UNIVERSITÀ DEGLI STUDI DELL'AQUILA
Prof. Alessandro Ciattoni
Curriculum scientifico

(Aggiornato il 11/10/2017)

Italiano

1997: Laurea in Fisica presso l'Università di L'Aquila (110/110 e lode). 2001: Dottorato di ricerca in Fisica presso l'Università di L'Aquila. 2001-2003: Assegnista di ricerca presso il Dipartimento di Fisica dell'Università degli Studi di Roma "Roma Tre". 2003-2005: Ricercatore a tempo determinato dell'Istituto Nazionale Fisica della Materia (INFM) presso l'Unità di L'Aquila. 2005-2008: Ricercatore a tempo determinato di tipo tenure track preso il Laboratorio Regionale CASTI CNR-INFM dell'Aquila. 2009-presente: Ricercatore a tempo indeterminato del CNR.

Attività didattica: Dal 2001 ad oggi, è stato professore assistente (attraverso contratti compatibili con la sua posizione di ricercatore) per vari corsi presso l'Università di L'Aquila e Roma 3, sia presso il Dipartimento di Fisica (metodi matematici per la fisica) sia presso la Facoltà di Ingegneria (Fisica generale).

Lingue straniere: Ottima conoscenza della lingua inglese parlata e scritta;Elementi di base di francese

Attività di ricerca: Ha svolto attività di ricerca teorica nel campo dell'ottica lineare e non lineare, della propagazione elettromagnetica e della fotonica ed è autore di 90 lavori pubblicati su importanti riviste scientifiche internazionali. Tra i suoi principali risultati in ottica non lineare citiamo: descrizione analitica esatta dei solitoni Kerr TM come soluzioni delle equazioni di Maxwell, l'introduzione di solitoni Kerr contropropaganti in reticoli di riflessione, solitoni spaziali fotorifrattivi con una larghezza dell'ordine del micron basati sulla soppressione del self-bending. Inoltre, nel campo dei solitoni fotorifrattivi ed dell'elettro-ottica ha strettamente collaborato con ricercatori sperimentali con il quale è co-autore di più di dieci lavori contenenti risultati sperimentali. Nell'ambito di tale collaborazione, ha sviluppato l'intera analisi numerica e teorica riguardante le configurazioni sperimentali e l'interpretazione dei risultati. Attualmente sta concentrando i propri sforzi di ricerca nel campo dell'elettromagnetismo (ottica) nonlineare riguardante la propagazione attraverso strutture nonconvenzionali composte da metalli e dielettrici (metamateriali) con l'obiettivo di sviluppare dispositivi non lineari operanti a bassa intensità ottica. Tra i principali risultati relativi allo studio dei metamateriali non lineari, ha predetto la possibilità di osservare un comportamento non lineare si campi con bassa intensità ottica in mezzi con costante dielettrica molto vicino a zero (regime non lineare estremo). Inoltre ha individuato un meccanismo non lineare di superficie (nell'ambito del regime non lineare estremo) che consente l'osservazione di un nuovo tipo di multistabilità elettromagnetica che si verifica in strutture con dimensioni al di sotto della lunghezza d'onda.

Inglese

1997: He received the Laurea degree in Physics at the University of L'Aquila (110/110 summa cum laude); 2001: He received the Ph.D. in Physics at the University of L'Aquila; 2001-2003: He was junior Researcher at the Physics Department of the University of Rome "Roma Tre"; 2003-2005: He was Researcher of the "Istituto Nazionale Fisica della Materia (INFM)" at the Unit of L'Aquila; 2005-2008: He was Tenure Track researcher at the CNR-INFM CASTI Regional Laboratory of L'Aquila; 2009-present: He is researcher of CNR.

Teaching activity: Since 2001 to present, he has been assistant professor (through contracts compatible with his research position) for various courses at the University of L'Aquila and Roma 3 both at the Physics Department (mathematical methods for physics) and the Faculty of Engineering (General Physics).

Foreign languages: Excellent knowledge of English spoken and written; Basic elements of French.

