Giuseppe Fumero

EDUCATION

Doctor of Philosophy 2015-2019

Sapienza, Università di Roma

Graduation Date: 04/02/2019
Description: Experimental and theoretical research in the fields of ultrafast and multidimensional spectroscopy, radiation-matter interaction and quantum properties of light.
Program: Mathematical Models for engineering, electromagnetics and nanosciences
Final grade: with honors

Master degree in Physics 2012-2014

Sapienza, Università di Roma

Graduation Date: 27/01/2015
Final grade: 110/110 cum laude
Average exams grade: 29.3/30

Bachelor degree in Physics 2009-2012

Sapienza, Università di Roma

Graduation Date: 06/11/2012
Final Grade: 109/110

RESEARCH EXPERIENCE

Postdoctoral researcher 11/2020 - today

Sapienza, Università di Roma

Description: Development and application of machine learning techniques to nonlinear and ultrafast spectroscopy. Development of multidimensional spectroscopies with stochastic pulses in the optical and x-ray domains.

Independent researcher 03/2019- 10/2020

Description: Collaborations with Sapienza, University of Rome, University of California, Irvine and Oxford University on multidimensional and time-resolved nonlinear spectroscopy.

Beam Time 22-26 July 2018

Fermi · Elettra-Sincrotrone Trieste

Description: Generation of ultrashort EUV light continuum from condensed matter exposed to FEL pulses (Beamline TIMEX - proposal ID 20149024).

Visiting research scholar March-June 2018

Mukamel's group · University of California, Irvine

Description: Elaboration and application of novel pulse shaped Impulsive Stimulated Raman protocols.

Visiting research scholar November-December 2016

Mukamel's group · University of California, Irvine

Description: Developing of a theoretical framework for two dimensional Impulsive Stimulated Raman Spectroscopy in harmonic systems.

Research internship January-June 2015

Femtoscopy Lab. · Sapienza, Università di Roma

Description: Modeling of 2D Raman spectroscopies with femtosecond time resolution.

Laboratory Training June-September 2013

Femtoscopy Lab. · Sapienza, Università di Roma

Description: Development of an optical setup for RIKES Spectroscopy on proteins.

RELATED EXPERIENCE

Peer-reviewing for international journals 07/2016-today

Referee for APS, ACS and Science Advances journals.

Science Communication 11/2018-today

Salotti Matematici: A cycle of introductory lessons and laboratory demonstrations in Physics for first grade students.
Volunteer for Unione Matematica Italiana: Demonstrations and orientation for high school students.

Teaching Assistant Fall Semester 2015, 2017

Class preparation and frontal lessons for the graduate course 'Fotonica', held at Sapienza University of Rome for the master degrees in Physics.

Student supervisor 2017-today

Supervision of students of the master degree in Physics and Computer Engineering during the preparation of projects and final thesis.

PUBLICATIONS

15. *Excited-State Energy Surfaces in Molecules Revealed by Impulsive Stimulated Raman Excitation Profiles*, G. Batignani, C. Sansone, C. Ferrante, G. Fumero, S. Mukamel, and T. Scopigno, *J. Phys. Chem. Lett. 12, 9239-9247 (2021)*
DOI: 10.1021/acs.jpclett.1c02209

14. *Non-linear self-driven spectral tuning of Extreme Ultraviolet Femtosecond Pulses in monoatomic materials*, C. Ferrante, E. Principi, A. Marini, G. Batignani, G. Fumero, A. Virga, L. Foglia, R. Mincigrucci, A. Simoncig, C. Spezzani, C. Masciovecchio, and T. Scopigno, *Light Sci. Appl. 10, 92 (2021)*
DOI: 10.1038/s41377-021-00531-8

13. *Two-dimensional impulsively stimulated resonant Raman spectroscopy of molecular excited-states*, G. Fumero[1], C. Schnedermann[1], G. Batignani, T. Wende, M. Liebel, G. Bassolino, C. Ferrante, S. Mukamel, P. Kukura and T. Scopigno, *Phys. Rev. X 10, 011051 (2020)*
DOI: 10.1103/PhysRevX.10.011051

