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Optics

Virtual 2020

September

24-25, 2020

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OPTICS VIRTUAL 2020

September 24-25, 2020

Theme:

Highlighting research trends in
Lasers, Photonics and Optics

INDEX

About MAGNUS GROUP

Magnus Group (MG) is initiated to meet a need and to pursue collective goals of the scientific community specifically focusing in the field of Sciences, Engineering and technology to endorse exchanging of the ideas & knowledge which facilitate the collaboration between the scientists, academicians and researchers of same field or interdisciplinary research. Magnus group is proficient in organizing conferences, meetings, seminars and workshops with the ingenious and peerless speakers throughout the world providing you and your organization with broad range of networking opportunities to globalize your research and create your own identity. Our conference and workshops can be well titled as 'ocean of knowledge' where you can sail your boat and pick the pearls, leading the way for innovative research and strategies empowering the strength by overwhelming the complications associated with in the respective fields.

Participation from 90 different countries and 1090 different Universities have contributed to the success of our conferences. Our first International Conference was organized on Oncology and Radiology (ICOR) in Dubai, UAE. Our conferences usually run for 2-3 days completely covering Keynote & Oral sessions along with workshops and poster presentations. Our organization runs promptly with dedicated and proficient employees' managing different conferences throughout the world, without compromising service and quality.

About Optics Virtual 2020

"Optics Virtual 2020" during **September 24, 2020** with the theme "Highlighting research trends in Lasers, Photonics and Optics" will offer you an impressive roaster of speakers, quality attendees and compelling content and is an excellent opportunity for leading academicians and scholars from universities and institutes to interact with the world-class scientists. You can increase your professional skills in this free time and discuss the practical challenges encountered and the solutions adopted.

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KEYNOTE FORUM

OPTICS VIRTUAL 2020

SEPTEMBER 24-25 2020

Heinrich Hora

University of New South Wales, Australia

Non-thermal pressure in extreme CPA laser pulses for alternative ignition of nuclear fusion

Following the recent result of a possible design may lead to electric power stations with nuclear energy from fusion of hydrogen H with the boron isotope eleven (HB-11fusion) withoutt any primary radioactive radiation emission,.This nuclear reaction energy is about ten million times higher than from burning carbon. This energy difference is the reason why the chemical reaction can be ignited thermally at pressures by a match and the nuclear reaction needs temperatures of dozens of millions 0C, aimed with ITER not before 2040. In contrast are the new results that instaed of the thermal pressures, focussed laser beams can produce alternative non-thermal pressures with laser pulses now for laser boron fusion as we know from nonlinear force driven plasma block acceleration, first calcultated in 1978 and measured in 1996 by Sauerbrey using picosecond CPA laser pulses. It took a long time until energy densities above 6 Terajoule/ccm.

The modern civilization is based on the energy source of burning carbon. This leads to climate change with the problem of existential survival. One option is to use nuclear energy that produces ten million times more energy per reaction than the chemical energy from coal. One option for nuclear energy is the fission of uranium nuclei by neutrons where reactors are on the market producing now more than 10% of all electricity. The other energy source is the fusion of very light nuclei to melt them together into heavier (fusion) as this is the energy source of myriads of stars in the Universe. In view of the million times highes reaction energy, the ignition cannot be done at temperatures of several 100 oC as with burning of coal, but one needs temperatures of dozens of million oC. This has been shown during the last 60 years but each reaction with plasmas confined by magnetic fields of several tesla or by inertial compression and heatng (IEC) using lasers were far too short that a power reactor cannot be expected for very many years.

A radical change of this situation is now neverless open thanks to avoiding of the high temperatures above of the million degrees Celsius by using the just reached ultra-extreme CPA (Chirped Pulse Amplification) laser pulses for LASER BORON FUSION without the problems of dangeous nuclear radiation. The equation of motion for the force density f in high-temperature plasmas is given by hydrodynamics for nuclear fusion consists of a first term with the gas dynamic pressure p given by the density and the thermal equilibrium temperature T. This is in the range below eV (electronvolt = 8560 oC) as chemical energy when burning coal, but is at about ten million times higher for thermally igniting nuclear fusion. These many dozens of million degree Celsius oC and was well reached with magnetic plasma confinement in tokamaks or stellarators or in laser driven spherical compression by nanosecond pulses, but too short for generating electricity.

Apart from the first term with the thermal pressure p, the presence of electric and magnetic fields and plasma-optical responses can generate the non-thermal electromagnetic nonlinear force fNL. This could directly be seen in the experiments by Sucov at laser interaction in Figure 1 resulting first in the non-transient equation of motion with Maxwell's plasma stress tensor needing additional nonlinear terms. Finally after clarifying six controverisl solutions the Lorentz and gauge invariant was derived. Evaluating about 500 pictures like Fig. 1 for different laser pulse energies, pulse durations and sphere diameters showed the central plasma thermally expanding with temperaures around 20 eV fully following the expected thermal plasma propeerty of the heated sphere taking the varying energy depending on the cases of the interacting 90% laser energy.

The maximum energy of the ions in the half-moons were in the range up to 5 keV showing a non-thermal behaviour. This definitely could not be from bremsstrahlung in the corresponding range of 20 MeV tempeature. Very detailled hydrodynamic computation of plane geometry condition of deuterium plasma at 1017 W/cm2 laser intensity up to the critical density during 1.5 ps laser irradiation showed a plasma block acceleration of 1020 cm/s2 . This ultrahigh acceleration against the direction of the laser beam was measured from blue Doppler-shifted spectral lines by Sauerbrey using CPA laser pulses for which discovery the 2018 Physics Nobel Prize was awarded to Donna Strickland and Gerard Mourou. The nonlinear force driven acceleration was about 100,000 times higher than thermally accelerted by the NIF laser.One highlight of non-thermal energy density by nonlinear force conditions against the thermal energy density with plasma temperaures of hundred Million oC is the measururement by Sven Steinke where 18nm thin diamond films absorbed 99% energy of laser pulses and produces an energy density of 6.55x1012 J/cm3. This is much higher than the hundred million degrees of thermal equilibrium ignition especially for the very low gains of hydrogen H with the boron isotope 11 (HB11 reaction) that is primarily environmnatally clean without radioacitvity. This supports the design and is the basis for an absolutely clean, safe, low-cost and abundant electricity generator.

