

Massimo Brambilla

Curriculum studiorum

Contents:

- **Personal data**
- **Formation**
- **Positions & projects**
- **Research**
- **Teaching**
- **List of publications**
- **Conferences**

In short

Associate Professor in Physics of Matter

Research in Nonlinear, Laser and Quantum Optics

Projects : 9

Publications : Journals 66 / Books/Proceedings 36

Conferences and Workshop/School Lessons : > 80, Invited : 35

Personal Gross Impact Factor > 172

Citations of papers: over 1200

Bari, May 20th 2010

Personal Data

Massimo Brambilla,
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Formation

- Scientific Lyceum degree achieved with 60/60 (1980)
- Prize “Città di Monza” for the Lyceum curriculum (1980)
- Italian Laurea in Physics at the “Università Statale di Milano”, thesis work on "Phase noise and transverse effects in optical bistability" under the supervision of Profs. L.A.Lugiato and G.Strini
Final score : *110 / 110 cum laude*. (1988)
- The degree of Ph. D. in Physics was achieved at the University of Zuerich, under the supervision of Prof. Ernst Brun. Dissertation title: "Spatio-temporal instabilities and pattern formation in passive optical systems". (1989-1992)
The research work concerned the formation of spatio-temporal structures in passive nonlinear optical systems both in resonators and in single passage configurations in presence of vectorial fields. The work has been carried out in close collaboration with the local experimental group led by Dr. Reto Holzner. Other themes concerned the characterisation of the transient behaviour in a NMR ruby laser. The title was declared equivalent to the Italian “Dottorato di Ricerca” by the Ministry of Education and University.

Attended the LIII course of the Higher Theoretical Physics School " J. Fourier " in Les Houches, on "Fundamental Systems in Quantum Optics". Among the course lecturers were Profs. C.Cohen-Tannoudji, W.Phillips, H.Walther, S.Haroche, H.Kimble. (June-July 1990).

Positions and Projects

- Invited Researcher at the Department of Physics and Applied Physics of the University of Strathclyde, Glasgow (UK) (1988).
- Permanent Researcher in Physics at the 2nd Faculty of Engineering of the Polytechnic of Bari (1995-2001)
- Associate Professor in “Fisica della Materia – Ottica Quantistica” SSD Fis/03 at the 2nd Faculty of Engineering of the Polytechnic of Bari (2001-present)

- Visiting Scientist at the University of Strathclyde, Glasgow, UK (2010)
- Visiting Scientist at the UMR-CNRS "Laboratoires Photonique et Nanostructures", Marcoussis, France (Several periods between 1999 and 2006)
- Referee since 1990 for the following journals : Physical Review A, Physical Review E, Physical Review Letters, Optics Letters, Optics Communications, Journal of the Optical Society of America A&B, Journal of the European Optical Society, Journal of Modern Optics, Journal of Pure and Applied Physics, Journal of Optics A & B.
- Supervisor of research fellowships and grants for 12 man/year globally (1999-20010)
- Member of the Italian National Institute for Matter Physics (INFN) since 1988; member of CNISM since foundation.
- Local Coordinator for the Ministry Basic Research Project "PHOCOS"
- Group leader for INFN in the E.U. Project FET-STREP n. 4868 FunFACS (Fundamental, Functionalities and Applications of Cavity Solitons) (2005-2008).
- Group leader for INFN in the E.U. Project ESPRIT n. 28.235 P.I.A.N.O.S. (Processing Information in Arrays of Nonlinear Optical Solitons) 1998-2001.
- Local co-ordinator for the Ministry Relevant Interest National Project "Formation and control of cavity solitons in semiconductor microresonators" (2001-2003)
- Local scientific reference for the CNR Project MADESS II (99.00036.PF48) "Study of spatial instabilities in passive microresonators" (1997-1999)
- Scientific co-ordinator in the CNR Project n. 96.05431.PF37, Chemical, industrial and ecological risks group "Employing a TEM10/TEM01 laser for monitoring specific atmospheric pollutants – feasibility study" (1996-1999)
- Principal Investigator in E.U. Project ESPRIT LTR n. 21.112 P.A.S.S. (Spatial Soliton Array Processor) 1996.
- Local scientific reference in the Ministry Relevant Interest National Project 1997-1999 "Formation and control of spatial structures in nonlinear optical systems" .
- Scientific collaboration at various levels in Advanced Sectional Projects (P.A.I.S.) of the INFN focused on quantum and nonlinear dynamical phenomena in non-linear optical systems.
- Appointed by INFN with several grants within E.U. Information Technology projects (1989-1995)

- Appointed by the European Community as official expositor of the ESPRIT project T.O.P.P. (Transverse Optical Patterns n.3260) at the E.P.S. Condensed Matter Conference (Prague, April 1992).

