Optical Society of America

NLGW

Nonlinear Guided Waves and Their Applications

Topical Meeting

September 1-4, 2002

Stresa Congress Center
Stresa, Italy

Abstracts

■ Monday
■ September 2, 2002

Room: Auditorium

8:00am–10:00am
NLMA ▪ Temporal Fiber Solitons

Stefan Wabnitz, Xtera Communications, Inc. USA, United States, Presider

Presider

NLMA1 8:00am Invited

Is soliton communications really beneficial in presence of polarization mode dispersion? *M. Karlsson, C. Xie, H. Sunnerud, P. A. Andrekson, Chalmers Univ. of Tech., Sweden.* We discuss and review the impairments from random birefringence and PMD on soliton systems, including timing jitter coming from PMD and WDM-collision-induced polarization scattering.

NLMA2 8:30am

Phase-locked soliton pairs in a fiber ring laser, *Ph. Grelu, F.Belhache, F.Gutty, Univ. de Bourgogne, France; J. M. Soto-Crespo,Instituto de Optica, Spain.* We have experimentally observed the formation of stable pulse pairs with a $\pi/2$ phase difference in a passively mode-locked stretched-pulse fiber ring laser. We have developed a simplified theoretical model that, keeping the essential features of the experiment, reduces greatly the number of free parameters and solved it numerically. The agreement with the experimental results is excellent.

NLMA3 8:45am

Observation of soliton explosions, *Steven T. Cundiff, Natl. Inst. of Standards and Tech. and Univ. of Colorado-Boulder, USA; J. M. Soto-Crespo,C.S.I.C., Spain; Nail Akhmediev, Australian Natl. Univ., Australia.* We show, experimentally and numerically, that Ti:sapphire mode-locked lasers can operate in a regime in which they produce exploding solitons. In stable conditions of operation all explosions have similar features, but are not identical.

NLMA4 9:00am

Temporal soliton compression in beta-barium borate, *S. Ashihara, T. Shimura, K. Kuroda, Univ. of Tokyo, Japan.* We present the temporal soliton compression of femtosecond pulses in quadratic media, where cascade quadratic nonlinearity and normal dispersion contribute for compression. Compression factor of 3 is achieved by using ~30 mm long beta-barium borate.

NLMA5 9:15am

Nonrecursive multiple shock formation via four-wave mixing: Theory and experiment, *S. Trillo, Univ. of Ferrara, Italy; F. Gutty, G. Millot, Univ. de Bourgogne, France.* We show theoretically and experimentally that a beat signal propagating along a normally dispersive fiber can trigger the formation of multiple shocks. This phenomenon critically depends on the input frequency separation and power of the beat signal.

NLMA6 9:30am

Importance sampling for noise-induced amplitude and timing jitter in soliton transmission systems, *R. O. Moore, Brown Univ., USA; G. Biondini, Ohio State Univ., USA; W. L. Kath, Northwestern Univ., USA.* We apply importance sampling to the Monte-Carlo simulation of low-probability amplitude and timing jitter events produced by amplified spontaneous emission noise in a soliton-based lightwave transmission system.

NLMA7 9:45am

Complete characterization of milliwatt peak power picosecond pulses at 10 GHz propagating over 300 km in a fiber recirculation-loop, *Marc Hanna, Pierre-Ambroise Lacourt, GTL-CNRS Telecom, France; John M. Dudley, Jean-Pierre Goedgebuer, Univ. de Franche-Comté, France.* Frequency resolved optical gating using a novel fiber-based wavelength conversion geometry is used to characterize the intensity and phase evolution of milliwatt peak power pulses propagating over 300 km in an optical fiber recirculation loop.

Room: Auditorium

10:30am–12:30pm

NLMB ■ Spatial Solitons and Spatio-Temporal Effects

Mordechai Segev, Technion Israel Inst. of Tech., Israel, Presider Presider

NLMB1 10:30am (Invited)

Nonlinear X-waves: A new perspective for space-time localization, *S. Trillo, INFM and Univ. of Ferrara, Italy; C. Conti, INFM, Italy; P. Di Trapani, O. Jedrkiewicz, J. Trull, INFM and Univ. of Insubria, Italy; G. Valiulis, Vilnius Univ., Lithuania.*
Nonlinear and normally dispersive media support a novel form of space and time 3D localization of light in the form of so-called X-waves. We discuss their properties and their evidence in second-harmonic generation experiments.

NLMB2 11:00am

Induced Group-Velocity Dispersion in Second-Harmonic Generation: a Route to Light Bullets, *K. Beckwitt, Y.-F. Chen, F. W. Wise, Cornell Univ.,USA; T. Wang, H. Zhu, L. Qian,Fudan Univ., China.*
We show that in phase-mismatched second-harmonic generation, an effective group-velocity dispersion is induced at the second-harmonic frequency. In quasi-phase-matched structures this allows for temporal soliton formation and therefore facilitates the formation of 3-D spatiotemporal solitons.

NLMB3 11:15am

Snake instability of the 2+1D spatio-temporal bright soliton stripe, *N. Roig, S.-P. Gorza, Ph. Emplit, M. Haelterman, Univ. Libre de Bruxelles, Belgium.*
We demonstrate experimentally the snake instability of the bright soliton stripe in the 2+1D hyperbolic nonlinear Schroedinger equation. The instability is observed on a spatially extended femtosecond pulse propagating in a normally dispersive self-defocusing semiconductor planar waveguide.

NLMB4 11:30am

Observation of self-similar nonlinear wave collapse, *K.D. Moll, Alexander, L. Gaeta, Cornell Univ., USA; Gadi Fibich, Tel Aviv Univ., Israel.*
We show that during self-focusing induced collapse of a laser beam, the spatial profile evolves into the same cylindrically symmetric shape, known as the Townes soliton, regardless of the shape of the input beam profile.

NLMB5 11:45am

3D mapping of self-focussed light pulses, *Stefano Minardi, Giovanni Blasi, Paolo Di Trapani, INFM and Univ. degli Studi dell'Insubria, Italy; Arunas Varanavicius, Gintaras Valiulis, Algis Piskarskas; Vilnius Univ.,Lithuania.*
By exploiting a cross-correlation technique, we were able to investigate the space-time structure of the parametric spatial solitons excited by picosecond light pulses. Temporal effects that a simple 2D model cannot explain are discussed.

NLMB6 12:00pm

Symmetry-breaking instability of multimode vector solitons in Kerr media, *C. Cambournac, Thibaut Sylvestre, Hervé Maillote, Université de Franche-Comté, France; Bruno Vanderlinden, Pascal Kockaert, Philippe Emplit,Marc Haelterman, Univ. Libre de Bruxelles, Belgium.*
We show experimentally that the two-component two-hump vector soliton exhibits a sharp left-right symmetry-breaking instability in Kerr media. The experiment is performed using molecular re-orientation in CS_2 and the opposite circular polarization states of light as the two components of the vector soliton.

NLMB7 12:15pm

Skewed coherence along space-time trajectories in parametric generation processes, *Antonio Picozzi,Univ. de Nice-Sophia Antipolis, France; Marc Haelterman,Univ. Libre de Bruxelles,France.*
Considering the spatio-temporal problem of the parametric generation process, we show theoretically that the down-converted fields exhibit, as a general rule, a hidden coherence characterized by skewed coherence lines along specific space-time trajectories.

Room: Auditorium

2:00pm–4:00pm

NLMC ■ Nonlinear Fiber Optics and Pulse Propagation

Marc Haelterman, Univ. Libre de Bruxelles, Belgium, Presider Presider

NLMC1 2:00pm (Invited)

What is the role of modulational instability in ultra-high repetition rate pulse generators based on passive and active fiber cavities? *Stephane Coen, Univ. Libre de Bruxelles, Belgium.*
We study experimentally the role of modulational instability in two classes of devices that are commonly called "modulational instability lasers". For one of them, this denomination is found to be misleading.

NLMC2 2:30pm

Temporal modulational instability controlled by pulse envelope dynamics, *Domenico Salerno, Univ. of Milano, Italy; Jose Trull, Paolo Di Trapani, INFM and Univ. degli Studi dell'Insubria, Italy; Gintaras Valiulis, Vilnius Univ., Lithuania; S. Trillo, C. Conti, INFM, Italy.*
In second harmonic generation, temporal splitting into a train of solitons is observed owing to modulational instability seeded by a self-induced pulse-envelope modulation.

NLMC3 2:45pm
Generation of entanglement between frequency bands via a nonlinear fiber propagation and a spectral pulse shaping, *F. Kannari, D. Fujishima, K. Ohno, M. Sakurama, Keio Univ., Japan; M. Sasaki, M. Takeoka, Comm. Res. Lab., Japan.*
A novel fiber-based scheme for generating quadrature entanglement between a desired pair of frequency bands is proposed. The scheme is based on a nonlinear fiber, a spectral pulse shaper, and an adaptive feedback loop.

NLMC4 3:00pm
Experimental observation of modal attraction in optical fibers, *Stéphane Pitois, Guy Millot, Univ. de Bourgogne,France; Marc Haelterman, Univ. Libre de Bruxelles, Belgium.*
We investigate experimentally nonlinear optical attractors based on four-photon mixing interaction of counterpropagating waves in optical fibers.

NLMC5 3:15pm
Nonlinear optical properties of As-Se fiber, *R.E. Slusher, Lucent Tech., USA; J.S. Sanghera, L.B. Shaw, I.D. Aggarwal, NRL, USA.*
Large optical Kerr nonlinearities in low linear loss As-Se glass fibers are shown to have potential for ultra-fast, low power, all-optical processing applications. Nonlinear phase shifts near pi radians are demonstrated in fibers only 60 cm long.

NLMC6 3:30pm Invited
Slow light, fast light, and optical solitons in structured optical waveguides, *Robert W. Boyd, John E. Heebner, Univ. of Rochester, USA.*
We describe the exotic optical properties of a device consisting of a sequence of optical microresonators coupled to an optical waveguide. This device can display slow or fast group voelocities of propagation, large tailored dispersion, and the propagation of optical solitons.

Room: Lower Level Foyer

4:00pm–6:00pm
NLMD ▪ Poster Session: 1

NLMD1
Nonlinear transmission in photonic crystal waveguides: Optical switchers and diodes, *Sergei F. Mingaleev, The Australian Natl. Univ., Australia and Bogolyubov Institute for Theoretical Physics,Ukraine; Yuri S. Kivshar, The Australian Natl. Univ., Australia.*
We derive effective discrete equations with long-range interaction which accurately describe light transmission in photonic crystal waveguides with embedded nonlinear defects and demonstrate the possibility of a bistable (all-optical switcher) and unidirectional (optical diode) transmission.

NLMD2
Modulational instability of Bose-Einstein condensates in two- and three-dimensional optical lattices, *B.B. Baizakov, M. Salerno, Univ. of Salerno, Italy; V.V. Konotop, Univ. of Lisboa, Portugal.*
We show that the phenomenon of modulational instability gives rise to coherent spatial structures in arrays of Bose-Einstein condensates confined to optical lattices. A simple way to retain these spatial structures is proposed, which may be of interest for applications.