12. *Broadband Impulsive Stimulated Raman Scattering based on a Chirped Detection*, G. Batignani, C. Ferrante, G. Fumero and T. Scopigno, *J. Phys. Chem. Lett.*, 10, 24, 7789-7796 (2019)
DOI: 10.1021/acs.jpclett.9b03061

11. *Modelling the ultrafast response of two-magnon Raman excitations in antiferromagnets on the femtosecond timescale*, G. Batignani, E. Pontecorvo, D. Bossini, C. Ferrante, G. Fumero, G. Cerullo, S. Mukamel and T. Scopigno, *Annalen der Physik, 531, 1900439 (2019)*
DOI: 10.1002/andp.201900439

10. *The Potential of EuPRAXIA@SPARC_LAB for Radiation Based Techniques*, A. Balerna et al, *Condens. Matter 4,1, 30 (2019)*
DOI: 10.3390/condmat4010030

9. *Genuine dynamics vs cross phase modulation artefacts in Femtosecond Stimulated Raman Spectroscopy*, G. Batignani, G. Fumero, E. Pontecorvo, C. Ferrante, S. Mukamel, T. Scopigno, *ACS Photonics 6, 2, 492 (2019)*
DOI: 10.1021/acsphotonics.8b01467

8. *Probing Femtosecond Lattice Displacement upon Photo-carrier generation in Lead Halide Perovskite*, G. Batignani [1], G. Fumero[1], A. R. S. Kandada[1], G. Cerullo, M. Gandini, C. Ferrante, A. Petrozza and T. Scopigno, *Nat. Commun. 9, 1971 (2018)*
DOI: 10.1038/s41467-018-04367-6 (see arXiv:1705.08687 for preprint)

7. *Resonant Broadband Stimulated Raman scattering in Myoglobin*, C. Ferrante, G. Batignani, G. Fumero, E. Pontecorvo, A. Virga, L. C. Montemiglio, G. Cerullo, M. H. Vos and T. Scopigno, *J. Raman Spectrosc. 1-8 (2018)*
DOI: 10.1002/jrs.5323

6. *Manipulating Impulsive Stimulated Raman Spectroscopy with a Chirped Probe Pulse*, L. Monacelli, G. Batignani, G. Fumero, C. Ferrante, S. Mukamel and T. Scopigno *J. Phys. Chem. Lett. 8, 966−974 (2017)*
DOI: 10.1021/acs.jpclett.6b03027

5. *Broadband Stimulated Raman spectroscopy in electronically resonant biomolecules*, G. Batignani, E. Pontecorvo, G. Giovannetti, C. Ferrante, G. Fumero and T. Scopigno, *Sci. Rep. 6, 18445 (2016)*
DOI: 10.1038/srep18445

4. *On the resolution limit of Femtosecond Stimulated Raman Spectroscopy: modelling fifth-order signals with overlapping pulses*, G. Fumero, G. Batignani, K. E. Dorfman, S. Mukamel and T. Scopigno, *ChemPhysChem 16, 3438–3443 (2015)*
DOI: 10.1002/cphc.201500548
Selected for the journal's cover

3. *Energy flow between spectral components in 2D Broadband Stimulated Raman Spectroscopy*, G. Batignani, G. Fumero, S. Mukamel and T. Scopigno, *Phys. Chem. Chem. Phys. 17, 10454–10461 (2015).*
DOI: 10.1039/c4cp05361c

2. *Disentangling genuine dynamics from cross phase modulation artefacts in Femtosecond Stimulated Raman Spectroscopy*, G. Batignani, C. Ferrante, G. Fumero and T. Scopigno, *in The 22nd International Conference on Ultrafast Phenomena 2020*, F. Kärtner, M. Khalil, R. Li, F. Légaré, and T. Tahara, eds., OSA Technical Digest (Optical Society of America, 2020), paper Tu4A.14 (2020)
DOI: 10.1364/UP.2020.Tu4A.14

1. *Probing ultrafast processes by fifth order Stimulated Raman Scattering*, G. Fumero, G. Batignani, K. E. Dorfman, S. Mukamel and T. Scopigno, *Journal of Physics Conference Series 689, 012023 (2016).*
DOI: 10.1088/1742-6596/689/1/012023

SEMINARS AND INTERNATIONAL CONFERENCES

10. 27^{th} International Conference on Raman Spectroscopy (ICORS 2022), August $14^{th} - 19^{th}$ 2022. Long Beach, California, USA.
Invited speaker

9. 20^{th} Time Resolved Vibrational Spectroscopy (TRVS 2021), June $14^{th} - 19^{th}$ 2021. Ann Arbor, Michigan (virtual).
Poster contribution: 2D Impulsively Stimulated Resonant Raman Spectroscopy of Molecular Excited States.