Research

The research activities described in the following, are mainly centered on the theoretical and numerical studies of spatiotemporal instabilities in non-linear optical systems (n.l.o.s.). A special focus is the formation of self-organised and self-confined structures in the transverse profile of the coherent field (transverse, i.e., with respect to the optical axis of the system). This topic in the last decade has indeed originated a new branch of Optics (Transverse Non-linear Optics). Within this framework a mainstream of activities was activated on modelling and studying semiconductor-based optical devices, which stimulated to promotion of a number of projects on national and European scales. Most relevant is the ESPRIT LTR P.I.A.N.O.S. Project n.28235, devoted to the demonstration and exploitation of cavity solitons (see below) in optical information treatment. To this respect, paper n.26 in the list was the theoretical prediction of the new class of dissipative solitons and properties thereof, it has been considered as an Excellence milestone by INFN and included in the volume "INFN Highlights 1997" as one of the 5 representative and outstanding researches of the Institute in the field of Non-linear Optics. Its citation index is 117 and the following in-depth publication on the subject (paper n.28) has been cited 84 times.

The joint description and confirmation of cavity solitons as dissipative self-confined structures and at the same time plastic, addressable pixel, appeared in Nature in 2002 (paper n.44, cited 136 times) and was the first-timer in this field as for semiconductor-based devices.

The FET-STREP project FunFACS (see website www.funfacs.org for details) was the natural prosecution of the former, and within this framework new first-time predictions were developed concerning total three-dimensional confinement of radiation in optical nonlinear systems.

The largest part of the research has been performed in close collaboration with broadly acknowledged experimental groups, with the precise aim of providing modelistic interpretation of evidences, or conversely to stimulate experiments confirming theoretical predictions. Many of the publications listed in this CV stem from those collaborations. In the few cases where no experimental activity was available on the subject, the treatment has been particularly steered, so to provide useful indications for an eventual experiment. It thus happened that experiments came later, supporting the predictions.

After the appointment of a permanent position (Researcher, in Dec. 1995), the activities were carried on within the group of Nonlinear and Quantum Optics of the joint University and Polytechnic Department of Physics. It should be stressed that up to that period there did not exist any structured theoretical activity. In the course of the first four years, adequate numerical resources have been acquired (a RISC workstation, a net of post-processing PCs, appropriate software resources) and access to greater resources has been granted via national and international collaborations. In the following years the nucleated group attained international status as witnessed by scientific production and project encadrement. The various research issues have been opened to graduating and Ph.D. students (see section "Teaching") and financial resources have been acquired, sufficient to fund ten men-years at postdoc level.

A 3-year project (PHOCOS: Spatial soliton composites bridging PHOtorefractive and Cavity Optical Structures) has been funded by the Italian Ministry of Research in March 2010 which will

allow to export and compendiate the phenomenologies of dissipative and propagative solitons in different media.

Early: Between 1985 and 1988, the research work concerned mainly the temporal dynamics of n.l.o.s., with a particular interest for the single- and multi- mode instabilities of Optical Bistability, in collaboration with experimental and theoretical groups (H.J.Kimble et al. University of Texas, Austin, B.Macke et al. Laboratoires de spectroscopie hertzienne, Université de Lille, France, L.M.Narducci et al. Drexel University, Philadelphia). Excellent agreements were achieved with the experimental evidences, as reported in joint experimental and theoretical publications.

Since 1989 the focus moved toward Transverse Non-linear Optics, in particular on the formation and control of spatio-temporal structures in n.l.o.s. with low Fresnel number, where boundary effects are relevant and whose dynamics can be conveniently described by a limited number of Gauss-Laguerre modes (or Gauss-Hermite modes, depending on the system's symmetry).

In this respect publications 4,5,13 and 14 on the control of the transverse laser profile have been highly considered in the community and the relative citation indices are 117,84,70 and 59, respectively.

Some of the main results are:

- The original analysis and interpretation of pattern formation and dynamics in various n.l.o.s. with a limited (2-36) number of transverse modes. Classes of devices ranged from free-running lasers, to passive absorbers with or without cavity, LSA, parametric optical converters etc. Their dynamics was studied both in regular and irregular regimes, in connection to transitions to spatio-temporal chaos.
- The description of transverse-mode-switching and mode selection via a generalised potential approach, and the introduction of a formal parallelism between laser and fluid dynamical models.
- The prediction (experimentally confirmed) of an operational scheme for the mode competition and dynamics, in which the laser with injected signal functions as an associative memory
- The prediction (experimentally confirmed) of an operational scheme for the transverse mode dynamics, in which the laser with injected signal functions as an all-optical amplifier and commutation element.

Recent: Since 1993, the research bias moved towards the studies of pattern formation and dynamics in n.l.o.s. with high Fresnel number, where the number of contributing transverse modes becomes very large and boundary effects are ineffective in the pattern selection process; the system in general exhibits a translational symmetry in the transverse plane. In such conditions, optical systems show similarities with other (e.g. hydrodynamical) systems, well-known to exhibit spontaneous morphogenesis (Rayleigh-Benard convection, defect-mediated turbulence, etc.). In these systems the formation of global, spatially modulated structures has been predicted, such as rolls, hexagonal or honeycomb lattices, more complicated non-stationary structures.