NLMD3
Optimized 2-dimensional poling pattern for fourth harmonic generation, *Andrew H. Norton, C. Martijn de Sterke, Univ. of Sydney, Australia.*
The efficiency of a recently proposed fourth harmonic generation scheme depends on two Fourier coefficients of a 2-dimensional periodic poling pattern. We describe a poling pattern responding to a local maximum of this efficiency.

NLMD4
Negative group velocities in quasi-phase-matched second-order nonlinear optical interactions, *S. Longhi, P. Laporta, M. Marano; Istituto Nazionale per la Fisica della Materia, Dipartimento di Fisica, Politecnico di Milano, Italy.*
Cascading effects can lead to anomalous group velocities for pulse propagation in quasi-phase-matched parametric amplifiers. This phenomenon permits to observe negative transit times in a photonic devices, simulating resonant propagation through a gain-doublet atomic system

NLMD5
Novel type nonlinear semiconductor waveguide crystal for efficient frequency up/down conversion, *E. U. Rafailov, P. Loza-Alvarez,Univ. of St. Andrews, UK; D. Artigas,Univ. Politecnica de Catalunya, Spain; M. B. Flynn, W. Sibbett,Univ.of St Andrews, UK.*
We demonstrate SHG at 980 nm from a novel first-order QPM semiconductor GaAs/AlGaAs waveguide crystal. Our calculations show that the SHG conversion efficiency from the crystal significantly exceeds that from PPLN for wavelengths exceeding 3.4 µm for both femtosecond and CW pump beams

NLMD6
Semiconductor optical amplifier Mach-Zehnder interferometers with feedback, *R. Van Dommelen, M. Cada, Dalhousie Univ.,Canada.*
We present new results on numerical simulations carried out on semiconductor optical amplifier Mach-Zehnder interferometers with feedback. We show that these devices can exhibit bistability, with the potential for high speed all-optical switching applications.

NLMD7

Shaping the optical components of solitary three-wave weakly coupled states in a two-mode crystalline waveguide, *Alexandre S. Shcherbakov, Natl. Inst. for Astrophysics, Mexico.*
Bragg solitons, representing collinear three-wave weakly coupled states, are investigated both theoretically and experimentally. The dynamics of shaping their optical components is studied, and the roles of localizing pulse width and phase mismatch are revealed.

NLMD8

Instability of gap 2π-pulses, *B.I.Mantsyzov,R.A.Silnikov, Moscow State Univ., Russia.*
Different regimes of the gap 2π-pulse dynamics in the one-dimensional resonantly absorbing Bragg grating are studied. A new family of stable oscillating and excited unstable gap 2π-pulses is analytically and numerically described by transition from the two-wave Maxwell-Bloch equation to the modified sine-Gordon equation and by direct integration of the Maxwell-Bloch equation.

NLMD9

All-optical AND gate using Kerr nonlinear microresonators, *Suresh Pereira, Philip Chak, J. E. Sipe, Univ. of Toronto, Canada.*
We demonstrate numerically that two channel waveguides, coupled by Kerr nonlinear microresonators, can operate as an all-optical AND gate. The device is about 100mm long, and intensity thresholds are lower than in similar Bragg systems.

NLMD10

Triply resonant integrated optical parametric oscillator, *B. Naveh, S. Ruschin, Tel-Aviv Univ., Israel; Z. Weissman, Tel-Hai Academic Coll., Israel.*
We report the modeling of a triply resonant, quasi phase matched, one chip, integrated optical parametric oscillator. Using a novel iterative calculation scheme, we predict threshold levels, conversion efficiency, passive and active tuning behavior and bistability.

NLMD11

Complete description of all modulational instability gain bands generated by nonlinear QPM gratings, *Ole Bang, Tech. Univ. of Denmark, Denmark; Joel F. Corney, Univ. of Queensland, Australia.*
We consider plane waves propagating in quadratic nonlinear slab waveguides with nonlinear quasi-phase-matching gratings. We predict analytically and verify numerically the complete gain spectrum for transverse modulational instability, including hitherto undescribed higher order gain bands.

NLMD12

Temporal compression of self-focusing femtosecond pulses in silica glasses, *Helene Ward, Luc Berge, CEA-DAM, France.*
Compression of femtosecond pulses to a few optical-cycles duration by coupling with an electron plasma in solids is shown. Nonlinear dissipation induced by multiphoton-absorption, and fast temporal modulations induced shock-terms can, however, maintain self-guided propagation.

NLMD13

Mode coupling by photorefractive grating in multiple quantum well slab waveguide, *Ewa Weinert-Raczka, Marek Wichtowski, Tech. Univ. of Szczecin, Poland.*
Photorefractive grating in slab waveguide based on semi-insulating AlGaAs/GaAs multiple quantum well structure with electric field applied along the quantum well planes as an externally controlled, frequency selective mode coupling element with memory is analysed.

NLMD14

Measurement of optical frequency ratios using a spectrally broadened frequency comb, *Nils Haverkamp, Joern Stenger, Harald Schnatz, Christian Tamm, Harald R. Telle, Phys.-Tech. Bundesanstalt, Germany.*
Due to nonlinear effects, fsec-pulses from a mode-locked laser are spectrally broadened in a photonic crystal fiber to span an octave in the visible wavelength region. Using this comb, we measured frequency ratios.

NLMD15

Nonlinear interactions in slow-wave structures, *A. Melloni, M. Martinelli, S. M. Pietralunga, DEI, Italy; F. Morichetti, CoreCom, Italy.*
Nonlinear interactions in coupled resonator slow-wave structures are investigated. Kerr based phase modulation and wavelength conversion by four-wave-mixing result strongly enhanced thanks to both the increase of the intra-cavity mean power and the interaction time between propagating fields.

NLMD16

Peakons - a novel type of robust pulses in photonic crystals, *U.Peschel, F.Lederer, Friedrich-Schiller-Univ. Jena, Germany; B.A.Malomed, Tel Aviv Univ., Israel.*
We demonstrate that near resonances, e.g. around the band gaps of Bragg gratings, non-solitonic pulses can propagate undistorted. These so-called peakons are stabilized by nonlinearly induced self-phase modulation, which shifts their frequency out of resonance.

NLMD17

Canonical Hamiltonian formulation for nonlinear pulse propagation in 3D photonic bandgap structures, *Suresh Pereira, Philip Chak, J. E. Sipe, Univ. of Toronto, Canada.*
We present a canonical Hamiltonian formulation for pulse propagation in a Kerr nonlinear 3D photonic bandgap material (PBG). The formulation is amenable to bulk crystals and to patterned waveguides in PBGs.

NLMD18

Depositing light in a photonic stop gap using Kerr nonlinear microresonators, *Philip Chak, J. E. Sipe, Suresh Pereira, Univ. of Toronto, Canada.*
We numerically simulate the trapping of light, via four-wave mixing, in a photonic stop gap using Kerr nonlinear microresonators. We also present a scheme, based on cross-phase modulation, to retrieve the trapped light.

NLMD19

Efficient integrated Ti:PPLN MIR-optical parametric generator, *Marc C. Huebner, D. Hofmann, W. Sohler, Univ. of Paderborn, Germany.*
Efficient tunable MIR-optical parametric fluorescence was demonstrated for the first time in a 80mm long single mode Ti:PPLN channel guide of 31 µm domain periodicity. Up to several µW of MIR-power were generated using a modelocked fiber laser as pump source.

NLMD20

Faraday patterns in Bose-Einstein condensates, *Kestutis Staliunas,PTB Braunschweig,Germany; Stefano Longhi, Politech. di Milano,Italy; German J. de Valcarcel, Univ. de València,Spain.*
Temporal periodic modulation of the scattering length in Bose-Einstein condensates is shown to excite subharmonic patterns of atomic density through a parametric resonance. The patterns are analogous to the Faraday waves excited in vertically vibrated liquids.

NLMD21

Stability of spiralling solitary waves in Hamiltonian systems, *D.V. Skryabin, Univ. of Bath, UK; J.M. McSloy, W.J. Firth, Univ. of Strathclyde, UK.*
We present a rigorous criterion for stability of spiralling solitary structures in Hamiltonian systems incorporating the angular momentum integral and demonstrate its applicability to the spiralling of two mutually incoherent optical beams propagating in photorefractive material.

NLMD22

Dynamics of an optical beam in parabolic waveguide with periodic and random nonlinear refractive index, *F.Kh. Abdullaev, Physical-Tech. Inst. of the Uzbek Acad. of Sciences, Uzbekistan; J.C.Bronski, Univ. of Illinois-Urbana-Champaign, USA; R.M. Galimzyanov, Physical-Tech. Inst. of the Uzbek Acad. of Sciences,Uzbekistan.*
Oscillations and associated resonance of an 2D optical beam under periodic and random modulations of nonlinear refractive index. For random oscillations the mean growth rate for the beam width is calculated. Analytical results are compared with the numerical simulations of the full 2D NLS equation.

NLMD23

Non-paraxial dark solitons, *P. Chamorro-Posada, Univ. de Oviedo, Spain;G.S. McDonald, Univ. of Salford, UK; G.H.C. New, Imperial Coll., UK.*
We present an analysis of the properties of dark spatial solitons when the paraxial restriction is removed. The results reveal modifications in the soliton phase period, width and transverse velocity.

NLMD24

Lossless planar X-junctions induced by vector solitons, *Andrey A. Sukhorukov, Nail N. Akhmediev, Australian Natl. Univ., Australia.*
We propose a new design for planar X-junctions based on vector soliton theory. Transmission coefficients for such device can vary from zero to a maximun value for any fixed angle between the waveguide channels.

NLMD25

Optical vortices of parametrically coupled waves, *Anatoly P. Sukhorukov, Alexey A. Kalinovich, Moscow State Univ., Russia; Gabriel Molina-Terriza, Lluis Torner,Univ. Politech. da Catalunya, Spain.*
We demonstrate two-component generation of one or three dislocations by equally charged input vortices, and two or four ones by oppositely charged singularities. The vortex 3D trajectories are calculated when the beams interact due to frequency conversion.

NLMD27

Collapse of optical vacuum pulses due to QED nonlinearities, *D. Anderson, M. Lisak, M. Marklund, P. Johannisson ,Chalmers Univ. of Tech., Sweden; G. Brodin, L. Stenflo, Umea Univ., Sweden.*
Due to quantum electrodynamical (QED) effects there are nonlinear corrections to Maxwell's equations in vacuum. We show that stationary two-dimensional light bullets can form, which are unstable and exhibit the possibility of self-focusing collapse.

NLMD28

Self-pumped phase conjugation in a $BaTiO_3$:Rh waveguide, *P.A. Márquez Aguilar,Univ. Autónoma del Estado de Morelos, México; P. Mathey,Univ. de Bourgogne,France; P. Moretti, Univ. Claude, France; D. Rytz, GmbH, Germany.*
We present a self-pumped phase conjugator originated by self-bending of the incident beam at $\lambda = 515$ nm in a $BaTiO_3$:Rh waveguide elaborated by three successive He^+ ion implantations. Phase conjugate reflectivity reached is 28 %.

NLMD29

Reflection of excited vector spatial solitons from an interface between two photorefractive media, *Ilya Shadrivov, The Australian Natl. Univ. Canberra, Australia; Alexander A. Zharov, Russian Acad. of Sciences, Russia*
Momentum method towards a study of multi-component spatial solitons dynamics in photorefractive media was developed. It describes both an excitation of the soliton intrinsic degrees of freedom associated with the oscillations of centres of gravity of the beams making up the soliton and soliton interaction with nonlinear interface.