Biography

Heinrich Hora Dr.rer.nat. (1960 Jena) D.Sc. (1979 UNSW) is an Australian Professor of Theoretical Physics University of New South Wales, Sydney 1975, emeritus 1992, Visiting Professor Rochester, Bern, Tokyo, Iowa, Osaka, Giessen, Weizmann-Institute, CERN after he was 20 years in research at industry laboratories (Zeiss, IBM, Westinghouse, Siemens) and of the MaxPlanck-Institute of Plasma Physics in Garching-Munich. He is author of 12 books and editor of 15 books and founder and first Editor-in-Chief of the Journal "Laser and Particle Beams" at Cambridge University Press. His research is in the field of plasma theory and laser, nonlinear forces, relativistic self-focusing, Schwarz-Hora effect (Appl. Phys. Lett. 102, 141119 (2013)) on non-resonance quantum excitations in solids, volume ignition of fusion, and predicted non-thermal ultrahigh acceleration of plasma blocks by lasers for environmentally clean, low cost and lasting boron fusion energy. He is FInstP(London), FAIP, FRSN and received the Edward Teller, the Dirac, the Ernst-Mach and the Ritter von Gerstner Medals. He is founding director of the International Research and Development Corporation "HB11 Energy" in Sydney/Australia.

Koichi Shimizu

Waseda University, Japan

Functional transillumination imaging of animal body with NIR light scattering

Using a near-infrared (NIR) light with 700-1200 nm wavelength, we can visualize the internal structure of an animal body by transillumination imaging. However, the deep structure is severely blurred because of the strong scattering in body tissue. We developed some techniques to suppress the scattering effect and verified their feasibility in experiments. They are: the extraction of the near-axis scattered light and the weakly scattered light from the strongly scattered light. The deconvolution with a depth-dependent point spread function is another technique to suppress the scattering effect in a transillumination image. With these techniques we can visualize the macroscopic structure of an animal body in two dimensional (2D) images. Using the 2D transillumination images taken from different orientations, we can reconstruct the cross-sectional images and eventually the macroscopic three-dimensional (3D) image of the internal structure of an animal body. The effectiveness of the proposed technique was examined in the experiments with 3D model phantoms, and its applicability to an animal body was verified in the imaging of experimental animals.

Further, we can quantify the physiological change occurred in the body as the change in transillumination images. A fundamental study has been conducted to visualize the functional change inside a living animal body using the NIR light. We have developed a technique to visualize the attenuation change occurred in a diffuse scattering medium. Transillumination images are obtained before and after the physiological change. Using these images, one can obtain the spatial distribution of attenuation change while suppressing the blurring effect of scattering. This principle was derived in theoretical analysis and its effectiveness was verified in experiments. To examine the applicability of this principle to a biological body, localized physiological changes were made in the mouse abdomen and the rat brain. The hypoxia in one of the mouse kidneys was visualized selectively from another normal kidney. The local increase in the blood volume was detected in the somatosensory area of a rat brain when its forelimb was electrically stimulated. The blood increase occurred in a symmetrical position with respect to the sagittal plane, when the forelimb of the opposite side was stimulated. The functional change occurred in a human hand and a foot was also visualized in transillumination images. Through these experiments, it was found that the changes in the tissue oxygenation and the blood volume could be detected noninvasively and that they are visualized in the transillumination images using the NIR light.

Audience Take Away:

- Audience will find the potential of a new noninvasive technique for biomedical imaging.
- They can see some techniques to solve the problem of severe blurring caused by light scattering.
- They can understand the basic principle of the functional transillumination imaging.
- They will see some practical applications of the proposed techniques to animal and human bodies.
- They will see how the new deep learning techniques are used in transillumination imaging.

Biography

Koichi Shimizu received M.S. (1976) and Ph.D. (1979) degrees, from University of Washington (UW), Seattle, USA. He was Research Associate in UW 1974-79. He was an Assistant-, an Associate- Professors, and a Professor in Hokkaido University, Sapporo, Japan in 1979-2016. He is currently a Professor Emeritus of Hokkaido University and a Professor of Waseda University, Kitakyushu, Japan. He has been engaged in the studies of biomedical engineering including those of wave propagation in biological media, optical measurement, biotelemetry and biological effects of electromagnetic field. He served as an associate editor of IEEE Trans. ITB in 1999–2007. He has been a Fellow of the Electromagnetics Academy, and an editorial board member of Scientific Reports, Nature.

Saktioto

University of Riau, Indonesia

Linearized series structure design of metamaterial antenna applications with high characteristics performance

The uniqueness of metamaterial becomes attention in science on the structure and materials to obtain the negative refractive index properties. Applications in the world of metamaterial technology are always intensified to obtain high material media work effectiveness through improving the quality of performance such as antenna components. Application of this structure can increase the profile of an antenna technology. The influence of the characteristics and optimization of the structure and material determines the work effectiveness of a device. This research was carried out by applying a series combination from 1 until 4 hexagonal, square and circular ring resonator (SRR) structures operated at a maximum frequency of 9GHz in the Ultra Wide Band category, while the experiment is underway to investigate its properties. The results showed that the metamaterial is double negative, with the highest negative refractive index in the combination of SRR-H structures and a resonant frequency shift of 1.73GHz to a frequency of as low as 1.97GHz. Combination structure 4, SRR-H has the highest antenna work performance with the width of the working frequency band width1.09-9.00GHz and the highest power loss is -55.91dB. Increased hexagonal, square, and circle antenna structure gain has a difference of around 5% with isotropic radiation patterns. Appropriate antenna radiation occurs at a maximum SRR-H structure of 4.63dBi on a 5.97GHz frequency.

Audience Take Away:

The audience will know the new characteristics of metamaterial which are material properties do not depend on the chemical compound but their structures instead having differences.

- Explain how the audience will be able to use what they learn?

  Metamaterial properties have abilities to change the function of material and its application, even metamaterial can be applied more than common material. Therefore, to understand these characteristics, the audience is required to study the fundamental concept of metamaterial.

- How will this help the audience in their job?

  This presentation offers new designs of antenna in order to have kinds modifications for industry then it can be created and fabricated for various matematerial antennas. Although this modification in science segmentation, but for engineering and industry purposes are not difficult to bring them as a job into market where its application can be matched to human needs.

