

Filippo Bencivenga

Curriculum Vitae (December 2020)

Personal data

Name: Filippo Bencivenga

Citizenship: Italian

Data and place of birth: 13 May 1979, Perugia (Italy)

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Languages: Italian (native), English, French

Education

July 2003 – Laurea in fisica at the “Università degli studi di Perugia”, Perugia, Italy.

Thesis title: Inelastic light and x-ray scattering from Salol in the supercooled, glassy and single crystalline phases.

Supervisor: Daniele Fioretto.

Mark: 110/110 e lode.

October 2006 – Ph.D. at the “Université Joseph Fourier”, Grenoble, France.

Thesis title: The high-frequency dynamics of liquids and supercritical fluids.

Supervisors: Francesco Sette and Michael Krisch.

Working activities

Oct. 2003 – Oct. 2006: Ph.D. Student at the High Resolution and Resonant Scattering (HRRS) group at the European Synchrotron Radiation Facility (ESRF, Grenoble, France).

Nov. 2006 – Dec. 2010: post-doctoral scientist at the Inelastic UV Scattering (IUVS) and Elastic and Inelastic Scattering (EIS) beamlines at Elettra-Sincrotrone Trieste (Trieste, Italy).

Jan. 2011 – present: staff scientist and beamline coordinator of the EIS-TIMER beamline, at the FERMI FEL facility (Elettra-Sincrotrone Trieste, Italy); member of the FERMI project office (Jan. 2020 – present).

Research activities

As scientist in charge of the EIS-TIMER beamline at the FERMI free electron laser (FEL) facility, I'm responsible for the scientific evaluation, practical realization and user operation of FEL-based transient grating (TG) and wave-mixing (WM) experiments. In this context, I proposed and realized dedicated experimental setups (some of them in collaboration with the team of the DiProI beamline at FERMI), which are now available for users and represent the state-of-the-art for short wavelength TG experiments. This has so far been my main research activity.

A fraction of my time was previously dedicated to collaborate with scientists at other large scale facilities on inelastic x-ray and neutron scattering investigations focused on the study of high frequency dynamics in liquids and disordered solids, as well as to realize and lead the operation of an optical laser laboratory. The latter was used to perform test experiments related to the FEL-based transient grating method and to develop special setup, such as a UV Fabry-Perot tandem interferometer.

Presently, my main research interests are: i) non-linear light-matter interactions in the EUV and soft x-ray regime; ii) Transport phenomena, elasticity and magnetic dynamics at the nanoscale; iii) Developments of FEL-based setups.

Training activities

Since 2006 I have tutored undergraduate and graduate students (from the Universities of Trieste, Perugia, Sapienza di Roma, Modena and Reggio Emilia) who carried out their thesis work or training periods at the IUVS beamline, at the EIS laser laboratory or at the FERMI FEL.

Since 2007 I have given a few lectures, focused on applications of synchrotron and FEL radiation, at international schools and at the Universities of Trieste, Trento and Perugia.

Since 2009 I have supervised Master and PhD students from the University of Trieste, who carried out their work at the EIS laser laboratory or at the EIS-TIMER beamline.

Other activities

As a member of the FERMI project office I evaluate technical needs and eventual interferences between beamtimes and, together with the machine operation manager, I'm responsible for defining the operation calendar of the facility. I also overlook the experimental activities carried out at the FERMI FEL beamlines, and the process of technical and scientific evaluation of the beamtime proposals. In collaboration with the "FERMI editorial board", I'm responsible in monitoring the scientific throughput of the facility in term of publications and I collaborate to the related evaluations.

Referee for the following journals: Journal of Applied Physics and Applied Physics Letters, Applied Science, Nature Photonics, Nature Communications, Journal of Chemical Physics, Journal of Physics B, Physical Review Letters, Photonics, Nuclear Instruments and Methods in Physical Research A, Philosophical Magazine, Journal of Raman Spectroscopy, Physical Review Applied, Optics Communications, Chemical Physics Letters

Reviewer of research projects for the Italian Ministry of University and Research (Italy), UEFISCDI (Romania), the National Science Centre (Poland) and the U.S. Department of Energy (USA).