NLMD30

Analysis of fields of nonlinear-cladding optical waveguides with butt-coupled linear waveguides: Effects of the film index, *Kiyoshi Tsutsumi, Kyoto Inst. of Tech., Japan.*
Effects of the film index of nonlinear-cladding optical waveguides are investigated numerically. The path of a beam winds between the film and the nonlinear cladding for larger film index, whereas soliton-like emission occurs for smaller film index.

NLMD31

Interaction of incoherently coupled transversely asymmetric beams, *P. Papagiannis, K. Hizanidis, Natl. Tech. Univ. of Athens, Greece.*
The stationary evolution of two incoherently coupled beams of bi-Gaussian intensity profile propagating in a bulk Kerr or saturable medium is studied variationally. The stability is investigated on the basis of the Vakhitov-Kolokolov criterion and comparisons are made with numerical integration of the (2+1)D coupled NLS equations involved.

NLMD32

Spatial solitons in nematic liquid crystals: A new model, *Claudio Conti, Marco Peccianti, Gaetano Assanto, Natl. Inst. for the Physics of Matter, Univ. "Roma Tre", Italy.*
We derive a model describing 3D spatial solitons in nematic liquid crystals. These solitary waves are governed by the same equations of parametric simultons, with nonlocality being the dominant stability mechanism.

NLMD33

Exact soliton solutions of the quintic complex Swift-Hohenberg equation of the quintic complex Swift-Hohenberg equation, *Adrian Ankiewicz, The Australian Natl. Univ., Australia; Kenichi Maruno, Kyushu Univ.,Japan; Nail Akhmediev,Australian Natl.Univ.,Australia.*
Several soliton solutions of the complex quintic generalized complex Swift-Hohenberg equation (CSHE) are found analytically. These solutions exist for certain relations between the parameters of CSHE which are also presented analytically.

NLMD34

Spatial solitons and Anderson localisation, *Kestutis Staliunas, PTB Braunschweig,Germany.*
Anderson localization is the spatial localization of the wavefunction of electrons in random media. We suggest, that analogous phenomenon can stabilize the spatial solitons in optical resonators: the spatial solitons in resonators with randomly distorted mirrors are more stable, than in perfect mirror resonators.

NLMD35

Discrete solitons in nonlinear zigzag optical waveguide arrays with tailored diffraction properties, *Nikos K. Efremidis, Jared Hudock, Demetrios N. Christodoulides, CREOL, USA.*
We show that the discrete diffraction properties of a nonlinear optical zigzag waveguide array can be signifigantly modified by exploiting the topological arrangement of the lattice itself. This introduces extended interactions (beyond nearest-neighbors), which, in turn, affect the lattice dispersion relation within the Brillouin zone. As a result, we demonstrate that new families of discrete soliton solutions are possible which are stable over a wide range of parameters. Our method opens new opportunities for diffraction management that can be employed to generate low power spatial discrete optical solitons.

NLMD36

Engineering the nonlinear phase shift, *Yan Chen, Benjamin Yang, Geeta Pasrija, Steve Blair, Univ. of Utah, USA.*
Large nonlinear phase shifts can be achieved using cascaded and coupled microresonator systems even if the constituent material has large linear and two-photon absorption. Proper design can maintain nearly constant intensity transmittance.

NLMD37

Characterisation and process evolution of quasi-phase-matched semiconductor superlattice waveguides using intermixing, *K. Zeaiter, T. C. Kleckner, J. S. Aitchison, D. C. Hutchings, Univ. of Glasgow, UK.*
We characterise the intermixing fabrication process by examining the photoluminescence spectra. Subsequently we adapt the process, which was initially developed for optoelectronic integration, to be optimised for the production of semiconductor superlattice waveguides for quasi-phase-matched frequency conversion.

NLMD38

Symmetry properties of χ^3 in semiconductor heterostructure waveguides, *D. C. Hutchings, Univ. of Glasgow, UK.*
The symmetry of the third-order susceptibility tensor elements is addressed for semiconductor heterostructures. 8 independent elements are found for the normal sample geometry and coefficients for nonlinear refractive phenomena are derived. The change in dimensionality with intermixing is discussed.

NLMD39

Self-bending of the light in a photorefractive planar waveguide fabricated with He^+ implanted $BaTiO_3$:Rh, *Pierre Mathey,Univ. de Bourgogne,France; Pedro Marquez, Univ. Autonoma del Estado de Morelos, Mexico; Paul Moretti, Univ. Claude Bernard Lyon 1, France; Daniel Rytz, Edelmetalle GmbH, Germany.*
The self-bending of a beam caused by the photorefractive non-linearity is observed in a $BaTiO_3$:Rh waveguide. The response time in function of the intensity is compared with the results in the bulk.

NLMD40

Diffraction effects in copper-doped helium-implanted $LiNbO_3$ waveguide, *Yury M. Larionov,Marina N. Frolova, Stanislav M. Shandarov, State Univ. of Control Systems and Radioelectronics, Russia; Sergey M. Kostritski, Kemerovo State Univ., Russia.*
We report an experimental observation of leaky substrate TM modes diffraction on a grating-like periodical structure formed by defects of waveguide layer. Appearance of such defects we explain by features of copper-doped helium-implanted optical $LiNbO_3$ waveguide fabrication process.

NLMD41

Femtosecond measurement of nonlinear refraction in periodically poled lithium tantalate, *S. Ashihara, J. Nishina, T. Shimura, K. Kuroda, Univ. of Tokyo, Japan.*
We present femtosecond measurements of nonlinear refraction in periodically poled lithium tantalate by using spectrally resolved two-beam coupling. The sign and magnitude of nonlinear phase shifts induced by cascade quadratic nonlinearity and intrinsic Kerr nonlinearity are measured.

NLMD42

Towards an optical parametric oscillator in a GaAs-based waveguide, *A. De Rossi, M. Calligaro, V. Ortiz, THALES Res. and Tech., France; V. Berger, Univ. Denis Diderot Paris VII, France.*
We will discuss the feasibility of an integrated parametric oscillator based on GaAs. Results on parametric fluorescence will be presented. Minimization of losses and mirror deposition are the crucial points for obtaining parametric oscillation. A threshold around 100 mW is expected

NLMD43

Photorefractive solitons and light induced resonance control in semiconductor CdZnTe, *Tal Schwartz, Yaniv Ganor, Tal Carmon, Raam Uzdin, Sharon Shwartz, Mordechai Segev, Technion - Israel Inst. of Tech., Israel; Uri El-Hanany, Imarad Imaging Systems LTD., Israel.*
We experimentally demonstrate the formation of (1+1)D and (2+1)D solitons in photorefractive CdZnTe:V, exploiting the intensity-resonant behavior of the space charge field. We show that the resonance intensity is tunable, allowing soliton formation times as low as 10μ sec scales with very low optical power.

NLMD44

Efficient parallel algorithm for Simulating wavelength-division-multiplexed dispersion-managed optical fiber systems, *P.M. Lushnikov, Los Alamos Natl. Lab., USA.*
An efficient numerical algorithm is presented for massively parallel computation of dispersion-managed wavelength-division-multiplexed optical fiber systems. The algorithm is based on a weak nonlinearity approximation and independent parallel calculation of fast Fourier transforms.

NLMD45

Nonclassical statistics of intracavity coupled quadratic nonlinear waveguides: The quantum optical dimmer, *M. Bache, Yu. B. Gaididei, P. L. Christiansen, Tech. Univ. of Denmark, Denmark.*
Two quadratic nonlinear waveguides are immersed in a cavity suited for second-harmonic generation. The quantum equations are derived to calculate intensity correlation spectra and strong quantum violations of the classical limit is observed.

NLMD46

Dark-ring cavity solitons in lasers with bichromatic injected signal, *German J. de Valcarcel, Univ. de Valencia, Spain; Kestutis Staliunas, Physikalisch Tech. Bundesanstalt, Germany.*
We show theoretically that broad area lasers driven by a nearly resonant bichromatic field may support dark-ring cavity solitons as well as domain walls and labyrinthine patterns.

NLMD47

Localized structures formation and control in second-harmonic, intra-cavity generation, *E. Toniolo, M. Giltrelli, M. Santagiustina, INFM and Univ. of Padova, Italy.*
A regime in which spontaneous formation of localized structures occurs is found for intra cavity second harmonic generation. Independent writing, erasing and moving of structures are numerically demonstrated.

NLMD48

Two-dimensional clusters of solitary structures in driven optical cavities, *J. M. McSloy, W. J. Firth, Univ. of Strathclyde, UK; A. G. Vladimirov, St. Petersburg State Univ., Russia; D. V. Skryabin, Univ. of Bath, UK; N. N. Rosanov, Res. Inst. for Laser Physics, Russia.*
Interaction between localized structures in the transverse plane of a passive optical cavity containing a saturable medium is studied analytically and numerically. Stability properties of clusters of localized structures and their spontaneous motion are described.

NLMD49

Optical parametric oscillator in waveguides induced by photorefractive spatial solitons, *Song Lan,Princeton Univ., USA; J.A. Giordmaine, Princeton Univ., USA and NEC Res. Inst.,USA; Mordechai Segev, Technion – Israel Inst. of Tech., Israel and Princeton Univ., USA;Daniel Rytz, FEE GmbH, Germany.*
We demonstrate experimentally an optical parametric oscillator constructed in the waveguide induced by photorefractive spatial solitons, and show that the pumping threshold is reduced considerably.

NLMD50

Frequency up-conversion of 770 nm ultra-short pulses by two-photon absorption in doped PMMA fibers, *Grace Jordan, Takeyuki Kobayashi, Werner J. Blau, Trinity Coll.,Ireland; Hartwig Tillmann, Hans-Heinrich Hörhold, Friedrich-Schiller-Univ., Germany.*
We report on the up-converted emission of blue light from a novel organic stilbenoid compound (1,4-bis(diphenylamino-styryl)-benzene) dopant in a PMMA fiber due to the two-photon absorption of 770 nm pulses from a Tittanium Sapphire laser.

NLMD51

Long-wavelength continuum generation about the second dispersion zero of a tapered fiber, *J. M. Harbold, F. O. Ilday, F. W. Wise,Cornell Univ., USA; T. A. Birks,W. J. Wadsworth, Univ. of Bath, UK;Z. Chen, Univ.of California-Irvine, USA.*
We demonstrate continuum generation at wavelengths longer than the zero-dispersion wavelength of ordinary fiber for the first time using a narrow-diameter tapered fiber.

NLMD52

Origin of supercontinuum generation in microstructured fibers, *Alexander L. Gaeta, Cornell Univ., USA;Xun Gu, Lin Xu, Mark Kimmel, Erik Zeek, Patrick O'Shea, Aparna P. Shreenath, Rick Trebino, Georgia Inst. of Tech., USA;Robert S. Windeler, OFS Fitel Lab., USA.*
We investigate the propagation of femtosecond pulses in microstructured fibers under conditions in which a supercontinuum is generated. We find that higher-order dispersion primarily determines the spectral envelope and that it contains a highly complicated underlying sub-structure which is highly sensitive to input fluctuations.

