

Alessandro Belardini

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Postdoctoral Researcher

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Education

Ph.D.: Università di Roma Tre (Italy), Physics, 2005

M.S.: Sapienza – Università di Roma (Italy), Electronics Engineering, 2001.

Research Interests

Second harmonic generation in nanoplasmonic materials

Second harmonic generation in metallo-dielectric nanostructures

Second harmonic generation in hybrid organic metallo-dielectric nanostructures

Optical delay line and nonlinear interaction in femtosecond and picosecond regime

Measurement and characterization of the electro-optic properties of organic molecules

Photorefractive solitons

Research Career

2005-2012: Postdoctoral Researcher, Sapienza – Università di Roma

2002-2005: PhD Student, University of Roma Tre jointly with Sapienza – Università di Roma

Didactic Career

2007-2011: Contract Professor of Physics II (Electromagnetism), Sapienza – Università di Roma

2002-2007: Tutor of Physics I-II (Mechanics, Thermodynamics, Electromagnetism), Sapienza – Università di Roma

2002-2012: Conductor of the laboratory tutorial of Physics II (Electromagnetism), Optics, Quantum Electronics.

Professional Honours and Scientific Awards

2008: Special award of “Premio Innovazione ELSAG DATAMAT 2008 per ‘Sviluppo di una Full Optical XOR (FOX) in nitrato di gallio’”.

2007: Best paper award from the European Network of Excellence (NoE) PHOREMOST: 1st Place for the paper ‘Femtosecond pulses chirping compensation by using one-dimensional compact multiple-defect photonic crystals’, A Belardini, A Bosco, G Leahu, M Centini, E Fazio, C Sibilìa, M Bertolotti, S Zhukovsky and SV Gaponenko, *Appl. Phys. Letts.* **89**, (2006).

Professional Services

2008: Member of the Organizing Committee for the 9th European Conference on Applications of Polar Dielectrics (ECAPD'9), Roma, Italy.

2008: Member of the secretariat for the 9th European Conference on Applications of Polar Dielectrics (ECAPD'9), Roma, Italy.

2003: Member of the secretariat for the School of Quantum Electronics 39th Course – ‘Microresonators as Building Blocks for VLSI Photonics’, Erice, Italy.

Active Peer Reviewer

- Ferroelectrics
- Optics Letters
- Journal of Applied Physics
- Journal of European Optical Society: Rapid Communications

Memberships

- Italian society of Optics and Photonics - SIOF (since 2008)
- CNISM – former INFN (since 2002)

Invited seminars

2008-08-28: ‘Complete characterisation of the electro-optic properties of poled polymers by using the Teng and Man technique’ 9th European Conference on Applications of Polar Dielectrics, Rome, Italy

2009-02-12: ‘Second Harmonic generation from bacteria/metallo - dielectric interfaces’ EC - ICT Concertation Meeting on Nanophotonics, Florence (Italy).

14 Conference talks

h-index: 10 (isi-web)

Publications

Peer-Reviewed Journals

- 1) Eugenio Fazio, V. Babin, Adrian Petris, A. Belardini, Mario Bertolotti, and Valentin I. Vlad, *Spatial solitons in photorefractive crystals with large optical activity and absorption*, Proc. SPIE **4829**, 944 (2003).
- 2) E. Fazio, W. Ramadan, A. Belardini, A. Bosco, M. Bertolotti, A. Petris, V.I. Vlad, *(2+1)D “vortex soliton-like propagation in photorefractive $Bi_{12}SiO_{20}$ crystals”*, Phys. Rev. E **67**, 026611 (2003).
- 3) F. Michelotti, A. Belardini, M. C. Larciprete, and M. Bertolotti, A. Rousseau, A. Ratsimihety, G. Schoer, J. Mueller, *“Measurement of the electro-optic properties of poled polymers at $\lambda=1.55\mu\text{m}$ by means of sandwich structures with zinc oxide transparent electrode”*, Appl. Phys. Lett. **83**, 4477 (2003).
- 4) A. Miniewicz, F. Michelotti, A. Belardini, *Photoconducting Polymer - Liquid Crystal Structure Studied by Electroreflectance*, J. Appl. Phys. **95** 1141 (2004).
- 5) F. Michelotti, L. Dominici, and A. Belardini *“Charge injection and trapping contributions to the electro-optic response of mesoscopic polymer systems”* AIP Conf. Proc. **709**, 233 (2004).
- 6) M.C. Larciprete, E.J. Klein, F. Michelotti, A. Belardini, D. Geuzebroek, A. Driessen, *Polarization conversion in vertically coupled Si_3N_4/SiO_2 microring resonators*, AIP Conf. Proc. **709**, 415 (2004).