An extremely interesting feature, theoretically predicted by several groups including ours and experimentally confirmed in "slow" optical systems, is the occurrence of non diffracting, self-confined structures which appear as bright peaks of light in the transverse profile of the coherent field. Such self-organised "pixels" are now currently called Cavity Solitons (CS) and are excellent candidates for optical information treatment. As it emerges from theoretical indications (see publication n. 23, cited 66 times, and references therein) CS can be caused to drift in a controlled manner across the device's transverse section. Thus, at difference from presently used arrays of

microlasers or S.E.E.D.s , the self-organisation of CS allows us to conceive classes of all-optical reconfigurable matrices, serial to parallel converters, commutators which can couple more efficiently to the “silicon” part of optoelectronic devices.

Relevant results in this issue are:

- The prediction of a threshold lowering for the signal emission in an Optical Parametric Oscillators with spontaneous roll formation at threshold.
- The description of pattern dynamics in an OPO with blue or red pump detuning, including regimes of roll and hexagon formation, transition to spatiotemporal chaos and formation of solitonic structures
- The detailed study of parametric domains where saturable absorbers exhibit CS formation and controls thereof. In particular critical features were studied, such as techniques for switching on and off individual CS, addressing beam powers and durations, mutual CS interaction schemes, CS drift velocities etc., on these basis relevant figures such as information density and commutation speeds could be appreciated.
- The first prediction of stable CS in theoretical models (originally developed) in semiconductor heterostructured microresonators. The models contemplated both “passive” devices (where the carrier generation relies on externally injected optical fields) and “active” ones, wherein pumping electrical currents cause the device to operate as an amplifier. These results stimulated experimental activities on CS beyond pristine “slow” optical systems (liquid crystal light valves, organic absorbers, etc.). After the consolidation of the indications, the PIANOS project was activated and funded, with the precise aim to observe CS in microdevices and to demonstrate basic processing features based on CS.
- On the grounds of CS properties as they emerged from the basic research, it was possible to show how they can be used for all-optical signal amplification with large differential gains, with contextual signal commutation operation (publication n.30). Architectures have been suggested to show the principles of all-optical logic gate(AND, OR, NOT) operation with CS. It is worthwhile to stress the recent experimental results obtained at the Nonlinear Optics group at the Westfälische Wilhelms-Universität in Münster (D), which confirm the predictions about the possibility of achieving a differential gain (5-10) by optically modulating a CS, even in a passive system. Experiments have been performed in a Sodium cell and presently appear in excellent agreement with the general theoretical indications.
- The existence and manipulability of CS in VCSEL devices, as predicted in 1997, has been achieved in 2001 and the joint theoretical and experimental results appeared in the journal “Nature” in 2002. The achieved evidences determined the successful conclusion of the PIANOS Project.

Other research issues, related to this general mainstream, cover non-classical states with spatial modulation, mechanical effects on neutral atoms, influence of stochastic effects in pattern dynamics, structure formation and localisation in 3-level lasers (cascaded and two-photon schemes).

Other research subjects

- Research work at the Department of Physics and Applied Physics of University of Strathclyde (Glasgow, UK) with Prof. W.J.Firth on the subject of transverse mode instabilities in counter-propagating beams in Kerr media (reported European Quantum Electronics Conference , Hanover RFT , 1988)

- Research work on heat dissipation in human tissues within the CNR project “Biomedical technologies, energy transmission through intact skin”. (1988-89)
- Research work in coherent field dynamics and non classical states in FWM, analysis of squeezing in the signal and pump fields. (1992-94)
- Research work on the application of transverse mode selection and switching in lasers with injected signals towards the realisation of a fast differential sensor for specific atmospheric pollutants (1998-99)
- Modelistic refinements to match experiments on semiconductor microcavities at CNET- France Telecom / CNRS, Bagnaux (F) and INLN, Nice (F). (1999-2001)
- Modelistic, analytical and numerical research in collaboration with the University of Strathclyde (UK) in the framework of a SCRC project, on Quantum Dot Lasers

Teaching

Teaching has been mainly provided in the 2nd Engineering Faculty of the Bari Polytechnic, at the time a recently established one, counting in 1995 on just nine Researchers and four Full Professors. For three years M.B. was the only Physicist in the Faculty and provided coverage for tutorship, assistance, exam commissions and teaching. At the moment the Faculty numbers two Associate Professors and one Researcher in Physics, covering all teaching duties on 51 credits for a population around 270 immatriculations/year and an overall enrolled population of over 700 students