NLMD53

Exact solitary wave solutions of the nonlinear Schrodinger equation with distributed gain, *V.I. Kruglov,J.D. Harvey, Univ. of Auckland, New Zealand.*
We present new exact analytical solutions to the NLSE with gain in the anomalous dispersion regime corresponding to a compressing or spreading solitary pulses. These solutions have application in high gain nonlinear fiber amplifiers.

NLMD54

Timing and amplitude jitter due to intra-channel dispersion-managed pulse interactions, *Toshihiko Hirooka, Mark J. Ablowitz, Univ. of Colorado, USA.*
Analytical expressions to estimate timing and amplitude jitter due to intra-channel pulse interactions in dispersion-managed systems are provided. Results are compared to direct numerical simulation. Distributed amplification reduces timing and amplitude jitter with fixed path-average power.

NLMD55

Design considerations of all-optical header processing circuit for a novel packet forwarding scheme in optical networks, *W. M. Wong, K. J. Blow,Aston Univ., UK.*
Design of an all-optical circuit that performs modulo-N operation for packet forwarding without header modification in optical networks is presented. Design considerations such as gain modulation effects and bit rate and pattern dependence are investigated.

NLMD56

Traveling-wave model of semiconductor optical amplifier based nonlinear loop mirror with feedback, *W. M. Wong, K. J. Blow, Aston Univ., UK.*
A traveling-wave model of an all-optical switching device with feedback is developed to identify important dynamical effects for better prediction of device behavior. Using a constant lifetime approximation, an efficient heuristic model is also developed.

NLMD57

Wavelength-division-multiplexed bi-soliton transmission in dispersion-managed system, *Takashi Inoue, Yasuhiro Yoshika, Akihiro Maruta, Osaka Univ., Japan.*
Bi-soliton transmission in dispersion-managed WDM system is studied. It is numerically confirmed that anti-phase bi-soliton is more robust for the collision than in-phase one. The XPM effects induced by the collision can be analyzed by using the variational method.

NLMD58

Towards nonlinear waveguide devices from conjugated polymers: Tuning of the materials properties and structuring, *A. Bahtiar, K. Koynov, C. Bubeck, Max-Planck-Inst. for Polymer Res., Germany; M. A. Bader, U. Wachsmuth, G. Marowsky, Laser-Lab. Göttingen e.V., Germany.*
We prepared slab waveguides of the conjugated polymer MEH-PPV and demonstrate that fine-tuning of refractive index is feasible by control of molecular weight. Grating waveguide structures are fabricated by UV-laser ablation.

■ Tuesday
■ September 3, 2002

Room: Auditorium

8:00am–10:00am

NLTuA ▪ Discrete Solitons and Waveguide Arrays

George I. Stegeman, Univ. of Central Florida, United States, Presider Presider

NLTuA1 8:00am

Discrete solitons in quadratic nonlinear waveguide arrays, *T. Pertsch, U. Peschel, F. Lederer, Friedrich-Schiller-Univ. Jena, Germany; J. Meier, Roland Schiek, Robert Iwanow, George Stegeman, CREOL, USA; Yoo Hong Min, Wolfgang Sohler, Univ. Paderborn, Germany.*
We observed the formation of discrete solitons in periodically poled Lithium Niobate (PPLN) waveguide arrays. Strongly localized dichromatic nonlinear beams were excited with fundamental wave pulses at a wavelength of 1572 nm.

NLTuA2 8:15am

Discrete gap solitons in modulated waveguide arrays, *Andrey A. Sukhorukov, Yuri S. Kivshar, Australian Natl. Univ., Australia.*
We demonstrate that the discrete gap solitons can be efficiently generated in arrays of optical waveguides with alternating widths. Depending on the light intensity, these solitons display the properties of both conventional and Bragg grating solitons.

NLTuA3 8:30am

Discrete vector Kerr spatial solitons in AlGaAs array waveguides, *Joachim Meier, George Stegeman, CREOL, USA; H.S. Eisenberg, Y. Silberberg, The Weizmann Institute of Science, Israel; R. Morandotti, J.S. Aitchison, Univ. of Toronto, Canada.*
We report the first observation of discrete vector solitons in arrays of AlGaAs waveguides. By changing the phase between the TE and TM soliton components, we were able to control their relative amplitude.

NLTuA4 8:45am

Discrete solitons in photorefractive optically-induced photonic lattices, *Nikos K. Efremidis, Jared Hudock, Demetrios N. Christodoulides, CREOL, USA; Jason Fleischer, Suzanne Sears, Mordechai Segev, Princeton Univ., USA.*
We demonstrate that optical discrete solitons are possible in appropriately oriented biased photorefractive crystals. This can be accomplished in optically-induced periodic waveguide lattices that are created via plane wave interference. Our method paves the way towards the observation of entirely new families of discrete solitons.

NLTuA5 9:00am

The action of linear modes on the evolution and on the decay of discrete solitons, *U.Peschel, F.Lederer, Friedrich-Schiller-Univ. Jena, Germany; R. Morandotti, J. S. Aitchison, Univ. of Toronto, Canada; H. S. Eisenberg, Y. Silberberg, The Weizmann Inst. of Science, Israel.*
We experimentally investigate how linear modes evolve around the soliton state. In the presence of nonlinear absorption they induce collapse and subsequent splitting of the soliton, or a transverse motion opposite to initial beam tilts.

NLTuA6 9:15am

Strong spatiotemporal localization in an array of silica waveguides, *D. Cheskis, S. Bar-Ad, Tel Aviv Univ., Israel; R. Morandotti, J. S. Aitchison, Univ. of Toronto,Canada;D. Ross, Univ. of Glasgow,UK; H.S Eisenberg, Y. Silberberg, Weizmann Inst. of Science, Israel.*
We experimentally investigated beam propagation in an array of silica waveguides, under a regime of anomalous dispersion and for different input conditions. In all the cases, we succeeded in compressing most of the energy in a single waveguide.

NLTuA7 9:30am

Optically-controlled photorefractive solitons arrays, *Jürgen Petter, Inst.of Applied Physics, Germany; Denis Träger, Cornelia Denz,Wilhelms-Univ. Münster, Germany.*
We present an optically-controlled array of photorefractive spatial screening solitons. Each channel of the array is found to guide a probe beam independently. Furthermore a Y-coupler within the array is realized by combining two channels with an additional control beam.

NLTuA8 9:45am

Discrete solitons in optically-induced real-time waveguide arrays, *J. W. Fleischer, M. Segev, Technion - Israel Inst. of Tech., Israel and Princeton Univ., USA; T. Carmon, Technion - Israel Inst. of Tech., Israel; N. K. Efremidis, D. N. Christodoulides, CREOL, USA.*
We report the first experimental observation of discrete solitons in an array of optically-induced waveguides. The waveguide arrays are induced in photorefractives by interfering pairs of plane waves, and the solitons form when the screening nonlinearity is employed. We demonstrate both in-phase and staggered bright solitons in 1-D arrays and discuss recent experiments in 2D waveguide lattices.

Room: Auditorium

10:30am–12:30pm

NLTuB ■ Dissipative Spatial Structures

Luigi Alberto Lugiato, Univ. Degli Studi Dell'Insubria, Italy, Presider Presider

NLTuB1 10:30am Invited

Interaction of dissipative localized structures in nonlinear optics, *Dmitry V. Skryabin, Univ. of Bath, UK.* Recent theoretical results on existence and stability of static, moving and rotating clusters of bright spatially localized structures of light in passive and active optical cavities will be reported.

NLTuB2 11:00am

Cavity pattern formation with incoherent light, *Tal Carmon, Mordechai Segev, Technion, Israel; Marin Soljacic, MIT, USA.* We present the first observation of cavity modulation instability and pattern formation with incoherent light. In addition, we also study, theoretically and experimentally, the evolution of patterns in a nonlinear cavity without resonant frequencies: a passive cavity for which beams from different cycles are mutually-incoherent with one another.

NLTuB3 11:15am

Self-propelled solitons and moving patterns in a nonlinear resonator, *Andrew J. Scroggie, John M. McSloy, William J. Firth, Univ. of Strathclyde, UK.* Spontaneously moving bright and dark spatial solitons and patterns are shown to exist in a nonlinear resonator. The motion is caused by thermal effects and arises through an instability of the stationary soliton.

NLTuB4 11:30am

Cavity solitons work as pixels in semiconductors, *S. Barland, M. Giudici, J. R. Tredicce,Inst. Non Lineaire de Nice, France; S. Balle, IMEDEA, Spain; M. Brambilla, T. Maggipinto, Univ. di Bari, Italy; L. A. Lugiato, L. Spinelli, G. Tissoni, Univ. dell'Insubria, Italy;T. Knödl, M. Miller, R. Jäger, Univ. of Ulm, Germany.* By using a vertical cavity semiconductor amplifier with a large Fresnel number, driven by a coherent field, we provide the first proof of the generation of cavity solitons in semiconductors, written and erased independently of each other and of the boundary.

NLTuB5 11:45am

The origin of motion of solitary waves near Hopf bifurcations, *D. Michaelis, Fraunhofer Inst. für Angewandte Optik und Feinmechanik, Germany; U. Peschel, F. Lederer, Friedrich Schiller-Univ. Jena, Germany; D.V. Skraybin, Univ. of Bath, UK; W.J. Firth, Univ. of Strathclyde, UK..* We show that the coupling between oscillating eigenstates and the translational mode causes solitary waves to move steadily, oscillatory or with irregular jumps. Theoretical results are compared with numerical simulations for different dissipative systems.

NLTuB6 12:00pm

Effects of nonlinear guiding on spontaneous pattern formation: Formation of spirals and target patterns, *F. Huneus, T. Ackemann, B. Schaepers, W. Lange, Univ. Muenster, Germany.* Nonlinear guiding induced by gradients of the pump beam intensity can drastically affect optical pattern formation. A specific example is the emergence of spiral and target patterns in a single-mirror scheme with sodium vapor.

NLTuB7 12:15pm

Dark ring cavity solitons and stable droplets in models of nonlinear optical cavities, *Damià Gomila, Pere Colet, Maxi San Miguel,IMEDEA (CSIC-UIB), Spain;Gian-Luca Oppo,Andrew Scroggie, Univ. of Strathclyde, UK.* Two kinds of localized structures are found in different regimes in nonlinear Kerr cavities and optical parametric oscillators. Its dynamics is closely related to the growth rate of spatial domains of different phases.

Room: Auditorium

2:00pm–4:00pm

NLTuC ■ Fiber Nonlinearity Applications

Nail N. Akhmediev, Australian National University, Australia, Presider Presider

NLTuC1 2:00pm Invited

Ultrafast optical TDM transmission with the use of novel nonlinear optical fiber devices, *Masataka Nakazawa, Tohoku Univ., Japan.* We have recently succeeded in transmitting an ultrafast OTDM signal which exceeds 1 Tbit/s over 70 km with the adoption of nonlinear optical fiber devices such as soliton compressor, DI-NOLM for pulse shaping, and NOLM for Terabit/s demultiplexing. In this talk, key technologies for ultrahigh-speed OTDM transmission are described.

