DAY 1

Keynote Forum

EuroSciCon Joint Event on

Laser Optics & Photonics and Atomic & Plasma Science

July 16-17, 2018 Prague, Czech Republic

Taiichi Otsuji, Am J Compt Sci Inform Technol 2018, Volume 6
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TERAHERTZ LIGHT EMISSION AND LASING IN GRAPHENE UNDER CURRENT-INJECTION PUMPING

Taiichi Otsuji
RIEC-Tohoku University, Japan

Graphene has attracted considerable attention due to its massless and gapless energy spectrum. Carrier-injection pumping of graphene can enable negative-dynamic conductivity in the terahertz (THz) range, which may lead to new types of THz lasers. The dual-gate graphene channel transistor (DG-GFET) structure serves carrier population inversion in the lateral p-i-n junctions under current-injection pumping, promoting spontaneous incoherent THz light emission. A laser cavity structure implemented in the active gain area can transcend the incoherent light emission to the single-mode lasing. We designed and fabricated the distributed feedback (DFB) DG-GFET. The DG forms the DFB cavity having the fundamental mode, modal gain and the Q factor of 4.96 THz, ~5 cm^{-1}, and ~240, respectively. THz emission from the sample was measured using a Fourier-transform spectrometer with a 4.2K-cooled Si bolometer. Broadband rather intense (~10~100 μW) amplified spontaneous emission from 1 to 7.6 THz and weak (~0.1~1 μW) single-mode lasing at 5.2 THz were observed at 100K in different samples. When the substrate-thickness dependent THz photon field distribution could not meet the maximal available gain-overlapping condition, the DFB cavity cannot work properly, resulting in broadband LED-like incoherent emission. To increase the operating temperature and lasing radiation intensity, further enhancement of the THz gain and the cavity Q factor are mandatory. Plasmonic metasurface structures promoting the super radiance and/or instabilities as well as double-graphene-layered van der Waals heterostructures promoting photon/plasmon-assisted resonant tunnelling are promising for giant THz gain enhancement.

Biography

Taiichi Otsuji is a Professor at the Research Institute of Electrical Communication (RIEC), Tohoku University, Japan. He has received the PhD degree in Electronic Engineering from Tokyo Institute of Technology, Tokyo, Japan in 1994. He has worked at the NTT Labs from 1984 till 1999, Kyushu Institute of Technology from 1999 to 2005, and Tohoku University since 2005. He has authored and co-authored more than 240 peer-reviewed journal papers. He has been an IEEE Electron Device Society Distinguished Lecturer in 2013. He is a Fellow of the IEEE, a Senior Member of the OSA, and a Member of the JSAP, MRS, and IEICE.

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Yukio Tomozawa, Am J Compt Sci Inform Technol 2018, Volume 6
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PULSAR IDENTIFICATION OF BACKGROUND SPECTRA OF LIGO DATA

Yukio Tomozawa
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By choosing the metric in general relativity as the exact solution to the Einstein equation that is the time delay data, one can determine the gravitational redshift on the surface of neutron stars. The author presents the physical metric that is observed time delay data and using the Kerr metric, the author has shown the effect of a pulsar' rotation on gravitational redshift in the determination of gravitational wave frequency is within 1%. Based on this result, the author has identified potential pulsar candidates with gravitational wave spectra that will be critical in the study of gravitational redshift and the relationship between rotation and gravitational waves of a neutron star.

Biography

Yukio Tomozawa obtained his DSc in 1961 from Tokyo University. He was an Assistant at Tokyo University (1956) and at Tokyo University of Education (1957-1959) - Member at the Institute for Advanced Study, Princeton, NJ (1964-1966). He was an Assistant Professor, Associate Professor, Professor and Emeritus Professor at the University of Michigan, USA. He found that the Schwarzschild metric does not fit the data of time delay experiment in the field of general relativity. He has introduced a physical metric which fits the data. It was constructed with the constraint that the speed of light on the spherical direction is unchanged from that in vacuum. This modification changes the way we understand the nature of gravity drastically. In particular, the nature of compact objects, neutron stars and black holes, is very different from that described by the Schwarzschild metric. It also explains the dark energy, supernova explosion and high energy cosmic ray emission from AGN (active galactic nuclei), massive black hole.

