



UNIVERSITÀ DEGLI STUDI DELL'AQUILA

Prof. Andrea Marini Curriculum scientifico

(Aggiornato il 27/09/2018)

The research background and expertise of Dr Marini extend over the theoretical modelling of miniaturized photonic devices, where novel physical mechanisms can be exploited to achieve active functionalities at micro- and nano-scales. From 2008, Dr Marini has co-authored 43 papers in top-level international journals, one book chapter, and 17 conference abstracts (with 750 citations and h-index of 16). In particular, Dr Marini has experience in the theoretical modelling of graphene plasmons, nonlinear dynamics in plasmonic waveguides and metamaterials, supercontinuum generation and dispersive waves in photonic crystal fibers.

Personal

Born in L'Aquila (Italy) on 11 August 1983.

Marital status: single.

Italian Citizen.

Employment

December 2017 - Present Assistant Professor at The University of L'Aquila (Italy).

October 2017 - November 2017 Researcher at CNR-ISC, Institute for Complex Systems, Rome (Italy).

September 2014 - September 2017 Postdoctoral fellow at ICFO-Institut de Ciències Fotoniques, Castelldefels (Spain).

December 2011 - August 2014 Postdoctoral researcher at the Max Planck Institute for the Science of Light, Erlangen (Germany).

Education

7 March 2012 PhD in Photonics, achieved at the Department of Physics in the University of Bath (United Kingdom), under the supervision of Prof. Dmitry Skryabin. I defended the thesis "Theory of nonlinear and amplified surface plasmon polaritons" in a viva voce exam with the advisors Prof. Tim

Birks and Prof. Yuri Kivshar on 14 November 2011.

22 July 2008 Laurea Specialistica in Fisica, Curriculum Fisica della Materia (Master Degree in Physics of Condensed Matter), achieved at the University of L'Aquila (Italy) with a final mark of 110/110 cum laude, defending the thesis "Wiggling and bending-free soliton propagation in microstructured photorefractive ferroelectrics" supervised by Dr. Eugenio Del Re, Dr. Alessandro Ciattoni and Prof. Paolo Di Porto.

22 February 2006 Laurea Triennale in Fisica, Curriculum Generale (Bachelor Degree in Physics), achieved at the University of L'Aquila (Italy) with a final mark of 110/110 cum laude, defending the thesis "Coherent States of Quantum Electromagnetic Field" supervised by Dr. Alessandro Ciattoni and Prof. Paolo Di Porto.

9 July 2002 Diploma di maturità scientifica (High School Diploma), achieved at Liceo Scientifico "Andrea Bale" of L'Aquila (Italy) with a final mark of 80/100.

Awards

September 2017 "Rita Levi Montalcini" programme for the recruitment of young researchers.

February 2017 Individual Marie Curie Fellowship 746774 - OUTNANO.

September 2014 ICFOnest+ (Marie Curie Cofund) Postdoctoral Fellowship.

Scientific Interests

Electromagnetism and Optics: nanophotonics, nonlinear plasmonics, photonic crystal fibers, ultrafast photonics, ultrafast plasmonics, epsilon-near-zero metamaterials, graphene plasmonics, optical sensing, optical solitons, silicon-on-insulator waveguides, dissipative solitons, waveguide arrays, discrete and gap solitons.

Solid State Physics: physics of photorefractive materials, statistical mechanics of phase transitions in ferroelectric crystals, out-of-equilibrium statistical mechanics, ultrafast electron dynamics in noble metals and graphene.

Languages

Italian: Native language.

English: Excellent.

Spanish: Excellent.

German: Basic.

French: Basic.

Teaching experience

"Fisica 2" class (Electromagnetism and Optics) for the undergraduate programme in Industrial Engineering at the University of L'Aquila, academic year 2018/2019.

Tutorials for the "EV-1 Vertiefung Experimentalphysik: Atom-, Molek•ulphysik und Quantenoptik" class (Advanced Experimental Physics: Atomic, Molecular Physics and Quantum Optics) of the master programme in Physics at the Friedrich Alexander University of Erlangen-Nuremberg, academic year 2013/2014.

Tutorials for the "EV-1 Vertiefung Experimentalphysik: Atom-, Molek•ulphysik und Quantenoptik" class (Advanced Experimental Physics: Atomic, Molecular Physics and Quantum Optics) of the master programme in Physics at the Friedrich Alexander University of Erlangen-Nuremberg, academic year 2012/2013.