NLTuC2 2:30pm

Raman gain efficiencies of modern terrestrial transmission fibers in S-, C- and L-band, *D. Grot, L. Bathany, S. Gosselin, M. Joindot, France Telecom R&D, France; S. Bordais, Y. Jaouen, J.M. Delavaux, Keopsys, France.* We report the most complete measurements presented to date of Raman gain efficiency and noise figure for current G.652 and G.655 fibers in all three transmission windows (S-, C- and L-band). Such fiber characterization is paramount to the engineering and deployment of future terrestrial 40 Gbit/s-based WDM transmission systems.

NLTuC3 2:45pm

160-GHz picosecond pulse train generation through multiwave mixing compression of a dual frequency beat signal, *Julien Fatome, Stéphane Pitois, Guy Millot, Univ. de Bourgogne,France.* We report the experimental generation and characterization of a 160-GHz picosecond pulse train using multiple four-wave mixing temporal compression of an initial dual frequency beat signal in the anomalous-dispersion regime of a non-zero dispersion shifted fiber.

NLTuC4 3:00pm
Cross correlation frequency-resolved optical gating characterization of supercontinuum generation in microstructure fiber: Simulation and experiment, *John M. Dudley, Univ. de Franche-Comté, France; Xun Gu, Lin Xu, Mark Kimmel, Erik Zeek, Patrick O'Shea, Aparna P. Shreenath, Rick Trebino, Georgia Inst. of Tech., USA; Stéphane Coen,Univ. Libre de Bruxelles, Belgium.*
Cross-correlation frequency resolved optical gating (XFROG) characterization of supercontinuum generation in microstructure fiber is studied using numerical simulations and experiments. The XFROG trace clearly reveals the signatures of dispersive wave and Raman soliton generation.

NLTuC5 3:15pm
Broadband 60% energy conversion of a two-pump fiber optical parametric amplifier, *Jose Manuel Chavez Boggio, Hugo Luis Fragnito, IFGW-UNICAMP, Brazil; Walter Margulis, ACREO, Sweden.*
We demonstrate over 60% energy conversion on 20 nm bandwidth centered at 1568 nm in a two-pump fiber optical parametric amplifier.

NLTuC6 3:30pm
Spectral phase fluctuations and coherence degradation in supercontinuum generation in photonic crystal fibers, *John M. Dudley, Remo Giust, Univ. de Franche-Comté, France; Stéphane Coen, Univ. Libre de Bruxelles, Belgium.*
Numerical simulations are used to study spectral phase fluctuations and coherence degradation in supercontinuum generation in photonic crystal fibers. The spectral coherence is shown to depend strongly on the input pulse duration and wavelength.

NLTuC7 3:45pm
Single-mode supercontinuum generation in a standard dispersion-shifted fiber using a nanosecond microchip laser, *A. Mussot, L. Provino, T. Sylvestre, H. Maillotte, UMR CNRS/Univ. de Franche Comté, France.*
We have generated a single-mode supercontinuum of more than 1100-nm simply using a nanosecond microchip laser and an usual dispersion-shifted fiber in a regime in which both self-phase modulation and parametric generation near the zero dispersion wavelength cannot be involved in the continuum formation.

Room: Lower Level Foyer

4:00pm–6:00pm
NLTuD ■ Poster Session: 2

NLTuD1
Thermal effects and spontaneous motion of cavity solitons in semiconductor microcavities, *T. Maggipinto, I. M. Perrini, M.Brambilla, INFM and Univ. di Bari, Italy; L. Spinelli, G. Tissoni, L.A. Lugiato, INFM and Univ. dell'Insubria, Italy.*
We formulate a model to describe the spatio-temporal dynamics of a semiconductor microcavity driven by an external field including the thermal field. A new kind of modulational instability is found, leading to travelling cavity solitons and patterns.

NLTuD2
Image processing with cavity type-II second harmonic generation, *Pierre Scotto, Pere Colet, Maxi San Miguel, Campus Univ. Illes Balears, Spain.*
Injecting in a Type II intracavity second harmonic generation an image in one polarization and a homogeneous field in the other, we can perform either a frequency and polarization transfer or a contrast enhancement.

NLTuD3
Noise-induced growth of arrays of spatial solitons in optical parametric oscillator, *Ivan Rabbiosi, Andrew Scroggie, Gian-Luca Oppo, Univ. of Strathclyde, UK.*
Domain walls with oscillatory tails can lock and form spatially irregular stable states in models of nonlinear optical devices. Their stochastic dynamics lead instead to the formation of periodic arrays of solitons.

NLTuD4
Unconditional instability of the degenerate backward optical parametric oscillator, *C. Montes,A. Picozzi, Univ. de Nice-Sophia Antipolis, France; C. Durniak, M. Taki,Univ. de Sciences et Tech. de Lille,France.*
Stability analysis of the degenerate backward optical parametric oscillator in the quasi-phase-matching decay interaction, between a cw-pump and a counter-propagating signal, proves that the inhomogeneous stationary solutions are always unstable whatever the cavity length and pump power.

NLTuD5
Spatial solitons in an optically pumped semiconductor microresonator, *V. B. Taranenko, C. O. Weiss, Physikalisch-Tech. Bundesanstalt, Germany.*
We show experimentally and numerically the existence of stable spatial solitons in an optically pumped semiconductor microresonator. We demonstrate that the pump substantially reduces the light intensity necessary to sustain the solitons.

NLTuD6

Spectral control of solitons under periodical dispersion-slope compensation, *Joji Maeda, Ichiro Matsuda, Tokyo Univ. of Science, Japan.*
Effects of guiding filters on solitons in fiber links with periodical dispersion slope-compensation are numerically studied. The optimum filter bandwidth and the optimum transmission power are discussed in comparison with slope-free fiber links.

NLTuD7

Stability criterion for solitons in passively mode-locked fiber lasers, *J. M. Soto-Crespo, C.S.I.C., Spain, Nail Akhmediev,Australian Natl. Univ., Australia,Graham Town, Univ. of Sydney, Australia.*
The complex cubic-quintic Ginzburg-Landau equation has multiplicity of soliton solutions for the same set of parameters. Based on their analysis, we propose a conjecture for a stability criterion for solitons in dissipative systems.

NLTuD8

Compound state of dark and bright solitons in dispersion-managed fibers, *M. Stratmann, F. Mitschke, Univ. Rostock, Germany.*
We report of a bright-dark-bright soliton compound state in dispersion managed fibers with either sign of path-average dispersion.

NLTuD9

Cross-phase-modulation induced modulation instability in Raman fiber amplifiers, *I.Velchev, R.Pattnaik, J.Toulouse, Lehigh Univ., USA.*
Modulation instability in forward-pumped Raman amplifiers is investigated in detail. The frequency dependence of the instability is explained in terms of a two-beam coupling process due to a finite relaxation time of the Kerr nonlinearity.

NLTuD10

Numerical study of parabolic pulse generation in microstructured fibre Raman amplifiers, *A.C. Peacock, N.G.R. Broderick, T.M. Monro, Univ. of Southampton, UK.*
Numerical simulations are used to demonstrate parabolic pulse generation in a highly nonlinear, normally dispersive microstructrured fibre Raman amplifier. The results show that the output pulse shape depends on the sign of the third order dispersion.

NLTuD11

Improving eficiency of supercontinuum generation in photonic crystal fibers by direct degenerate four-wave-mixing, *N. I. Nikolov,Univ. of Denmark, Denmark; O. Bang, A. Bjarklev, Tech. Univ. of Denmark, Denmark.*
The efficiency of supercontinuum generation in photonic crystal fibers is significantly improved by designing the dispersion to allow widely separated spectral lines generated by degenerate four-wave-mixing directly from the pump to broaden and merge.

NLTuD12

Carrier frequency hopping for optical pulse transmission in dispersion-managed fiber links, *Alessandro Tonello, Istituto Nazionale per la Fisica della Materia,italy;Fabrizio Carbone, Luciano Socci, Marco Romagnoli, Pirelli Labs., Italy.*
We propose a chirped return-to-zero transmission format, combining wavelength conversion with dispersion management. Periodically varying the pulse's carrier frequency at optimal points, we reduce the impairments of third-order dispersion and we mitigate the timing jitter.

NLTuD13

Eigenvalues of the Zakharov-Shabat scattering problem for real symmetric pulses, *M. Desaix, Univ. Coll. of Boras, Sweden;D. Anderson, L. Helczynski, M. Lisak, Chalmers Univ. of Tech., Sweden.*
The problem of determining the solitons generated from symmetric real initial conditions in the Nonlinear Schrödinger equation is revisited. The corresponding Zakharov-Shabat scattering problem is solved for an example of a real double-humped rectangular initial pulse form. It is found that this real symmetric pulse generates moving soliton pulse pairs corresponding to eigenvalues with non-zero real parts.

NLTuD14

Interaction of pulses in optical fibers, *E. N. Tsoy, F. Kh. Abdullaev, Uzbek Acad. of Sciences, Uzbekistan.*
Interaction of pulses in optical fibers is analyzed by solving the scattering problem associated with the nonlinear Schroedinger equation. It is shown that two pulses without initial phase modulation can generate moving daughter solitons.

NLTuD15

Suppression of soliton self-frequency shift by up-shifted filtering, *P. Tchofo Dinda, A. Labruyere, Univ. de Bourgogne, France; K. Nakkeeran, Hong Kong Polytech. Univ.,Hong Kong.*
We propose an efficient method for suppressing the soliton self-frequency shift in high-speed transmission lines by means of up-shifted filters.

NLTuD16

Analytical design of dispersion-managed fiber systems with $S \approx 1.65$, *K. Nakkeeran, Hong Kong Polytech.Univ.,Hong Kong; A. B. Moubissi,P. Tchofo Dinda, Univ. de Bourgogne,France.*
We present an easy analytical method for designing dispersion-managed fiber systems with map strength of 1.65, where the transmission lines have minimal pulse-pulse interactions.

NLTuD17

Suppression of nonlinear effects by phase alternation in strongly dispersion-managed optical transmission, *P. Johannisson, D. Anderson, M. Marklund ,Chalmers Univ. of Tech., Sweden; A. Berntson, M. Forzati, J. Martensson, Ericsson Telecom AB, Sweden.*
The nonlinear effects amplitude jitter and ghost pulse generation can be suppressed by alternating the phase of the bits. This is due to destructive interference between different contributions to the total nonlinear effect.

NLTuD18

Optical solitons in the femtosecond regime, *J. Wyller, Agricultural Univ. of Norway, Norway; Jan S. Hesthaven, Brown Univ., USA; Jens Juul Rasmussen, Risø Natl. Lab., Denmark.*
The evolution of optical solitons in the presence of amplification effects and nonlocal Raman response is investigated using perturbational analysis. The analysis reveals the existence of a soliton which acts as a global attractor in certain regimes of the amplification parameters.

NLTuD19

Stability of dissipative solitons in transmission lines beyond the average concept, *C.Knoell, D. Michaelis, Z. Bakonyi, G. Onishchukov, F. Lederer, Friedrich Schiller Univ. Jena, Germany.*
We investigate existence and stability of dissipative solitons in a transmission line with lumped amplification/absorption introducing a matrix algorithm. Parts of the domain in parameter space where the background is stable exhibit Hopf instabilities.