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Vijayan Asari et al., Am J Compt Sci Inform Technol 2018, Volume 6
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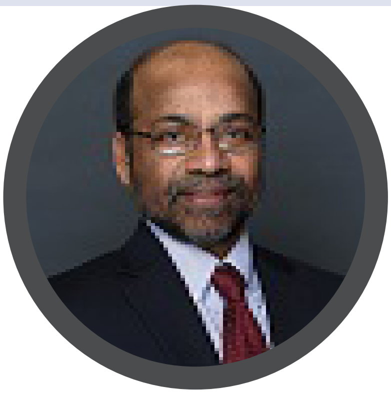
LIDAR DATA ANALYSIS FOR AUTOMATIC REGION SEGMENTATION AND OBJECT CLASSIFICATION

Vijayan Asari and Nina Varney
University of Dayton, USA

Light detection and ranging (LIDAR) presents a series of unique challenges, the foremost of these being object identification. Because of the ease of aerial collection and high range resolution, analysts are often faced with the challenge of sorting through large datasets and making informed decisions across multiple square miles of data. This problem has made automatic target detection in LIDAR a priority. We propose a novel algorithm with the overall goal of automatic identification of five object classes within aerially collected LIDAR data: ground, buildings, vehicles, vegetation and power lines. The main objective of this research is addressed as two specific tasks viz. region segmentation and object classification. The segmentation portion of the algorithm uses a progressive morphological filter to separate the ground points from the object points. The object points are then examined and a Normal Octree Region Merging (NORM) segmentation process is applied. This new segmentation technique, based on surface normal similarities, subdivides the object points into clusters. Next, for each cluster of object points, a Shape-based Eigen Local Feature (SELF) is computed. Finally, the features are used as the input to a cascade of classifiers, where four individual support vector machines (SVM) are trained to distinguish the object points into the remaining four classes. The ability of the algorithm to segment points into complete objects and also classify each point into its correct class is evaluated. Both the segmentation and classification results are compared to datasets which have been manually ground-truthed. The evaluation demonstrates the success of the proposed algorithm in segmenting and distinguishing between five classes of objects in a LIDAR point cloud. Future work in this direction includes developing a method to identify the volume changes in a scene over time in an effort to provide further contextual information about a given area.



Biography

Vijayan Asari is the University of Dayton Ohio Research Scholars Endowed Chair in Wide Area Surveillance and a Professor with the Department of Electrical and Computer Engineering. He is also the Director of the Center of Excellence for Computer Vision and Wide Area Surveillance Research (Vision Lab). He is the Senior Member of IEEE since 2001 and Senior Member of the SPIE. He co-organized several IEEE and SPIE conferences and workshops. He is also a Member of IEEE Computational Intelligence Society (CIS); IEEE Systems, Man and Cybernetics Society (SMC) Technical Committee of Human Perception in Vision, Graphics and Multimedia; IEEE Internet of Things (IoT) Community; Society for Imaging Science and Technology (IS&T); IS&T Data Analytics and Marketing Task Force; Institute for Systems and Technologies of Information, Control and Communication (INSTICC); and American Society for Engineering Education (ASEE).

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D Levy et al., Am J Compt Sci Inform Technol 2018, Volume 6
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SOL-GEL MATERIALS FOR OPTICAL APPLICATIONS

D Levy[2], E Castellon[1] and M Zayat[2]
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[2]ICMM-CSIC, Spain

