

Giuseppe Bevilacqua

Curriculum Vitae

Personal information

first name Giuseppe
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Education

- 2000 **Ph.D. in Physics**, *University of Pisa*, Italy.
◦ Advisor: Prof. Liana Martinelli
◦ Title: Optical properties in vibronic localized systems
- 1995 **Master Degree (Laurea) in Physics**, *University of Pisa*, Italy.
◦ Advisor: Prof. Liana Martinelli
◦ Title: Studio dell'effetto Jahn-Teller in ZnS:Fe^{2+} con un nuovo metodo ricorsivo

Current and previous positions

- nov06 – pres **Assistant Professor in Physics (SSD: FIS/01 – 02/B1)**, *University of Siena*, Italy.
- oct05–oct06 **Assegnista di ricerca**, *Dipartimento di Fisica dell'Università di Siena*, Italy.
- jun02–sep05 **Contrattista**, *Dipartimento di Fisica dell'università di Siena nell'ambito del progetto europeo G6RD-CT-2001-00642 "New Magnetometer"*, Italy.
- jun00–jun02 **Assegnista di Ricerca**, *Dipartimento di Fisica dell'università di Pisa*, Italy.

Scientific Interests

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My research interests are of theoretical nature and spans a range of different phenomena from quantum optics, solid state physics and phase transitions in liquid crystals.

I am also interested in developing applications of quantum optical phenomena. This results in a large modelling activity of optical atomic magnetometers, whose working principle relies on optical pumping and quantum interference.

During my PhD I worked on solid state physics topics like the electron-phonon interaction and the Jahn-Teller effect. Then I was interested in Coherent Population Trapping in multilevel atomic systems, and in the possibility of using the related Stimulated Raman Adiabatic Passage to control the quantum state of cavity-QED systems. In the same time I published some works on the Fredericksz transition in both nematic and smectic liquid crystals.

More recently I am working on the modeling of the thermoelectrics efficiency of nanoscale devices and the use of a bichromatic drive to “dress” the energy separation of a qubit. See the publications list for details.

Membership

- 2023-pres Member of the *VIRGO Collaboration*
- 1999-pres Member of the Italian *Gruppo Nazionale per la Fisica Matematica (GNFM)*.
- 1999-2005 Member of the Italian *Istituto Nazionale per la Fisica della Materia (INFN)*.

Research Grants

- 2022-2025 Mathematics for Industry 4.0 (PRIN 2020F3NCPX_005)
- 2021-2022 Progetto PhAST finanziato dalla Regione Toscana (soggetto capofila Aerospazio Tecnologie)
- 2014-2015 GNFM project *Collasso meccanico di membrane biologiche confinate*, P.I. Dr. S. Turzi.
- 2012-2015 Progetto FIRB RBAP11ZJFA *Idrogeli nanocompositi ibridi contenenti nanoparticelle ferromagnetiche per il trattamento di tumori ossei primitivi e secondari*
- 2002-2005 European project *New Magnetometer* G6RD-CT-2001-00642, P.I. Prof. L. Moi

Teaching Experience

- 2023-pres Università di Siena, Course of *Meccanica Statistica*, undergraduate programme in *Fisica e Tecnologie Avanzate*
- 2019-pres Università di Siena, Course of *Mathematical Physics*, graduate programme in *Applied Mathematics* (SSD MAT/07)
- 2011-19 Università di Siena, Course of *Probabilità e Statistica*, undergraduate programme in *Ingegneria Gestionale*

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- 2009-11 Università di Siena, Course of *Fisica dei Semiconduttori*, graduate programme in *Ingegneria Elettronica e delle Telecomunicazioni*
- 2005-06 Università di Siena, Course of *Fisica dello Stato Solido*, graduate programme in *Fisica e Tecnologie Avanzate*
- 2005 Università di Siena, Course of *Complementi di Elettromagnetismo Classico*, undergraduate programme in *Fisica e Tecnologie Avanzate*
- 2004 Università di Siena, Course of *Fisica Moderna*, undergraduate programme in *Fisica e Tecnologie Avanzate*
- 2002-11 Università di Siena, Course of *Fisica Generale I*, undergraduate programme in *Ingegneria dell'Automazione*