NLTuD20

Dynamical evolution of weak perturbations superposed to dispersion-managed soliton transmission, *Alessandro Tonello, Antonio-D. Capobianco, Gianfranco Nalesso, Costantino De Angelis, Francesco Consolandi, INFM, Italy.*
We analyze numerically and analytically the evolution of weak perturbations in fiber systems with dispersion management. Linearizing the governing equation around a dispersion-managed soliton, we discuss the role of average dispersion and of nearby pulses.

NLTuD21

Dependence of spectral width and gain of stimulated Brillouin scattering on numerical aperture in optical fibre, *Valeri I. Kovalev, Heriot-Watt Univ., UK and Russian Acad. of Sciences, Russia; Robert G. Harrison, Heriot-Watt University, UK.*
We give theoretical interpretation for the recently observed phenomenon of inhomogeneous spectral broadening of Brillouin scattering in optical fibres. SBS spectral width and gain dependencies on numerical aperture and are shown to be in good agreement with experiments for both single- and multi-mode fibres.

NLTuD22

Pulse broadening in dispersion-managed optical fiber links with random dispersion, *Tobias B. Schaefer, Richard O. Moore, Christopher K. R. T. Jones, Brown Univ., USA.*
Random dispersion variations lead to pulse degradation in fiber lines. We discuss the validity of a finite-dimensional reduction of the nonlinear Schroedinger equation and derive an analytical formula describing pulse broadening induced by randomness.

NLTuD23

The role of dispersion of nonlinearity in supercontinuum generation with photonic crystal fibers, *Rumen Iliew, Falk Lederer, Friedrich-Schiller-Univ. Jena, Germany.*
We derive field equations in frequency domain for describing spectrally broad pulses in nonlinear waveguides. Applying this model to supercontinuum generation in photonic-crystal fibers we investigate the influence of a frequency-dependent nonlinear term for realistic fibers.

NLTuD24

Pulse train dynamics in actively modelocked lasers, *J. Nathan Kutz, Jennifer J. O'Neil, Univ. of Washington, USA.*
A new model for the active modulation of a modelocked laser cavity shows pulsetrains can be stabilized only if adjacent pulses are out-of-phase, whereas instabilities destroy the pulsetrain or give Q-switching.

NLTuD25

On the theory of self-similar parabolic optical solitary waves, *S. Boscolo, S.K. Turitsyn, Aston Univ., UK; V. Yu. Novokshenov, Inst. of Mathematics RAS, Russia; J.H.B. Nijhof, Marconi Solstis, UK.*
Solutions of the nonlinear Schrodinger equation with gain, describing optical pulse propagation in an amplifying medium, are examined. A self-similar parabolic solution in the energy-containing core of the pulse is matched to the linear low-amplitude tails. The theoretical analysis reproduces accurately the numerically calculated solution.

NLTuD26

Error preventable line-coding schemes using bi-soliton to suppress intra-channel interactions in dispersion-managed system, *Akihiro Maruta, Yasumichi Nonaka, Takashi Inoue, Osaka Univ., Japan.*
Bi-soliton is a periodically stationary pulse propagating in a dispersion-managed (DM) transmission system. We propose novel transmission line coding schemes in which binary data are assigned to single DM solitons and bi-solitons to reduce impairments arising from intra-channel interactions.

NLTuD27
Experimental investigations and theoretical description of the spectral broadening of a femtosecond pulse train in tapered fiber, *S.N.Bagayev, S.V.Chepurov, V.I.Denisov, A.K. Dmitriyev, A.S. Dychkov, V.M.Klementyev, D.B.Kolker, I.I.Korel, S.A.Kuznetsov, Yu.A.Matyugin, M.V. Okhapkin, V.S.Pivtsov, M.N. Skvortsov, V.F.Zakharyash, Inst. of Laser Physics, Russia; T.A.Birks, W.J.Wadsworth, P.St.J.Russell, Univ. of Bath, UK.*
Experimental investigations and theoretical description of the tapered fiber influence on the spectral characteristics of the passed continuous femtosecond pulse train were made with the use of high stable Ti:S laser. Study of the input and output broadened spectrum envelope and intermode beats noise pedestal for various experimental conditions are presented.

NLTuD28
Wavelength conversion of femtosecond pulses by cross phase modulation in single mode fibers, *Gilbert Boyer, Ecole Polytech. -ENSTA, France.*
Efficient wavelength conversion of a femtosecond probe pulse in a single-mode fiber is performed by collision with a pump pulse. The background-free auto-correlation of the blue- and red-shifted probe is presented and discussed.

NLTuD29
Anti-guide assisted spatial soliton logic gate, *Balakishore Yellampalle, Kelvin Wagner, Univ. of Colorado-Boulder, USA; Steve Blair, Univ. of Utah, USA.*
An anti-guiding structure is shown to assist spatial soliton dragging logic gate. A weak beam easily breaks the balanced symmetry of a pump propagating in an anti-guide, allowing very efficient optical switching. More than an order of magnitude improvement over previous spatial dragging gates is possible.

NLTuD30
Competition of gain—guided modes in stimulated Raman scattering with Bessel beams, *T. Manz, J. Baier, J. Zeitler, U. T. Schwarz, Max Maier,Univ. Regensburg, Germany.*
Stimulated Raman scattering with a Bessel pump beam in hydrogen gas shows conical or axial Stokes emission. Selection of the gain—guided Stokes modes is due to gain suppression in phase—matched Stokes—anti—Stokes coupling.

NLTuD31
Spatial trapping in PPLN waveguides with picosecond pulsed excitation at 1548nm, *Fabio Baronio, Costantino De Angelis, Univ. di Brescia, Italy; Paul Pioger, Vincent Couderc, Laurent Lefort, Alain Barthelemy, I.R.C.O.M., Univ. de Limoges/CNRS, France; Yoohong Min, Victor Quiring, Wolfgang Sohler, Univ.-GH Paderborn, Germany.*
Numerical simulations and experiments have shown the possibility of exciting spatially trapped beams in PPLN slab waveguides with pulses significantly shorter than the temporal walk off between FF and SH, with only FF at input.

NLTuD32
Ultrafast temporal reshaping of picosecond pulses based on quadratic spatial soliton generation, *C. Simos, V. Couderc, A. Barthélémy, IRCOM, France.*
We propose and demonstrate the use of quadratic spatial soliton generation together with a spatial filtering of the optical beam, as an efficient mean for the realization of ultrafast temporal reshaping of optical pulses.

NLTuD33
Collisions between optical spatial Solitons, *Oren Cohen, Raam Uzdin, Tal Carmon, Technion, Israel; Jason W. Fleischer, Mordechai Segev, Technion, Israel and Princeton University, USA; Serguey Odouov, Inst. of Physics, Ukraine.*
We theoretically study interactions between spatial solitons that propagate in opposite directions. Coherent collisions in this setting give rise to interference-induced focusing, are insensitive to the relative phase between the beams, and are accompanied by radiation even in the ideal Kerr case.

NLTuD34
High-order vortices and multi-hump rotating laser solitons, *Sergey V. Fedorov, Nikolay N. Rosanov, Anatoliy N. Shatsev, Res. Inst. for Laser Physics, Russia; Nikolay A. Veretenov, Andrei G. Vladimirov, St. Petersburg State Univ., Russia.*
We present results of semianalytical and numerical study of transversely two-dimensional spatial and spatio-temporal solitons in a laser with a saturable absorber. We demonstrate axially symmetric and asymmetric rotating solitons with wavefront dislocations of different order.

NLTuD35
Blocking and routing discrete solitons in two-dimensional networks of nonlinear waveguide arrays, *Nikos K. Efremidis, Jared Hudock, Demetrios N. Christodoulides, CREOL, USA; Eugenia D. Eugenieva, Intel Corp., USA.*
We show that discrete solitons can be navigated in two–dimensional nonlinear waveguide arrays. This can be accomplished by using vector interactions between two classes of solitons – signals and blockers. Disrete solitons in such two dimensional array networks exhibit a rich variety of functional operations, e.g. blocking, routing, logic functions, and time-gating.

NLTuD36
Minimizing bending losses in two-dimensional discrete soliton networks, *Jared Hudock, Nikos K. Efremidis, Demetrios N. Christodoulides, CREOL, USA; Eugenia D. Eugenieva, Intel Corp., USA.*
We show that reflection losses suffered by discrete solitons along sharp bends in two-dimensional waveguide-array networks can be almost eliminated. Analysis indicates that this can be accomplished by appropriately engineering the corner site of the bend. Our analytical results are verified using numerical simulations.

NLTuD37

Self-focusing of light mediated by cubic nonlinearities in potassium titanyl phosphate, *Silvia Carrasco, Hongki Kim, George Stegeman, CREOL, USA; Lluis Torner, Univ. Politecnica de Catalunya, Spain.*
We report our observations of the self-narrowing of light beams mediated by dominant dissipative Kerr nonlinearities in a bulk KTP crystal. Observations agree with comprehensive numerical investigations. Drastic differences between up and down-conversion processes are uncovered.

NLTuD38

Inverse transverse modulational Instability, *C. McCormick, R. Y. Chiao, Univ. of California–Berkeley, USA; J. M. Hickmann, Univ. Federal de Alagoas, Brazil.*
We investigate the inverse of a spatial modulational instability process resulting from a cross-phase modulation mediated four-wave interaction between two noncolinear beams crossing a self-defocusing Kerr media.

NLTuD39

Dielectric nonlinearity in photorefractive spatial soliton formation, *Eugenio DelRe, Univ. dell'Aquila and INFM, Italy; Aharon J. Agranat, Hebrew Univ. of Jerusalem, Israel.*
We find that anomalous behavior of spatial screening solitons observed in the paraelectric phase is a consequence of nonlinear dielectric effects. These change the effective optical nonlinearity even far from the phase-transition regime.

NLTuD40

Nonlocal mean-field theory in N-body quantum mechanics for Bose-Einstein condensation, *J. Nathan Kutz, Univ. of Washington, USA; Bernard Deconinck, Colorado State Univ., USA.*
Nonlocal interactions in the mean-field theory for Bose-Einstein condensation can destabilize nonlinear wavetrain solutions for a condensate trapped in standing light waves. The dynamics and stability are considered for arbitrary interaction potential.

NLTuD41

All-optical AND & XOR logic gates in a single device, *Marco A. Magaña Cervantes, J. Stewart Aitchison, Univ. of Glasgow; UK.*
We simulate an all-optical device which performs the AND and XOR logic operations. The device is based on the Kerr-like nonlinear effect present in AlGaAs optimised to operate at 1.55 micrometers.

NLTuD42

Nonlinear beam shaping in an ensemble of cold rubidium atoms, *T. Ackemann, M. Pesch, Univ. Muenster, Germany; G. L. Lippi, Inst. Non Lineaire de Nice, France; G. Labeyrie, B. Klappauf, R. Kaiser, Lab. Ondes et Desordre, France.*
Nonlinear beam shaping is observed in the far field of an intense resonant beam traversing a sample of cold rubidium atoms. Numerical simulations indicate the significance of the dispersive action of neighboring lines.

NLTuD43

Soliton interaction in weakly nonlocal nonlinear media, *N.I. Nikolov, O. Bang, P.L. Christiansen, Tech. Univ. of Denmark, Denmark; J.J. Rasmussen, Risø Natl. Lab., Denmark; Wieslaw Krolikowski, The Australian Natl. Univ., Australia.*
A new way to reduce the Kerr type soliton interaction due to nonlocality of the nonlinear responce function is reported. This effect may lead to stabilization of the two soliton propagation.