Tutorials for the "Electricity and Magnetism" class of the undergraduate programme in Physics at the University of Bath, academic year 2008/2009.

Tutorials for the "Thermodynamics and Statistical Mechanics" class of the undergraduate programme in Physics at the University of Bath, academic year 2008/2009.

Publications

Journal Articles

A. Autere, H. Jussila, A. Marini, J. R. M. Saavedra, Y. Dai, A. Saynatjoki, L. Karvonen, H. Yang, B. Amirsolaimani, R. A. Norwood, N. Peyghambarian, H. Lipsanen, K. Kieu, F. J. Garcia de Abajo, and Z. Sun "Optical harmonic generation in monolayer group-VI transition metal dichalcogenides," *Physical Review B* 98, 115426 (2018).

A. Marini, G. R. Di Biase, S. C. Alapati, G. C. Choi, M. Baudisch, A. Marini, J. D. Cox, T. Zhu, F. Silva, S. Teichmann, M. Massicotte, F. Koppens, L. S. Levitov, F. J. Garcia de Abajo, and J. Biegert, "Ultrafast nonlinear optical response of Dirac fermions in graphene" *Nature Communications* 9, 1018 (2018).

F. Floris, L. Fornasari, A. Marini, V. Bellani, F. Ban, S. Roddaro, D. Ercolani, M. Rocci, F. Beltram, M. Cecchini, L. Sorba, and F. Rossella, "Self-Assembled InAs Nanowires as Optical Reflectors" *Nanomaterials* 7, 400 (2017).

F. Ciampa, A. Mankar, and A. Marini, "Phononic Crystal Waveguide Transducers for Nonlinear Elastic Wave Sensing" *Scientific Reports* 7, 14712 (2017).

D. N. Carvalho, F. Biancalana, and A. Marini, "Monolayer Graphene Can Emit SHG Waves", *Optical Data Processing and Storage* 3, 47 - 53 (2017).

D. N. Carvalho, A. Marini, and F. Biancalana, "Dynamical centrosymmetry breaking - A novel mechanism for second harmonic generation in graphene", *Annals of Physics* 378, 24 - 32 (2017).

A. Ciattoni, A. Marini, and C. Rizza, "Efficient Vortex Generation in Subwavelength Epsilon-Near-Zero Slabs", *Physical Review Letters* 118, 104301 (2017).

A. Marini, J. D. Cox, and F. J. Garcia de Abajo, "Theory of graphene saturable absorption", *Physical Review B* 95, 125408 (2017).

J. D. Cox, A. Marini, and F. J. Garcia de Abajo, "Plasmon-assisted high-harmonic generation in graphene", *Nature Communications* 8, 14380 (2017).

A. Ciattoni, A. Marini, and C. Rizza, "All-optical modulation in wavelength-sized epsilon-near-zero media", *Optics Letters* 41, 3102 - 3105 (2016).

A. Marini and J. F. Garcia de Abajo, "Graphene-Based Active Random Metamaterials for Cavity-Free Lasing", *Physical Review Letters* 116, 217401 (2016). (Highlighted in the Cover of PRL Volume 116, Number 21)

A. Ciattoni, C. Rizza, A. Marini, A. Di Falco, D. Faccio, and M. Scalora, "Enhanced nonlinear effects in pulse propagation through epsilon-near-zero media", *Laser & Photonics Reviews* 10, 517-525 (2016).

A. Marini and J. F. Garcia de Abajo, "Self-organization of frozen light in near-zero-index media with cubic nonlinearity", *Scientific Reports* 6, 20088 (2016).

M. F. Saleh, A. Armaroli, A. Marini, and F. Biancalana "Strong Raman-induced noninstantaneous soliton interactions in gas-filled photonic crystal fibers", *Optics Letters* 40, 4058 (2015).

A. Marini, I. Silveiro, and J. F. Garcia de Abajo, "Molecular sensing with tunable graphene plasmons", *ACS Photonics* 2, 876 (2015).

M. F. Saleh, A. Armaroli, Tr. X. Tran, A. Marini, F. Belli, A. Abdolvand, and F. Biancalana "Raman-induced temporal condensed matter physics in gas-filled photonic crystal fibers", *Optics Express* 23, 11879 (2015).