Editorial board member for Scientific Reports (Nature Publishing Group)

Member of the beamline evaluation panel (femtosing/time-resolved experiments) at BESSY II (Berlin, Germany)

Member of the organizing committee of the Science@FELs conference 2016 and of the HERCULES school 2018 and 2019

Member of the review committee of the FURKA beamline at SwissFEL (Villingen, Switzerland)

Publications and conferences

Since 2006 I've published 67 regular papers in international peer-reviewed journals and 41 conference papers (h-index: 18 ; SCOPUS).

Since 2008 I've presented about 30 oral contributions to international conferences as invited speaker.

Further below a list of 5 selected publications related to my main research activity:

- 1) F. Bencivenga, R. Mincigrucci, F. Capotondi et al.
Nanoscale transient gratings excited and probed by extreme ultraviolet femtosecond pulses
Science Advances **5**, eaaw5805 (2019) – cited by (SCOPUS): 4
- 2) F. Bencivenga, R. Cucini, F. Capotondi et al.
Four-wave mixing experiments with extreme ultraviolet transient gratings
Nature **520**, 205-208 (2015) – cited by (SCOPUS): 117
- 3) E. Allaria, F. Bencivenga, R. Borghes et al.
Two-color pump-probe experiments with a twin-pulse-seed extreme ultraviolet free-electron-laser
Nature Communications **4**, 2476 (2013) – cited by (SCOPUS): 145

- 4) F. Bencivenga, S. Baroni, C. Carbone et al.
Nanoscale dynamics by short-wavelength four wave mixing experiments
New Journal of Physics **15**, 123023 (2013) – cited by (SCOPUS): 36

- 5) F. Bencivenga and C. Masciovecchio
FEL-based transient grating spectroscopy to investigate nanoscale dynamics
NIM-A **606**, 785-789 (2009) – cited by (SCOPUS): 38

Publication list (regular papers)

- 1) F. Bencivenga, A. Cunsolo, M. Krisch, G. Monaco, G. Ruocco, and F. Sette
Adiabatic and isothermal sound waves: the case of supercritical nitrogen
Europhysics Letters **75**, 70-76 (2006)
- 2) F. Bencivenga, A. Cunsolo, M. Krisch, (...), F. Sette, and A. Vispa
Structural and collisional relaxations in liquids and supercritical fluids
Physical Review Letters **98**, 085501 (2007)
- 3) S. di Fonzo, C. Masciovecchio, F. Bencivenga, (...), O. de Giacomo, and A. Cesàro
Concentration-temperature dependencies of structural relaxation time in trehalose-water solutions by Brillouin inelastic UV scattering
The Journal of Physical Chemistry A **111**, 12577-12583 (2007)
- 4) H. Reichert, F. Bencivenga, B. Weingher, M. Krisch, F. Sette, and H. Dosch
High frequency subsurface and bulk dynamics in liquid indium
Physical Review Letters **98**, 096104 (2007)
- 5) F. Bencivenga, A. Cunsolo, M. Krisch, G. Monaco, G. Ruocco, and F. Sette
High-frequency dynamics of liquid and supercritical water
Physical Review E **75**, 051202 (2007)
- 6) C. Masciovecchio, F. Bencivenga, and A. Gessini
Water dynamics at the nanoscale
Condensed Matter Physics **11**, 47-56 (2008)
- 7) F. Bencivenga, A. Cunsolo, M. Krisch, G. Monaco, G. Ruocco, and F. Sette
High frequency dynamics in liquids and supercritical fluids: A comparative inelastic x-ray scattering study
The Journal of Chemical Physics **130**, 064501 (2009)
- 8) F. Bencivenga, A. Cimattorus, M. G. Izzo, A. Gessini, and C. Masciovecchio
Temperature and density dependence of the structural relaxation time in water by inelastic ultraviolet scattering
The Journal of Chemical Physics **131**, 144502 (2009)
- 9) F. Bencivenga and C. Masciovecchio
FEL-based transient grating spectroscopy to investigate nanoscale dynamics
Nuclear Instruments and Methods in Physics Research A **606**, 785-789 (2009)
- 10) Cunsolo, F. Formisano, C. Ferrero, F. Bencivenga, and S. Finet
Pressure dependence of the large-scale structure of water
The Journal of Chemical Physics **131**, 194502 (2009)

