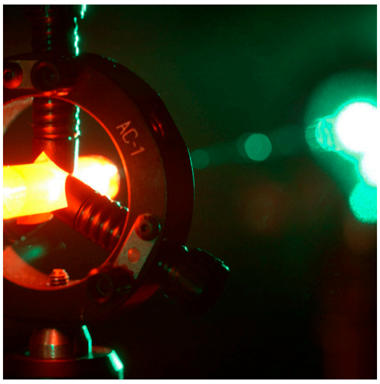
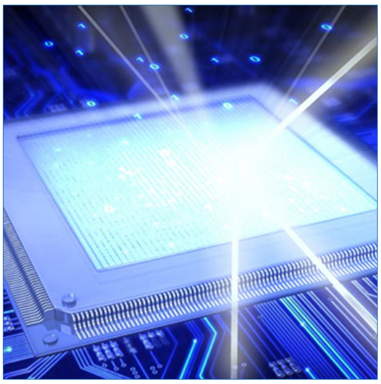
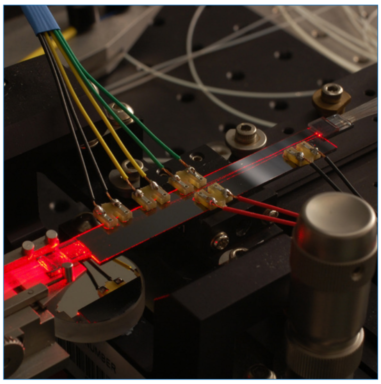
Scientific Tracks & Sessions
August 23, 2018

Laser Tech 2018





International Conference on

Laser, Optics and Photonics

August 23-24, 2018 | Paris, France

Parametric generation in PPLN crystal with pumping by a Q-switched mode locked Nd:YAG laser: Comparison of super luminescent and singly - resonant regimes

Valery Ilyich Donin, D V Yakovin and **M D Yakovin**
Siberian Branch of RAS, Russia

In this paper, we compared two regimes of optical parametric generation (parametric super luminescence and a singly-resonant OPO) in a periodically poled lithium niobate (PPLN) crystal pumped by a train of ~50ps pulses using a Q-switched mode locked Nd:YAG laser. In the super luminescent regime at the average pumping power of the laser of ~0.5W and train repetition rates of 2kHz, the peak total (at the signal ~1.5µm and idler ~3.82µm wavelengths) output power were as high as ~200kW. The total conversion efficiency (with respect to the absorbed power) was ~83%. To the best of our knowledge, this is the highest efficiency obtained with powerful super luminescent parametric sources. In the considered regimes, the values of the output powers and the generation thresholds at the idle wavelength differed by a factor of 1.5 (the output power in the regime OPO was higher and the threshold was lower). The pump depletion was ~50% for both regimes. Divergences at signal and idle wavelengths are measured. New lines in the visible and UV spectrum were observed and are explained

Speaker Biography

Valery Ilyich Donin received his degrees MSc (Tomsk State University) and PhD (Siberian Branch of the Russian Academy of Sciences SB RAS) and Doctorate in Physics and Maths (SB RAS) in 1963, 1972, and 1989, respectively. He has authored about 130 scientific publication, including 7 invitations. He has been awarded a Medal at the Exhibition of National Economic Achievements (USSR, 1979), the American Medal of Honor and the Twenty-first Century Achievement Award (ABI, 2001). He has been inducted into the 500 Leaders of influence Hall of Fame (ABI, 2002) and the 500 Founders of 21st century Honours List (IBC, 2002). He is a member of the Russian Rozhdestvensky Optical Society, the European Optical Society and American Optical Society. His main interests is on physics of CW high-current gas ion lasers.

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Notes:

Generation and visualization of few electron states in a quantum conductor

Bisognin Remi, Kumar Manohar, Roussel Benjamin, Cabart Clement, Bocquillon Erwann, Berroir Jean-Marc, Plaais Bernard, Cavanna Antonella, Gennser Ulf, Jin Young, Chapdelaine Camille, Mohammad-Djafari Ali, Degiovanni Pascal and **Feve Gwendal**
CNRS - Pierre Aigrain Laboratory, France

