

Curriculum Vitæ

Andrea Giachero

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Employment and Career history

- **October 2017 - Present:** Assistant Researcher (Art. 24, L.n. 240/10, 30 dicembre 2010) at the University of Milano-Bicocca;
- **April 2017 - Aprile 2026:** Italian Qualification for University Associate Professors in experimental physics of fundamental interactions
- **June 2015 - May 2017:** Staff Researcher (Art. 36 D.Lgs. 30 marzo 2001, n. 165) at the Italian Institute of Nuclear Physics (INFN), Unit of Milano-Bicocca;
- **June 2012 - May 2015:** post-doctoral fellowship at the University of Milano-Bicocca within the project *Development of Microresonator Detectors for Neutrino Physics*;
- **May 2012:** first selected candidate, amongst 16 admitted, for a Post-Doctoral Research fellowship at University of Milano Bicocca (*declined*);
- **January 2009 - May 2012:** post-doctoral fellowship at the Italian Institute of Nuclear Physics (INFN), Unit of Milano-Bicocca;
- **May 2008 - December 2008:** post-doctoral fellowship at L'Università degli Studi "La Sapienza", Roma;
- **January 2006 - December 2007:** INFN fellowship for young technologist at Gran Sasso Underground Laboratory.

Education

- **Ph.D in Physics**, University of Genoa, Department of Physics, March 2008. Dissertation: *"Characterization of cryogenic bolometers and data acquisition system for the CUORE experiment"*. Advisor: Prof. Marco Pallavicini, University and INFN of Genoa. Co-Advisor: Dr. Carlo Bucci, Laboratori Nazionali del Gran Sasso (LNGS).

- **Diploma di Laurea in Fisica (Italian M.Sc. in Physics)**, University of Genoa, Department of Physics, July 2004. Dissertation: "*Sviluppo di un Apparato di caratterizzazione per l'elettronica di EUSO*" ("*Development of an apparatus for the EUSO electronics characterization*"). Advisor: Prof. Marco Pallavicini, University and INFN of Genoa.

Scientific responsibilities

- **2019 - present**: Principal Investigator of the PARADOx project (2019-ATESP-0024), funded by the University of Milano-Bicocca. Budget around 25k€ per two years;
- **2018 - present**: local coordinator for the PTOLEMY experiment (international collaboration co-funded by the INFN at LNGS). Budget around 15k€ per year.
- **2018 - 2020**: Member of the CUORE Publication Board;
- **2017 - present**: Member of the CUORE Detector Response Working Group;
- **2016 - present**: Member of the HOLMES Publication Board (HPB);
- **2015 - 2020**: Principal Investigator for the KIDS_RD project. Budget around 30k€ per year;
- **2014 - present**: Coordinator for readout and multiplexing systems working group for the HOLMES experiment. Total Budget 150k€;
- **2012 - 2015**: Coordinator for the Slow Control System working group of the CUORE experiment. Budget around 25k€ per year;

Scientific Collaborations and Affiliations

- **2019 - present**: PARADOx project (2019-ATESP-0024): Principal Investigator.
The main objective of the project is to exploit the superconducting technologies for the realization of a quantum-limited noise parametric amplifier.
Main tasks: project management, amplifier design, development and characterization, development of the read out system, data analysis;
- **2018 - present**: PTOLEMY experiment: local coordinator.
The aim of the experiment is to combine MAC-E filter methods, cryogenic calorimetry, and RF tracking to achieve the sensitivity required to detect the relic neutrino background.
Main tasks: local group management, low temperature detector development and characterization, development of the readout system, data analysis;
- **2015 - 2020**: KIDS_RD project: Principal Investigator.
The main objective of the project is to develop superconducting Thermal Kinetic Inductance Detectors (TKID) suitable for high resolution X-ray spectroscopy and for neutrino physics.
Main tasks: project management, detector design, development and characterization, development of the read out system, data analysis;
- **2014 - present**: HOLMES experiment: coordinator of the read-out and multiplexing systems, from 2019 coordinator of the analysis software.
The primary goal of this experiment is the development of a new technique, based on superconducting transition edge sensor (TESs), for the direct calorimetric measurement of the neutrino mass using the electron capture (EC) decay of ¹⁶³Holmium.
Main tasks: read out development, detector characterization and data analysis;