- 11) A. Cimattoribus, S. Saccani, F. Bencivenga, A. Gessini, M. G. Izzo, and C. Masciovecchio
Mixed longitudinal-transverse nature of collective modes in water
New Journal of Physics **12**, 053008 (2010)
- 12) M. G. Izzo, F. Bencivenga, A. Cunsolo, S. Di Fonzo, R. Verbeni, and R. Gimenez De Lorenzo
The single particle dynamics of iodine in the Sachs–Teller regime: An inelastic x-ray scattering study
The Journal of Chemical Physics **133**, 124514 (2010)
- 13) F. D'Amico, F. Bencivenga, A. Gessini, and C. Masciovecchio
Temperature Dependence of Hydrogen-Bond Dynamics in Acetic Acid-Water Solutions
The Journal of Physical Chemistry B **114**, 10628-10633 (2010)
- 14) E. Principi, C. Ferrante, A. Filipponi, F. Bencivenga, F. D'Amico, C. Masciovecchio, and A. Di Cicco
A method for estimating the temperature in high energy density free electron laser experiments
Nuclear Instruments and Methods in Physics Research A **621**, 643-649 (2010)
- 15) R. Cucini, F. Bencivenga, and C. Masciovecchio
All-reflective femtosecond optical pump–probe setup for transient grating spectroscopy
Optics Letters **36**, 1032 (2011)
- 16) F. Bencivenga and A. Cunsolo
The dispersive behavior of collective excitations in fluids: An experimental test for the generalized collective modes theory
The Journal of Chemical Physics **136**, 114508 (2012)
- 17) A. Cunsolo, C. N. Kodituwakku, F. Bencivenga, M. Frontzek, B. M. Leu, and A. H. Said
Transverse dynamics of water across the melting point: A parallel neutron and x-ray inelastic scattering study
Physical Review B **85**, 174305 (2012)
- 18) E. Principi, R. Cucini, A. Filipponi, (...), A. Di Cicco, and C. Masciovecchio
Determination of the ion temperature in a stainless steel slab exposed to intense ultrashort laser pulses
Physical Review Letters **109**, 025005 (2012)
- 19) F. Bencivenga, A. Battistoni, D. Fioretto, A. Gessini, J. R. Sandercock, and C. Masciovecchio
A high resolution ultraviolet Brillouin scattering set-up
Review of Scientific Instruments **83**, 103102 (2012)