Thanks to the recent development in nanoelectronics, we can now study the quantum properties of electrical currents at the elementary excitation level. This naturally leads to the following question: can we experimentally extract from an electrical current its elementary excitations and fully characterize their coherence properties? In this work by driving locally a 1D conductor with a Lorentzian drive, we generate current pulses carrying one or two elementary excitations. Using two-particle interferometry, we fully reconstruct the wavefunction of the excitations propagating in the conductor. By shaping the width of the current pulses, we can engineer single electron wavefunctions of controlled energy and time distributions related by the Heisenberg uncertainty principle. To implement these electron quantum optics experiments, we use a model conductor which consists in a 2D electron gas in the integer quantum Hall effect at very low temperature. In this regime charges propagate along 1D ballistic edge channels which are used to characterize elementary excitations in electronic interferometers. The wavefunction measurement is based on a general quantum tomography protocol. The protocol relies on repeated overlap measurements between the generated current pulses and a set of reference probes in a Hong Ou-Mandel electronic interferometer. The reduction of the low frequency shot noise at the interferometer output is a direct measurement of this overlap. The wavefunction is extracted in two steps. First, we reconstruct the time-energy Wigner representation of the electronic current using all overlaps. Secondly a signal-processing algorithm decomposes the Wigner distribution in its elementary building blocks: the single electron wavefunctions. By demonstrating the controlled generation and the visualization of few electron states in a quantum conductor, this work opens new perspectives in quantum nanoelectronics.

Speaker Biography

Bisognin Remi currently a PhD student in the Quantum Electron Optics group of the Pierre Aigrain Laboratory. He is doing his PhD under the supervision of Gwendal Feve. His research interest are Quantum Optics, Optical Networks and Quantum Electron.

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Workshop
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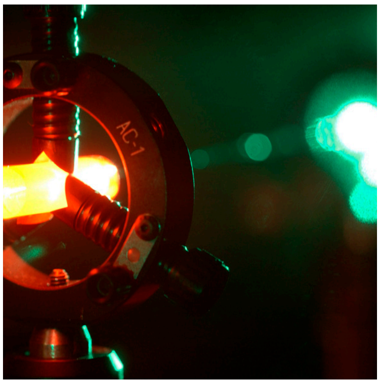


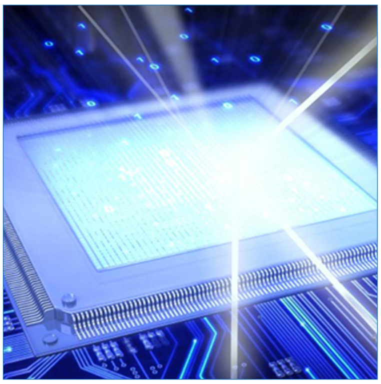
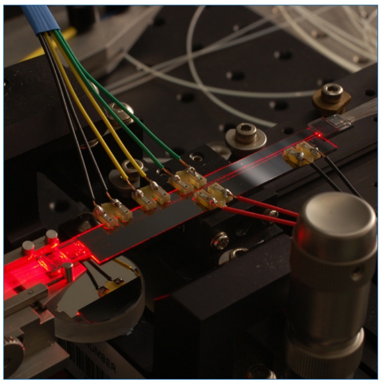

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Vishwa Pal

Indian Institute of Technology Ropar, India

Degenerate cavity lasers and their applications

Degenerate cavities are known from long time, but recently these have attracted lot of attentions and exploited for both practical applications as well as for the basic research. Degenerate cavity lasers support an enormous amount of spatial modes (~10^5), which are degenerate in losses and can lase equally. These novel sources allow efficient controlling of spatial coherence, where the number of spatial modes supported by laser can be controlled from 1 to as many as 320,000. Moreover, the output energy remains relatively constant over the entire tuning range of spatial coherence. These were also demonstrated for general manipulation of the spatial coherence properties of the laser by resorting to more sophisticated intra-cavity masks. These can be used for speckle-free wide field imaging systems, dynamic multimodality biomedical imaging, and can be employed in applications which require tailored spatial coherence properties. Degenerate cavity lasers have also shown an important method for generating and phase locking large array of lasers in various network geometries. The phase locking of large array of lasers can generate high powers with tight focusing. For the basic research phase locked lasers serve as a platform to investigate the behaviour of coupled nonlinear oscillators and complex network dynamics. Large array of coupled lasers has also exploited for simulating spin systems and solving computationally hard problems. For example, degenerate cavity lasers were shown to investigate geometric frustration in the Kagome lattice, real-time wave front shaping through scattering media by all-optical feedback and rapid phase retrieval. In this talk I will present the experimental and theoretical findings of degenerate cavity lasers and their potential applications for both applied and basic research.