- Short course "Dinamica e strutture nei sistemi ottici non lineari" within the Physics Ph.D. programme (X ciclo) at the Università di Milano (1991).
- Practice Lessons for "Fisica Generale II" at the Science faculty of the Università di Milano. (1994-95).
- Practice Lessons for "Fisica Generale I" and "Fisica Generale 2" for the II Engineering Faculty at the Politecnico di Bari (1995-2000).
- Course "Dinamica, formazione di strutture ed effetti quantistici nei sistemi ottici non lineari", within the Physics Ph.D. curriculum at the Università and Politecnico di Bari (1998-2000).
- Course "Fisica Generale II" at the Diploma in "Ingegneria dell'Ambiente e delle Risorse". (A.A. 1999/2000)
- Course "Fisica Generale I" at the Laurea in "Ingegneria dell'Ambiente e del Territorio". (A.A. 2000/2001)
- Course "Fisica Generale" at the Laurea in "Ingegneria dell'Ambiente e del Territorio" and "Ingegneria Civile". (A.A. 2001/2002)
- Course "Fisica Generale" at the Laurea in "Ingegneria Industriale". (A.A. 2003-2008)
- Course "Ottica Applicata e Fondamenti di Fisica dei Laser" (Applied Optics and Fundamental Laser Physics) at the Laurea Specialistica in "Ingegneria Industriale". (A.A. 2003-2008)
- Course "Fisica 2" (Electromagnetism and Modern Physics) at the Laurea in "Ingegneria Industriale". (A.A. 2009 to date)
- Course "Applies optics and modern physics" at the Laurea Specialistica in "Ingegneria Industriale". (A.A. 2009 to date)
- Member of the Doctorate Ph.D. School in Environmental and Sustainable Engineering of the Bari Polytechnic (XIX-XX-XXI courses)
- Member of the Doctorate Ph.D. School in Physics of the University of Bari since 2000
- Course "Quantum Optics" at the Laurea in Fisica of the University of Bari (2002-4)
- Supervisor of ten Laurea theses and three Ph.D. theses.
- Member of the jury for the "Doctorat en Physique" at the Université de Nice (F) and Rapporteur de Thèse at the Université P&M Curie (Paris,F)

Full papers in International Journals with “Peer Review”

(The impact factor of the publications has been obtained from the ISI Web of Knowledge service; for publication years where the figure wasn't available, the chronologically closer value has been adopted)

- M. Brambilla, “Spatio-temporal instabilities and pattern formation in passive optical systems”, Ph. D. Thesis, University of Zuerich (1993). (The dissertation is published in 120 copies deposited at the Zentral Bibliothek in Zuerich after referee review by two qualified international scientists).
- 1) M. Brambilla, L.A. Lugiato, G. Strini, L.M. Narducci “Influence of Phase Diffusion on Spontaneous Oscillations in Driven Optical Systems”, Phys. Rev. A **34**, 1237, (1986) IF: 2.83
- 2) L.A. Orozco, H.J. Kimble, A.T. Rosenberger, L.A. Lugiato, M.L. Asquini, M. Brambilla, L.M. Narducci “The Single Mode Instability in Optical Bistability”, Phys. Rev. A **39** 1235 (1989) IF 2.83
- 3) B. Segard, B. Macke, L.A. Lugiato, F. Prati and M. Brambilla "The Multimode Instability of Optical Bistability" Phys. Rev. A **39** 706 (1989) IF : 2.83
- 4) M. Brambilla, F. Battipede, L. A. Lugiato, V. Penna, F. Prati, C. Tamm and C. O. Weiss, "Transverse Laser Patterns, I. Phase Singularity Crystals", Phys. Rev. A **43** 5090 (1991) IF: 2.83
- 5) M. Brambilla, L. A. Lugiato, V. Penna, F. Prati, C. Tamm and C. O. Weiss, "Transverse Laser Patterns, II. Variational Principle for Pattern Selection, Spatial Multistability, Laser Hydrodynamics ", Phys. Rev. A **43** 5114 (1991) IF: 2.83
- 6) P. Colet, M. San Miguel, M. Brambilla and L. A. Lugiato, "Fluctuations in Transverse Laser Patterns", Phys. Rev. A, **43** 3862 (1991) IF: 2.83
- 7) M. Brambilla, L. A. Lugiato F. Prati and G. Strini, "Nondegenerate Four Wave Mixing in a Cavity: Instabilities and Quantum Noise Reduction ", Opt. Comm. **83**, 367 (1991) IF: 1.19
- 8) M. Brambilla, G. Broggi, F. Casagrande, L. A. Lugiato and E. Arimondo, "Two-Peaked Probability Distribution in Laser Cooling", Phys. Rev. A, **45** 4768 (1992) IF: 2.83
- 9) M. Brambilla, G. Broggi, F. Prati, "Spatiotemporal Pattern Formation and Chaos in Passive Optical Systems ", Physica D **58**, 339 (1992) IF: 1.64
- 10) M. Brambilla, L. A. Lugiato, M. V. Pinna, F. Prati, P. Pagani, P. Vanotti, M. Y. Li and C. O. Weiss, "The Laser as Nonlinear Element for an Optical Associative Memory", Opt. Comm. **92**, 145 (1992) IF: 1.19
- 11) M. Brambilla, F. Castelli, L. A. Lugiato, E. M. Pessina, F. Prati, G. Strini, P. Galatola, "Generation of Nonclassical States by Nonlinear Optical Systems", Appl. Phys. B, **55**, 190 (1992) IF:1.91
- 12) C. O. Weiss, H. R. Telle, K. Staliunas and M. Brambilla, "The Restless Optical Vortex ", Phys. Rev. A, **47**, 1616 (1993) IF:2.83
- 13) M. Brambilla, M. Cattaneo, L. A. Lugiato, R. Pirovano, F. Prati, A. J. Kent, G.-L. Oppo, A. B. Coates, C. O. Weiss, C. Green, E. J. D'Angelo and J. R. Tredicce, "Dynamical Transverse Laser Patterns. I: Theory", Phys. Rev. A, **49** 1427 (1994) IF:2.83
- 14) M. Brambilla, M. Cattaneo, L. A. Lugiato, R. Pirovano, F. Prati, A. J. Kent, G.-L. Oppo, A. B. Coates, C. O. Weiss, C. Green, E. J. D'Angelo and J. R. Tredicce, "Dynamical Transverse Laser Patterns. II: Experiments", Phys. Rev. A **49**, 1452 (1994) IF:2.83