- **2005 - present:** CUORE (Cryogenic Underground Observatory for Rare Events) and CUPID (CUORE Upgrade with Particle Identification) experiments: the primary purpose of the experiment is to search for neutrinoless double beta decay/
Main tasks: past coordinator of the Slow Control System (CUORE-SCS) and past member of the CUORE Publication Board, current member of the CUORE Computing Infrastructure Working Group (CIWG) and CUORE Detector Response Working Group.
Other tasks: development of the RAD (Radiation Array Detector) detector arrays, development of the data acquisition and electronics read out, material screening and characterization of the electrical link (Cu-PEN tapes) connecting the detector array to the outside world, studying of new techniques to improve particle-identification capabilities needed to reduce the detector background for future double beta decay experiments (CUPID);
- **2012 - 2015:** MKIDs R&D: the purpose of this project was to study and to develop superconducting microwave microresonators (MKIDs) for X-ray detection suitable for a direct and calorimetric measurement of the neutrino mass.
Main tasks: detector development and characterization, read out and data acquisition development, data analysis;
- **2010 - 2015:** LHCb (Large Hadron Collider beauty) experiment, subdetector RICH (Ring-imaging Cherenkov detector) Upgrade: this activity aimed to characterize a new model of Multianode Photomultiplier (MaPMT), with a fast response, and to develop the electronics readout in order to resolve events in 25 ns intervals, a low crosstalk between channels and a low power consumption.
Main tasks: photomultiplier characterization, readout electronics and data acquisition development, test-beam participations at CERN;
- **2009 - 2013:** MARE-1 (Microcalorimeter Arrays for a Rhenium Experiment) experiment: this experiment, made of arrays of low temperature micro-calorimeters sensed by silicon thermistors, had the goal to directly measure the neutrino mass
Main tasks: data acquisition and electronics readout development;
- **2010 - 2015:** Associated member of the European Organization for Nuclear Research (CERN);
- **2005 - present:** Associated member of the Gran Sasso National Laboratory (LNGS);

Scientific performances

- 165 publications in peer-reviewed international journals with 1724 citations, excluding self-cites (source Web of Science/Publons, January 2021).
- Two paper exceeding 200 citations and three papers exceeding 100 citations citations;
- More than 70 publications in refereed conference proceedings;
- More than 10 invited oral presentations for seminars, conferences and workshop;
- More than 20 presentations at international conferences
- Several oral presentations at CERN and LNGS for internal reviews;
- Bibliometric indexes listed in the table below;

	Inspire	Web of Science	Scopus
# of papers	162	165	168
# of citations	4014	2227	2505
Average citations	24.8	13.5	14.9
h-index	28	22	22

update to January 2021

Invited Seminars and Lectures

- 2020 – *“Development of quantum limited amplifiers for quantum devices read out”*, Departmental Seminar at the Department of Physics, University of Milano-Bicocca, 19 October 2020, Milano, Italy;
- *“Cosmic Neutrino Background telescope: the PTOLEMY experiment”*, seminar presented at INFN weekly seminar series, INFN of Milano-Bicocca, 12 June 2020, Milano, Italy;
- 2019 – *“Probing the neutrino mass with calorimetric electron capture spectroscopy”*, seminar presented at the Max Planck Institut für Physik, Werner Heisenberg Institute, 29 January 2019, Munich, Germany;
- 2015 – *“The Electron Capture Decay of ¹⁶³HOLMES, an experiment for a direct measurement of neutrino mass”*, seminar presented at the Centre de Sciences Nucléaires et de Sciences de la Matière (CSNSM/IN2P3), Groupe Physique du solide, 2 December 2015, Campus d’Orsay, France;
- *“The Electron Capture Decay of ¹⁶³Ho to Measure the Electron Neutrino Mass with improved sensitivity: The HOLMES experiment”*, seminar presented at Neutrino Club, IRFU CEA-Saclay Laboratoire, 1 December 2015, Gif-sur-Yvette Cedex, France;
- *“The Electron Capture Decay of ¹⁶³Ho to Measure the Electron Neutrino Mass with improved sensitivity”*, seminar presented at the Laboratoire Leprince-Ringuet École Polytechnique IN2P3/CNRS, 03 November 2015, Palaiseau, France;
- 2012 – *“The CUORE Experiment: Bolometric Techniques for Double Beta Decay”*, seminar presented at the FLAP, Friday Lunch With Astroparticle, University of Padua, Departments of Physics, 19 November 2012, Padua, Italy
- *“Cerenkov light studies at low and high energy with the UVIScope data acquisition system”*, seminar presented at the Italian Institute of Space Astrophysics and Cosmic Physics of Palermo (IASF Palermo), 03 April 2012, Palermo, Italy.