Speaker Biography

Vishwa Pal joined Indian Institute of Technology Ropar, India, as an assistant professor of Physics in May 2018. He received his PhD degree in 2014 from School of Physical Sciences, Jawaharlal Nehru University, New Delhi, India. He has done part of his PhD at CNRS Laboratories Aime Cotton, Orsay, France. During his Ph.D. program, he investigated semiconductor laser systems. After Ph.D., he received a 3-years PBC fellowship for outstanding postdoctoral researcher by the Council for Higher Education of Israel. In 2018, he joined CREOL, The College of Optics and Photonics, Florida, USA, as a research scientist and worked on synthesizing non-diffracting optical beams in free space by exploiting space-time correlations. In 2018, he also received Marie Sklodowska-Curie Actions Individual Fellowship by European Commission.

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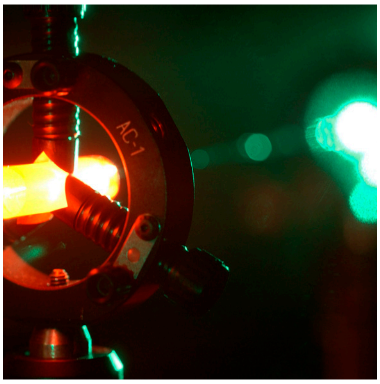


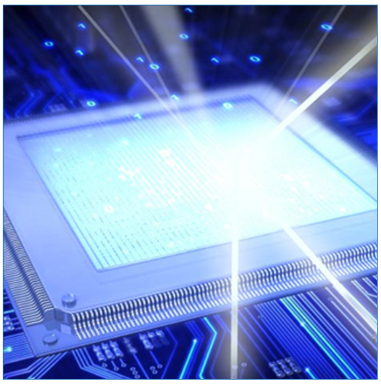
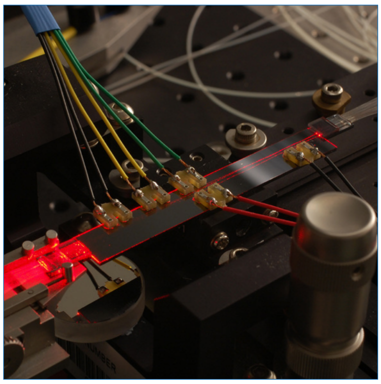

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AlGaAs on insulator second-order nonlinear nanophotonics

Guiseppe Leo[1], C Gigli[1], G Marino[1], A Lemaitre[2], M Celebrano[3], D Neshev[4] and **C De Angelis[5]**
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[3]Politecnico di Milano, Italy
[4]Nonlinear Physics Centre, Australia
[5]University of Brescia, Italy

All-dielectric nonlinear meta-optics is attracting a great deal of interest thanks to the feasibility of high refractive-index contrast nanostructures available with semiconductor lithography. While $\chi^{(3)}$ effects have been reported in silicon-on-insulator nanoantennas the AlGaAs-on-insulator platform has recently enabled the demonstration of second harmonic generation (SHG) in $\chi^{(2)}$ nanoantennas. When one excites them with a plane wave at normal incidence, they exhibit efficient SHG driven by a magnetic-dipole resonance at the pump frequency in the optical telecom range and a polarisation behaviour dominated by a high-order multipole resonance at the second harmonic. Here we will illustrate our recent activity on $Al_{0.18}Ga_{0.82}As$-on-AlOx nonlinear nanoantennas, where AlOx is obtained from selective wet etching of micrometer-thick aluminium-rich AlGaAs epitaxial layer. Such a low refractive index substrate allows to effectively decouple the nanoantenna modes from the underlying GaAs (100) wafer. After an introduction on the technology, we will get across the SHG performance of single nanoantennas with circular Bragg gratings, hybrid nanoantennas, and nanoantenna dimers exhibiting an anapole behaviour. All our experimental results are obtained with a pump excitation around 1.55µm on nanostructures of different size. The measured SHG conversion efficiency, in excess of 10-5 for a 1.6GW/cm^2 pump intensity, as well as the related polarization and radiation diagram properties, paves the way to the engineering of nanoantennas towards nonlinear meta surfaces.