One of the main research activities of the Sol-Gel Group at Madrid (*GSG-ICMM*) is based on a new approach of incorporating electroactive organic molecules in glasses. In other words, the possibility of manipulating the optical properties of molecules encapsulated in thin-films glasses by means of application of an external electric field. Due to their interesting optical properties, these new materials can be used in a very wide range of applications. This development consists on the microencapsulation of liquid crystal (LC) droplets dispersed in Sol-Gel glasses. The prototypes of optical switches have been developed as GDLC® (Gel-glass Dispersed Liquid Crystal). As an interesting alternative, the structure of biological templates has been also explored as a novel route for the preparation of an electro optical device from a biofilm structure created by bacterial activity. Biofilms created by live microorganisms can provide specific structures. The novel usage of the tridimensional architecture and optical properties of a biofilm created by the bacterium *Pseudomonas putida* mt-2 for the fabrication of a variable light-transmission device will be described. The bacterial cell factory is a promising non-chemical route for the generation of tridimensional structures oriented to the design of new. A new concept of an optical thin-film material that exhibits reversible humidity-responsive light-transmittance properties is presented. The novel reversible humidity-responsive light transmission thin-film material consists on a dispersive porous structure, with embedded hygroscopic and deliquescent compounds, that is able to scavenge water molecules from humid air to fill-up the pores and become transparent to the incident light. Upon exposure to dry air, water is released from the structure and the material recovers its original light scattering properties. The developed thin-films can change their transparency when exposed to air with different relative humidity (RH), adjusting the light throughput. Therefore, this material concept can be used to design new optical windows, having the advantage that they do not require liquid crystal, transparent conductive glass substrates or complex layer-by-layer architectures for operation as in conventional smart windows. The general design of the humidity-driven light-scattering device concept will be presented.

Biography

D Levy has started (1982-89) at The Hebrew University of Jerusalem, with the pioneering first application of the Sol-Gel process to the preparation of organically doped silica gel-glasses and reached the ICMM-CSIC in 1989. He was awarded the First Ulrich Prize for the most innovative work and was nominated to the Juan Carlos I Rey research award. He has authored over 133 papers (> 6800 citations; h=40, G-Scholar), reviews, book chapters, Co-Editor of The Sol-Gel Handbook, and several patents, and was PI for 27 Industry Projects. He is member of the International Advisory Board of the Sol-Gel Optics and Optoelectronics and Optical Science and Technology of the SPIE (USA), and a Member of the Experts Panel of the FP7 and H2020 Materials and Space Programs. He Chaired the XVII Sol-Gel International Conference in Madrid, 2013. He is a Professor at ICMM-CSIC heading the Sol-Gel Group (*SGG*) and his research interests are optical materials and their applications, and also headed the LINES of the INTA, where developed space materials for space optical instruments, able to be implemented on the board of a satellite.

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Jose Pozo, Am J Compt Sci Inform Technol 2018, Volume 6
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TECHNOLOGY TRENDS OF THE EUROPEAN INDUSTRY IN LASERS AND OPTICS

Jose Pozo
EPIC – European Photonics Industry Consortium, Netherlands

Over the last 30 years, new developments in laser systems have impacted strongly on every single aspect in the manufacturing of devices and products that are currently available on the market. Lasers and optics are used in the manufacturing of cars, PCs, and displays as well as in marking steel and in the creation of logos. In lithography, lasers have been the key enabler of wafer-level manufacturing. Furthermore 3D printing has a central role in the customized manufacturing of devices in the Industry 4.0 era. In ophthalmology and cosmetic surgery, lasers play a key role in maintaining our eyesight and transforming our appearance. The military applications should also not be forgotten as lasers have provided improvements in many areas, such as, range finders, designators, LIDARs, and illuminators. Finally, the biggest industrial breakthrough of photonics in the latest year has been the use of photonic devices (VCSELs, freeform optics, IR detector arrays...) in the consumer market in general, and in mobile phones in particular.

Biography

Jose Pozo is the Director of Technology and Innovation at EPIC (European Photonics Industry Consortium). As EPIC's CTO, he represents 350 companies active in the field of Photonics. His job consists on actively engaging with them and provides them with tools to strengthen their position in the supply chain; such tools are the organization of 20 technology workshops per year, provision of market intelligence and finding B2B leads. He has the vision that the future of optoelectronic manufacturing can take place in Europe to a large extent, and as part of that vision he is actively involved in the EU-funded pilot lines. He has 20 years' background in photonics technology, market knowledge, and a large network within the industrial and academic photonics landscape. He holds a PhD in Electrical Engineering from the University of Bristol, U K, MSc and B E in Telecom Engineering from UPNA (Spain) / VUB (Belgium). In addition, he has worked as Post-doctoral researcher at the Eindhoven University of Technology (The Netherlands), EU proposal coordinator at TNO (The Netherlands) and Sr. Photonics Technology Consultant at PNO Consultants.

