterni and R. Rizzi**, *Correcting electron density resolution bias in reciprocal space*, Acta Crystallographica Section A, vol. 65, pp. 183-189 (2009), doi 10.1107/S0108767309003687.
Impact factor: **49.93**, h-index: **58**, SJR quartile: **Q1**.

2007 **V. Lacquaniti, N. De Leo, M. Fretto, S. Maggi and A. Sosso**, *Nb/Al-AlOx/Nb Overdamped Josephson Junctions Above 4.2 K for Voltage Metrology*, Applied Physics Letters, vol. 91, eid 252505, pp. 1-3 (2007), doi 10.1063/1.2825469.
Impact factor: **3.59**, h-index: **329**, SJR quartile: **Q1**.

2005 **V. Lacquaniti, C. Cagliero, S. Maggi and R. Steni**, *Overdamped Nb/Al-AlOx/Nb Josephson junctions*, Applied Physics Letters, vol. 86, eid 042501, pp. 1-3 (2005), doi 10.1063/1.1856135.
Impact factor: **4.13**, h-index: **329**, SJR quartile: **Q1**.

2000 **M. Greco, V. Lacquaniti, S. Maggi, E. Menichetti and G. Rinaudo**, *Anderson Localization in Nb/Al Superconducting Bilayers*, Journal of Low Temperature Physics, vol. 118, pp. 75-89 (2000), doi 10.1023/A:1004678503644.
Impact factor: **1.18**, h-index: **51**, SJR quartile: **Q1**.

1996 **S. Maggi**, *Step Width Enhancement in a Pulse–driven Josephson Junction*, Journal of Applied Physics, vol. 79, pp. 7860-7863 (1996), doi 10.1063/1.362395.
Impact factor: **2.18**, h-index: **240**, SJR quartile: **Q1**.

1994 **V. Lacquaniti, S. Maggi, E. Monticone and G. B. Picotto**, *Surface Characterization of Sputtered Niobium Films by Scanning Tunneling Microscopy*, Journal of Vacuum Science and Technology B, vol. 12, pp. 1734-1737 (1994), doi 10.1116/1.587587.
Impact factor: **1.70**, h-index: **102**, SJR quartile: **Q1**.

Selected grants

2018–current **VIOLA**, *Background values In Apulian aquifers (V.I.O.L.A.)*, Regional Plan of Environmental Protection, 2018.
Definition of a protocol for the determination of natural background values of the main water quality parameters (Fe, Mn, nitrates, chlorides, sulphates). Evaluation of the areas at risk of exceeding the predefined thresholds. Identification of novel microbiological indicators for the assessment of groundwater status.
Total funding: euro 630.000.

2012–2015 **NET-ECO**, *Competence NETwork for the monitoring of contaminated sites and the transfer of ECO-sustainable technologies.*, Ministry of Economic Development Project, RIDITT Program 2009.
Development and dissemination of low-cost integrated technologies and methodologies for the monitoring and remediation of polluted sites.
Total funding: euro 250.000.

2011–2013 **Anagrafe**, *Realization of the Register of Contaminated Sites.*, Regional Plan of Environmental Protection.
Creation of a Register of contaminated sites to facilitate the integrated management of information, assess the state of the territory and carry out prevention and reclamation operations.
Total funding: euro 500.000.

2010–2012 **VIGOR**, *Evaluation of the geotermal potential of Convergence Regions: Campania, Calabria, Puglia and Sicily.*, MiSE-DGENRE–CNR–DTA Project, POI Renewable Energy and Energy Conservation 2007–2013, FESR.
Evaluation and realization of interventions to expand the exploitable geothermal energy potential in the Convergence Regions: Campania, Calabria, Puglia and Sicily.
Total funding: euro 8.000.000

2010–2012 **PRIN2008**, *National Interest Research Projects.*
Engineering and development of molecular or nano-structured catalysts and of sustainable and eco-friendly synthetic strategies (high conversion and selectivity) for the production of multifunctional molecular systems of high applicative interest by assembly of simple building blocks in ordered sequence.
Coordinator of CNR operating unit.
Total funding: euro 150.000.

2003–2004 **MIUR-FIRB**, *Semiconductor-superconductor structures for integrated electronics.*
Microwave properties of YBCO superconducting films on Si semiconducting substrates.
Operating unit funding: euro 11.600.

2002–2004 **INFN**, *MaBo project.*
Properties of MgB_2 thin films, a novel high transition temperature superconducting material.
Operating unit funding: euro 10.000.

2001–2004 **ASI**, *Electro-Optical Technologies.*
Fabrication of superconducting Josephson junctions for the development of photon counting detectors for astrophysical applications.
Coordinator of IEN operating unit.
Total funding: euro 128.200.

