

Eleonora GUARINI GDT

Dipartimento di Fisica e Astronomia - Università degli Studi di Firenze
Via G. Sansone, 1
I-50019 Sesto Fiorentino (FI)
Italy
Tel: +39-055-457-2052
e-mail: guarini@fi.infn.it; eleonora.guarinigrisalditajaodeltaja@unifi.it

Curriculum vitae et studiorum – synopsis:

Born in Siena (Italy) on January 30th, 1965

1994: University Degree (“Laurea”) in Physics at the University of Florence with the thesis: “Neutron diffraction in liquid deuterium close to solidification” (supervisors: Dr. U. Bafile and Prof. F. Barocchi).

1995: Collaboration with the Istituto Nazionale per la Fisica della Materia (INFN) and post-lauream training experience at the Interfacultair Reactor Instituut in Delft (NL) with Dr. P. Verkerk.

1996-1998: PhD in Physics at the University of Genoa: “Two- and three-body interactions in fluid krypton by small angle neutron diffraction” (supervisors: Prof. G. Casanova and Prof. F. Barocchi).

1999-2000: INFN Research grant at the Physics Department of the University of Genoa concerning “Investigations on the structural properties of classical and quantum fluids by neutron scattering”.

2000-2001: INFN Research grant at the Physics Department of the University of Firenze for the “Project and construction of the BRISP spectrometer and inelastic neutron scattering experiments”.

2001-2004: Fixed-term INFN Researcher for the construction, test and use of the BRISP neutron spectrometer, with related activity carried out between the INFN Research Unit of Florence (Italy) and the INFN Operative Group in Grenoble (France).

2004-2006: Fixed-term First Researcher of CNR-INFN for the development and management of inelastic neutron scattering instruments, with special concern to the implementation and use of the BRISP spectrometer at ILL, carried out between the CNR-INFN Research Unit of Florence (Italy) and the INFN Operative Group in Grenoble (France).

Since the end of 2006: Researcher (permanent) at the Physics and Astronomy Department of the University of Florence.

Scientific, technical and other appointments - synopsis:

2001-2004 – Full-time collaborator for the design, construction, test and installation of the various components of the BRISP spectrometer at ILL, Grenoble (France). In charge also of the preparation of numerous technical reports and calculation notes about mechanical devices and safety aspects, approved at an international level. Collaborating tutor of a PhD thesis in Physics regarding computer simulations of BRISP optics, and inelastic neutron scattering experiments on simple fluids.

2004-2006 – Coordinator of scientific-technical activity and human resources during the final phases of the BRISP project and the instrument commissioning period. General responsible of the final installation phases, including the setting up and alignment of the instrument, and the realization of appropriate radiation shielding along the whole beamline.

2005-2006 – Scientific responsible of a CNR-INFM Research grant concerning neutron experiments on the collective dynamics of molecular liquids performed using BRISP and other spectrometers.

2008-2012 – Member of the Didactics Committee for the Physics courses of the University of Florence. Delegate for the organization of the didactics.

2012-2022 - Tutor of several degree, master and PhD theses in Physics of the University of Florence.

2013-2014 - Hired as a Senior Scientist by the Institut Laue Langevin in Grenoble for quantum calculations of the neutron cross section of the hydrogen liquids (temporary 9 months' stop of the activity at the University of Florence).

2016-2019 - Member of the Ethics committee coordinated by the Guarantor of the University of Florence.

2018-2021 member of the international panels of the Institut Laue Langevin (Grenoble) for the selection of proposals in Subcommittee 6 “Structure and dynamics of liquids and glasses”.

2021-2022 Member of the Organizing Committee of the Physics and Astronomy Dept. of the University of Florence.

End 2021- Member of the Scientific Library Committee of the University of Florence.

Awards:

Winner of 3 prizes for the best poster presented by young researchers at the national conferences of the Italian Society for Neutron Spectroscopy (years 1994, 1997, 1999), and of the prize of the Istituto Nazionale per la Fisica della Materia for the best PhD thesis discussed in the field of neutron studies on condensed matter in the years 1998-2000.

Research and teaching activity – synopsis:

Wide experience in the field of neutron spectroscopy for investigations of the structural and dynamical properties of fluids (classical and quantum liquids, monatomic and molecular fluids, liquid metals, binary mixtures and molten alloys) and in quantum calculations of the neutron double-differential cross-section of simple molecules.

Good technical and scientific skills for the development of big neutron instrumentation. Experience in the handling of under-pressure equipment and samples.

Knowledge of most of the neutron techniques and confident use of several types of instruments: two-axis and ToF diffractometers, Small-Angle diffractometers, three-axis and ToF spectrometers, available at hot, thermal, and cold neutron sources of European research reactors and pulsed spallation sources.