- 7) A. Belardini, M.C.Larciprete, F.Michelotti, E.Cianci, V.Foglietti, A.Rousseau, *Direct e-beam writing of electro-optic polymer channel waveguide*, AIP Conf. Proc. **709**, 427 (2004).
- 8) D.Passerì, M.C.Larciprete, F.Michelotti, S.Paoloni, A. Belardini, D.Passaseo, *Characterisation of the nonlinear coefficients of AlGaN/GaN crystalline thin films via SHG measurements*, AIP Conf. Proc. **709**, 437 (2004).
- 9) D.Passerì, M.C.Larciprete, A. Belardini, S.Paoloni, C.Sibilia, F.Michelotti, A.Passaseo, *“Second harmonic generation in AlGaN, GaN and Al_xGa_{1-x}N/GaN multiple quantum well structures”*, Appl. Phys. B **79**, 611-615 (2004).
- 10) M.C.Larciprete, D.Passerì, F.Michelotti, A. Belardini, F.Sarto, S.Paoloni, F.Somma, S.Lo Mastro, C.Sibilia, M.Bertolotti, *“Second order nonlinear optical properties of zinc oxide films deposited by low temperature dual ion beam sputtering”*, J. Appl. Phys. **97**, 023501 (2005).
- 11) A. Belardini, M. C. Larciprete, D. Passerì, A. Rousseau, A. Ratsimihety, F. Menchini, E. Nichelatti, and F. Michelotti, *“Concentration dependence of the optical nonlinearity in extremely doped fluorinated organic copolymers”*, J. Appl. Phys. **98**, 093521 (2005).
- 12) A. Belardini, A. Bosco, G. Leahu, M. Centini, E. Fazio, C. Sibilia, M. Bertolotti, S. Zhukovsky, S.V. Gaponenko, *‘Chirping compensation of femtosecond pulses by using 1-D photonic crystals anomalous dispersion’*, Proc. SPIE **6182**, 61821N (2006).
- 13) M.C. Larciprete, D. Haertle, A. Belardini, M. Bertolotti, F. Sarto, P. Gunter, *“Characterization of second and third order optical nonlinearities of ZnO sputtered films”* Appl. Phys. B **82**, 431-437 (2006).
- 14) F. Michelotti, G. Roma, A. Belardini, N. Danz, A. Pace, F. Sarto, R.M. Montereali, *‘Micro-cavity organic light emitting diodes for biochip applications’* J. Non-Cryst. Solids **352**, 2476 (2006).
- 15) F. Michelotti, A. Belardini, A. Rousseau, A. Ratsimihety, G. Schoer, J. Mueller, *‘Use of sandwich structures with ZnO:Al transparent electrodes for the measurement of the electro-optic properties of standard and fluorinated poled copolymers at $\lambda = 1.55 \mu\text{m}$ ’* J. Non-Cryst. Solids **352**, 2339 (2006).
- 16) A. Belardini, A. Bosco, G. Leahu, M. Centini, E. Fazio, C. Sibilia, M. Bertolotti, S. Zhukovsky, S.V. Gaponenko, *‘Femtosecond Pulses Chirping Compensation by Using 1-D Compact Multiple Defect Photonic Crystals’*, Appl. Phys. Lett. **89**, 031111 (2006). Also selected for the July 31, 2006 issue (Vol. 14 Iss. 5) of Virtual Journal of Nanoscale Science & Technology. Also selected for the August 2006 issue (Vol. 5 Iss. 8) of Virtual Journal of Ultrafast Science. Winner (1st place) of the Best Paper Award in the frame of the Phoremot NoE in the first two years (2005-2006).
- 17) M. C. Larciprete, A. Bosco, A. Belardini, R. Li Voti, G. Leahu, C. Sibilia, E. Fazio, R. Ostuni, M. Bertolotti, A. Passaseo, B. Potì, Z. Del Prete, *‘Blue second harmonic generation from aluminium nitride films deposited onto silicon by sputtering technique’*, J. Appl. Phys. **100**, 023507 (2006). Also selected for the August 2006 issue (Vol. 5 Iss. 8) of Virtual Journal of Ultrafast Science.
- 18) M. C. Larciprete, M. Centini, A. Belardini, L. Sciscione, C. Sibilia, M. Bertolotti, A. Passaseo, B. Potì, M. Scalora, *‘Second harmonic generation in GaN/Al₅₀Ga₅₀N multilayer structures deposited by Metal Organic Vapor Deposition’*, Appl. Phys. Lett. **89**, 131105 (2006).
- 19) A. Belardini, L. Dominici, M. C. Larciprete and F. Michelotti, A. Rousseau, A. Ratsimihety, *‘Enhanced stability of the second order optical properties of high-T_g fluorinated electro-optic copolymer’*, Appl. Phys. Lett. **89**, 231110 (2006).
- 20) A. Belardini, O. Baganov, G. Leahu, A. Bosco, M. Centini, E. Fazio, C. Sibilia, M. Bertolotti, S. Zhukovsky, S. V. Gaponenko, *“Dynamic response of a coupled-cavities one-dimensional photonic crystal in the femtosecond regime”*, J. Optoelectron. Adv. M. **8**, 2015-2018 (2006).