Invited at International Conferences, Workshops and Meetings

- 2020 – *“Results of CUORE”*, invited presentation at the 55th Rencontres de Moriond 2020, 21-28 October, La Thuile, Italy. Cancelled due to the Covid-19 outbreak;
- 2018 – *“Cryogenics microwave rf-SQUID multiplexing read-out for the calorimetric measurement of the neutrino mass”*, invited presentation at the 13th International Workshop On Low Temperatures Electronics (WOLTE13), 10 - 13 September, Sorrento, Napoli, Italy. Chair for the session “Low Temperature Detectors & Devices”;
- *“Experimental challenges in neutrinoless double beta decay search”*, invited presentation at the XIIIth Quark Confinement and the Hadron Spectrum conference, 1-6

- August 2018, Maynooth University, Ireland;
- 2016 – *“Assess the neutrino mass with micro and macro calorimeter approach”*, invited presentation at the 7th Young Researcher Meeting 2016 (7YRM), 24 - 26 October 2016, Turin, Italy;
- 2015 – *“High resolution X-ray spectroscopy with Kinetic Inductance Detectors”*, invited presentation at the annual meeting of the Commission V of the INFN (CSN5), 28 September - 02 October 2015, INFN National Laboratories of the South (LNS, Laboratori Nazionali del Sud) Catania, Italy;
- 2014 – *“High resolution X-ray spectroscopy with Kinetic Inductance Detectors”*, invited presentation at the annual meeting of the Commission V of the INFN (CSN5), 24 - 25 November 2015, Rome, Italy;
- *“The Electron Neutrino Mass Measurement by the HOLMES experiment: a Status Report”*, invited presentation at the Chalonge Meudon Workshop 2014, 4 - 6 June 2014, CIAS Observatoire de Paris, Meudon campus, Château de Meudon;

Presentations at International Conferences and Workshops

- 2020 – *“New results from the CUORE experiment”*, oral presentation at 40th International Conference on High Energy Physics (ICHEP2020), 28 July - 6 August, Prague, Czech Republic. Virtual Conference due to the Covid-19 outbreak.
- 2019 – *“TES microcalorimeter detectors suitable for neutrino mass measurement”*, oral presentation at 14th European Conference on Applied Superconductivity (EUCAS2019), 1-5 September 2019, Glasgow, Scotland;
- *“Thermal Kinetic Inductance Detectors suitable for X-ray spectroscopy”*, poster presentation at 14th European Conference on Applied Superconductivity (EUCAS2019), 1-5 September 2019, Glasgow, Scotland;
- *“High speed microwave rf-SQUID multiplexing read-out for the HOLMES experiment”*, poster presentation at 18th International Workshop on Low Temperature Detectors, 22-26 July 2019, Milano, Italy;
- 2018 – *“Probing the neutrino mass with calorimetric electron capture spectroscopy: the HOLMES project”*, poster presentation at the XXVIII International Conference on Neutrino Physics and Astrophysics (Neutrino 2018), 4 - 9 June, 2018, Heidelberg, Germany;
- 2016 – *“Measuring the Electron Neutrino Mass with improved sensitivity: the HOLMES experiment”*, oral presentation at the 14th Topical Seminar on Innovative Particle and Radiation Detectors (IPRD16), 3 - 6 October, 2016, Siena, Italy;
- *“Microwave rf-SQUID multiplexing read-out for the HOLMES experiment”*, poster presentation at the ECT* Trento Workshop on direct (anti-)neutrino mass determination, 4 - 8 April, 2016, ECT, European Centre for Theoretical Studies in Nuclear Physics and Related Areas, Trento, Italy;
- 2015 – *“Development of microwave-multiplexed superconductive detectors for the HOLMES experiment”*, poster presentation at the XIV International Conference on Topics in Astroparticle and Underground Physics (TAUP2015), 7 - 11 September, 2015, Turin, Italy;
- *“Development of microwave superconducting microresonators for neutrino mass*