Equally broad experience in neutron data collection and analysis (with implementation of original software), and comparison with classical and quantum computer simulation results.

Pluriennial activity devoted to studies of the theories of the liquid state, of the interaction properties in classical and quantum fluids, and of the collective and single-particle dynamics in liquids.

Constant teaching activity (1997-2022) both in the field of theoretical and experimental approaches to the structural and dynamical properties of fluids and condensed matter (both within university degree and PhD courses of the Universities of Genova and Firenze, and at national and international Physics Schools), and regarding general physics degree courses of the University of Florence (General Physics I, General Physics II, Electromagnetic Waves).

Related activities:

- Referee for Physical Review Letters, Physical Review, Journal of Chemical Physics, Applied Physics Letters, Journal of Applied Physics.
- Treasurer of the Italian Society for Neutron Spectroscopy (SISN) in the years 2006-2010.
- Main tutor or co-tutor of several first and second level theses in Physics of students of the University of Florence.
- Tutor and co-tutor of two PhD theses in Physics at the University of Florence.
- Referee of a PhD Thesis of the University of Valladolid (Spain).
- Organizer of conferences, international schools and workshops:
 - a) Secretary of the Organizing Committee of the “First International Workshop on Neutron Brillouin Scattering” held in Perugia, June 12-14, 2005.
 - b) Member of the Scientific Committee of the Italian Society for Neutron Spectroscopy and organizer of the society annual conference in the years from 2006 to 2010.
 - c) Member of the Organizing Committee of the “Second International Workshop on Brillouin Scattering” held in Rome, February 3-5, 2016.
- Director of 3 editions (years 2014-2016) of the Learning Days organized by the Italian Society for Neutron Spectroscopy, with 5 days of frontal lectures and 4 days of experiments at the research reactor of the Institut Laue-Langevin in Grenoble.
- Director of the Advanced School organized by the Italian Society for Neutron Spectroscopy in June 2018.
- Member of Subcommittee 6 “Structure & dynamics of liquids and glasses” of the Institut Laue Langevin for the scientific evaluation of the experimental proposals in the years 2018-2020.
- Member of the Organizing Committee of the Summer School Training on Neutron Techniques (TNT) of the Italian Society of Neutron Spectroscopy held in June 2022.
- Author of 47 presentations at International Conferences and of 36 presentations at National Conferences.
- Author of 97 publications in peer-reviewed international journals and ILL annual reports.
- Presenting author of 13 invited seminars at national and international research institutes.

Financed projects:

- Finanziamento ministeriale attività base di ricerca FFABR 2017. Individual.
- PRIN 2017, member of the Unit of Florence “SOFT ADAPTIVE NETWORKS”, PI: Francesco Sciortino.
- Ente Cassa di Risparmio di Firenze 2018: “Soft Bio Net: Processi di aggregazione di biomolecole per la formazione di reti percolative, dalle proprietà molecolari a quelle strutturali e meccaniche”, PI: Renato Torre.

Most significant publications

1. M. Zoppi, U. Bafile, E. Guarini, F. Barocchi, R. Magli, M. Neumann
“Microscopic structure and intermolecular potential in liquid deuterium”
Phys. Rev. Lett. **75**, 1779 (1995).
2. E. Guarini, G. Casanova, U. Bafile, F. Formisano, R. Magli, F. Barocchi
“Direct determination of long-range dipolar interactions in Kr by neutron diffraction”
Europhys. Lett. **49**, 62 (2000).
3. U. Bafile, P. Verkerk, E. Guarini, F. Barocchi
“Neutron Brillouin Scattering study of collective dynamics in a dense He-Ne gaseous mixture”
Phys. Rev. Lett. **86**, 1019 (2001).
4. M. Sampoli, U. Bafile, E. Guarini, F. Barocchi
“Dynamic structure of He-Ne mixtures by Molecular Dynamics simulation: from hydrodynamic to fast and slow modes”
Phys. Rev. Lett. **88**, 085502 (2002).
5. E. Guarini
“The neutron double differential cross-section of simple molecular fluids: refined computing models and nowadays applications”
J. Phys.: Condens. Matter **15**, Topical Review R775-R812, (2003).
6. M. Celli, U. Bafile, G. J. Cuello, F. Formisano, E. Guarini, R. Magli, M. Neumann, and M. Zoppi
“Measuring the microscopic structure factor of liquid hydrogen using neutrons”,
Phys. Rev. B **71**, 014205 (2005).
7. E. Guarini, U. Bafile, F. Barocchi, F. Demmel, F. Formisano, M. Sampoli, G. Venturi
“Collective excitations in liquid CD₄: neutron scattering and molecular dynamics simulations”
Europhys. Lett. **72**, 969 (2005).
8. U. Bafile, E. Guarini, F. Barocchi
“Collective acoustic modes as renormalized damped oscillators: unified description of neutron and x-ray scattering data from classical fluids”
Phys. Rev. E **73**, 06123 (2006).
9. L. E. Bove, F. Formisano, E. Guarini, A. Ivanov, C. Petrillo, and F. Sacchetti
“Evidence for the coexistence of two density fluctuation modes in molten Li₃₀Bi₇₀ as probed by neutron scattering”
Europhys. Lett. **79**, 16002 (2007).
10. E. Guarini, M. Sampoli, G. Venturi, U. Bafile, and F. Barocchi
“Inelastic neutron scattering and molecular dynamics determination of the interaction potential in liquid CD₄”
Phys. Rev. Lett. **99**, 167801 (2007).
11. U. Bafile, E. Guarini, M. Sampoli, and F. Barocchi
“Characteristic times in the nanometer-picosecond translational collective dynamics of molecular liquids”
Phys. Rev. E, Rapid Communication **80**, 040201 (R) (2009)
This paper has been selected for the October 26, 2009 issue of Virtual Journal of Nanoscale Science & Technology, published by the American Institute of Physics and the American Physical Society. Vir. J. Nan. Sci. & Tech. **20** (17) (2009)