- 21) E. Fazio, A. Passaseo, M. Alonzo, A. Belardini, C. Sibilìa, M. C. Larciprete and M. Bertolotti, “*Measurement of pure Kerr nonlinearity in GaN thin films at 800 nm by means of eclipsing Z-scan experiments*”, J. Opt. A: Pure Appl. Opt. **9**, L3-L4 (2007).
- 22) A. Belardini and F. Michelotti, A. Rousseau, A. Ratsimihety, ‘Temperature stability of the electro-optic response of highly fluorinated side chain organic copolymers’, *Ferroelectrics* **352**, 35 (2007) DOI: 10.1080/00150190701354901.
- 23) R. Ostuni, M. C. Larciprete, G. Leahu, A. Belardini, C. Sibilìa, M. Bertolotti, ‘Optical limiting behaviour of Zinc-Phthalocyanines in polymeric matrix’, J. Appl. Phys. **101**, 033116 (2007). Also selected for the 2007 issue (Vol. 15 Iss. 8) of Virtual Journal of Nanoscale Science & Technology.
- 24) F. Michelotti, R. Canali, L. Dominici, A. Belardini, F. Menchini, G. Schoer, J. Mueller, ‘Second Order Optical Nonlinearity of ZnO/ZnO:Al bilayers deposited on glass by low temperature radio frequency sputtering’, *Appl. Phys. Lett.* **90**, 181110 (2007).
- 25) M. C. Larciprete, R. Ostuni, A. Belardini, M. Alonzo, G. Leahu, E. Fazio, C. Sibilìa, M. Bertolotti, “Nonlinear optical absorption of zinc-phthalocyanines in polymeric matrix”, *Photonics and Nanostructures – Fundamentals and Applications* **5**, 73 (2007), invited paper.
- 26) M. C. Larciprete, A. Belardini, M. G. Cappeddu, D. de Ceglia, M. Centini, E. Fazio, C. Sibilìa, M. J. Bloemer, and M. Scalora, “Second-harmonic generation from metallodielectric multilayer photonic-band-gap structures”, *Phys. Rev. A* **77**, 013809 (2008). Also selected for the 2008 issue (Vol. 7 Iss. 2) of Virtual Journal of Ultrafast Science.
- 27) M. C. Larciprete, S. Mangialardo, A. Belardini, C. Sibilìa, and M. Bertolotti, “Realization and characterization of tetra(tert-butyl) zinc phthalocyanine poly(methyl methacrylate) films for optical limiting applications”, *J. Appl. Phys.* **104**, 073109 (2008).
- 28) S. Mangialardo, M. C. Larciprete*, A. Belardini, C. Sibilìa, and M. Bertolotti, ‘Determination of the aggregation degree of zinc-phthalocyanines derivatives into polymeric films via the characterization of the linear-optical absorption’, *Laser Physics* **18**, 1371 (2008).
- 29) A. Belardini, M. C. Larciprete, M. Centini, E. Fazio, C. Sibilìa, M. Bertolotti, A. Toma, D. Chiappe, F. Buatier de Mongeot, 'Tailored second harmonic generation from self-organized metal nano-wires arrays', *Opt. Express* **17**, 3603 (2009).
- 30) E. Fazio, F. Pettazzi, M. Centini, M. Chauvet, A. Belardini, M. Alonzo, C. Sibilìa, M. Bertolotti, M. Scalora, 'Complete spatial and temporal locking in phasemismatched second-harmonic generation', *Opt. Express* **17**, 3141 (2009).
- 31) F. A. Bovino, M. C. Larciprete, A. Belardini, and C. Sibilìa, ‘Evaluation of the optical axis tilt of zinc oxide films via noncollinear second harmonic generation’, *Appl. Phys. Lett.* **94**, 251109 (2009).
- 32) M. C. Larciprete, F. A. Bovino, M. Giardina, A. Belardini, M. Centini, C. Sibilìa, M. Bertolotti, A. Passaseo, and V. Tasco, 'Mapping the nonlinear optical susceptibility by noncollinear second-harmonic generation', *Opt. Lett.* **34**, 2189 (2009).
- 33) M. C. Larciprete, F. A. Bovino, A. Belardini, C. Sibilìa, and M., ‘Bound and free waves in non-collinear second harmonic generation’, *Optics Express* **17**, 17000 (2009).
- 34) F. A. Bovino, M. C. Larciprete, M. Giardina, A. Belardini, M. Centini, C. Sibilìa, M. Bertolotti, A. Passaseo, and V. Tasco, ‘Optical polarization based logic functions (XOR or XNOR) with nonlinear Gallium nitride nanoslab’, *Optics Express* **17**, 19337 (2009).
- 35) G. D’Aguanno, M. C. Larciprete, N. Mattiucci, A. Belardini, M. J. Bloemer, E. Fazio, O. Baganov, M. Centini, and C. Sibilìa, ‘Experimental study of Bloch vector analysis in nonlinear, finite, dissipative systems’, *Phys. Rev. A* **81**, 013834 (2010).
- 36) Fazio, E., Belardini, A., Alonzo, M., Centini, M., Chauvet, M., Devaux, F., Scalora, M., ‘Observation of photorefractive simultons in lithium niobate’, *Optics Express* **18** (8), pp. 7972-7981 (2010). Also selected for the 2010 issue (Vol. 9 Iss. 9) of Virtual Journal of Ultrafast Science.