NLTuD44

Dark spatial solitons in photorefractive planar waveguide $LiNbO_3$:Ti:Fe, *Marina N. Frolova, Maxim V. Borodin, Stanislav M. Shandarov, Vladimir M. Shandarov, State Univ. of Control Systems and Radioelectronics, Russia.*
We study the processes of formation of dark photovoltaic spatial soliton in photorefractive $LiNbO_3$:Ti:Fe waveguide. The 2-D distribution of the optical field is considered to define the nonlinear change of the refractive index.

NLTuD45

Thermally induced spatial soliton in dye doped nematic liquid crystal, *J.F. Henninot, F. Derrien, M. Debailleul, M. Warenghem, Univ. d'Artois, France.*
We have observed the self-trapping of a laser beam in a liquid crystal thick sample. This propagation mode, which can be assimilated to a spatial soliton, is due to a thermally induced index change, especially strong for nematics. We show here that the non-locality of the thermal effect insures the stability of the soliton.

NLTuD46

Instabilities of multicomponent spatial solitons in photorefractive media, *Kristian Motzek, Friedemann Kaiser, Darmstadt Univ. of Tech., Germany; Wieslaw Krolikowski, Glen McCarthy, Anton Desyatnikov, Yuri S. Kivshar, The Australian Natl. Univ., Australia; Carsten Weilnau, Cornelia Denz, Univ.Muenster; Germany.*
We investigate numerically the dynamics associated with the instabilities of multicomponent spatial solitons in photorefractive media. The instabilities can lead to the formation of swinging structures, giving evidence of the oscillatory nature of the instabilities.

NLTuD47

Distortion and improvement of the formation of quadratic spatial solitons by temporal walk-off and wave-vector-mismatch non-uniformities, *Roland Schiek, Univ. of Applied Sciences Regensburg, Germany; Robert Iwanow, George I. Stegeman, CREOL, USA; Gerhard Schreiber, Wolfgang Sohler, Univ. of Paderborn, Germany.*
The influence of temporal walk-off and wave-vector mismatch non-uniformities on the formation of quadratic spatial solitons in lithium niobate film waveguides with a specially engineered non-uniform QPM grating is experimentally investigated.

NLTuD48

Internal oscillations of (2+1) dimensional solitons in a saturable nonlinear medium, *Jianke Yang, Univ. of Vermont, USA.*
Internal oscillations of (2+1) dimensional fundamental solitons in a saturable medium is studied. Internal modes both with and without angular dependence are discovered. The effect of angle-dependent internal modes on the soliton visually appears as a rotation of the perturbed soliton.

NLTuD49

Single-component higher-order mode solitons in liquid crystals, *X. Hutsebaut, M. Haelterman, Univ. Libre de Bruxelles, Belgium; A. Adamski, K. Neyts, Ghent Univ., Belgium.*
We demonstrate experimentally the existence of single-component multihump spatial solitons in a dye-doped nematic liquid crystal planar cell. The low absorption obtained at the working wavelength of 890 nm allows us to observe soliton propagation over lengths in the centimeter range.

NLTuD50

Optical solitons in twisted nematics, *Miroslaw A. Karpierz, Katarzyna Brzdakiewicz, Quang V. Nguyen, Warsaw Univ. of Tech., Poland.*
Light beam propagation in twisted nematic liquid crystal layer is analyzed theoretically. Reorientation nonlinearity induces self-focusing and moreover changes the direction of light beam propagation. This behavior requires milliwats of light power.

NLTuD51

Formation of photorefractive solitons in barium-calcium titanate: From dark and bright solitons to self-trapped bright rings, *Detlef Kip, Monika Wesner, Univ. of Osnabrück, Germany; Vladymir M. Shandarov, State Univ. of Control Systems and Radioelectronics, Russia; Jingjun Xu, Nankai Univ., China.*
We investigate photorefractive spatial soliton formation in iron-doped barium-calcium titanate. In this material with both photovoltaic and screening nonlinearity, we observe bright and dark spatial solitons, as well as the propagation of self-trapped bright rings.

Room: Auditorium

8:00am–10:00am

NLWA ■ New Materials and New Directions

Alain J. Barthelemy, UER Des Science, France, Presider Presider

NLWA1 8:00am Invited)

Nonlinear phenomena in Bose-Einstein condensates, *Luis Santos, Univ. at Hannover, Germany.*

We present a brief overview of the research on Bose-Einstein condensation, discussing some of the most recent developments in the field, with particular enphasis in the links between condensate physics and nonlinear physics.

NLWA2 8:30am Invited

Single-photon and two-photon photopolymerization for micro-nano fabrication, *Satoshi Kawata, Satoru Shoji, Hong-Bo Sun, Osaka Univ., Japan.*

Self-growth of micro-fiber structures and spatial optical soliton propagation based on single- photon photopolymerization, and nonlinear property of two-photon photopolymerizaiton which gives rise to three-dimensional microfabrication with sub-diffraction limit spatial resolution are introduced.

NLWA3 9:00am

Ultrahigh-speed all-optical wavelength conversion, *B. S. Ham, ETRI, Korea; P. R. Hemmer, Texax A&M Univ., USA.*

Ultrahigh-speed all-optical wavelength conversion has been demonstrated using a rare-earth doped crystal as a proof of principle. The observed switching time is two orders of magnitude shorter than the carrier lifetime for on-resonance transitions. This demonstration shows a breakthrough in the T_1 limitation of current switching technologies.

NLWA4 9:15am Invited

Waveguiding by optically induced dipolar clusters at the ferroelectric-paraelectric phase transition region, *Aharon Agranat, The Hebrew Univ., Israel.*

Abstract not available at this time.

Room: Oral Room

10:30am–12:30pm

NLWB ■ Spatial Solitons

Demetrios N. Christodoulides, Univ. of Central Florida, United States, Presider Presider

NLWB1 10:30am

Spatial solitons and their interactions via nonlocality and reorientation in nematic liquid crystals, *Marco Peccianti, Claudio Conti, Gaetano Assanto, Terza Univ. of Rome, Italy.*

A reorientational nonlocal nonlinearity governs 3D-spatial solitons in undoped nematic liquid crystals. We demonstrate solitons, their attraction and interlacing, outlining the role of nonlocality in time and in space, in agreement with a simple model.

NLWB2 10:45am

Experimental observation of phase controlled three-dimensional interactions between two quadratic spatial solitons: Scattering, fusion and spiraling, *Christos Simos, Vincent Couderc, Alain Barthelemy, Inst. de Recherche en Comm. Optiques et Microondes, France.*

We experimentally investigated the non-planar interaction of two quadratic spatial solitons in a bulk crystal. We obtained repulsion, fusion and spiraling by controlling the phase difference between the input fields and/or their direction.

NLWB3 11:00am

Collisions of (2+1)D Dipole-mode vector solitons in an anisotropic nonlinear medium, *Carsten Weilnau, Cornelia Denz, Westfälische Wilhelms-Univ., Germany;Marcus Ahles, Kristian Motzek, Friedemann Kaiser, Darmstadt Tech. Univ., Germany;Wieslaw Królikowski, Glen McCarthy, The Australian Natl. Univ.,Australia.*

We investigate the specific influence of anisotropy on generation, stability and dynamics of dipole-mode vector solitons in a photorefractive medium, experimentally and numerically. Further, we demonstrate collision-induced transformation of transverse to angular momentum.

NLWB4 11:15am

Multicomponent vector solitons: Theory and experiment, *Glen McCarthy,Wieslaw Krolikowski,Barry Luther-Davies, Australian Natl. Univ.,Australia; Anton Desyatnikov,Yuri S. Kivshar ,Australian Natl. Univ., Australia; Kristian Motzek, Friedemann Kaiser, Darmstadt Univ.of Tech., Germany; Carsten Weilnau,Cornelia Denz, Westfalische Wilhelms-Univ. Muenster,Germany.*

We study, theoretically and experimentally, multicomponent spatial solitons in nonlinear saturable (isotropic and anisotropic photorefractive) bulk media. We find numerically a family of the three-component dipole-mode solitons and demonstrate their stability in a wide range of the input parameters. We also observe the formation and stability of these spatial solitons in experiment with photorefractive strontium barium niobate (SBN) crystals.

NLWB5 11:30am

Propagation of spatially and temporally incoherent light and modulation instability in non-instantaneous nonlinear media, *Hrvoje Buljan,Univ. of Zagreb,Croatia; Antonio Siber, Inst. of Physics, Croatia; Marin Soljacic ,MIT, USA; Mordechai Segev, Technion - Israel Inst. of Tech., Israel.* We present a theory describing propagation of spatially and temporally incoherent light in non-instantaneous nonlinear media, and demonstrate the existence of modulation instability of "white" light. We find that modulation instability of "white" light is fundamentally a collective effect, where all the temporal frequencies participate in the formation of a pattern, and self-adjust their respective contributions.

NLWB6 11:45am

A solitonic all-optical switch based on the fractional Talbot effect, *Stefano Minardi, Gianluca Arrighi, Paolo Di Trapani, INFM and Univ. degli Studi dell'Insubria, Italy; Arunas Varanavicius, Algis Piskarskas, Vilnius Univ., Lithuania.* In a parametric down-conversion scheme, a weak seeding can shift a periodic array of optical beams by half of its transverse period as the result of the spatial solitons excitation and the fractional Talbot effect.

NLWB7 12:00pm

The final state of evolution of incoherent light patterns in nonlinear media, *Mordechai Segev, Raam Uzdin, Technion, Israel.* By using a new coherence measure which can be measured without interferometry, we find that a pattern of weakly correlated light evolves into a state characterized by [pattern's feature size]/[correlation distance)]. A new relation between intensity profile and coherence is presented.

NLWB8 12:15pm

Nonlinear beam dynamics in χ^2 waveguides, *G. Stegeman, R. Malendevich, R. Schiek, R. Iwanow, L. Jankovic, H. Fang, CREOL, USA; G. Schreiber, W. Sohler, Univ. GH Paderborn, Germany; L. Torner, Un. Polit. de Catalunya, Spain.* The evolution from diffraction, to single and then multiple quadratic soliton generation, and finally the onset of modulational instability were observed for wide fundamental beams in both birefringence and quasi-phase matched $LiNbO_3$ slab waveguides.

Room: Oral Room

2:00pm–4:00pm

NLWC ■ Nonlinear Periodic Structures

Neil G. Broderick, Univ. of Southampton, United Kingdom, Presider Presider

NLWC1 2:00pm Invited

Microstructured photonic crystal optical fiber device structures, *Benjamin J. Eggleton, OFS Fitel Lab., USA.* We review several applications of microstructured photonic crystal optical fibers that incorporate active materials infused into the air-holes. The tunable optical characteristics of the materials combined with the unique structure of the fiber enable a number of functionalities including reconfigurability, tunability and enhanced nonlinearities for various fiber device applications.