- 20) E. Allaria, A. Battistoni, F. Bencivenga, (...), M. Trovò, and M. Zangrando
Tunability experiments at the FERMI@Elettra free-electron laser
New Journal of Physics **14**, 113009 (2012)
- 21) F. D'Amico, F. Bencivenga, A. Gessini, E. Principi, R. Cucini, and C. Masciovecchio
Investigation of acetic acid hydration shell formation through Raman spectra line-shape analysis
The Journal of Physical Chemistry B **116**, 13219-13227 (2012)
- 22) F. D'Amico, M. Saito, F. Bencivenga, (...), E. Giangrisostomi, and C. Masciovecchio
UV Resonant Raman scattering facility at Elettra
Nuclear Instruments and Methods in Physics Research A **703**, 33-37 (2013)
- 23) F. D'Amico, F. Bencivenga, G. Camisasca, A. Gessini, E. Principi, R. Cucini, and C. Masciovecchio
Thermodynamic hydration shell behavior of glycine
The Journal of Chemical Physics **139**, 015101 (2013)
- 24) S. Di Fonzo, C. Masciovecchio, A. Gessini, F. Bencivenga, and A. Cesàro
Water Dynamics and Structural Relaxation in Concentrated Sugar Solutions
Food Biophysics **8**, 183-191 (2013)
- 25) E. Allaria, F. Bencivenga, R. Borghes, (...), M. Trovò, and M. Zangrando
Two-color pump-probe experiments with a twin-pulse-seed extreme ultraviolet free-electron-laser
Nature Communications **4**, 2476 (2013)
- 26) F. Bencivenga, S. Baroni, C. Carbone, (...), C. Svetina, and C. Masciovecchio
Nanoscale dynamics by short-wavelength four wave mixing experiments
New Journal of Physics **15**, 123023 (2013)
- 27) A. Cunsolo and C. N. Kodituwakku, F. Bencivenga, B. M. Leu, and A. H. Said
The role of glycerol in the terahertz dynamics of water-glycerol mixtures
The Journal of Chemical Physics **139**, 184507 (2013)
- 28) F. Bencivenga and D. Antonangeli
Positive sound dispersion in vitreous GeO₂ at high pressure
Physical Review B **90**, 134310 (2014)
- 29) F. Bencivenga, E. Principi, E. Giangrisostomi, (...), M. Saito, and C. Masciovecchio
Reflectivity enhancement in titanium by ultrafast XUV irradiation
Scientific Reports **4**, 4952 (2014)

- 30) M. Saito, F. D'Amico, F. Bencivenga, R. Cucini, A. Gessini, E. Principi, and C. Masciovecchio
Spatial correlation between chemical and topological defects in vitreous silica: UV-resonance Raman study
Journal of Chemical Physics **140**, 244505 (2014)
- 31) F. Bencivenga, F. Capotondi, F. Casolari, (...), C. Masciovecchio, and E. Pedersoli
Multi-colour pulses from seeded free-electron-lasers: Towards the development of non-linear core-level coherent spectroscopies
Faraday Discussions **171**, 487-503 (2014)
- 32) A. Battistoni, F. Bencivenga, D. Fioretto, and C. Masciovecchio
Practical way to avoid spurious geometrical contributions in Brillouin light scattering experiments at variable scattering angles
Optics Letters **39**, 5858-5861 (2014)
- 33) M.B. Danailov, F. Bencivenga, F. Capotondi, (...), E. Principi, and P. Sigalotti
Towards jitter-free pump-probe measurements at seeded free electron laser facilities
Optics Express **22**, 12869-12879 (2014)
- 34) R. Cucini, A. Battistoni, A. Gessini, (...), R. Sergo, and C. Masciovecchio
Determination of dynamical parameters in liquids by homodyne transient grating spectroscopy at large angles
Optics Letters **39**, 5110-5113 (2014)
- 35) M. Ferrario, D. Alesini, M. Alessandroni, (...), M. Zobov, and F. Zomer
IRIDE: Interdisciplinary research infrastructure based on dual electron linacs and lasers
Nuclear Instruments and Methods in Physics Research A **740**, 138-146 (2014)
- 36) F. Casolari, F. Bencivenga, F. Capotondi, (...), C. Masciovecchio, and M. Kiskinova
Role of multilayer-like interference effects on the transient optical response of Si₃N₄ films pumped with free-electron laser pulses
Applied Physics Letters **104**, 191104 (2014)
- 37) A. Di Cicco, K. Hatada, E. Giangrisostomi, (...), C. Masciovecchio, and A. Filipponi
Interplay of electron heating and saturable absorption in ultrafast extreme ultraviolet transmission of condensed matter
Physical Review B **90**, 220303 (2014)
- 38) M. Saito, F. D'Amico, G. Camisasca, (...), T. Ogura, and C. Masciovecchio
Resonance Raman spectroscopy with chemical state selectivity on histidine and acetamide using synchrotron radiation
Bulletin of the Chemical Society of Japan **88**, 591-596 (2015)