- Is this research that other faculty could use to expand their research or teaching?

  Yes, this metamaterial application can be used for biosensors and antennas where the basic principles come from the structure of element, then it can be expanded for various science purposes.

- Does this provide a practical solution to a problem that could simplify or make a designer's job more efficient? Yes, the modification and fabrication of metamaterials design have both model and experiment for practical in application produced from industry.

- Will it improve the accuracy of a design, or provide new information to assist in a design problem?

  Yes, many kinds metamaterial designs can be investigated, it is of course this design aims to find the efficient, accuracy and effective output in application and market.

Biography

Prof. Dr. Saktioto, S.Si M.Phil, is a Professor of Physics at Department of Physics, Math and Natural Sciences Faculty, University of Riau, Indonesia. He completed his Degree (SSi) in Physics at University of Riau in 1993, Master degree (MPhil) in Plasma Physics at University of Manchester Institute of Science and Technology (UMIST) Manchester, United Kingdom in 2000 and Doctoral degree in Photonic Physics (Doctor) at Universiti Teknologi Malaysia, Johor Malaysia in 2009. He is also an active member in IEEE, OSA, AMC, PSI, SPIE and IOP. He has published many articles and supervised master and doctoral students.

Currently, his research focus is photonics such as fiber optic components, network and system for communication, antennas and biosensors of metamaterials. His research also designs and operates circuits and waveguides to generate plasma by electrical discharge and microwave in industrial application at atmospheric air pressure.

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SPEAKERS

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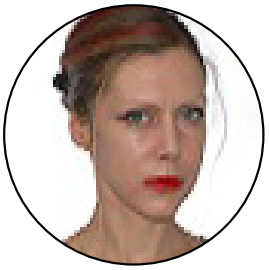

Orchidea Maria Lecian
Sapienza University of Rome, Italy

Optics, optical systems, further theoretical implementations of the optical equivalence principle and spectral analyses

The corrections to the wavefunction of a particles can therefore be applied toto the energy levels, and to the phase, respectively:

- constrains for the non-relativistic or geometrical corrections, relativistic-particles corrections
- optical systems contributions
- gravitomagnetic effects
- semiclassicalization techniques

Considerations of systems admitting a Haar measure, of which some subgroups are not efficient enough to recover the complete support of the quantum system(s).

Comparisosn of Birkhoff's theorem of asymptotic flatness wrt contributions arising from celestial objects at galactical scales and extragalactical ones at (parametrized) Post-Newtonian orders. Interferometer methods for detecting the implications of Teukolsky eq.for circular orbit test particles within the Penrose formalism (and Newmann-Penrose) (weighted spin harmonics). Spectrometer techniques for defining the background metric wrt asymptotic fltatness in Earth-based experiments, Satellite experiments and space-missions optical-interferometer experiments. Within quantum experiments and optical experiments, the possibility to detect new types of particles and new types of interactions are proposed.

New extensions for the Optical equivalence principle are formulated, and applied to different types of quantum systems, semiclassical systems and optical systems.

The control of the spectral analysis id proposed, to distinguish quantum contributions and gravitational contributions.

Audience Take Away:

- Spectral analysis for a particle wavefunction: quantum effects, quantum-gravitational effects, opttical-systems effects, gravitational contributions, geometrical contributions, gravitomagnetic contributions, new interferometer experiments;
- For rocky exoplanets (mostly found for red dwarfs) and terrestrial planets, general circulation model for gray gas radiative transfer as far as the interemishperical patterns of pressure and temperature are concerned; can be studied, as far as collapse pressure (as a function of planetary mass and stellar flux) to obtain constrains (through the molecules detected in the transit spectrum and the athmospheric composition) on athmosheric stability
- Further new examples of laser interferometry experimental apparati techniques can be obtained in a wide range of applications, such as cold atomic ensembles and cold atomic trapped ions (at different optical scales), temperature-jump experiment for protein-folding in molecular dynamics, quantum correlation of multispatial modes for Gauss-Markoff models, uncertainties estimations in quantum metrology, in decoherence and dissipation and for mixed system-collections for new highly-intense laser fields after the application for the of the pertinet expansions after the calculations of new formalisms for the Optical equivalence Principle
- Within the terrestrial crust, the presence of antinuclei and fractionally-charged particles is not experimentally totally excluded

- New techniques in the double control of the spectral analysis wrt to quantum contributions and gravitational contributions at different expansion orders wrt the two different fundamental constants; comparison with cantilever experiments, geometrical contributions and postulation of new interactions

Biography:

Lecian OM has completed her PhD in 2008 from Sapienza University of Rome, Italy, and ICRA (International Center for Relativistic Astrophysics), Rome, Italy. She is Professor at Sapienza University of Rome. She has over 50 publications that have been cited over 160 times, and her publication H-index is 7 and has been serving as an editorial board member of reputed Conferences Journals.

Munkhbat Batsaikhan
Tokyo Institute of Technology, Japan

Fundamental study on 2D elemental mapping of fuel debris materials using laser induced breakdown spectroscopy

Severe accident at Fukushima Daiichi Nuclear Power Plant (FDNPP) occurred after 9.0 magnitude earthquake and a huge tsunami that struck the Tohoku region of Japan. During the accident, fuel debris are formed in the Reactor Pressure Vessel (RPV) and Primary Containment Vessel (PCV) at Units 1-3. Many efforts to the decommissioning of the FDNPP is moving forward steadily and safely. One of most difficult work have left for near future is the fuel debris retrieval from the RPV/PCV under harsh environment. Due to high radiation dose inside damaged reactor buildings, human access inside PVC is impossible. Therefore, depending on the environment and condition of each units, internal investigation at each units has performed by remote measurement technologies such as robots that installed camera. Valuable information inside the PCV at each units were obtained by these previous investigations. However, distribution of fuel debris is still unknown, because the camera imaging is insufficient to determine and distinguish fuel debris and other structural materials. The fuel debris information is crucial to decide further decommissioning strategy such as selection of cutting technique. To respond to the situation inside the reactor building, investigating device should necessary to meet specification of radiation resistance, waterproofness, dust resistance and so on. Therefore, present study focuses on Laser Induced Breakdown Spectroscopy (LIBS), which is considering as a promising remote inspection technique for fuel debris inspection under high radiation dose.