NLWC2 2:30pm

Discrete temporal solitons along a chain of nonlinear coupled microcavities embedded in photonic crystals, *Demetrios N. Christodoulides, Nikos K. Efremidis, Jared Hudock, Univ. of Central Florida, USA.* We demonstrate that spatiotemporal discrete solitons are possible in nonlinear photonic crystal structures. Analysis indicates that these states can propagate undistorted along a series of coupled resonators or defects by balancing the effects of discrete lattice dispersion with material nonlinearity.

NLWC3 2:45pm

Soliton engineering with two-period QPM gratings, *Steffen Kjaer Johansen,Univ. Politecnica de Catalunya, Spain and Tech. Univ. of Denmark, Denmark; Silvia Carrasco , Lluis Torner,Univ. Politecnica de Catalunya, Spain; Ole Bang,Tech. Univ. of Denmark, Denmark.* Two-period quasi-phase-matching schemes might make it practically possible to engineer the averaged effective competing nonlinearities governing beams in quadratic materials. We show that the bandwidth for soliton generation is broader than in homogeneous structures.

NLWC4 3:00pm

Quasi-phase-matched second harmonic generation in polymer rib waveguides, *Jung-Jin Ju, Suntak Park, Seung Koo Park, Jung Yun Do, Myung-Hyun Lee, Electronics and Telecommunications Research Institute (ETRI), Korea.* Single-mode rib waveguides at both pump and second harmonic wavelengths were fabricated with low-loss polymers. We investigated the quasi-phase matching characteristics, and the second harmonic generation properties for wavelength conversions at the optical communication band.

NLWC5 3:15pm

Quadratic interactions in an hexagonally poled lithium niobate buried waveguide, *K. Gallo, R. T. Bratfalean, A. C. Peacock, N. G. R. Broderick, C. B. E. Gawith, L. Ming, P. G. R. Smith, D. J. Richardson, Univ. of Southampton, UK.*
We demonstrate for the first time second harmonic generation from 1.536 um in a buried planar waveguide fabricated by an annealed and reverse proton exchange in a two-dimensional (2D) nonlinear photonic $LiNbO_3$ crystal.

NLWC6 3:30pm Invited

Bistability in photonic crystal defects, *Marin Soljacic, Mihai Ibanescu, Steven G. Johnson, Chiyan Luo, Yoel Fink,J.D.Joannopoulos, MIT, USA; Shanhui Fan, Stanford Univ., USA.*
We present an analytical theory and computational experiments to demonstrate optical bistability in a class of nonlinear photonic crystal devices. Lengths of our devices are smaller than the wavelength of light, they can operate with only a few mW of power, and can be faster than 1ps.

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About NLGW

Nonlinear Guided Waves and Their Applications

September 1-4, 2002

The general purpose of the meeting is to bring together researchers in all aspects of nonlinear optics in guided-wave and self-guided geometries. The meeting will span the range from theory to experiments, and from fundamentals to applications. Development of new ideas and novel techniques in the areas of materials, fabrication, devices, applications, and nonlinear theory are particularly emphasized. The general objectives are to:

- Provide a forum for the discussion of nonlinear waveguide and soliton phenomena from theoretical, material, device, and applications perspectives.
- Identify nonlinear effects in all-optical communications and signal processing, and to understand the opportunities and challenges that arise from them.
- Encourage development of novel structures, materials, and devices with enhanced nonlinear functionality.
- Address effects such as intrinsic localization in various nonlinear environments such as bulk media, waveguides, waveguide arrays, resonators, and photonic crystals, and the novel phenomena based on them.
- Identify novel phenomena in configurations involving quadratic, cubic, photorefractive and resonant nonlinearities.
- Highlight the similarities and differences between nonlinear effects in conservative and dissipative systems.

Meeting Scope

Category 1: Nonlinear Fiber Effects and Temporal Solitons

- Basic nonlinear effects in fibers: Stimulated Raman Scattering (SRS), Stimulated Brillouin Scattering (SBS), four-wave mixing, Nonlinear guided wave spectroscopy, two-photon absorption, third-harmonic generation.
- Nonlinear pulse propagation: nonlinear pulse broadening, modulational instabilities, self-phase modulation, cross phase modulation, pulse compression, and pulse train generation.
- Temporal solitons in fibers: Generation of bright and dark solitons, application in transmission systems, polarization effects, stability of soliton trains, dispersion management, soliton-noise interaction, and soliton control.
- Applications: optical communication systems, optical switching and processing, fiber lasers and amplifiers.

Category 2: Spatial Solitons and Transverse Effects

- Spatial optical solitons, self-trapping, and self-guiding effects: generation of bright and dark solitons via second order, third order and photorefractive effects, longitudinal and transverse stability of solitary waves, modulational instability and spatio-temporal effects, interaction of spatial solitons.
- Self-focusing and nonlinear guided modes in waveguides and at nonlinear interfaces, self-trapping effects in waveguide arrays and discrete spatial solitons.
- Applications: Beam steering, solitary waves as induced and steerable waveguides, soliton-based all-optical switching and optical processing.

Category 3: Nonlinear Periodic Structures and Cavities

- Nonlinear effects in periodic structures: Bragg solitons, Bragg gratings in semiconductor waveguides, gap solitons, nonlinear effects in photonic crystals, solitons in photonic crystals.
- Dissipative solitons: Spatial solitons in optical cavities containing quadratic, cubic, saturable or semiconductor materials, spatial

solitons in lasers with saturable absorbers. Vortex solitons, parametric domain wall solitons.

- Spatial pattern formation in nonlinear cavities and waveguides.
- Nonlinear modes and solitons in trapped Bose-Einstein Condensates and optical lattices; nonlinear guided-wave atom-optics
- Applications: Optical switching, pattern storage, generation and recognition, parametric devices.

Category 4: Solitons and Self-organized Spatial Structures in Cavities and Feedback Systems

- Spatial and temporal self-localized states (cavity solitons) in non-conservative systems. Including, but not limited to, driven nonlinear cavities, lasers, optical parametric oscillators and single-mirror feedback systems. Vortex solitons, vectorial (polarization) solitons, domain walls and domain-wall solitons.
- Spontaneous pattern formation in lasers, driven cavities, and other systems with feedback. Connections between patterns and solitons, soliton clusters.
- Spatial quantum effects and fluctuations, including quantum features of patterns and solitons, spatial squeezing, and quantum images.
- Applications of solitonic and spatial pattern effects to optical switching, pattern storage, generation and recognition, and to pulse formation, mode-locking and filamentation in lasers (including VCSELs) and parametric devices.

Category 5: Materials and Fabrication

- Novel nonlinear materials for nonlinear waveguides, crystals, polymers, semiconductors, glasses, photorefractive materials.
- Measurements of nonlinear optical properties of nonlinear materials: Bulk, thin film, or fiber, effect of composition, quantum confinement, dopant, thermal history, dependence on the linear and nonlinear optical properties, photosensitivity, photorefractivity, relation between nonlinearities and other optical and physical properties of the materials.

- Fabrication: Microstructured nonlinear media, periodically poled materials for quasi-phase matching, fabrication of nonlinear waveguides in different materials, Bragg gratings, photonic bandgaps, micromachining, optimization of the nonlinear properties.

Speakers

Invited

The list of invited speakers during the main program includes a session code for easy reference.

- **Fibers**

  Ultrafast optical TDM transmission with the use of novel nonlinear optical fiber devices
  Masataka Nakazawa, Tohoku Univ. Japan [NLTuC1]

  Is soliton communication really beneficial in presence of polarization mode dispersion?
  Magnus Karlsson, Chalmers Univ., Sweden [NLMA1]

- **Spatial Solitons**

  Slow Light and Optical Solitons in Structured Optical Waveguides
  R. Boyd, Univ of Rochester, USA [NLMC6]

  Nonlinear X-waves: A new perspective for space-time localization
  Stefano Trillo, Fondazione Ugo Bordoni, Italy [NLMA5]

- **Periodic Structures**

  Microstructured photonic crystal optical fiber device structures
  Benjamin Eggleton, OFS Fitel Lab., USA [NLWC1]

  Bistability in Photonic Crystal Defects
  Marin Solijacic, MIT, USA[NLWC6]

- **Cavities**

  Interaction of dissipative localized structures in nonlinear optics
  Dmitry Skryabin, Univ. of Bath, UK [NLTuB1]

  What is the role of modulational instability in ultra-high repetition

rate pulse generators based on passive and active fiber cavities?
Stephane Coen, Univ. Libre de Bruxelles, Belgium [NLMC1]

- **Materials**

  Waveguiding by optically induced dipolar clusters at the ferroelectric-paraelectric phase transition region
  Aharon J. Agranat, The Hebrew Univ., Israel [NLWA4]

  Single-photon and two-photon photopolymerization for micro-nano fabrication
  Satoshi Kawata, Osaka Univ., Japan [NLWA2]

- **Related Concepts**

  Nonlinear phenomena in Bose-Einstein Condensates
  Luis Santos, Univ. of Hannover, Germany [NLWA1]

Publications

Advance Program

The Advance Program is only available online. Click here to review abstracts.

Technical Digest

The NLGW *Technical Digest* will be comprised of the camera-ready summaries of papers being presented during the meeting. At the meeting, each registrant will receive a copy of the *Technical Digest*. Extra copies can be purchased at the meeting for a special price of $60USD.

Agenda of Sessions

Sunday, September 1, 2002	
Time	**Event**
14:00 -19.00	Registration *Congress Center Lobby*

Monday, September 2, 2002	
Time	**Event**
7:00 - 17:00	Registration/Speaker and Presider Check-In *Congress Center Lobby*
8:00 - 10:00	NLMA, Temporal Fiber Solitions *Auditorium*
10:00 - 10:30	Coffee Break *Congress Center Foyer*
10:30 - 12:30	NLMB Spatial Solitions and Spatio-Temporal Effects *Auditorium*
12:30 - 14:00	Lunch Break
14:00 - 16:00	NLMC Nonlinear Fiber Optics & Pulse Propagation *Auditorium*
16:00 - 18:00	NLMD: Poster Session 1 *Lower Level Foyer*

Tuesday, September 3, 2002	
Time	**Event**
7:30 - 17:00	Registration/Speaker and Presider Check-In *Congress Center Lobby*
8:00 - 10:00	NLTuA Discrete Solitons and Waveguide Arrays *Auditorium*
10:00 - 10:30	Coffee Break Congress Center Foyer
10:30 - 12:30	NLTuB Dissipative Spatial Structures *Auditorium*
12:30 - 14:00	Lunch Break
14:00 - 16:00	NLTuC Fiber Nonlinearity Applications *Auditorium*
16:00 - 18:00	NLTuD: Poster Session 2 *Lower Level Foyer*
19:00 - 22:00	Conference Banquet *Hotel Regina*

Wednesday, September 4, 2002	
Time	**Event**

7:30 - 13:00	Registration/Speaker and Presider Check-In *Congress Center Lobby*
8:00 - 10:00	NLWA: New Materials and New Directions *Auditorium*
10:00 - 10:30	Coffee Break *Congress Center Foyer*
10:30 - 12:30	NLWB: Nonlinear Periodic Structures *Auditorium*
12:30 - 14:00	Lunch Break
14:00 - 16:00	NLWC: Spatial Solitons Structures *Auditorium*
16:00 - 16:30	Coffee Break *Congress Center Foyer*
16:30 - 18:30	Postdeadline Session *Auditorium*