- 39) F. Capotondi, E. Pedersoli, F. Bencivenga, (...), C. Masciovecchio, and M. Kiskinova
Multipurpose end-station for coherent diffraction imaging and scattering at FERMI@Elettra free-electron laser facility
Journal of Synchrotron Radiation **22**, 544-552 (2015)
- 40) C. Masciovecchio, A. Battistoni, E. Giangrisostomi, (...), A. Abrami, and M. Zangrando
EIS: The scattering beamline at FERMI
Journal of Synchrotron Radiation **22**, 553-564 (2015)
- 41) A. J. Corso, P. Zuppella, E. Principi, (...), S. Nannarone, and M.G. Pelizzo
Broadband multilayer optics for ultrafast euv absorption spectroscopy with free electron laser radiation
Journal of Optics (United Kingdom) **17**, 025505 (2015)
- 42) F. Bencivenga, R. Cucini, F. Capotondi, (...), M. Kiskinova, and C. Masciovecchio
Four-wave mixing experiments with extreme ultraviolet transient gratings
Nature **520**, 205-208 (2015)
- 43) F. D'Amico, B. Rossi, G. Camisasca, (...), R. Cucini, and C. Masciovecchio
Slow-to-fast transition of hydrogen bond dynamics in acetamide hydration shell formation
Physical Chemistry Chemical Physics **17**, 10987-10992 (2015)
- 44) R. Mincigrucci, F. Bencivenga, F. Capotondi, (...), E. Pedersoli, and C. Masciovecchio
Role of the ionization potential in nonequilibrium metals driven to absorption saturation
Physical Review E **92**, 011101 (2015)
- 45) A. Cunsolo, Y. Li, C.N. Kodituwakku, (...), D. Bolmatov, and Y.Q. Cai
Signature of a polyamorphic transition in the THz spectrum of vitreous GeO₂
Scientific Reports **5**, 14996 (2015)
- 46) F. Bencivenga, F. Capotondi, E. Principi, M. Kiskinova, and C. Masciovecchio
Coherent and transient states studied with extreme ultraviolet and X-ray free electron lasers: Present and future prospects
Advances in Physics **63**, 327 (2015)
- 47) R. Mincigrucci, E. Giangrisostomi, E. Principi, (...), M. G. Izzo, and C. Masciovecchio
Liquid Carbon Reflectivity at 19 nm
Photonics **2**, 50-56 (2015)

- 48) R. Cucini, A. Battistoni, F. Bencivenga, (...), M. Kiskinova, and C. Masciovecchio
Toward the Extreme Ultra Violet FourWave Mixing Experiments: From Table Top Lasers to Fourth Generation Light Sources
Photonics **2**, 57-70 (2015)
- 49) E. Principi, E. Giangrisostomi, R. Cucini, (...), S. Nannarone, and C. Masciovecchio
Free electron laser-driven ultrafast rearrangement of the electronic structure in Ti
Structural Dynamics **3**, 023604 (2016)
- 50) F. Bencivenga, A. Calvi, F. Capotondi, (...), M. Zangrando, and C. Masciovecchio
Four-wave-mixing experiments with seeded free electron lasers
Faraday Discussions **194**, 283-303 (2016)
- 51) R. Mincigrucci, A. Matruglio, A. Calvi, (...), C. Masciovecchio, and S. Dal Zilio
Toward an integrated device for spatiotemporal superposition of free-electron lasers and laser pulses
Optics Letters **41**, 5090-5093 (2016)
- 52) R. Mincigrucci, E. Principi, F. Bencivenga, (...), A. Simoncig and C. Masciovecchio
Transient EUV reflectivity measurements of carbon upon ultrafast laser heating
Photonics **4**, 23 (2017)
- 53) A. Simoncig, R. Mincigrucci, E. Principi, (...) M. Lazzarino, and C. Masciovecchio
Generation of coherent magnons in NiO stimulated by EUV pulses from a seeded free-electron laser
Physical Review Materials **1**, 073802 (2017)
- 54) R. Mincigrucci, D. Naumenko, L. Foglia, (...), F. Bencivenga, and F. Capotondi
Optical constants modelling in silicon nitride membrane transiently excited by EUV radiation
Optics Express **26**, 11877-11888 (2018)
- 55) L. Foglia, F. Capotondi, R. Mincigrucci, (...), C. Masciovecchio, and F. Bencivenga
First evidence of purely extreme-ultraviolet four-wave-mixing
Physical Review Letters **120**, 263901 (2018)
- 56) E. Principi, E. Giangrisostomi, R. Mincigrucci, (...), F. Bencivenga, and C. Masciovecchio
Extreme ultraviolet probing of nonequilibrium dynamics in high energy density Germanium
Physical Review B **97**, 174101 (2018)
- 57) R. Mincigrucci, L. Foglia, D. Naumenko, (...), F. Capotondi, and F. Bencivenga
Advances in instrumentation for FEL-based four-wave-mixing experiments
Nuclear Instruments and Methods in Physics Research A **907**, 132-148 (2018)