The LIBS is an atomic emission technique that suitable for quick analysis of any phase of materials. In the LIBS measurement, when pulsed laser with high-energy focuses on the sample surface, a portion of sample is ablated and micro plasma is created on the surface of investigating material. Optical emissions with various wavelengths, which permits identification of sample's composition, from the plasma are detected by a spectrometry. By spatial scanning without any sample preparation, the LIBS technique can be applied as elemental surface mapping technique. Depending on the spatial resolution of measurement and sample area, it may be necessary to carry out large number of measurements. To demonstrate applicability of LIBS technique for 2D elemental mapping, at first, measurement parameters such as laser power, inspection delay time and other parameters are optimized. Then, 2D elemental mapping have conducted using a simple simulated fuel debris under the optimal condition.

Audience Take Away:

- Fundamentals of LIBS technique
- 2D elemental mapping by LIBS technique

Biography:

Batsaikhan Munkhbat a doctoral student at Tokyo Institute of Technology, Japan.

Ligang Huang
Chongqing University, China

Dynamic parameter measurement of Ultra-Narrow-Linewidth lasers

With excellent properties of the high purity spectrum and long coherent length, narrow-linewidth lasers can be applied in many fields, such as optical quantum information, low-noise microwave generation, high-resolution spectroscopy, precise sensing, high-speed optical coherent communication and so on. We propose the fundamental route to achieve the deep compression of the laser linewidth and demonstrate that the Rayleigh Backscattering (RBS) as weak feedback is an efficient linewidth-compression mechanism to realize the route. In theory, the dynamic characteristics of the spectrum evolution of Rayleigh scattering in a one-dimensional waveguide (ODW) is investigated based on the quantum theory and a spectrum evolution model of RBS source is established. In the experiment, to verify the linewidth compression mechanism, we construct dynamic laser parameter measurement method based on short delayed fiber self-heterodyne interferometer (SDSHI), and analyze the corresponding optical frequency evolution process from quantum theory. Based on the SDSHI method, we demonstrate and observe the Rayleigh-scattering-based linewidth compression process of fiber lasers and semiconductor lasers. The linewidths of fiber lasers are dynamically compressed to sub-100 Hz from the conventional value of >1 kHz. Meanwhile, the linewidths of DFB semiconductor lasers are compressed to 200 Hz from the conventional value of >1 MHz within 1 ms. We also explore the measurement of dynamic parameters of tunable lasers. With all-optical tunable narrow-band fiber Bragg gratings and RBS linewidth compression, we obtain tunable fiber lasers with a precise tuning step of less than 0.02 nm and linewidth of about 200 Hz. With all-fiber acousto-optical tunable filters, we obtain fast tunable narrow-linewidth fiber lasers with a tuning band of 20 nm and switching time of less than 1 ms.

Audience Take Away:

- The audience will know the method to fabricate sub-kHz narrow-linewidth lasers by Rayleigh Scattering.
- This presentation provides a practical solution of fast and wide-band tunable narrow-linewidth lasers.
- This presentation provides the measurement method of laser parameters, including the transient frequency, linewidth, frequency noise, phase noise, intensity noise and state of polarization.

Biography:

Ligang Huang is a Chinese Physicist. He received Ph.D. in Physics from Nankai University (China) in 2016. Since July 2016, he works as a lecturer at the College of Optoelectronic Engineering in Chongqing University, China. His research interests include narrow-linewidth lasers, laser parameter measurement, all-fiber acousto-optic tunable filters and whispering-gallery-mode tunable filters. He is author or co-author of more than 40 peer-reviewed journal papers in the field of narrow-linewidth lasers and tunable filters, which have been cited by more than 300 times.

Francesco Dell'Olio
Polytechnic University of Bari, Italy

Devices and microsystems based on surface enhanced raman scattering: A powerful tool in oncology

Surface Enhanced Raman Scattering (SERS) is a well-known powerful nanoplasnonic tool with many medical applications, especially in oncolog Minion Proy. In fact, SERS is becoming a key tool in cancer biomarker detection, tissue histology, and imaging. In the last few years, many evidences of clinical utility of SERS for cancer early detection, characterization and monitoring are being reported in the literature.

Since SERS spectroscopy exhibits a detection sensitivity down to the single-molecule level and multiplexing capability, it is widely used in the field of liquid biopsy, i.e. a new diagnostic concept related to comprehensive and real-time tumor information collection by analysing biomarkers such as circulating tumor cells or cell-free tumor DNA in the bloodstream. In addition, very fascinating results in the field of in SERS-based vivo imaging for tumour targeting and monitoring of drug release are currently at the state-of-the-art. The talk, after a short overview of the physical fundamentals of SERS, critically reviews some selected last achievements in the wide research field of SERS applications in oncology, with a special focus on the clinical utility.

Audience Take Away:

- The talk will help the researchers in the audience to understand the potential of SERS in oncology.
- The talk will provide new ideas for applying SERS in emerging contexts related to the translational medicine.
- The talk will briefly introduce the basic concepts of SERS for the researchers in the audience that are not familiar with this technology.

Biography:

Francesco Dell'Olio received the M.Sc. degree in electronic engineering (cum laude) and the Ph.D. degree in information engineering from Polytechnic University of Bari, Bari, Italy, in 2005 and 2010, respectively. Since December 2019, he has been an Assistant Professor at the Polytechnic University of Bari. His research interests include integrated optoelectronics and photonics. He has been involved in several research projects and is the co-author of more than 100 journal articles and conference papers.