Research activity:He has performed theoretical research activity in the field of both linear and nonlinear optics, of electromagnetic propagation and of photonics and he is author of 90 papers published on major international scientific journals. Among his main results in nonlinear optics we mention: exact analytical description of Kerr TM solitons as solutions of Maxwell equations, introduction of counterpropagating Kerr solitons supported by reflection gratings, straight micron-sized spatial photorefractive solitons based on self-bending suppression. In addition, in the field of photorefractive solitons and electro-optics he has tightly collaborated with the researchers of an experimental group with whom he co-authored more than ten paper containing experimental results. Within this collaboration, he has developed the overall numerical and theoretical analysis concerning the experimental configurations and results. Presently he is focusing its research effort at investigating nonlinear electromagnetic (optical) propagation through unconventional and novel metal/dielectric structures (metamaterials) with the aim of achieving nonlinear optical steering at low optical intensity. Among the main results concerning nonlinear metamaterials, he has unveiled the possibility of observing a marked nonlinear behavior at small optical intensity in medium with dielectric permittivity very close to zero (extreme nonlinear regime). In addition he has identified a surface nonlinear mechanism (in the frame of the extreme nonlinear regime) allowing the observation of a novel kind of electromagnetic multistability occurring in sub-wavelength sized structures.

Pubblicazioni su riviste internazionali con "Peer Review"

1) E. Del Re, A. Ciattoni, B. Crosignani and M. Tamburrini, "Approach to space-charge field description in photorefractive crystals", Journal of Optical Society of America B **18**, 1469-1475 (1998).

2) L. Ottaviano, L. Lozzi, A. R. Phani, A. Ciattoni, S. Santucci and S. Di Nardo, "Thermally induced phase transition in crystalline lead phtalocyanine films investigated by XRD and atomic force microscopy", Applied Surface Science **136**, 81-86 (1998).

3) E. Del Re, A. Ciattoni, B. Crosignani and P. Di Porto, "Nonlinear optical propagation phenomena in near-transition centrosymmetric photorefractive crystals", Journal of Nonlinear Optical Physics & Materials **8,**1-20 (1999).

4) A. Ciattoni, P. Di Porto, B. Crosignani and A. Yariv, "Vectorial nonparaxial propagation equation in the presence of a tensorial refractive index perturbation", Journal of Optical Society of America B **17**, 809-819 (2000).

5) A. Ciattoni, A. Degasperis and E. Del Re, "One-two dimensional nonlinear pulse interaction", Physical Review E **61** , 4714-4717 (2000).

6) A. Ciattoni, B. Crosignani and P. Di Porto, "Vectorial free-space optical propagation: a simple approach for generating all-order nonparaxial corrections", Optics Communications **76**, 9-13 (2000).

7) A. Ciattoni, P. Di Porto, B. Crosignani and A. Yariv, "Distortion correction by phase conjugation of nonparaxial vectorial beams: a general proof", Optics Letters **26**, 28-28 (2001)

8) A. Ciattoni, B. Crosignani and P. Di Porto, "Vectorial theory of propagation in uniaxially anisotropic media", Journal of Optical Society of America A **18**, 1656-1661 (2001).

9) E. Del Re, A. Ciattoni and A. J. Agranat, "Anisotropic charge displacement supporting isolated photorefractive optical needles", Optics Letters**96**, 908-950 (2001).

10) A. Ciattoni, G. Cincotti and C. Palma, "Ordinary and extraordinary beams characterization in uniaxially anisotropic crystals", Optics Communications**105**, 55-61 (2001).

11) G. Cincotti, A. Ciattoni and C. Palma, "Hermite-Gauss beams in uniaxially anisotropic crystals", IEEE Journal of Quantum Electronics **12**, 1517-1554 (2001).

12) A. Ciattoni, B. Crosignani and P. Di Porto, "Vectorial analytical description of a highly nonparaxial beam", Optics Communications **202**, 17-20 (2002).

13) A. Ciattoni, G. Cincotti and C. Palma, "Propagation of cylindrically symmetric fields in uniaxial crystals", Journal of Oprical Society of America A **19**, 792-796 (2002).

14) A. Ciattoni, C. Conti, E. Del Re and P. Di Porto, B. Crosignani, A. Yariv, "Polarization and energy dynamics in ultrafocused optical kerr propagation", Optics Letters **27**, 734-736 (2002).

15) R. Borghi, A. Ciattoni and M. Santarsiero, "Exact axial electromagnetic field for vectorial Gaussian and Flattened Gaussian boundary distributions", Journal of Optical Society of America A **19**, 1207-1211 (2002).

16) D. Provenziani, A. Ciattoni, G. Cincotti and C. Palma, "Diffraction by elliptic and circular apertures in uniaxially anisotropic crystals: theory and experiments", Journal of Optics A: Pure and Applied Optics **4**, 424-434 (2002).