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John Seely, Am J Compt Sci Inform Technol 2018, Volume 6
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HIGH RESOLUTION X-RAY SPECTROSCOPY AND ATOMIC PHYSICS OF HIGH ENERGY DENSITY PLASMAS USING TRANSMISSION-CRYSTAL SPECTROMETERS IN THE 6-100 KEV ENERGY RANGE

John Seely
Artep Inc., Ellicott City, Maryland, USA
The National Institute of Standards and Technology, USA

Transmission crystal spectrometers have been fielded at the USA National Ignition Facility and other major international laser and pulsed-power facilities for the purpose of recording spectra in the >6 keV energy range for studying the atomic physics and diagnostics of hot, dense plasmas. Spectrometer sensitivities and spectral resolving powers have been measured at the NIST national standard X-ray calibration facility. This presentation will describe on-going efforts to experimentally demonstrate high resolving power (>12,000) using a compact spectrometer geometry that is compatible with major laser and pulsed-power facilities. Resolving power of 12,000 has already been experimentally demonstrated using the 8 keV Cu and 22 keV Ag K lines, with the capability for 20,000 resolving power with 0.5 m long spectrometer geometry. Experimentally measuring such high resolution requires the careful measurement of the detector spatial resolution, for example of photostimulable image plates and scanners, and of the source broadening of the spectral lines resulting from natural lifetime broadening and other effects. These techniques have been developed and experimentally demonstrated at NIST. The use of these spectrometers at major laser and pulsed-power facilities for high-resolution spectroscopic diagnostics and atomic physics of energetic plasmas will be described.

Biography

John Seely after completing his PhD in Physics and several Post-doctoral appointments joined the Naval Research Laboratory in Washington DC USA in 1977 and was the Head of the Space Science Division's UV and X-Ray Spectroscopy Section prior to his retirement from NRL in 2011. During that time he was Principal Investigator on numerous projects funded by ONR, NASA, NOAA, DOE, NSA, and other government agencies. He also participated in many projects in the NRL Plasma Division and other divisions. He is the author or co-author of 274 papers in refereed scientific journals and holds seven patents in EUV and X-Ray technology. He is author of the chapter on multilayer optics for space telescopes in the book observing photons in Space (2010, ESA Communications Productions). He originated the concept of fielding high resolution hard X-ray spectrometers using transmission crystals at large laser facilities to record the K shell and L shell spectra from heavy elements.

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G Courret et al., Am J Compt Sci Inform Technol 2018, Volume 6
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COUPLING OF TWO OSCILLATIONS OF CLOSE FREQUENCIES IN A HIGH PRESSURE PLASMA ENCLOSED IN A SPHERICAL BULB

G Courret, P W Egolf and M Croci

University of Applied Sciences and Arts Western Switzerland (HES-SO), Switzerland

In an applied research project on a pulsed microwave sulfur lamp prototype of 1 kW, fitted with a rotation less and electrode less spherical bulb, we discovered that the plasma may form, despite gravity, a ball of about half the bulb size, settled in the center. In a preceding publication, we then reported measurements performed with a photodiode that shows the high-pressure plasma response to short microwave pulses, and we showed by modelization that the ball formation results from an acoustic resonance in a spherical mode. Out of this formation, the signal AC component has the same frequency as the pulse rate, and resembles to a triangular signal, rising during the ON periods and falling back during the OFF periods. When the ball formation occurs, at a pulse rate a little below 30 kHz, the AC component changes to a sinusoidal signal of a slightly lower frequency, and beats appear with a frequency equal to the frequency shift. In the preceding publication, it was demonstrated that the beats could result from the simultaneous excitation of two normal modes, because they have a frequency difference matching the observed frequency shift. As the higher of the two frequencies is the pulse rate, the one is due to a forced oscillation, whereas the other one is due to a free oscillation. In this article, we study the dissipation due to bulk viscosity and, thus, identify a mechanism that can couple the two oscillations, explaining the simultaneous excitation.