Speaker Biography

Giuseppe Leo coordinates the Nonlinear Photonics Group of the MPQ Laboratory at Paris Diderot University. Besides editing 1 book and registering 4 patents, he has published more than 100 articles on peer-reviewed journals, 10 book chapters and about 250 conference papers, giving several invited presentations at major international conferences. His h-index is 26, for a total number of collected citations of more than 2000.

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Simulating XY spin systems with coupled laser networks

Vishwa Pal[1], **Chene Tradonsky**[2], **Ronen Chriki**[2], **Asher A Friesem**[2] and **Nir Davidson**[2]
[1]Indian Institute of Technology Ropar, India
[2]Weizmann Institute of Science, Israel

Coupled lasers are useful for both applied and fundamental research. It has been shown that a very large arrays of >1000 lasers with nearest-neighbour coupling rapidly dissipates into long range phase ordering, identical to the ground state of a corresponding XY spin Hamiltonian. Finding the ground state can be mapped to solve optimization problems that are NP hard. Topological defects arise as a result of spontaneous symmetry breaking, when a system undergoes a phase transition from a complex disordered phase state to an ordered phase state, known as Kibble Zurek Mechanism (KZM). Because of topological protection they become trapped in the system, therefore limits the coherence of the system and its ability to approach a fully ordered state. Revealing and controlling these topological defects has been an important area of research in various fields such as cosmology, spin systems, cold atoms and optics. We investigated dissipative topological defects in a one-dimensional ring network of coupled lasers and show how their formation is related to the Kibble-Zurek (KZ) mechanism. These defects may be topologically protected, depending on the size and geometry of the system, preventing it from reaching a perfect ordered state. We experimentally found that the probability of topological defects increases with the system size, and also strongly depends on various laser parameters such as pump and coupling strengths. We confirmed that the formation of topological defects is governed by two competing time scales, namely phase locking time and synchronization time of the lasers amplitude fluctuations. More specifically, when the phase locking time is smaller than the synchronization time, the probability for topological defects formation is zero. Whereas, when the phase locking time exceeds the synchronization time, the probability for topological defects formation is finite.

Speaker Biography

Vishwa Pal joined Indian Institute of Technology Ropar, India, as an assistant professor of Physics in May 2018. He received his PhD in 2014 from School of Physical Sciences, Jawaharlal Nehru University, New Delhi, India. He has done part of his PhD at CNRS Laboratories Aime Cotton, Orsay, France. During his PhD program, he investigated semiconductor laser systems. After PhD, he received a 3-years PBC fellowship for outstanding postdoctoral researcher by the Council for Higher Education of Israel. In 2018, he joined CREOL, the College of Optics and Photonics, Florida, USA, as a research scientist and worked on synthesizing non-diffracting optical beams in free space by exploiting space-time correlations. In 2018, he also received Marie Sklodowska-Curie Actions Individual Fellowship by European Commission.

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Efficacy of low-level laser therapy in the management of Bisphosphonate-related osteonecrosis of the jaw

Renata Stifelman Camilotti, John Baptist Blessmann Weber and **Juliana Jasper**
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Bisphosphonates are being increasingly used for the treatment of metabolic and oncological pathologies involving the skeletal system. Because of the severity of the Bisphosphonates associated osteonecrosis of the jaws, the difficulties of treatment, and patient discomfort, additional support methods for their management are needed. Laser therapy has an easy handling, photo biostimulator effect on tissues healing, so it can be considered a preferred therapy. The primary objective of the treatment should be to improve patient quality of life through pain and infection management, prevent the development of new lesions, and slow disease progression. In recent years, the use of laser for bisphosphonate-related osteonecrosis of the jaw has become more widespread, due to its use of administration and widely reported beneficial effects on tissue healing. The video present a systematic review of the literature sought to elucidate whether Low Level Laser Therapy has positive effects in the treatment of bisphosphonate-related osteonecrosis of the jaw and a study that evaluate the influence of low- level laser therapy in the 685nm and 830nm wavelength in the healing process of the bone and soft tissues in rats under Bisphosphonate therapy zoledronic acid and dexamethasone concomitantly that underwent a surgery for the extraction of upper molars.

Speaker Biography

Renata Stifelman Camilotti has completed her Master at the age of 31 years from Pontifical Catholic University of Rio Grande do Sul (PUCRS), Brazil. She is maxilla facial surgeon and works with laser therapy in Hospital Moinhos de Vento in Porto Alegre, Brazil. She has some publications that have been cited.

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