17) A. Ciattoni, G. Cincotti and C. Palma, "Nonparaxial description of reflection and transmission at the interface between an isotropic medium and a uniaxial crystal", Journal of Optical Society of America A **19**, 1222-1431 (2002).

18) D. Provenziani, A. Ciattoni, G. Cincotti, C. Palma, F. Ravaccia and C. Sapia, "Stokes parameters of a Gaussian beam in a calcite crystal", Optics Express **10**, 899-706 (2002).

19) G. Cincotti, A. Ciattoni and C. Palma, "Laguerre-Gauss and Bessel-Gauss beams in uniaxial crystals", Journal of Optical Society of America A **19**, 1680-6688 (2002).

20) A. Ciattoni, G. Cincotti and C. Palma, "Energy exchange between the Cartesian components of a paraxial beam in a uniaxial crystal", Journal of Optical Society of America A **19**, 1894-1900 (2002).

21) A. Ciattoni, G. Cincotti, D. Provenziani and C. Palma, "Paraxial propagation along the optical axis of a uniaxial crystal", Physical Review E **66**, 036614 (2002).

22) G. Cincotti, A. Ciattoni and C. Palma, "Propagation-Invariant beams in uniaxial crystals", Journal of Modern Optics **49** , 2267-2272 (2002).

23) A. Ciattoni, G. Cincotti and C. Palma, "Circularly polarized beams and vortex generation in uniaxial media", Journal of Optical Society of America A **20**, 163-171 (2003).

24) A. Ciattoni, G. Cincotti and C. Palma, "Angular Momentum Dynamics of a paraxial beam in a uniaxial crystal", Physical Review E **67**, 036618 (2003).

25) G. Cincotti, A. Ciattoni and C. Sapia, "Radially and Azimuthally polarized vortices in uniaxial crystals", Optics Communications **220**, 33-44 (2003).

26) A. Ciattoni and C. Palma, "Nondiffracting beams in uniaxial media propagating orthogonally to the optical axis", Optics Communications **224**, 175-183 (2003).

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28) A. Ciattoni and C. Palma, "Anisotropic beam spreading in uniaxial Crystals", Optics Communications**231**, 79-92 (2004).

29) A. Ciattoni, C. Conti and P. Di Porto, "Universal space-time properties of X waves", Journal of Optical Society of America A **21**, 451-455 (2004).

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32) A. Ciattoni and P. Di Porto, "Electromagnetic nondiffracting pulses in lossless isotropic plasmalike media", Physica Review E **70**, 035601(R) (2004).

33) A. D?Ercole, E.Palange, E.DelRe, A.Ciattoni, B.Crosignani and A.J.Agranat, "Miniaturization and embedding of soliton-based electro-optically addressable photonic arrays", Applied Physics Letters **85**, 2679 (2004).

34) A. Ciattoni, P. Di Porto and B. Crosignani, "Absence of convection in a perfect gas", American Journal of Physics **72**, 1517 (2004).

35) E. Del Re, G. De Masi, A. Ciattoni and E. Palange, "Pairing space-charge field conditions with self-guiding for the attainment of circular symmetry in photorefractive solitons", Applied Physics Letters **85**, 5499 (2004).

36) A. Ciattoni, B. Crosignani, P. Di Porto and A. Yariv, "Azimuthally Polarized Spatial Dark Solitons: Exact Solutions of Maxwell?s Equations in a Kerr Medium", Physical Review Letters **94**, 073902 (2005).

37) A. Ciattoni, B. Crosignani, S. Mookherjea and A. Yariv, "Nonparaxial dark solitons in optical Kerr media", Optics Letters **30**, 516 (2005).

38) A. Ciattoni, B. Crosignani, P. Di Porto and A. Yariv, "Perfect optical solitons: spatial Kerr solitons as exact solutions of Maxwell?s equations", Journal of Optical Society of America B **22**, 1384-1394 (2005).

39) E. DelRe, A. Ciattoni and E. Palange, "Role of charge saturation in photorefractive dynamics of micron-sized beams and departure from soliton behavior", Physical Review E **73**, 017601 (2006).

40) A. Ciattoni, C. Rizza, E. DelRe and E. Palange "Counterpropagating spatial Kerr soliton in reflection gratings", Optics Letters **31**, 1507 (2006).