A. Marini, S. Roy, A. Kumar, and F. Biancalana, "Loss-compensated nonlinear modes and symmetry breaking in amplifying metal-dielectric-metal plasmonic couplers", *Physical Review A* 91, 043815 (2015).

A. Marini, S. Longhi, and F. Biancalana, "Optical simulation of neutrino oscillations in binary waveguide arrays", *Physical Review Letters* 113, 150401 (2014).

S. Roy, A. Marini and F. Biancalana, "Free-carrier driven spatio-temporal dynamics in amplifying silicon waveguides", *Physical Review A* 89, 053827 (2014).

A. Marini, Tr. X. Tran, S. Roy, S. Longhi, and F. Biancalana, "Optical analog of spontaneous symmetry

breaking induced by tachyon condensation in amplifying plasmonic arrays", *Physical Review A* 89, 023840 (2014).

M. F. Saleh, A. Marini, and F. Biancalana, "Shock-induced PT-symmetric potentials in gas-filled photonic crystal fibers", *Physical Review A* 89, 023801 (2014).

M. Conforti, A. Marini, Tr. X. Tran, D. Faccio, and F. Biancalana, "Interaction between optical fields and their conjugates in nonlinear media", *Optics Express* 21, 31239 (2013).

A. V. Gorbach, A. Marini, and D. V. Skryabin, "Graphene-clad tapered fibre: effective nonlinearity and propagation losses", *Optics Letters* 38, 5244 (2013).

A. Marini and F. Biancalana, "Ultrashort Self-Induced Transparency Plasmon Solitons", *Physical Review Letters* 110, 243901 (2013).

A. Ciattoni, A. Marini, C. Rizza, M. Scalora, and F. Biancalana, "Polariton excitation in epsilon-near-zero slabs: transient trapping of slow light", *Physical Review A* 87, 053853 (2013).

S. Roy, A. Marini, and F. Biancalana, "Self-frequency blueshift of dissipative solitons in silicon based waveguides", *Physical Review A* 87, 065803 (2013).

H. Dong, C. Conti, A. Marini, and F. Biancalana, "Terahertz relativistic spatial solitons in doped graphene metamaterials", *Journal of Physics B: Atomic, Molecular and Optical Physics* 46, 155401 (2013).

A. Marini, M. Conforti, G. Della Valle, H. W. Lee, Tr. X. Tran, W. Chang, M. A. Schmidt, S. Longhi, P. St.J. Russell, and F. Biancalana, "Ultrafast nonlinear dynamics of surface plasmon polaritons in gold nanowires due to the intrinsic nonlinearity of metals", *New Journal of Physics* 15, 013033 (2013).

A. Marini, R. Hartley, A. V. Gorbach, and D. V. Skryabin, "Surface-induced nonlinearity enhancement in subwavelength rod waveguides", *Physical Review A* 84, 063839 (2011).

A. Marini, D.V. Skryabin, and B. Malomed, "Stable spatial plasmon solitons in a dielectric-metal-dielectric geometry with gain and loss", *Optics Express* 19, 6616 (2011).

D.V. Skryabin, A.V. Gorbach, and A. Marini, "Surface-induced nonlinearity enhancement of TM-modes in planar subwavelength waveguides", *Journal of the Optical Society of America B* 28, 109 (2011).

A. Marini, A.V. Gorbach, and D.V. Skryabin, "Coupled mode approach to surface plasmon polaritons in nonlinear periodic structures", *Optics Letters* 35, 3532 (2010).

A. Marini and D.V. Skryabin, "Ginzburg-Landau equation bound to the metal-dielectric interface and transverse nonlinear optics with amplified plasmon polaritons", *Physical Review A* 81, 033850 (2010).

A. Marini, A.V. Gorbach, D.V. Skryabin, and A. Zayats, "Amplification of surface plasmon polaritons in the presence of nonlinearity and spectral signatures of threshold crossover", *Optics Letters* 34, 2864 (2009).

A. Ciattoni, C. Rizza, E. Del Re, and A. Marini, "Light-induced dielectric structures and enhanced self-focusing in critical photorefractive ferroelectrics", *Optics Letters* 34, 3295 (2009).

A. Ciattoni, A. Marini, C. Rizza, and E. Del Re, "Collision and fusion of counterpropagating micrometer-sized optical beams in periodically biased photorefractive crystals", *Optics Letters* 34, 911 (2009).