1998–2000 **INFN-STRSC**, *Superconducting Nb/Al microstrip radiation detectors.*
Development of metal Nb/Al thin film structures for the development of ionizing radiation detectors in the framework of the STRSC experiment.
Coordinator of IEN operating unit.
Total funding: euro 55.000.

1998-2000 **EU-FP4**, *PRO VOLT: Programmable voltage standard for AC and DC metrology*, European Union Project, Fourth Framework Programme FP4.
Development of programmable arrays for the AC and DC voltage standard.
Total funding: euro 1.879.000

1998–2000 **ASI**, *Single-photon superconducting detector in the optical band.*
Fabrication and characterization of single-photon superconducting tunnel detectors in the infrared to ultraviolet frequency range.
Operating unit funding: euro 28.400.

1997–1999 **ASI**, *Superconducting bolometer detector on a suspended substrate for the infrared range.*
Fabrication and characterization of high-sensivity superconducting thin-film bolometers for microwave to infrared and far-infrared frequencies.
Operating unit funding: euro 103.300.

1995-1997 **CNR-PNRA**, *National Research Program in Antarctica*.
Low noise detectors for astrophysical observations.

Total funding: euro 160.000.

1994–1995 **ASI**, *Development of ultra low noise detectors in the sub-millimeter range for astrophysical applications*.
Development of ultra low noise detectors in the sub-millimeter range for astrophysical applications based on SIS devices.
Operating unit funding: euro 41.300.

1987-1988 **EU-BCR**, *Development of Josephson junction arrays*, European Union Project BCR 3108.
Development of Nb/Al-AlO_x/Nb Josephson junction arrays for the DC voltage standard.

Total funding: not available.

Positions of responsibility

2014–2019 **CNR-IRSA**, *Subsoil mapping by GPR to detect landfills and buried hazardous waste and for archeological applications*, In collaboration with italian police and judiciary bodies.

2011 **CNR-IRSA**, *Mapping the geothermal potential of Sicily by HTEM*, VIGOR Project.

2008–2011 **CNR-IC**, *Supervisor of the Laboratory for Single Crystal X-Ray Diffraction*.

2005 **IEN/INRiM**, *Coordinator of the IEN Research Line DQ1 Superconducting Electronics*, Quantum Devices Department.

1999–2006 **IEN**, *Supervisor of the Low-Temperature Electrical Characterization Laboratory*.

1999–2006 **IEN**, *Supervisor of the Laboratory for Thin Film Deposition*.

1999–2006 **IEN**, *Supervisor of the IEN Clean Room Facility*.

Teaching and dissemination activities

Associate professor at UniNettuno University, Rome.

Associate scientist to the National Institute of Metrological Research, INRiM.

Adjunct Professor of Thin Film Technology, Materials Science Department of the University of Torino.

Associate scientist to the National Institute of Nuclear Physics, INFN and the National Institute for the Physics of Matter, INFM.

Tutor of PhD and Master's theses for the Universities of Turin and Milan and the Polythecnic University of Turin.

Member of scientific and organization committees of international conferences, workshops and technical seminars. Currently permanent member of the IMEKO TC19 Technical Committee on Environmental Measurements and member of the International Program Committee of the 2018 IEEE International Workshop on Metrology for the Sea (Bari, October 8-10, 2018).

Referee for several scientific journals, such as the American Journal Physics, IEEE Transactions of Applied Superconductivity, Journal of Applied Physics, Journal of Low Temperature Physics, Journal of Physics D: Applied Physics, Measurement, Sensors, Thin Solid Films. Referee of international conference proceedings.

Miscellaneous

2012–2013 **Macworld**.
Collaboration with Macworld magazine for the publication of articles on software development tools and scientific software.

2013–today **MelaBit**.
Personal blog MelaBit (https://melabit.wordpress.com), focused mainly on software development and system administration topics, with frequent digressions on science and research topics.

2016–today **Il Nostro CNR**.
Development and administration of the web site Il Nostro CNR and of the related discussion forum (https://ilnostrocnr.it), to support discussion and exchange of information among the scientific and administrative staff of CNR.

Languages

Expert	English	*Good knowledge of written and spoken english*
Basic	German	*Basic knowledge of written and spoken german*
Basic	French	*Basic knowledge of written french*

Computing skills

Expert	Hardware	*Infrastructure, interfacing, networking*
Expert	Operating systems	*macOS, Unix, Windows*
Expert	Programming languages	*C, Fortran, Mathematica, Python, R*
Expert	Application software	*Scientific and office applications*
Intermediate	Automation languages	*Labview, HP Basic*
Intermediate	Programming languages	*Basic, HTML, JavaScript, PHP, sed/awk*
Basic	Database	*SQL, sqlite*

Bari, June 8, 2020