- 15) M. Brambilla, L. A. Lugiato and G.-L. Oppo, "Formation and evolution of roll patterns in optical parametric oscillators", *Phys. Rev. A*, **49**, 2028, (1994) IF:2.83
- 16) G.-L. Oppo, M. Brambilla, D. Camesasca, A. Gatti and L. A. Lugiato, "Spatio-temporal dynamics of optical parametric oscillators", *J. Mod. Opt.*, **41**, 1151 (1994) IF:1.02
- 17) F. Prati, M. Brambilla and L. A. Lugiato, "Pattern formation and dynamics in lasers", *Riv. Nuo. Cim.*, **17**, Sec. 3, n.3 pp.1-85 (1994) IF: 1.00
- 18) A. Barsella, P. Alcantara Jr., E. Arimondo, M. Brambilla and F. Prati, "Dynamics of Transverse Patterns in a Laser with Saturable Absorber", *Chaos, Solitons and Fractals*, special issue on Transverse Effects, **4**, 1665 (1994) IF:0.74
- 19) M. Brambilla, A. Gatti, L. A. Lugiato and F. Prati, "Spatiotemporal Structures from Four-Wave Mixing and Phase Modulation", *Chaos, Solitons and Fractals*, special issue on Transverse Effects, **4**, 1277 (1994) IF:0.74
- 20) B. Roehricht, A.W. McCord, M. Brambilla, F. Prati, S. Dangel, P. Eschle, R. Holzner, "Spatial separation of circularly polarized laser beams in sodium vapor", *Optics Comm.* **118**, 601 (1995). IF: 1.19
- 21) M. Brambilla, F. Castelli, A. Gatti, L.A. Lugiato, G.-L. Oppo and G. Grynberg, "Quantum and classical effects in nonlinear optical patterns", *Nuo. Cim.*, **110B**, 635 (1995) IF:1.00
- 22) L.A. Lugiato, S.M. Barnett, M. Brambilla, A. Gatti, I. Marzoli, G.-L. Oppo, F. Prati, M. Stefani, M. Travagnin and H. Wiedemann, "Nonlinear optical patterns: classical and quantum effects, perspectives for applications", *Phil. Tran. R. Soc. Lond. A* **354**, 767 (1996) IF:3.51
- 23) M. Brambilla, L. A. Lugiato and M. Stefani, "Interaction and control of optical localized structures", *Europhys.Lett.* **34**, 109 (1996). IF: 2.23
- 24) M. Brambilla, L. A. Lugiato and M. Stefani, "Formation and control of structures in nonlinear optical systems", *Chaos* **6**, 368 (1996). IF:2.35
- 25) J. Gutierrez, D.Y. Tang, C.O. Weiss, F. Prati and M. Brambilla, "Helical wave laser as an optical transistor", *Optics Comm.*, **135** 305 (1997). IF:1.19
- 26) M. Brambilla, L. A. Lugiato, F. Prati, L. Spinelli and W. J. Firth, "Spatial soliton pixels in semiconductor devices", *Phys. Rev. Lett.*, **79**, 2042 (1997). IF: 6.46 ISSN: 0031-9007.
- 27) M. Brambilla, A. Gatti and L.A. Lugiato, "Optical Pattern Formation", *Adv. in At. Molec. and Opt. Phys.*, **40**, 229-306 (1998) IF: 4.91 ISSN: 0065-2199.
- 28) M. Brambilla, L. A. Lugiato, G. Tissoni and L. Spinelli, "Spatial Solitons in Semiconductor Microcavities", *Phys.Rev.A*, **58**, 2542 (1998). (IF: 2.83) ISSN: 1050-2947.
- 29) J. Garcia-Ojalvo, V.M. Sanchez-Morcillo, M. Brambilla, M.C. Torrent and R. Vilaseca, "Pattern Formation in Three-Level Laser Systems", *Special Issue on Nonlinear Dynamics in Optics, Asian Journ. of Physics*, **7**, 576 (1998) ISSN: 0971-3093.
- 30) M. Brambilla and L. Spinelli, "Signal Amplification by means of Cavity Solitons in Semiconductor Microcavities", *Eur. Phys. J. D* **6**, 523-532 (1999). IF 1.50 ISSN: 1434-6060.
- 31) L. A. Lugiato, L. Spinelli, G. Tissoni and M. Brambilla, "Modulational instabilities and cavity solitons in semiconductor microcavities", *Journal of Optics B: Quantum and Semiclassical Optics*, **1**, 43 (1999). IF:0.60 ISSN: 1464-4266.