A. Ciattoni, E. Del Re, A. Marini, and C. Rizza, "Wiggling and bending-free micron-sized solitons in periodically biased photorefractives", *Optics Express* 16, 16867 (2008).

A. Ciattoni, E. Del Re, C. Rizza, and A. Marini, "Miniaturized bending-free solitons and symmetry restoring in periodically biased photorefractives", *Optics Letters* 31, 2110 (2008).

Book Chapters

A. Marini and F. Biancalana, "Quantum Field Theory Analog Effects in Nonlinear Photonic Waveguides" in *Odyssey of Light in Nonlinear Optical Fibers: Theory and Applications*, CRC Press ISBN978-148-223-613-2 (2015).

Conference Abstracts

A. Marini, J. D. Cox, and F. J. Garcia de Abajo, "Nonperturbative theory of graphene saturable absorption", *Lasers and Electro-Optics Europe & European Quantum Electronics Conference CLEO/Europe-EQEC* (2017).

A. Marini and F. J. Garcia de Abajo, "Cavity-free lasers through graphene-based random metamaterials", *Lasers and Electro-Optics Europe & European Quantum Electronics Conference CLEO/Europe-EQEC* (2017).

J. D. Cox, A. Marini, and F. J. Garcia de Abajo, "Extraordinary high-harmonic generation from plasmons in nanostructured graphene", *Lasers and Electro-Optics Europe & European Quantum Electronics Conference CLEO/Europe-EQEC* (2017).

A. Marini J. D. Cox, and F. J. Garcia de Abajo, "Saturable absorption of graphene", *SPIE Nanoscience + Engineering* (2016).

J. D. Cox, A. Marini, and F. J. Garcia de Abajo, "Nonlinear graphene plasmonics", *SPIE Nanoscience + Engineering* (2016).

A. Marini and F. J. Garcia de Abajo, "Nonlinear Optical Dynamics in Near-zero Index Media and in Graphene-based Random Meta-lasers", *Latin America Optics and Photonics Conference* (2016).

A. Marini, I. Silveiro, and F. J. Garcia de Abajo, "Infrared spectroscopy with tunable graphene plasmons", *SPIE Nanoscience+ Engineering* (2015).

M. F. Saleh, A. Armaroli, A. Marini, F. Belli, and F. Biancalana, "Non-local Soliton Interactions in Raman-

gas Photonic Crystal Fibers", *Frontiers in Optics* (2015).

M. F. Saleh, A. Armaroli, A. Marini, Tr. X. Tran, F. Belli, A. Abdolvand, and F. Biancalana, "Temporal Crystals in Gas-filled Photonic Crystal Fibers", *The European Conference on Lasers and Electro-Optics* (2015).

A. Marini, S. Longhi, and F. Biancalana, "Optical analogue of neutrino oscillations in binary waveguide arrays", *European Quantum Electronics Conference* (2015).

F. Biancalana and A. Marini, "Self-induced transparency in gold", *Nonlinear Photonics (NP)* (2014).

F. Biancalana, M. F. Saleh, F. Belli, A. Abdolvand, A. Marini, A. Armaroli, J. C. Travers, and P. St.J. Russell, "Raman-induced soliton oscillations and tunneling in gas-filled photonic crystal fibers", *Nonlinear Photonics (NP)* (2014).

F. Biancalana, S. Longhi, and A. Marini, "Optical simulation of neutrino oscillation in binary waveguide arrays", *Nonlinear Photonics (NP)* (2014).

F. Biancalana and A. Marini, "Ultrafast interband nonlinear dynamics of surface plasmon polaritons in gold nanowires", *Nonlinear Optics (NLO)* (2013).

A. Marini and F. Biancalana, "Towards a microscopic description of the optical nonlinearities of gold-based plasmonic devices", *International Quantum Electronics Conference (IQEC)* (2013).

F. Biancalana, A. Marini, M. Conforti and G. Della Valle, "Ultrafast interband nonlinear dynamics of surface plasmon polaritons in gold nanowires", *CLEO: QELS Fundamental Science (CLEO QELS)* (2013).

A. Marini, D. V. Skryabin and B. Malomed, "Stable spatial plasmon solitons in IMI waveguides with gain and loss", *European Quantum Electronics Conference (EQEC)* (2011).

Citation Metrics

Total articles in publication list: 55.