- measurement in the HOLMES framework*", oral and poster presentation at the 16th International Workshop on Low Temperature Detectors (LTD-16), 20 - 24 July, 2015, Grenoble, France;
- 2014 – *"The CUORE and CUORE-0 Experiments at Gran Sasso"*, oral presentation at the 3rd International Conference on New Frontiers in Physics (ICNFP 2014), 28 July - 6 August 2014, Kolymbari, Crete, Greece;
- 2013 – *"Superconducting microresonator detectors for neutrino mass measurements in Milano"*, oral presentation at the 10th International Workshop On Low Temperatures Electronics (WOLTE10), 14 - 17 October, Paris, France;
- *"Critical Temperature tuning of Ti/TiN multilayer films suitable for low temperature detectors"*, poster presentation at the 15th International Workshop on Low Temperature Detectors (LTD-15), 24 - 28 June, 2013, Pasadena, California, USA;
- 2012 – *"A Multichannel Data Acquisition system for bolometer detectors based on microcontroller Cortex M3 architecture"*, poster presentation at the 2012 Nuclear Science Symposium and Medical Imaging Conference (2012 NSS-MIC), 27 October - 03 November, 2012, Anaheim, California, USA;
- 2011 – *"A Very Low Noise AC/DC Power Supply System for Large Arrays of Cryogenic Detectors"*, poster presented at the 2011 Nuclear Science Symposium and Medical Imaging Conference (2011 NSS-MIC), 23 - 29 October, 2011, Valencia, Spain;
- *"The status of the CUORE experiment"*, oral presentation at the Nuclear Physics in Astrophysics - V (NPAV) Conference, 3 - 8 April, 2011, Eilat, Israel;
- 2010 – *"The Bias Generator System for the CUORE Large Mass Bolometer Detectors"*, poster presentation at the 2010 Nuclear Science Symposium and Medical Imaging Conference (2010 NSS-MIC), 30 October - 6 November, 2010, Knoxville, Tennessee, USA;
- *"A very high performance stabilization system for large mass bolometer experiments"*, poster presentation at the 12th Symposium on Radiation Measurements and Applications (SORMA XII), 24 - 28 May, 2010, Ann Arbor, Michigan, USA;
- 2009 – *"A programmable multichannel antialiasing filter for the CUORE experiment"* poster presentation at the 11th Pisa meeting on advanced detectors, Frontier Detectors For Frontier Physics, 24 - 30 May 2009, La Biodola, Isola d'Elba, Italy;
- 2006 – *"CUORICINO, tecniche bolometriche per lo studio del Doppio Decadimento Beta" (CUORICINO, bolometric techniques for Double Beta Decay Study)* oral presentation at Società Italiana di Fisica, XCII National Conference, 18 - 23 September 2006, Turin, Italy.

Organization of scientific Meetings, Conferences and Workshops

- 2019 – Member of the Scientific and Local Organization Committee for the *"18th international Workshop on Low Temperature Detectors cryogenic detectors for radiation and particles, and their applications (LTD-18)"*, 22-26 July 2019, Milano, Italy. Coordinator for the scientific track *"Detector readout, signal processing, and related technologies"*;
- 2016 – Chair of the Scientific and Local Organization Committee for the *"5th Workshop on the Physics and Applications of Superconducting Microresonators, WPASM5"*, 22 - 24 June 2016, University of Milano-Bicocca, Italy;
- 2013 – Member of the Scientific and Local Organization Committee for the workshop *"νMass*

2013, *The Future of Neutrino Mass Measurements: Terrestrial, Astrophysical, and Cosmological Measurements in the Next Decade*, 4 - 7 February 2013, University of Milano-Bicocca, Italy;

Editorial and Review activities:

- **2020:** member of the Reviewer Board of the *Instruments* journal
- **2019:** guest editor for the Special Issue "Development and Application of Particle Detectors" of *Applied Sciences* (currently open for submission);
- **2019:** guest editor for the Special Issue: Low Temperature Detectors LTD18, Part I of *Journal of Low Temperature Physics (JLTP)*, Volume 199, Part I: Issue 1-2 (April 2020), PartII, Issue 3-4 (May 2020) and Part III: Issue 5-6 (September 2020);
- **2013 - present:** Reviewer for *Physical Review Letters (PRL)*, *Applied Physics Letters (APL)*, *Journal of Applied Physics (JAP)*, *AIP Advances*, *IEEE Transactions on Applied Superconductivity (TAS)*, *IEEE Access*, *Journal of Low Temperature Physics (JLTP)*, *Sensors*, and *Instruments*.