- 32) G. Tissoni, L. Spinelli, M. Brambilla, T. Maggipinto, I. M. Perrini e L. A. Lugiato, "Cavity Solitons in Passive Bulk Semiconductor Microcavities. I. Microscopic Model and Modulational Instabilities", *J. Opt. Soc. Am. B* **16**, 2083-2094 (1999) IF: 1.94 ISSN: 0740-3224.
- 33) G. Tissoni, L. Spinelli, M. Brambilla, T. Maggipinto, I. M. Perrini e L. A. Lugiato "Cavity Solitons in Passive Bulk Semiconductor Microcavities. II. Dynamical Properties and Control ", *J. Opt. Soc. Am. B* **16**, 2095-2105 (1999). IF: 1.94 ISSN: 0740-3224.
- 34) J. García-Ojalvo, M. Brambilla, M.C. Torrent, R. Vilaseca, "Coupled Transverse Modes in Three-level Cascade Lasers", *Chaos, Solitons & Fractals*, **10**, 1999, pp. 819-824 IF: 0.74 ISSN: 0960-0779.
- 35) A. Gatti, L.A. Lugiato, L. Spinelli, G. Tissoni and M. Brambilla, and P. Di Trapani, F. Prati, and G.L. Oppo, and A. Berezanskis, "Nonlinear Optical Patterns: Applications to Spatial Soliton Arrays, Quantum Aspects", *Chaos, Solitons and Fractals*, **10**, 875 (1999). IF: 0.74 ISSN: 0960-0779.
- 36) M. Dabbicco, M. Brambilla, "Dispersion of the two-photon absorption coefficient in ZnSe", *Solid State Commun.*, **114** (2000), pp. 515-519 IF: 1.27 ISSN: 0038-1098.
- 37) R. Kuszelewicz, I. Ganne, G. Sleky, I. Sagnes and M. Brambilla, "Optical self-organisation in bulk and MQW GaAlAs Microresonators", *Phys. Rev. Lett.* **84**, 6006 (2000) IF: 6.46 ISSN: 0031-9007.
- 38) G.L. Oppo, A. Scroggie, S. Sinclair and M. Brambilla, "Complex spatio-temporal dynamics of Optical Parametric Oscillators close to threshold", *Journ. Mod. Opt.*, **47** 2005 (2000) IF: 1.02 ISSN: 0950-0340.
- 39) T. Maggipinto, M. Brambilla, G.K. Harkness, W.J. Firth, "Cavity solitons in semiconductor microresonators: Existence, stability, and dynamical properties", *Phys. Rev. E* **62**, 8726 (2000) IF: 2.14 ISSN: 1063-651X.
- 40) R. Vilaseca, M.C. Torrent, J. García-Ojalvo, M. Brambilla and M. SanMiguel "Two-photon cavity solitons in active optical media", *Phys. Rev. Lett.*, **87**, 3902 (2001) IF: 6.67 ISSN: 0031-9007.
- 41) L. Spinelli, G. Tissoni, M. Tarengi and M. Brambilla, T. Maggipinto, I. M. Perrini, F. Rizzi, "First Principle Theory for Cavity Solitons in Semiconductor Microresonators", *Eur. Phys. Journ. D*, **15**, 257 (2001). IF: 1.58 ISSN: 1434-6060.
- 42) L. Spinelli, G. Tissoni, L. Lugiato and M. Brambilla, "Thermal effects and transverse structures in semiconductor microcavities with population inversion", *Phys. Rev. A* **66**, 023817 (2002) IF: 2.99 ISSN: 1050-2947.
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Presentations at International Conferences and Schools