Sum of the times cited: 750.

h-index: 16.

i10-index: 22.

From Google Scholar Citations.

Conferences, Seminars and Schools

NANOP, Nanophotonics and Micro/Nano Optics International Conference, Barcelona - Spain 2017. (oral presentation)

CLEO PR-OECC&PGC, Conference on Lasers & Electro-Optics: QELS Fundamental Science, Pacific Rim Conference, Singapore 2017. (invited speaker)

CLEO Europe-EQEC, Lasers and Electro-Optics Europe & European Quantum Electronics Conference, Munich - Germany 2017. (oral presentation)

SPP8, the 8th International Conference on Surface Plasmon Photonics, Taipei - Taiwan 2017. (oral presentation)

NANOMETA, The 6th International Topical Meeting on Nanophotonics and Metamaterials, Seefeld - Austria. (poster contribution)

The 14th International Conference of Near-Field Optics, Nanophotonics and Related Techniques (NFO14), Hamamatsu - Japan 2016. (oral presentation)

OSA Latin America Optics & Photonics Conference (LAOP), Medellin - Colombia 2016. (invited speaker)

SPIE, Optics + Photonics, San Diego - United States of America 2016. (invited speaker)

META'16, the 7th International Conference on Metamaterials, Photonic Crystals and Plasmonics, Torremolinos - Spain 2016. (invited speaker)

Nanolight 2016, Benasque - Spain 2016. (poster contribution)

SPIE, Optics + Photonics, San Diego - United States of America 2015. (invited speaker)

META'15, the 6th International Conference on Metamaterials, Photonic Crystals and Plasmonics, New York City - United States of America 2015. (invited speaker)

SPP7, the 7th International Conference on Surface Plasmon Photonics, Jerusalem - Israel 2015. (poster contribution)

Imagine Nano - Bringing together Nanoscience & Nanotechnology, Bilbao - Spain 2015. (oral presentation)

IMPRS Doctoral School Seminar, Erlangen - Germany 2015. (oral presentation)

Meeting of the DFG priority program 1391 "Ultrafast Nano-optics", Bad Durkheim - Germany 2014. (oral presentation)

Spatio-Temporal Complexity in Optical Fibers, Como - Italy 2013. (poster contribution)

Conference on Lasers & Electro-Optics: QELS Fundamental Science, San Jose - United States of America 2013. (oral presentation)

SPP6, the 6th International Conference on Surface Plasmon Photonics, Ottawa - Canada 2013. (oral presentation)

META'13, the 4th International Conference on Metamaterials, Photonic Crystals and Plasmonics, University of Sharjah, Sharjah - United Arab Emirates 2013. (oral presentation)

Workshop on Nonlinear Optics and Complexity in photonic crystal fibers and nanostructures, Ettore Majorana Centre, Erice - Italy 2011. (poster contribution)

Conference on Lasers & Electro-Optics Europe & 12th European Quantum Electronics Conference CLEO EUROPE/EQEC, Munich - Germany 2011. (poster contribution)

I Jornadas Valencianas de Fotonica Computacional, Valencia - Spain 2010. (invited speaker)

International Workshop on Complexity in Periodically Structured Systems, Max-Planck-Institut für Physik Komplexer Systeme, Dresden - Germany 2010. (poster contribution)

Summer school on Nonlinear Nanophotonics, Ettore Majorana Centre, Erice - Italy 2010. (poster contribution)

IOP Nonlinear photonics in micro- and nano-structures, Institute of Physics, London - United Kingdom 2009. (poster contribution)

COST MP0702 Training School on Nonlinear Nanophotonics, Supélec, Metz - France 2009. (poster contribution)

SIAM Conference on Nonlinear Waves and Coherent Structures, Università La Sapienza, Rome - Italy 2008.

Peer Review

Referee for the Optical Society of America - Optics Express, Optics Letters, and JOSAB.

Referee for Nature Publishing Group - Scientific Reports, Light: Science & Applications.

Referee for Elsevier - Optics Communications.

Referee for the Institute of Physics - New Journal of Physics, Journal of Optics and Journal of Physics D: Applied Physics.

Participation in Professional Societies

2018 - Present Member of the Optical Society of America (OSA).

2018 - Present Member of the European Physical Society (EPS).

2018 - Present Member of the Optics and Photonics Society of Italy (SIOF).

2009 - Present Member of the Italian Physical Society (SIF).