M. Ajmal Khan
RIKEN Cluster for Pioneering Research, Japan

The influence of Al-Graded undoped-AlGaN cladding layer's thickness on the operating voltages as well as on injection current of Ultraviolet-B laser diode

Typical laser processing uses infrared light, however, due to the high energy absorption rates by metallic materials, demand for a portable short-wavelength deep ultraviolet (DUV) and ultraviolet-B (UVB) laser diodes (LDs) are increasing. UV LDs technology will find extensive application in medicine, recording, lighting, printing, nanolithography, fine machining, and painting. However, AlGaN-based UVB LEDs and LDs has a central issue of their low hole injection toward the multi-quantum-well (MQWs). Recently, Sato et al. successfully realized high current-injected UVB LD at 298 nm grown on sapphire, where multimodal laser spectrum was obtained over the threshold current density at 67 kA cm–2. We also attempted to optically-pumped UVB LD devices, where stimulated emission from the AlGaN DUV quantum wells with a very low-threshold exciting power density of 68 kW/cm2 was obtained. However, we used a different LD design than the one given. Based on good crystalline quality of AlGaN UVB LEDs and LDs, we re-design our electrically pumped UVB LD structure for better carrier and optical confiment (OC). Crystal growth and fabrication of ud-AlGaN cladding layer (CL) as well as Al-graded Mg-doped p-AlGaN hole sources layer (HSL) for UV LDs was attempted using LPMOVPE system. The relaxation ratio in the ud-AlGaN optical confinement layer (OCL) with respect to fully relaxed AlN template was enhanced up to 40%, as shown in the reciprocal space mapping (RSM). Next, the influence of udoped (ud)- AlGaN CL thickness on the operating volatges (Vfs) of UVB LDs were investigated, and quite low Vf of 10.3 V under 20 mA was obtained by using 200nm-thick ud-AlGaN CL in UVB LD. When the ud-AlGaN CL thickness were reduced from 400nm to 200nm using 2Fold-Quantum Wells and also set the Mg-level in the Al-graded p-AlGaN hole source layer (HSL) (Polarization effect), then the external-quantiumefficiency (EQE) and light power (L) on bare-wafer condition were improved up to 0.45% and 3.4 mW respectively. The current density of 1.28 kA/cm2 was estimated using 250 x 250 μm2 area under 800 mA current drive. Next the LD structure with ridged structure of area ~ 10μm x 700μm was processed including gold pad without mirror.

Subsequently, we attempted for injected current density measurement using pulse measurement with pulse width of 150ns and number of pulse shot around 01. This time the current densities were drastically improved from 1.2k A/cm2 to 15.7 k A/cm2 by using the ridge width of 10 μm and length of 700 μm. Quite high current density is expected after reducing the width of ridge beyond 5μm and length beyond 400μm as well as using mirror like structure. Summary: In this paper, a design and crystal growth of ultraviolet-B semiconductor laser diode (UVB LD) that operates under current injection at room temperature and at a UVB-wavelength emission of 288nm was demonstrated. The LD was grown on the (0001) face of an AlN template on sapphire substrate. The measured emission wavelength was 288nm with a pulsed duration of 150 ns. A polarization-induced Al-graded cladding layer (undoped) was employed to achieve improved conductivity and hole injection. By using undoped AlgaN CL and Mg-doped p-AlGaN hole source layer (HSL), a low operation voltage of 10.3 V at a 20 mA was achieved. This time the current densities (CDs) were drastically improved from 1.2k A/cm2 to 15.7 k A/cm2 by using the ridge width of 10 μm and length of 700 μm under pulse operation with pulse width of 150ns.

Biography:

M. Ajmal Khan was born in 1970 in the small town of Waziristan, Wana (Pakistan). He received his PhD degree in 2013, from University of Tsukuba, Japan. In 2012, he has discovered the thin film of boron (B) doped p-type BaSi2 layer "p+" along with his PhD supervisor Prof. Takashi Suemasu during his PhD work. From 2014 to 2016, he was appointed as a research scientist in the team of FUTUTER PV-Innovation, Japan Science and Technology Agency (JST), Fukushima Renewable Energy AIST Institute (FREA). In FREA, he worked on Si NWs, SiGe and a-Si/c-Si-based heterojunction solar cells. In 2016, he also worked as associate professor in National Institute of Technology, Fukushima College Iwaki. Later in 2017, he moved to the Professor Hideki Hirayama's group at CPR Riken as a researcher. Since then, he has been doing research on the growth, fabrication, characterization and device applications of group III-nitride semiconductors (AlGaN, AlN and GaN). Recently he developed low-temperature deposited AlGaN buffer layers underneath the multi quantum well for the growth of group III-nitride semiconductor films on AlN templet on sapphire substrate, which led to the realization of UVB LED with a world record external-quantum-efficiency (EQE) of 9.3% and light outpower of 42mW on bare-wafer condition at 300-304nm emission as well as light outpower of 29mW at 310nm emission for medical and agricultural applications. He is the author and co-author of more than 50 journal publications of the international repute. His main areas of interest are AlGaN/InAlGaN based UVA, UVB, UVC LEDs and laser diodes.

Selene Solorza-Calderon
Universidad Autonoma de Baja California, Mexico

Computer-aided diagnosis of five-class skin lesions

Nowadays, there is an increasing amount of skin diseases. The ultraviolet radiation and tanning beds are the primary risk factors. Early detection of skin diseases is one of today's priority tasks worldwide. Globally, in 2010, skin diseases were the fourth leading cause of nonfatal illnesses that caused economic losses due to inabilities. The actinic keratosis is one of the skin lesions considered pre-cancerous. Its diagnosis at the earlier stage could prevent to evolve to squamous cell carcinoma. This work proposes a computer-aided diagnosis model for color images of five skin lesions: actinic keratosis, basal cell carcinoma, intraepithelial carcinoma, malignant melanoma, and squamous cell carcinoma. The model is based on 1D fractal signatures. Three 1D signatures are built per image, and the energy of the signatures are used to construct the 3D classifier space. Five classifier spaces were studied: k-nearest neighbors, support vector machines, naive Bayes, and decision trees. The proposed methodology was tested on the Dermofit Image Library. Five thousand images were used to test the models. 80% of the images were part of the training step, and 20% of the images were utilized to test them. The KNN classifier space showed the best results, accuracy=97.23% precision=93.15%, sensitivity=93.11%, and specificity=98.27%. We propose a novel methodology easy to implement and reliable as the convolutional neuronal networks. In this work, the information on healthy skin is used as well as lesioned skin. The lesioned region is not segmented as it is done in most of the work on the same topic. So, the time and the errors of the wrong segmentation process are avoided.

Audience Take Away:

- In this talk, the audience will listen to the essential elements to build a pattern recognition model: 1) the database, 2) the extraction of characteristics, 3) the classifiers, 4) the evaluation metrics.
- Automated systems are being used more every day in more fields of research and everyday life.
- Skin cancer has increased in recent years, the diagnostic accuracy range is 64% to 80% measured in specialized dermatology centers. Nowadays, most diagnoses are made by physician assistants, whose accuracy is lower than the dermatologist's.
- The computer-aided diagnosis is a promising tool to help dermatologists.