- 37) M. C. Larciprete, A. Belardini, C. Sibilìa, M.-b. Saab, G. Váró, and C. Gergely, 'Optical chirality of bacteriorhodopsin films via second harmonic Maker's fringes measurements', Appl. Phys. Lett. 96, 221108 (2010). Also selected for the 2010 issue (Vol. 19 Iss. 12) of Virtual Journal of Biological Physics Research.
- 38) A. Belardini, M. C. Larciprete, M. Centini, E. Fazio, C. Sibilìa, D. Chiappe, C. Martella, A. Toma, M. Giordano, and F. Buatier de Mongeot, "Circular Dichroism in the Optical Second-Harmonic Emission of Curved Gold Metal Nanowires", Phys. Rev. Lett. 107, 257401 (2011).

Thesis dissertations

- 1) "Experimental characterisation of electro-optic organic copolymers for integrated optical devices", thesis dissertation for the Ph.D. in Physics, Roma, Italy, 18-3-2005.
- 2) "All optical logical gates acting by the nonlinear optical activity of photorefractive materials", thesis dissertation for the M.Sc. in Electronic Engineering, Rome, Italy, 6-11-2001.

Book Chapters

- 1) F. Michelotti, L. Dominici, and A. Belardini "*Charge injection and trapping contributions to the electro-optic response of mesoscopic polymer systems*" in "Microresonators as Building Blocks for VLSI Photonics" edited by Michelotti, Francesco; Driessen, Alfred; Bertolotti, Mario; ISBN: 0-7354-0184-5 NEW YORK: American Institute of Physics 2004. pp.233-251.