1. "International Workshop on Instabilities, Dynamics and Chaos in Nonlinear Optical Systems", 8-10 Luglio 1987, Il Ciocco, Lucca, Italy.
2. "European Quantum Electronics Conference (EQEC) 1988", Hanover RFT
3. "NATO Advanced Research Workshop on Noise and Chaos in Nonlinear Dynamical Systems", 7-11 Marzo 1989, Villa Gualino, Torino.
4. "XVII International Quantum Electronics Conference" 21-25 Maggio 1990 , Anaheim, USA.
5. "Nonlinear Dynamics in Optical Systems", 4-8 Giugno 1990 , Afton, Oklahoma, USA.
6. "Third International Workshop on Nonlinear Dynamics and Quantum Phenomena in Optical
7. Systems", 1-3 Ottobre 1990 , Blanes, Spagna. **(invited)**
8. "VII Congresso Nazionale di Elettronica Quantistica e Plasmi" (EQUAP), 5-7 Novembre 1990, Roma, Italia.
9. "Quantum Optics" (ECOOSA 90), 7-9 Novembre 1990, Roma, Italia. **(invited)**
10. "Nonlinear Dynamics in Optical Systems" 3 - 8 Febbraio 1991, Montecatini.
11. "EQEC 1991" 25 - 31 Agosto 1991, Edinburgh, UK. **(invited)**
12. "ESF Conference on Quantum Optics", 28 Settembre - 3 Ottobre 1991, Davos, Swizerland. **(invited)**
13. "II Meeting of the Twinning Project on Dynamics of Nonlinear Optical Systems", 27 - 29 Febbraio 1992, Sophie Antipolis, France. **(invited)**
14. "IQEC 1992" 14 - 19 Giugno 1992, Vienna, Austria. **(invited)**
15. "Nonlinear Dynamics in Optical Systems 1992", 22 - 26 Giugno 1992, Alpbach, Austria.
16. 41st SUSSP NATO-ASI" (Scuola) 24 Agosto - 4 Settembre 1992, Edinburgh, United Kingdom. **(invited lessons)**
17. "LXXVIII Congresso Nazionale della Societa' Italiana di Fisica" 5 - 9 Ottobre 1992, Pavia. **(invited)**
18. "III Meeting of the Twinning Project on Dynamics of Nonlinear Optical Systems", 30 Marzo -
19. 4 Aprile 1993, Palma de Mallorca, Spagna.
20. "Laser Optics 1993", 21 - 25 Giugno 1993, St. Petersburg, C.I.S.
21. "Nonlinear Dynamics in Lasers and Optical Systems", Volga Laser Tour, 27 Giugno - 3 Luglio 1993, Moscow - N.Novgorod, C.I.S.
22. "EQEC 1993", 10 - 14 Settembre 1993, Firenze. **(invited)**
23. "Complexity and Chaos in Quantum Optics", Workshop, 28-30 marzo 1994, Lille (F).
24. International Conference on "Research Trends in Nonlinear and Quantum Optics", La Jolla, USA, November 1993. **(Invited)**
25. "First International Conference on Synergetics and Synergetics Engineering" (ICASSE 94), Erlangen, Germany, 21-23 June 1994. **(Invited)**.
26. European Science Foundation Study Centre: "Nonlinear Optics and Guided Waves", Edinburgh, U.K., 1--20 Aug. 1994. **(Invited lessons)**.
27. European Quantum Electronics Conference (EQEC), Amsterdam, The Netherlands, Aug. 1994.
28. Royal Society of London, Workshop "Nonlinear Optics: applications to information processing and communication", London, 6-9 marzo 1995 **(Invited)**.
29. XIV Convegno di fisica teorica e struttura della materia, Fai della Paganella, 8-11 Aprile 1995 **(Invited)**.
30. "Nonlinear Dynamics in Optical Systems 1995", 5-10 Giugno 1995, Rochester, NY (USA).
31. "Measures of Spatio-Temporal Dynamics", Int. workshop, 11-13 Giugno 1995, Bryn Mawr, PA (USA).
32. International School on Nonlinear Sciences, Nizhny Novgorod (Russia), 4-17 Settembre 1995 **(Invited Lessons)**.
33. "Relaxation in Mesoscopic Systems", Italian-German Symposium, Menaggio (CO), Italy, 24-27 Settembre 1995 **(Invited)**.
34. XX International Quantum Electronics Conference, Sydney, Australia 1996 **(Invited)**.
35. Workshop "Nonlinear optical systems, fundamentals and applications", Maui, USA 1996 **(Invited)**.
36. EQEC/CLEO Europe, Hamburg (D), 1996
37. 10th General Conference Eur. Phys. Soc., Sevilla (E) 1996
38. Workshop "Pattern formation in nonlinear optical systems", Bonn, Germany (1997).
39. 11th EOS Topical Meeting "Materials for Nonlinear Optics", July 8-12 1997 **(Invited)** .