Students

- Master's degree 2022 – Bichromatic electromagnetic dressing of graphene band gap. (E. Pannini)
- Bachelor's degree 2020 – Espansione di Floquet-Magnus applicata alla dinamica di spin inequivalenti. (E. Pannini)
- Bachelor's degree 2013 – Sviluppi non-Lineari in un Magnetometro Atomico Ottico Auto-Oscillante. (B. De Ieso)
- PhD 2010 – Supervision of the activity of K. Khanbekyan – Advisor Prof. L. Moi
- Master's degree 2010 – Coherent Population Trapping con campo modulato. (E. Cali)

Conferences Organization

- 1998 Scientific secretary in the local organizing committee of the *XIV International Symposium on Electron-Phonon Dynamics and Jahn-Teller Effect* – Erice 7–13 july, 1998.

Referee Activity

Served as referee for the journals: *Phys. Rev. B*, *Phys. Rev. A*, *Phys. Rev. Lett.*, *Review of Scientific Instruments*, *Journal of Phys.: Condensed Matter*, *Optics Express*, *Optics Letter*, *European Physical Journal Plus* .

Served as referee for the *Polish National Research Agency*.

Publications

- 2024 Bevilacqua, Giuseppe, Gaetano Napoli, and Stefano Turzi (2024). “Growth-induced delamination of an elastic film adhered to a cylinder”. In: *Mathematics and Mechanics of Solids*, p. 10812865231209412. ISSN: 1081-2865. DOI: 10.1177/10812865231209412. URL: <https://doi.org/10.1177/10812865231209412> (visited on 01/08/2024).
- 2023 Bevilacqua, Giuseppe, Valerio Biancalana, Mario Carucci, et al. (2023). “A Wearable Wireless Magnetic Eye-Tracker, in-vitro and in-vivo tests”. In: *IEEE TRANSACTIONS ON BIOMEDICAL ENGINEERING*, pp. 1–10. DOI: 10.1109/TBME.2023.3286424. URL: <https://ieeexplore.ieee.org/document/10153628>.
- Bevilacqua, Giuseppe, Valerio Biancalana, and Yordanka Dancheva (2023). “Dynamic Response of a Light-Modulated Magnetometer to Time-Dependent Fields”. In: *ATOMS* 11.8. DOI: 10.3390/atoms11080111.
- Fregosi, Alessandro et al. (Sept. 2023). “Floquet space exploration for the dual-dressing of a qubit”. In: *Scientific Reports* 13.1, p. 15304. ISSN: 2045-2322. DOI: 10.1038/s41598-023-41693-2. URL: <https://doi.org/10.1038/s41598-023-41693-2>.
- 2022 Bellizzi, Lorenzo et al. (2022). “An innovative eye-tracker: Main features and demonstrative tests”. In: *Review of Scientific Instruments* 93.3, p. 035006. DOI: 10.1063/5.0079779. URL: <https://doi.org/10.1063/5.0079779>.
- Bevilacqua, Giuseppe and Ennio Arimondo (June 2022). “Bright and dark Autler–Townes states in the atomic Rydberg multilevel spectroscopy”. In: *Journal of Physics B: Atomic, Molecular and Optical Physics* 55.15, p. 154001. DOI: 10.1088/1361-6455/ac7684. URL: <https://doi.org/10.1088/1361-6455/ac7684>.
- Bevilacqua, Giuseppe, Valerio Biancalana, T. Zanon-Willette, et al. (Feb. 2022). “Harmonic dual dressing of spin-1/2 systems”. In: *Phys. Rev. A* 105, p. 022619. DOI: 10.1103/PhysRevA.105.022619. URL: <https://link.aps.org/doi/10.1103/PhysRevA.105.022619>.
- Bevilacqua, Giuseppe, Alessandro Cresti, Giuseppe Grosso, Guido Menichetti, and Giuseppe Pastori Parravicini (2022). *Quantum bounds for power production, efficiency and thermal currents in thermoelectric nanostructures*. DOI: 10.48550/ARXIV.2206.00294. URL: <https://arxiv.org/abs/2206.00294>.
- Bevilacqua, Giuseppe, Alessandro Cresti, Giuseppe Grosso, Guido Menichetti, and Giuseppe Pastori Parravicini (2022). “Regimes and quantum bounds of nanoscale thermoelectrics with peaked transmission function”. In: *Physica E: Low-dimensional Systems and Nanostructures* 138, p. 115105. ISSN: 1386-9477. DOI: <https://doi.org/10.1016/j.physe.2021.115105>. URL: <https://www.sciencedirect.com/science/article/pii/S1386947721004550>.