Biography

Gilles Courret has completed his PhD at the Swiss Federal Institute of Technology (EPFL) in 1999. Since 2013, he is Professor of Physics in the Department of Industrial Technologies of the University of Applied Sciences and Arts Western Switzerland (HES-SO). His research interests include Microwave-Plasma Interaction, Plasma Chemistry, Light Sources and Illumination Engineering, with Emphasis on the Improvement of Energy Efficiency. He has published more than 20 papers in reputed journals.

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DAY 2

Keynote Forum

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Edik U Rafailov, Am J Compt Sci Inform Technol 2018, Volume 6
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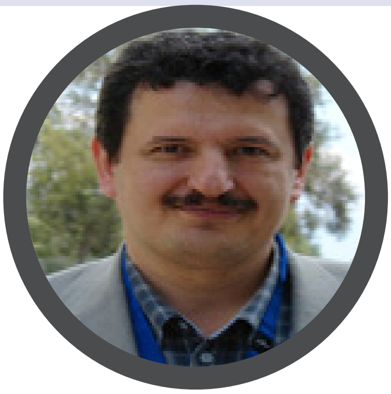
ADVANCES IN THE DEVELOPMENT OF COMPACT LASER SOURCES FOR IMAGING, DIAGNOSTICS AND TREATMENT IN BIOMEDICINE



Edik U Rafailov
Aston Institute of Photonic Technologies, Aston University, UK

In the last decades, progress in the development of compact laser sources has brought to science and industry an enormous number of new applications. Previously, such lasers were mostly utilised in the communication and other industries. However, now such laser sources are becoming adopted in biomedicine and related fields. In this talk, I will present the recent progress on the development of novel compact quantum dot based laser sources generating light across broad spectral ranges in CW and ultra-short pulse regimes. I will also review some of the most promising applications where such laser sources are being used. Particularly I focus on biophotonics areas such as multi-photon imaging, non-invasive diagnostics and photo treatment.

Biography

Edik U Rafailov received his PhD degree from the Ioffe Institute, St Petersburg. Since 1987, Rafailov has been engaged in the research and development of high-power CW and short pulse diode and solid-state lasers. He has authored and co-authored over 450 articles in refereed journals and conference proceedings, including two books (Wiley), ten invited chapters and numerous invited talks to SPIE, LEOS and CLEO. He also holds 11 UK and two US patents. He coordinated a €14.7M FP7 FAST-DOT project: development of new ultrafast lasers for Biophotonics applications and the €12.5M NEWLED project aims to develop a new generation of white LEDs. Recently, he was awarded as a coordinated the H2020 FET project Meso-Brain (€3.3M). He also leads other projects funded by EU FP7/H2020 and UK EPSRC. His current research interests include high-power CW, ultrashort-pulse lasers; generation of UV/visible/IR/MIR and THz radiation, nano-structures; nonlinear and integrated optics; and Biophotonics.

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SURFACE-ENHANCED OPTICAL PROCESSES AND A STRONG QUADRUPOLE LIGHT-MOLECULE, MATTER INTERACTION

V P Chelibanov[1] and A M Polubotko[2]
[1]ITMO University, Russian Federation
[2]Loffe Physico-Technical Institute, Russian Federation