8. First WavemiX workshop on "Non-linear X-ray spectroscopy", January $13^{th} - 15^{th}$ 2021. (Remote).

7. Center for Nano Science and Technology at Polimi-IIT, Milan, Italy, September 26^{th} 2018.
Invited seminar: Novel control knobs for multidimensional stimulated Raman Spectroscopy.

6. 26^{th} International Conference on Raman Spectroscopy (ICORS 2018), August $26^{th} - 31^{th}$ 2018. Jeju Island, Korea.
Oral contribution: Unraveling vibronic couplings during ultrafast chemical reactions by 2D Impulsive Stimulated Raman Spectroscopy.

5. 9^{th} International Conference on Advanced Vibrational Spectroscopy (ICAVS 9), June $11^{th} - 17^{th}$ 2017. Victoria, BC, Canada.
Oral contribution: Manipulating Impulsive Stimulated Raman Spectroscopy with a Chirped Probe Pulse.

[1] Equally contributing authors

4. International Symposium on Two-Dimensional Correlation Spectroscopy (2DCOS), June $7^{th} - 10^{th}$ 2017. Victoria, BC, Canada.
   Oral contribution: Unraveling vibronic couplings during ultrafast chemical reactions by two dimensional Impulsive Stimulated Raman Spectroscopy.

3. 8^{th} International Conference on Coherent Multidimensional Spectroscopy (CMDS2016), June 29^{th} – July 1^{th} 2016. Groningen, The Netherlands.
   Poster contribution: Energy flow between spectral components in 2D Broadband Stimulated Raman Spectroscopy.

2. Dynamic Pathways in Multidimensional Landscapes 2016 - Young investigator workshop, January $10^{th} - 15^{th}$ 2016. Winklmoos-Alm, Reit im Winkl, Deutschland.
   Oral contribution: Probing ultrafast processes by fifth order Stimulated Raman Scattering.

1. 6^{th} *Young researcher meeting*, October $12^{th} - 14^{th}$ 2015. L'Aquila, Italy.
   Oral contribution: Exploring the ultimate resolution limit of Femtosecond Stimulated Raman Scattering.
   Poster contribution: Probing ultrafast processes by fifth order Stimulated Raman Scattering.

GRANTS AND FELLOWSHIPS

- **Student travel grant** for the conference: "26^{th} International Conference on Raman Spectroscopy (ICORS)", 2018.

- **Avvio alla Ricerca 2017**, Sapienza, Università di Roma
  Proposal: Enabling excited state selectivity in vibrational spectra of photosynthetic complexes by chirped broad band Impulsive Stimulated Raman measurements.
  Role: PI.

- **Student travel grant** for the conference: "9^{th} International Conference on Advanced Vibrational Spectroscopy (ICAVS 9)", 2017.

- **Mobilità dottorandi 2016**, Sapienza, Università di Roma
  Proposal: SUNLIGHT-Spectroscopy for UNderstanding LIGHT harvesting.
  Role: PI.
  ranked #1 among all science departments of Sapienza University

- **Avvio alla Ricerca 2016**, Sapienza, Università di Roma
  Proposal: Time resolved investigation of dynamical process and vibronic couplings by two dimensional Impulsive Vibrational Spectroscopy.
  Role: PI.

- **Travel grant** for the workshop: "Dynamic Pathways in Multidimensional Landscapes 2016 - Young investigator workshop", 2016.

- **PhD Fellowship** from Sapienza University, 2015.
  PhD program in Mathematical Models for Engineering, Electromagnetics and Nanosciences.

Roma, 29/10/2021