40. Congresso Nazionale I.N.F.M., 25-30 giugno 1998, Rimini.
41. CLEO/EQEC Europe, Glasgow (UK), 1998.
42. Opt.Soc.Am. Annual Meeting, Baltimore (USA) 4-8 ottobre 1998.
43. International Conference on Transparent Optical Networks ICTON '99, 9 – 11 June 1999, Kielce (Poland).
44. Congresso Nazionale INFIM, Catania, 14-18 giugno 1999
45. International Seminar on “Topological Defects in Non-Equilibrium Systems and Condensed Matter”, Dresden (Germany), 28 Giugno – 16 Luglio 1999.
46. Opt. Soc. of America, Annual Meeting, Santa Clara, USA, 26 – 30 Settembre, 1999.
47. Optical Soc. of America, Annual Meeting “Nonlinear Guided Waves and Their Applications”, Dijon (F), 31/8-3/9 1999
48. Workshop on Applications of Nonlinear Optical Phenomena and Related Industrial Perspectives, Amalfi (Italy), 6 – 9 Ottobre, 1999.
49. Laser Optics 2000, St.Petersburg (Russia) 28/6 – 2/7 2000 (**Invited**)
50. Congresso Nazionale INFIM, Genova, 12-16 Giugno 2000
51. CLEO/IQEC, Nice (France), 10-15 /9/2000
52. NOIS 2000 (Nonlinear Optics for the Information Society), University of Twente, Enschede, The Netherlands, 26 – 27 October, 2000.
53. Photonics West, SPIE Conference, San Jose, USA, Jan. 2001 (**Invited**)
54. Opt. Soc. Am., Annual meeting : “Non Linear Guided Waves and Their Applications”, Miami (USA) 2001 (**Invited**)
55. 3rd International Conference on Transparent Optical Networks ICTON 2001, Krakow (Polonia), June 18 – 21, 2001 (**Invited**)
56. XVII International Conference on Coherent and Nonlinear Optics (ICONO – 2001), June 28 – July 1, 2001, Minsk (Bielorussia) (**Invited**)
57. September 24-28, Sep. 2001 “Workshop on dynamics of lasers and OPOs” (PICS Franco-Catalan)
58. Electronic Imaging 2002, Symposia of Photonic West 2002, January 19 – 25, 2002, San Jose, USA
59. 4th International Conference on Transparent Optical Networks ICTON 2002, Warsaw (Poland), April 21 – 25, 2002. (**Invited**)
60. 15th Annual Lasers and Electro Optics Society Meeting (LEOS 2002), 10 – 14 November 2002, Glasgow, UK.
61. IQEC 2002, International Quantum Electronics Conference, Moscow, Russia, 22 - 28 June 2002. (**Invited**)
62. Workshop “Optical Solitons”, Aug. 2002, Varenna, Italy (**invited**)
63. International workshop on dynamics of nonlinear optical systems, Platja d’Aro (Spain), September 2 – 6, 2002
64. Nonlinear Guided Waves and Their Applications (NLGW 2002), September 1 – 4, 2002, Stresa (Italy).
65. CLEO/EQEC 2003 Munich (D) 24-29 June 2003 (**Keynote** + Contributed)
66. Laser Optics 2003 St.P. 29/6-4/7 2003
67. Third IMACS International Conference on Nonlinear Evolution Equations and Wave Phenomena: Computation and Theory, Athens (USA), 7-10 April 2003, (**Invited**)
68. A Conference on the dynamics of societies, multimode lasers, patterns, and nuclear interference, in honour of the 60th birthday of Paul Mandel, Brussels, 11-12 April 2003, (**Invited**).
69. First Rio de la Plata workshop on Noise, Chaos and Complexity in Lasers and Nonlinear Optics, Colonia del Sacramento, Uruguay, 1-5 December 2003, (**Invited**)
70. Non-Linear Guided Waves and Their Applications (NLGW 2004), Toronto, 28-31 March 2004.
71. Photonics Europe 2004, Strasbourg (France), 26-30 April 2004.
72. CLEO/IQEC 2004, San Francisco (USA), 16-21 May 2004.
73. Photonics West 2005, San Jose (USA), Jan 2005 (**Invited**)
74. Laser Optics 2006, Sankt Petersburg (Russia), 25-30 June 2006 (**invited**)
75. EOS Annual Meeting, Paris (F) Oct. 2006
76. Photonics West 2007, San Jose (USA), 22-26 Jan 2007 (**invited**)
77. International Workshop on Instabilities, Patterns and Spatial Solitons, Metz (France), 28-30, March, 2007.
78. FRISNO9, Les Houches (F), Jan 11-16 2007 (**invited**)
79. ICONO/LAT, Minsk, Russia, May 20-24 2007, (**invited**)
80. SIAM Conference on Nonlinear Waves and Coherent Structures, Rome, 21-25 / 07 / 2008 (**Two invited**)
81. **EOS Annual Meeting**, Paris (F), 29/9-3/10 2008