Biography:

Selene Solorza-Calderón received her Bachelor degree in Applied Math from Universidad Autónoma de Baja California (UABC), Mexico, in 1997; her MSc degree in Earth Sciences from Centro de Investigación Científica y de Educación Superior de Ensenada (CICESE), Mexico, in 1999; and her PhD degree in Earth Sciences from CICESE in 2005. She is a researcher of the Math Department in the Faculty of Sciences, UABC. Her research interest includes image processing, pattern recognition in digital images and seismic images, and wave propagation in poroelastic media.

Davide Cascella
GEM ICT srl, Italy

An innovative RAMI 4.0 compliant network design for predictive maintenance on automatic testing equipment

The continuity of service of the machines during the test cycles is essential for customers. That is why ELES Semiconductor Equipment SpA, manufacturer of machines for testing electronic components, decided to invest in IIoT solutions. In particular, the main objective of this research project was to design and create an optimal network architecture according to RAMI 4.0 (Reference Architectural Model for Industrie 4.0), in order to perform disaster recovery and remote control of the equipment by exploiting the computational, storage and network load sharing offered by the cloud. This is configured as an innovative solution, placed between edge and cloud computing, crucial for the good implementation of services. This solution helps customers to do predictive maintenance on components and reporting, with a significant reduction in hardware costs, while it helps the manufacturer to access data from sensors and offer support, with a lower expenditure of human and economic resources and from anywhere.

The main benefits of a RAMI 4.0 solution are:

- Service-based architecture: each company can implement its activities as it sees fit.
- Combine the physical elements with the life cycle of the whole process in order to find the right points of contact between theory and practice.
- Complex processes are divided into smaller and simpler developments so that they can be better managed.
- The devices communicate and collaborate with each other through a network without hierarchy constraints.
- The devices on board can be cyber-physical systems, terminals and applications through which operators interact with the system.

The activity included configuring field to cloud connectivity, collecting, organizing, processing and storing data, monitoring operational metrics in near-real time and alerting. The implemented solution is scalable, cost effective and secure, and offers flexible access with operational dashboard and alerts. It makes available self-serve analytics and BI reporting.

Audience Take Away:

- The solution presented lends itself as concrete starting point for similar solutions in Industrial IoT applications
- It is a transversal solution between different technological fields (cloud computing, edge computing, fiber-based networking), offering a set of know-how from typically independent sectors
- It provides a practical solution to a problem that could simplify a designer's job and make it more efficient
- It provides new information to assist in a design problem

Biography:

Davide Cascella was born on April 1980. He received the MSc degree and the PhD degree in Electrical Engineering from the Polytechnic University of Bari. He is author of 20+ peer reviewed scientific papers on industry 4.0 and AI applications. He currently works as Innovation Manager and Industrial & Process Automation specialist. He is also responsible for technological innovation and energy efficiency projects, enabling the digital transformation and the adoption of Industry 4.0 Key Enabling Technologies in manufacturing companies.

Ph.V. Kiryukhantsev-Korneev
National University of Science and Technology "MISIS", Russia

Hard ZrBN-based transparent films for protection of optical devices

Development of new protective materials is being conducted in a new direction related to solving the global problem of the impact of space debris particles and micrometeoroids on spacecraft. The use of special maneuvering in orbit, as well as protective systems (Whipple shielding) does not completely avoid the damaging effects of small abrasive particles. The optical devices of spacecraft are particularly vulnerable. Thus, there is an urgent need to find new ways and materials to protect the solar cells. Protection of optical devices (portholes and solar cells of spacecraft, as well as solar power stations, solar collectors, etc.) from abrasive effects can be provided by the use of wear - and erosionresistant ion-plasma coatings, including those based on oxygen-free ceramics. The use of hard and optically transparent ZrBN and ZrSiBN films is promising. Films were deposited by DC and pulsed DC magnetron sputtering of ZrB2, ZrB2+20%Si, and ZrB2+50%ZrSi2 targets in Ar+N2 gas mixtures [1-4]. The targets were manufactured by means of self-propagating high-temperature synthesis. The structure, chemical and phase composition of films were studied by HR TEM, XRD, SEM, EDS, XPS, Raman and FTIR spectroscopy, and GDOES. The films were characterized using nanoindentation, sliding pin-on-disk, impact ball-on-plate, abrasive calowear, and scratch tests. The refraction index, coefficients of transmittance (Tr) and reflectance were measured by KFK-3 and Cary 5000 Agilent + UMA attachment for wavelength range from 200 to 2500 nm. Results obtained show that films deposited at low nitrogen partial pressure predominantly consist of nanocrystallites of hexagonal ZrB2-phase, 1-20 nm in size and amorphous regions. N-rich films exhibit fully amorphous structure. Specific optical properties were observed for these ZrBN and ZrBSiN coatings including Tr=70-100%. The hardness of 15-37 GPa and Young's modulus of 150-470 GPa were determined for films deposited onto alumina substrates. Coatings demonstrated friction coefficient 0.2-0.4. The addition of nitrogen significantly increased wear resistance in sliding and impact conditions. The work was supported by the Russian Foundation for Basic Research No. 19-08-00187

Audience Take Away:

- The audience will be able to get acquainted with new thin-film materials that have optical transparency. The film was obtained by magnetron sputtering of multiphase ceramic targets. Comprehensive studies of the structure, mechanical, tribological, and optical properties were performed.
- How will this help the audience in their job?
- Is this research that other faculty could use to expand their research or teaching?
- Does this provide a practical solution to a problem that could simplify or make a designer's job more efficient?
- Will it improve the accuracy of a design, or provide new information to assist in a design problem?

Biography:

PhVKK graduated as MS in 2001 at NUST "MISiS". He received his PhD degree in 2004 at the same institution. He obtained the position of an Associate Professor in 2007. He has published more than 100 research articles in journals, H-index 24 (Scopus). He was a head and responsible executor of projects from RFBR, RSF, FCP, etc. The area of interest includes: surface engineering (MS, PMS, CAE, HIPIMS, IIAMS, PACVD, ESA); materials science of thin films and coatings (hard wear-resistant, heat-resistant, low-friction, biomedical coatings etc.); nanocomposite materials; coatings characterization by TEM, GDOES, FTIR, XPS, NHT, etc.