Qualifications and Skills

- **Experimental physics:** particle physics, neutrino physics, search of rare events, search of neutrinoless double beta decay;
- **Detectors:** development and construction of thermistors-based large and micro low temperature calorimetric detectors for the study on the neutrinoless double beta decay (CUORE R&D, CUORE-0, CUORE, CUPID), direct measurement of the neutrino mass (MARE1) and for the study of radioactive contaminations. Characterization of light detectors, based on Multianode Photomultiplier (MaPMT), for single photon-electron counting (LHCb-RICH upgrade). Development of superconductive microresonator (MKIDs) and transition edge sensor (TES) for the direct measurement of the neutrino mass (HOLMES);
- **Data analysis:** analysis of experimental data using Python, and its numeric and scientific modules, the object oriented framework ROOT, the GNU Scientific Library (GSL), the Fastest Fourier Transform in the West Library (FFTW, for computing discrete Fourier transforms), and the computing environment Matlab;
- **Signals theory:** good knowledge of digital signal processing, digital filtering (FIR, IIR), Fast Fourier Transform algorithm, homodyne and heterodyne readout techniques, Software defined radio (SDR) applications for micro-resonators readout and lock-in amplifier, also using DSP;
- **Programming:** very good knowledge of the programming language C/C++, on GNU/Linux environment (gcc compiler) and on Windows environment (wxDev-C++ and Visual C++ compilers). Very good knowledge of scripting languages on GNU/Linux environment (in particular Bash and Perl). Very good knowledge of the programming languages Python and its numeric and scientific modules. Basic knowledge of the programming languages Ruby and Go. ;
- **Data acquisition and control:** very good knowledge in instrumentation control and data acquisition system development by using different communication protocols and different programming languages. Good knowledge of the National Instruments and CAEN acquisition systems, PXI Platform, VME bus, GPIB communications bus, standard VISA

and CAN-Bus. Very good knowledge of the ANSI C programming environment LabWindows/CVI, developed by National Instruments. Basic knowledge of the .NET programming environment Measurement Studios, developed by National Instruments. Basic knowledge of the system-design platform LabVIEW, developed by National Instruments;

- **Electronics:** experience in design and characterization of custom boards; in particular very front-end electronics, anti-aliasing filters and calibration systems, for low temperature detectors. Experience with microcontrollers (ARM, Cortex and 8051 families);
- **Development tools:** good knowledge of the Cadence OrCAD tool suite (OrCAD Capture, OrCAD Layout, OrCAD PCB Editor). Very good knowledge of the uVision4/5 compiler for ARM, Cortex-M, Cortex-R4, 8051, C166, and 251 processor families. Good knowledge of the Xilinx ISE Design Kit for synthesis and analysis of HDL (Hardware Description Language) design.
- **Operating System:** excellent knowledge of the distribution GNU/Linux, in particular Debian/Ubuntu and Scientific Linux. Good knowledge of Microsoft Windows.

Teaching and Advising Experiences

Academic Service:

- **2017 - present:** member of the final Oral Examination Committee for the B.Sc. and M.Sc. degrees in physics at the University of Milano-Bicocca;
- **2017 - present:** member of the Selection Board for post-doc recruitment at the University of Milano-Bicocca;

Classes:

- **2019 - present:** lectures on "Nuclear and Subnuclear Physics Laboratory", course for B.Sc. students at the University of Milano Bicocca;
- **2017 - 2019:** lectures on "Laboratory of Physics II", course for B.Sc. students at the University of Milano Bicocca;
- **2013 - 2018:** lectures on "Laboratory of Physics I", course for B.Sc. students at the University of Milano Bicocca;
- **2009 - 2013:** lectures on "Laboratory of Analog Electronics", course for B.Sc. students at the University of Milano Bicocca;
- **2009 - 2010:** lectures on "Digital Electronics", course for B.Sc. students at the University of Milano Bicocca;