Surface-enhanced optical processes, surface-enhanced Raman scattering (SERS), surface-enhanced hyper Raman scattering (SEHRS) and surface enhanced infrared absorption (SEIRA) are of great interest for physics, chemistry and biology since they allow strongly increased sensitivity of these spectroscopic methods and are caused by a fundamental physical mechanism. It is so-called strong quadrupole light-molecule interaction, arising in surface electromagnetic fields, strongly varying in space near a rough metal surface. Just this interaction is responsible for the enhancement in SERS $\sim10^6$, in SEIRA $\sim10^3$ -10^4 and in SEHRS $\sim10^{12}$and significantly higher. Moreover, this interaction is the base for implementation of single molecule detection by SERS, when the enhancement can achieve the value $\sim10^{14}$-10^{15}. This interaction is responsible for appearance of forbidden lines in all these processes on molecules with sufficiently high symmetry. In SEIRA and SEHRS, it is expressed in their belonging to the vibrations with a unit irreducible representation of the molecule symmetry group. In SERS these lines are those, caused by vibrations transforming as the dipole moment component , which is perpendicular to the metal surface. One of the main fundamental properties of this interaction is that it is forbidden in molecules with cubic and icosahedral symmetry groups due to the electrodynamical law div **E=0**. This forbiddance is named as the electro dynamical forbiddance and was observed in fullerene C_{60}. At present the theory of the above mentioned processes, based on this concept is created and explains the most of the observed phenomena, accompanying SERS, SEHRS and SEIRA.

Biography

Aleksey Mikhailovich Polubotko has graduated from Physical Faculty of Leningrad State University in 1973. He is Radiophysicist in accordance with his education. However, now he works as a Physicist Theorist. He received his Doctor of Science degree in 1983. He worked as a Junior Scientific researcher and Scientific researcher from 1982 till 2013 and Senior Scientific researcher from 2013 till now. He worked abroad in October 1993 as an Associated Professor in Tohoku University, Sendai, Japan, as a Post-doctoral fellow from 1 August till 30 October 1997 in Northwestern University, Evanston, USA and as a Professor from 1 August till 30 November 2000 in Xiamen University, Xiamen, China. Now he is a Senior Scientific researcher of the sector of the Theory of semiconductors and dielectrics, the Department of dielectrics and semiconductors, A F Ioffe Physico-Technical Institute, Saint Petersburg, Russia.

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Nabeel A Riza, Am J Compt Sci Inform Technol 2018, Volume 6
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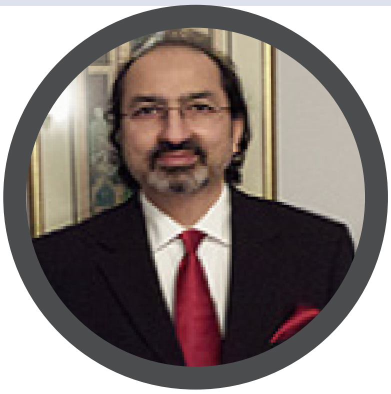
ADVANCES IN CAOS CAMERA IMAGING

Nabeel A Riza
University College Cork, Ireland

Multi-pixel imaging devices such as CCD, CMOS and FPA photo-sensors dominate the imaging world. These photo-detector array (PDA) devices certainly have their merits including increasingly high pixel counts and shrinking pixel sizes, nevertheless, they are also being hampered by limitations in instantaneous linear dynamic range, inter-pixel crosstalk, quantum full well capacity, signal-to-noise ratio, sensitivity, spectral flexibility, and in some cases, imager response time. Recently invented is the coded access optical sensor (CAOS) smart camera that works in unison with current PDA technology to counter fundamental limitations of PDA-based imagers while providing extreme linear dynamic range, extreme image security, extreme inter-pixel isolation, and high enough imaging spatial resolution and pixel counts to match application needs. This talk describes recent advances in the CAOS smart camera imaging invention using the Texas Instruments (TI) Digital Micromirror Device (DMD). The talk highlights recent experimental demonstrations of both white light and multi-spectral CAOS-based imaging including CAOS-mode imaging over a 136 dB linear dynamic range. Novel applications of the CAOS smart camera include automotive and surveillance imaging where smartness to identify vital targets in extreme contrast scenarios is vital for both mobile and stationary system operations.