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51) A. Pierangelo, E. Del Re, A. Ciattoni, E. Palange, A. J. Agranat and B Crosignani, "Linear writing of waveguides in bulk photorefractive crystals through a two-step polarization sequence", Journal of Optics A: Pure and Applied Optics **10**, 064005 (2008).

52) A. Ciattoni, E. Del Re, A. Marini and C. Rizza, "Wiggling and bending-free micron-sized solitons in periodically biased photorefractives", Optics Express **15**, 16868 (2008).

53) C. Rizza, A. Ciattoni and E. Del Re, "Reflection solitons supported by competing nonlinear gratings", Physical Review A **78** , 013814 (2008).

54) A. D?Ercole, A. Pierangelo, E. Palange, A. Ciattoni, A. Agranat and E. DelRe, "Photorefractive solitons of arbitrary and controllable linear polarization determined by the local bias field", Optics Express **16**, 12002 (2008).

55) A.Ciattoni, E. DelRe, C. Rizza and A. Marini, "Miniaturized bending-free solitons by restoring symmetry in periodically biased photorefractives", Optics Letters **33**, 2110 (2008).

56) 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).

57) 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).

58) A. Pierangelo, A. Ciattoni, E. Palange, A. J. Agranat, and E. Del Re, "Electro-activation and electro-morphing of photorefractive funnel waveguides", Optics Express **17**, 22659 (2009).

59) C. Rizza, A. Ciattoni and E. Palange, "Highly nonparaxial (1+1)-D subwavelength optical fields", Optics Express **18**, 7617 (2010).

60) A. Ciattoni, C. Rizza and E. Palange, "Extreme nonlinear electrodynamics in metamaterials with very small linear dielectric permittivity", Physical Review A **81**, 043839 (2010).

61) A. Ciattoni, C. Rizza and E. Palange, "Transverse power flow reversing of guided waves in extreme nonlinear metamaterials", Optics Express **18**, 11911 (2010).

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64) P. Di Porto, B Crosignani, A. Ciattoni and H. C. Liu, "Bertrand?s paradox: a physical way out along the lines of Buffon?s needle throwing experiment", European Journal of Physics **32**, 819(2011).

65) A. Ciattoni, C. Rizza and E. Palange, "All-optical active plasmonic devices with memory and power-switching functionalities based on epsilon-near-zero nonlinear metamaterials", Physical Review A **83**, 043813 (2011).

66) C. Rizza, A. Ciattoni and E. Palange, "Optical hollow-core waves in nonlinear Epsilon-Near-Zero metamaterials", Optics Communications **284**, 2573 (2011).

67) C. Rizza, A. Ciattoni and E. Palange, "Two-peaked and flat-top perfect bright solitons in nonlinear metamaterials with epsilon near zero", Physical Review A **83**, 053805 (2011).

68) E. Spinozzi and A. Ciattoni, "Ultrathin optical switch based on a liquid crystal/silver nanoparticles mixture as a tunable indefinite medium", Optical Materials Express **1**, 732 (2011).

69) C. Rizza, A. Di Falco and A. Ciattoni, "Gain assisted nanocomposite multilayers with near zero permittivity modulus at visible frequencies", Applied Physics Letters **99**, 221107 (2011).

70) M. A. Vincenti, D. de Ceglia, A. Ciattoni and M. Scalora, "Singularity-driven second- and third-harmonic generation at epsilon-near-zero crossing points", Physical Review A **84**, 063826 (2011).

71) A. Ciattoni and E. Spinozzi, "Efficient second-harmonic generation in micrometer-thick slabs with indefinite permittivity", Physical Review A **85**, 043806 (2012).

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79) C. Rizza, E. Palange and A. Ciattoni, "Electromagnetic chirality induced by graphene inclusions in multilayered metamaterials", Photonic Research **2**, 121 (2014).

80) A. Ciattoni and C. Rizza, "Harnessing quadratic optical response of two-dimensional materials through active microcavities", Physical Review A **90**, 033828 (2014).

81) C. Rizza, A. Ciattoni, F. De Paulis, E. Palange, A. Orlandi, L. Columbo and F. Prati, "Reconfigurable photoinduced metamaterials in the microwave regime", Journal of Physics D: Applied Physics **48**, 135103 (2015).

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2) A. Ciattoni, G. Cincotti and C. Palma, "Paraxial propagation in uniaxial crystals", 19th Congress of the International Commisssion for Optics Optics for the Quality of Life; Firenze; Italy. Volume 4829 II, 2003, Pages 763-764.

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