Advisor:

- 2020 – Serena Fumagalli "*Study of the response of superconducting transition-edge sensor microcalorimeters suitable for neutrino physics*", B.Sc. thesis in Physics at the University of Milano Bicocca. Co-Advisor: Dr. Andrea Barresi;
- 2019 – Martina Fassi "*Study of the response of superconducting transition-edge sensor microcalorimeters suitable for neutrino physics*", B.Sc. thesis in Physics at the University of Milano Bicocca. Co-Advisor: Dr. Elena Ferri;
- 2018 – Francesco Grattacaso "*Microwave readout optimization for the cryogenics detectors of the HOLMES experiment.*", B.Sc. thesis in Physics at the University of Milano Bicocca. Co-Advisor: Dr. Elena Ferri;

- 2017 – Mauri Beatrice *"Noise characterization of Transition Edge Sensor cryogenic microcalorimeters for the neutrino mass measurement"*, B.Sc. thesis in Physics at the University of Milano Bicocca. Co-Advisor: Dr. Marco Favrezan;

Co-Advisor:

- 2017 – Maver Leonardo *"Characterization of Transition-Edge Sensors for the direct measurement of the neutrino mass"*, M.Sc. thesis in Physics at the University of Milano Bicocca. Advisor: Prof. Angelo Nucciotti;
- Fendillo Alessandro *"Thermal conductance estimation of detectors in an experiment for the calorimetric measurement of the neutrino mass"*, B.Sc thesis in Physics at the University of Milano Bicocca. Advisor: Prof. Angelo Nucciotti;
- 2013 – Bianchi Filippo *"Design and realization of a multichannel data acquisition system for bolometers based on simultaneous 24-bit Delta-Sigma sampling and RISC ARM Cortex M4 microcontroller"*, M.Sc thesis in Physics at the University of Milano Bicocca. Advisor: Prof. Gianluigi Pessina;
- 2012 – Gelmi Lorenzo *"Realization of a multi-protocol (TPC/IC, USB, CAN-Bus, I2C, SPI, etc) communication interface based on 32-bit ARM Cortex M3 microcontroller"*, B.Sc thesis in Physics at the University of Milano Bicocca. Advisor: Prof. Gianluigi Pessina;
- 2011 – Rota Lorenzo *"Realization of a multi-protocol Multi-channel (analog/digital) scanning system of sensors of environmental pollution synchronized with GPS or via Ethernet and based on Cortex ARM microcontroller for SMELLER experiment"*, B.Sc thesis in Physics at the University of Milano Bicocca. Advisor: Prof. Gianluigi Pessina;
- Gavardi Laura *"Validation of the electric and radioactive performances of the CUORE experiment high density link"*, B.Sc thesis in Physics at the University of Milano Bicocca. Advisor: Prof. Chiara Brofferio;
- 2009 – Ferreiro Iachellini Nahuel *"Implementation of CUORE antialiasing filter firmware and communication system with CAN-BUS protocol, developed on ARM platform"*, B.Sc thesis in Physics at the University of Milano Bicocca. Advisor: Prof. Gianluigi Pessina;
- Tarantola Marco *"Development, based on a ARM microcontroller, of the control system for an ultrastable calibration pulser for the CUORE experiment"*, B.Sc thesis in Physics at the University of Milano Bicocca. Advisor: Prof. Gianluigi Pessina;

Outreaching:

- **2018 - present:** member of the Coordinating Committee for the second edition of the project *"Art & Science Across Italy"*, a European project that aspires to act as an education and outreach bridge between high school students and particle physicists using art as common language. The project is developed by INFN and CERN under the umbrella of CREATIONS by Horizon2020;
- **2014:** tutor for the *"LHCb International Physics Masterclasses"*, 25 March 2014, University of Milano Bicocca. Activity promoted by the International Particle Physics Outreach group (IPPOG);
- **2004 - 2006:** instructor and animator at exhibitions regarding particle physics in collaboration with INFN: *"I microscopi della Fisica"* (Physics microscopes, 2004), *"La Fisica su Ruote"* (Physics on the Roads, 2005), and *"Le cattedrali Nascoste"* (Hidden cathedrals, 2006).