Biography

Nabeel A Riza (Fellow IEEE, IET, EOS, OSA, SPIE, and Honorary Fellow Engineers Ireland Society) holds a PhD (1989) from Caltech. His awards include the 2001 ICO Prize, 2001 Ernst Abbe Medal from Carl Zeiss Foundation-Germany, 2009 and 2010 IEEE Distinguished Lecturer Awards, and 1994 GE Gold Patent Medal. In 2011, he was appointed as Chair Professor of Electrical and Electronic Engineering, University College Cork (UCC), Ireland. From 2013-2016, he was the Dean of UCC School of Engineering. He has published 404 works that include 46 US issued Patents and is a 2017 Inductee of the US National Academy of Inventors (NAI).

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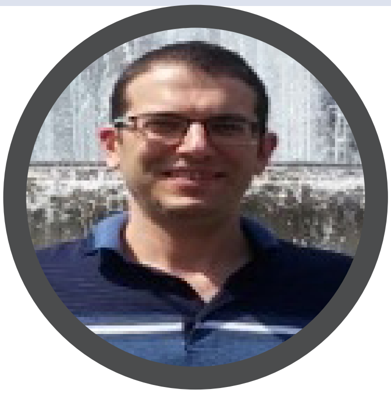
RGB WAVELENGTH DEMULTIPLEXER BASED ON PHOTONIC CRYSTAL FIBER

Dror Malka[1], Rami Dadabayev[1], and Moshe Ran[2]

[1]Holon Institute of Technology, Israel
[2]MostlyTek LTD, IORL, Israel



High transmission losses are the key problems that limit the performances of visible light communication (VLC) systems that work on wavelength division multiplexing technology. In order to overcome this problem, we propose a novel design for a 1×3 optical demultiplexer based on photonic crystal fiber (PCF) structure that operates at 450 nm, 550 nm, 650 nm. The new design is based on replacing some air-holes zones with silicon nitride material along the PCF axis with optimization of the PCF size. Numerical investigations were carried out on the geometrical parameters by using a beam propagation method. Simulation results show that the proposed device can transmit 3-channel that works in the visible range with low crosstalk ((-18.63)-(-21.24) dB) and bandwidth (5.79-18.63nm). Thus, this device can be very useful in VLC networking systems that work in wavelength division multiplexing technology for increasing VLC speed.

Biography

Dror Malka received his BSc and MSc degrees in Electrical Engineering from Holon Institute of Technology (HIT) in 2008 and 2010, respectively, Israel. He has also completed a BSc degree in Applied Mathematics at HIT in 2008 and received his PhD degree in Electrical Engineering from Bar-Ilan University (BIU) in 2015, Israel. Currently, he is a Lecturer in the Faculty of Engineering at HIT. His major fields of research are Nanophotonics, Super-Resolution, Silicon Photonics and Fiber Optics. He has published around 27 refereed journal papers, 22 conference proceeding papers, 2 book chapters and one patent.

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I Naeh, Am J Compt Sci Inform Technol 2018, Volume 6
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RAY TRACING PROPAGATION OF LASERS IN A CONTINUOUS TURBULENT ATMOSPHERE

I Naeh
Rafael Advanced Defense Systems Ltd, Israel

A novel method for simulating the propagation of lasers in turbulent atmosphere is presented. The method incorporates two new approaches; the first is a way to describe the turbulent media as a volumetric bulk, instead of the well-known 2D phase screens. The second is a ray-tracing engine developed for this purpose. The combination of these two approaches allows the reliable modelling of the fine details of the propagation process and the observation of all the relevant parameters. The results are compared to analytic cases and additional data. This method of propagation is probably the most straight-forward modelling scheme available for this purpose. The assumptions and approximations that were used are minimal, thus increasing the validity and scope of this work to include all atmospheric conditions.

Biography

I Naeh has completed his PhD in physics from Tel-Aviv University. During his PhD study he developed new methods for simulatingpropagation of lasers in turbulent atmosphere. Based on these simulations, he has established the concept of atmospheric channels and suggested a newapproach for using these channels to perform coherent beam combining using an optical phased array. Currently, he works at Rafael Advanced Defense Systems Ltd., as a Research Associate. His work was published in leading peer-reviewed journals.

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