Prashant Bansilal Patel
DIT, India

Optical Mach Zehnder Interferometer Sensors

Accurate measurement of various concentrations of solids, gases and liquid have become more and more important in chemical analysis, biomedical, food, environmental monitoring and in the semiconductor manufacturing area. This webinar is based on Mach Zehnder Interferometer Waveguide (MZIW) structure for Refractive Index (RI) measurement application and deals with interferometer using single mode transmission. Waveguide under consideration is very small in size and faces difficulty in the light guiding into it. Instead of the penetration depth of evanescence wave, light guiding efficiency dominates the detection sensitivity of structure. So careful light guiding is an important aspect of the photonics structure. As the concentration and hence the refractive index changes the path length of the light in measurement arm of the structure and this change in path length produces the corresponding changes in phase shift of light passing through it. Other arm is reference arm in which phase shift remains constant. Details discussions about various tests carried out using Beam Propagation Method (BPM) technique using Beam PROP software to analyze MZIW structure and measurement of refractive index of medium using this structure. The examination carried out on the behavior of MZIW structure using Y branches and establishes the general design principles. The main objective is to provide continuous quantitative and qualitative analysis. This reduces the time laps produced due to traditional measurement. It also maintains precision and accuracy of the sample analysis. Photonics based sensors are one class of sensors which satisfies the objectives. This technology gives rise to new devices and systems having improved sensitivity and accuracy for sensing application.

Audience Take Away:

- The above webinar elucidates the optimization of MZIW structure and its application for refractive index measurement. For short span of refractive index measurement it shows linear relation between refractive index and change in phase shift.
- These types of waveguide structure are useful in various measurement applications that changes phase of light passing through its measurement arm. The results obtained from BPM simulation and Interferometer theory shows reasonable agreement. This MZIW structure can be tuned for specific application
- The webinar may contribute to a better understanding of necessary waveguide techniques for developing micro- and nano-scale OMZI structure. Study bridges this crucial gap by providing an explanation through theory, simulations and experimentation as to why such dimensions have been used over the years and where the cut-off dimension of the Y-junction lies for OMZI structure and its sensitivity improvement. The entire platform can be tuned for specific biosensing application.

Biography:

Mr. Prashant B. Patel is working as Associate Professor in Instrumentation department at Dr. D. Y. Patil Institute of Technology (DIT). He has completed B.E. (Instrumentation) from NMU, Jalgaon and M.E. (Instrumentation) from Government College of Engineering, Pune University. He has also completed PGDMM (Marketing Management) from Indian Institute of Cost and Management Studies and Research, Pune University. He has secured first rank during PGDMM course at the Institute and second rank at Pune University. He has submitted his Ph.D. Thesis at SGGSIET, Nanded in Aug-2019. His research area is interferometer based fiber optics sensors.

He has over 24 years of experience in Industry, teaching, academic planning, administration, training and campus recruitments. He is Fellow-IEI (FIE) and Life Member ISTE, BMESI, ISOI, ISA and IETE. He has published 38 papers at National / International conferences and 05 papers at technical Journals. He is reviewer for "Optical Fiber Technology" Elsevier publication Journal and Journal of the European Optical Society. He has worked as Executive Committee member for IETE and IEI Pune center. He has completed international certification from "DALE CARNEGIE" in "High Impact Teaching Skills" under Mission 10X program of Wipro Technologies. He has signed MoU with various organizations like, Infosys Ltd., B and R automation, BOSCH, Schneider, Yamaha Motors, Sungard etc. He has an impressive record in mentoring students and academic leadership

Prashant Chauhan
Kaushal Teleportation Lab, India

Wave-particle duality?

An intuitive way of performing young's double slit experiment has been proposed which can mark an end to the long-lasting debate of wave-particle duality. Insights related to it have been derived from the understanding of nature which include a hypothesis. Observer effect went obsolete and observed result matches with classical physics results.

Audience Take Away:

- Light is a particle and it travels with the help of gravitational waves
- New way of doing an old experiment, Young's Double Slit experiment whose results are very surprising and matches with classical physics results.
- A gist of an emerging unified theory of special connectivity
- Some properties of gravitational waves

Biography:

Prashant studied Electronics and Communication at Jaypee Institute of Information Technology, India and post-graduated in 2017. He then went to University of Glasgow for MSc in Theoretical Physics and later in 2017 he dropped out from the university after doing his independent research. He then started doing job at Tata Consultancy Services in 2018 and kept working on his research side by side. As a result, he got more research publications along with his theory of special connectivity which is now translated into 8 foreign languages across the globe. He left his job in 2019 and started Kaushal Teleportation Lab.

Yahia Chergui
IGEE Institute Boumerdes University, Algeria

Effect of isobaric and isothermal ensemble on ZnO bonds a computational prediction

Parallel molecular dynamics becomes today a powerful tool for computational calculations for material sciences, due to its speed and nanoscale of space and time. In this prediction we will use the RAVEN supercomputer of Cardiff University (UK) and the software of dl_poly_4 to find the behavior of bond length of ZnO wurtzite type of 2916 atoms (1458 atoms of Zn+2 and 1458 atoms of O-2). Our system will be effected by thermal and isobaric system in the range of 0-200GPa and 300-3000K of pressure and temperatures respectively. In this work we search to study the effect of pressure and temperature on the bond length of chemical liaison between each two atoms Zn-Zn, Zn-O, and O-O. Although no more data under previous conditions of pressure and temperature, our results are in agreement with available data.

These information have a great important in technology and nanotechnology because permit us to know the behavior of ZnO bond length in nanoscale which effect on the macroscopic properties of this material.

Biography:

Yahia CHERGUI is a lecturer in Electrical & Electronic Engineering Institute, M'Hamed Bougara University, Boumerdes, Algeria. He has completed his PhD from Badji Mokhtar University in Annaba, Algeria. He did all his PhD work in Cardiff University in UK. His research field is Physics (condensed matter, simulation by molecular dynamics). He has 8 published articles in international journal, and 11 international conferences, beside more than 37 invitations to international conferences. He has been serving as a referee with condensed matter journal (IOP), Energy journal (Elsevier), and recently accepted to be a reviewer of American Journal of Modern Physics. He is a Memberships of Scientific Societies of the Athens Institute for Education and Research belonging to Physics Unit, and a member of Organisation committee of International Conference on Physics and Networks, June 08-10, 2020, Seoul, South Korea.