- 2021 Bevilacqua, G, V Biancalana, et al. (Mar. 2021). “Studying and applying magnetic dressing with a Bell and Bloom magnetometer”. In: *Journal of Physics: Conference Series* 1859.1, p. 012018. ISSN: 1742-6596. DOI: 10.1088/1742-6596/1859/1/012018. URL: <http://dx.doi.org/10.1088/1742-6596/1859/1/012018>.
- Bevilacqua, Giuseppe, Valerio Biancalana, Yordanka Dancheva, Alessandro Fregosi, Gaetano Napoli, et al. (Nov. 2021). “Electromagnetic induction imaging: signal detection based on tuned-dressed optical magnetometry”. In: *Opt. Express* 29.23, pp. 37081–37090. DOI: 10.1364/OE.437930. URL: <http://www.osapublishing.org/oe/abstract.cfm?URI=oe-29-23-37081>.
- Bevilacqua, Giuseppe, Valerio Biancalana, Yordanka Dancheva, Alessandro Fregosi, and Antonio Vigilante (Aug. 2021). “Spin dynamic response to a time dependent field”. In: *Applied Physics B* 127.9, p. 128. ISSN: 1432-0649. DOI: 10.1007/s00340-021-07673-y. URL: <https://doi.org/10.1007/s00340-021-07673-y>.
- Biancalana, Valerio, Roberto Cecchi, Piero Chessa, Marco Mandalà, et al. (Mar. 2021). “Validation of a Fast and Accurate Magnetic Tracker Operating in the Environmental Field”. In: *Instruments* 5.1, p. 11. ISSN: 2410-390X. DOI: 10.3390/instruments5010011. URL: <http://dx.doi.org/10.3390/instruments5010011>.
- Guarrera, V., R. Gartman, G. Bevilacqua, and W. Chalupczak (July 2021). “Spin-noise spectroscopy of a noise-squeezed atomic state”. In: *Phys. Rev. Research* 3, p. L032015. DOI: 10.1103/PhysRevResearch.3.L032015. URL: <https://link.aps.org/doi/10.1103/PhysRevResearch.3.L032015>.
- 2020 Bevilacqua, Giuseppe, Valerio Biancalana, Marco Consumi, et al. (2020). “Ferromagnetic contamination of ultra-low-field-NMR sample containers. Quantification of the problem and possible solutions”. In: *Journal of Magnetism and Magnetic Materials* 514, p. 167220. ISSN: 0304-8853. DOI: <https://doi.org/10.1016/j.jmmm.2020.167220>. URL: <http://www.sciencedirect.com/science/article/pii/S0304885320315651>.
- Bevilacqua, Giuseppe, Valerio Biancalana, Antonio Vigilante, et al. (Aug. 2020). “Harmonic Fine Tuning and Triaxial Spatial Anisotropy of Dressed Atomic Spins”. In: *Phys. Rev. Lett.* 125, p. 093203. DOI: 10.1103/PhysRevLett.125.093203. URL: <https://link.aps.org/doi/10.1103/PhysRevLett.125.093203>.
- Biancalana, Valerio, Roberto Cecchi, Piero Chessa, Giuseppe Bevilacqua, et al. (Dec. 2020). “Fast, Cheap, and Scalable Magnetic Tracker with an Array of Magnetoresistors”. In: *Instruments* 5.1, p. 3. ISSN: 2410-390X. DOI: 10.3390/instruments5010003. URL: <http://dx.doi.org/10.3390/instruments5010003>.
- 2019 Bevilacqua, Giuseppe, Valerio Biancalana, Yordanka Dancheva, Leonardo Staccini, et al. (Sept. 2019). “Spurious ferromagnetic remanence detected by hybrid magnetometer”. In: *Review of Scientific Instruments* 90, p. 046106. DOI: <https://doi.org/10.1063/1.5094623>. URL: <https://doi.org/10.1063/1.5094623>.