- 58) A. A. Maznev, F. Bencivenga, A. Cannizzo, (...), A. Vega-Flick, and K. A. Nelson
Generation of coherent phonons by coherent extreme ultraviolet radiation in a transient grating experiment
Applied Physics Letters **113**, 221905 (2018)
- 59) R. Mincigrucci, M. Kowalewski, J. R. Rouxel, (...), S. Mukamel, and C. Masciovecchio
Impulsive UV-pump/X-ray probe study of vibrational dynamics in glycine
Scientific Reports **8**, 15466 (2018)
- 60) F. Bencivenga, F. Capotondi, L. Foglia, (...), E. Pedersoli, and A. Simoncig
Short-wavelength four wave mixing experiments using single and two-color schemes at FERMI
Journal of Electron Spectroscopy and Related Phenomena 156901 (2019)
- 61) R. Bohinc, G. Pamfilidis, J. Rehalt, (...), K. A. Nelson, and G. Knopp
Nonlinear XUV-optical transient grating spectroscopy at the Si L_{2,3}-edge
Applied Physics Letters **114**, 181101 (2019)
- 62) L. Foglia, F. Capotondi, H. Höppner, (...), A. Simoncig, and F. Bencivenga
Exploring the multiparameter nature of EUV-visible wave mixing at the FERMI FEL
Structural Dynamics **6**, 040901 (2019)
- 63) F. Bencivenga, R. Mincigrucci, F. Capotondi, (...), K. A. Nelson, and C. Masciovecchio
Nanoscale transient gratings excited and probed by extreme ultraviolet
Science Advances **5**, eaaw5805 (2019)
- 64) D. Naumenko^(*), R. Mincigrucci^(*), M. Altissimo, (...), F. Capotondi, and F. Bencivenga
Thermoelasticity of Nanoscale Silicon Carbide Membranes Excited by Extreme Ultraviolet Transient Gratings: Implications for Mechanical and Thermal Management
ACS Applied Nanomaterials **2**, 5132-5139 (2019)
- 65) C. Fasolato, F. Sacchetti, P. Postorino, (...), C. Masciovecchio, and C. Petrillo
Ultrafast Plasmon Dynamics in Crystalline LiF Triggered by Intense Extreme UV Pulses
Physical Review Letters **124**, 184801 (2020)
- 66) S. L. Raj, S. W. Devlin, R. Mincigrucci, (...), C. Masciovecchio, and R. J. Saykally
Free electron laser measurement of liquid carbon reflectivity in the extreme ultraviolet
Photonics **7**, 35 (2020)

- 67) E. Principi, S. Krylow, M. E. Garcia, (...), S. Nannarone, and C. Masciovecchio
Atomic and Electronic Structure of Solid-Density Liquid Carbon
Physical Review Letters **125**, 155703 (2020)