12. Milva Celli, Ubaldo Bafile, Daniele Colognesi, Alessio De Francesco, Ferdinando Formisano, Eleonora Guarini, Martin Neumann, and Marco Zoppi
"Non-Gaussian self dynamics of liquid hydrogen"
Phys. Rev. B, Rapid Comm. **84**, 140510 (R) (2011).
13. E. Guarini, U. Bafile, F. Barocchi, A. De Francesco, E. Farhi, F. Formisano, A. Laloni, A. Orecchini, A. Polidori, M. Puglisi, and F. Sacchetti
"Dynamics of liquid Au from neutron Brillouin scattering and ab initio simulations: Analogies in the behavior of metallic and insulating liquids"
Phys. Rev. B **88**, 104201 (2013).
14. F. Barocchi, E. Guarini, and U. Bafile
"Exponential series expansion for correlation functions of many-body systems"
Phys. Rev. E **90**, 032106 (2014).
15. M. Zanatta, F. Sacchetti, E. Guarini, A. Orecchini, A. Paciaroni, L. Sani, and C. Petrillo
"Collective ion dynamics in liquid zinc: Evidence for complex dynamics in a non-free electron liquid metal"
Phys. Rev. Lett. **114**, 187801 (2015).
16. E. Guarini, M. Neumann, U. Bafile, M. Celli, D. Colognesi, E. Farhi, and Y. Calzavara
"Velocity autocorrelation in liquid para-hydrogen by quantum simulations for direct, parameter free, computations of the neutron cross sections"
Phys. Rev. B **92**, 104303 (2015).
17. Stefano Bellissima, Simone De Panfilis, Ubaldo Bafile, Alessandro Cunsolo, Miguel Angel González, Eleonora Guarini, and Ferdinando Formisano
"The hydrogen-bond collective dynamics in liquid methanol"
Sci. Rep. **6**, 39533 (2016).
18. S. Bellissima, M. A. González, U. Bafile, A. Cunsolo, F. Formisano, S. De Panfilis, and E. Guarini
"Switching off hydrogen-bond-driven excitation modes in liquid methanol"
Sci. Rep. **7**, 10057 (2017).
19. E. Guarini, M. Neumann, U. Bafile, S. Bellissima, and D. Colognesi
"Dynamical Origin of the Total and Zero-Point Kinetic Energy in a Quantum Fluid"
Phys. Rev. Lett. **123**, 135301 (2019).
20. Eleonora Guarini, Alessio De Francesco, Ubaldo Bafile, Alessio Laloni, Beatriz G. del Rio, David J. González, Luis E. González, Fabrizio Barocchi, and Ferdinando Formisano
"A neutron Brillouin scattering and *ab initio* simulation study of the collective dynamics of liquid silver"
Phys. Rev. B **102**, 054210 (2020).
21. Eleonora Guarini, Fabrizio Barocchi, Alessio De Francesco, Ferdinando Formisano, Alessio Laloni, Ubaldo Bafile, Milva Celli, Daniele Colognesi, Renato Magli, Alessandro Cunsolo, and Martin Neumann
"Collective dynamics of liquid deuterium: neutron scattering and approximate quantum simulation methods"
Phys. Rev. B **104**, 174204 (2021). Article chosen as Editors' suggestion by the journal
22. Francesco Sacchetti, Franz Demmel, Eleonora Guarini and Caterina Petrillo
"Complex dynamics in low electron density lithium ammonia solutions. Interacting modes revealed by comparing neutron and x-ray inelastic scattering"
Phys. Rev. Materials **6**, 115001 (2022).