Beddiaf Zaidi
University of Batna, Algeria

Effect of buffer layer on CIGS solar cells: Numerical analysis

Materials for thin film solar cells are currently the subject of multiple researches in order to reach the highest ratio efficiency/cost. Tin sulfide (SnS) is one of the most promising solar cell absorber materials because it has appropriate optoelectronics properties and cost-effective. Zinc sulfide are the most common material for buffer layer of a heterojunction solar cell. In this work, we study the electrical characteristics of CIGS based solar cells (Current density Jsc short circuit, open circuit voltage VCO, P(V), and C(V)). The one-dimensional SCAPS-1D is used to analyze numerically the performances of CIGS based solar cells.

Biography:

Dr. Zaidi working as Asst. Prof. in Dept. of Physics at the University of Batna 1. He obtained a doctorate in Physics at the University of Annaba in 2014. He has published a number of research papers in reputed journals, has written one book on solar cells. He acted as an Editor-in-Chief of IJMSA (From 2017 to 2018). He is a potential reviewer for reputed journal papers. He participated in many international conferences serving as a referee, PC member... etc. He is also an Editorial Board member of numerous journals.

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POSTERS

OPTICS VIRTUAL 2020

SEPTEMBER 24-25 2020

Saadi Berri
University of Setif, Algeria

Theoretical analysis of the structural and optoelectronic properties of trigonal and hexagonal Cs3Sb2I9 compound

The structural, electronic and optical properties of Cs3Sb2I9 compound with 0-D dimer form (hexagonal SP; P63/mmc, no. 194) and the 2-D layered form (trigonal SP; $P\bar{3}$ m1, no.164) phases have been investigated and reported using both FP-LAPW and PP-PW methods. The optimized lattice parameters are found to be ingood accord with experiment. Features such as bulk modulus and its pressure derivative, electronic band structure and density of states are reported. Moreover, the optical properties reveal that Cs3Sb2I9 compound are suitable candidates for optoelectronic devices in the visible and ultraviolet (UV) regions.

Biography:

Dr. Saadi Berri is interested in the field of spintronic applications. He is author of different articles published in different journals and reviews. Currently, Dr. Saadi Berri is Associate Professor of Physics at University M'sila of Algeria. He is a member at Laboratory for Developing New Materials and their Characterizations, University of Setif 1, Algeria.

T.M. Sarukhanyan
Yerevan State University, Armenia

Lasing polarization peculiarities in cholesterics separated by dye-doped polymeric layer

Cholesteric liquid crystals (CLC) are the most famous representatives among the one-dimensional (1D) chiral soft photonic crystals. The investigation of liquid crystals (LC) includes a wide range: chemical structure, physical properties and technical applications. In this work, the physical properties and application areas of LCs are investigated. LCs are optically anisotropic materials which means that the speed of light waves in the medium depends on the direction and polarization of light. The property of anisotropy of liquid crystals leads to spatial modulation of refractive index i.e. the material possesses different refractive indexes in different directions. So, the control of light leads to the so-called photonic bandgap (PBG) existence in the medium where the selective reflection of light occurs. LCs are interesting materials also in regard to PBG control via external factors e.g. temperature, light, electromagnetic field, etc. All these properties make them attractive in different applications such as lasers, optical shutters, filters, displays, etc.

There are two approaches to induce optical defects inside the CLC structure: either by introducing of iso-tropic/anisotropic defect layer or creating of a phase jump by external factors (induced defects). The CLCs with defect layers inside them have been recently considered in view of generating additional modes in spectra and the possibility of low threshold lasing on these modes. There are many theoretical/experimental results dedicated to the defect modes existence inside the PBG of CLC. In this work we experimentally investigated the lasing possibility from the CLC - dye-doped isotropic polymer layer- CLC three-layered wedge-shaped system and investigated the polarization state of laser modes generated from the defect modes inside the PBG. The information about polarization is important in different applications' points of view such as information decoding in different polarization states, etc. The defect modes existence for our experimental study also verified theoretically. For our experiment, the wedge-shaped three-layered system was prepared where two CLC layers provide wedge-shape of the cell. Continuously changing the CLC layers' thickness gives an opportunity to obtain continuous circularly polarized lasing using a linearly polarized excitation beam.

Audience Take Away:

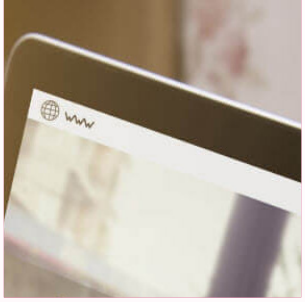
1. In this work, we provide a photonic microlaser model based on CLC layers and dye-doped isotropic defect layer inside them which provide low threshold lasing. It was known that defect modes' existence inside the PBG decreases the threshold of lasing. Let's note that the wedge-shape of the sample gives chance for continuous lasing. Observed multiple defect modes inside the PBG widen application area of our system such as
    - low threshold mirrorless lasing
    - multi-position trigger,
    - multi-wavelength filters,
    - ht shutters.
2. The main objective of our work is to get circularly polarized laser emission from the linearly polarized excitation light beam. This advantage can be used also to store optical information.

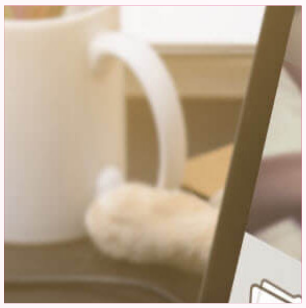
Biography:

Tatevik Sarukhanyan has earned Bachelor's and Master's degrees in Yerevan State University. Now, she is a Ph.D. student (4rd year) at Yerevan State University under the supervision of Dr. Roman Alaverdyan. Her research area is liquid crystals, their combinations with polymers, laser generation from such systems, light-matter interaction, optical computing, optical neural networks. She has one article published in the journal of Liquid Crystals, one article accepted for publication in the journal of Optics & Spectroscopy and other two are in the review process.

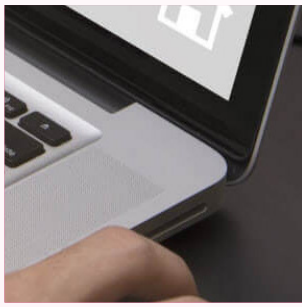
PARTICIPANTS LIST









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