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- 2018 Gartman, R. et al. (Dec. 2018). “Linear and nonlinear coherent coupling in a Bell-Bloom magnetometer”. In: *Phys. Rev. A* 98, p. 061401. DOI: 10.1103/PhysRevA.98.061401. URL: <https://link.aps.org/doi/10.1103/PhysRevA.98.061401>.
- 2017 Bevilacqua, Giuseppe, Valerio Biancalana, Yordanka Dancheva, Antonio Vigilante, et al. (2017). “Simultaneous Detection of H and D NMR Signals in a Micro-Tesla Field”. In: *The Journal of Physical Chemistry Letters* 8.24. PMID: 29211488, pp. 6176–6179. DOI: 10.1021/acs.jpcllett.7b02854. eprint: <http://dx.doi.org/10.1021/acs.jpcllett.7b02854>. URL: <http://dx.doi.org/10.1021/acs.jpcllett.7b02854>.
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- 2016 Bevilacqua, G., V. Biancalana, and Y. Dancheva (July 2016). “Atomic orientation driven by broadly-frequency-modulated radiation: Theory and experiment”. In: *Phys. Rev. A* 94, p. 012501. DOI: 10.1103/PhysRevA.94.012501. URL: <http://link.aps.org/doi/10.1103/PhysRevA.94.012501>.

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- Bevilacqua, Giuseppe, Valerio Biancalana, Piero Chessa, et al. (Mar. 2016). “Multichannel optical atomic magnetometer operating in unshielded environment”. In: *Applied Physics B* 122.4, pp. 1–9. ISSN: 1432-0649. DOI: 10.1007/s00340-016-6375-2. URL: <http://dx.doi.org/10.1007/s00340-016-6375-2>.
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- 2014 Bevilacqua, G. and E. Breschi (June 2014). “Magneto-optic spectroscopy with linearly polarized modulated light: Theory and experiment”. In: *Phys. Rev. A* 89, p. 062507. DOI: 10.1103/PhysRevA.89.062507. URL: <http://link.aps.org/doi/10.1103/PhysRevA.89.062507>.
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- 2013 Alderighi, M. et al. (2013). “A room-temperature alternating current susceptometer – Data analysis, calibration, and test”. In: *Review of Scientific Instruments* 84.12, 125105, pp. -. DOI: <http://dx.doi.org/10.1063/1.4842255>. URL: <http://scitation.aip.org/content/aip/journal/rsi/84/12/10.1063/1.4842255>.
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- Bevilacqua, G., G. Schaller, et al. (July 2013). “Implementation of stimulated Raman adiabatic passage in degenerate systems by dimensionality reduction”. In: *Phys. Rev. A* 88, p. 013404. DOI: 10.1103/PhysRevA.88.013404. URL: <http://link.aps.org/doi/10.1103/PhysRevA.88.013404>.

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- Martinelli, Liana, Giuseppe Bevilacqua, and Eugenio E. Vogel (2013). “Optical Properties of 3d-Ions in Crystals”. In: ed. by Nicolae M. Avram and Mikhail G. Brik. Springer. Chap. Dynamic Jahn-Teller effect in crystals doped with 3d ions. ISBN: 978-3-642-30837-6. URL: <http://www.springer.com/physics/optics+%5C%26+lasers/book/978-3-642-30837-6>.
- 2012 Bevilacqua, G., V. Biancalana, Y. Dancheva, and L. Moi (Apr. 2012). “Larmor frequency dressing by a nonharmonic transverse magnetic field”. In: *Phys. Rev. A* 85, p. 042510. DOI: 10.1103/PhysRevA.85.042510. URL: <http://link.aps.org/doi/10.1103/PhysRevA.85.042510>.
- Bevilacqua, Giuseppe and Gaetano Napoli (2012). “Parity of the weak Fredericksz transition”. English. In: *The European Physical Journal E* 35, p. 133. ISSN: 1292-8941. DOI: 10.1140/epje/i2012-12133-7. URL: <http://dx.doi.org/10.1140/epje/i2012-12133-7>.
- 2011 Bevilacqua, G., V. Biancalana, Y. Dancheva, T. Mansour, et al. (2011). “A new class of sum rules for products of Bessel functions”. In: *Journal of Mathematical Physics* 52, p. 033508. DOI: 10.1063/1.3567410.
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- 2010 Belfi, J., G. Bevilacqua, V. Biancalana, R. Cecchi, et al. (2010). “Stray magnetic field compensation with a scalar atomic magnetometer”. In: *Review of Scientific Instruments* 81, p. 065103. DOI: 10.1063/1.3441980.
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