POSTER SESSION SCHEDULE

Dear participants and lecturers, we are waiting for you METANANO SCHOOL POSTER SESSION.

Monday, July 6th from 17.40 to 19.10

№	Presenters name	Poster title	Poster abstract	Connect via the link
1	Adria Canos Valero	Nanovortex-driven all-dielectric optical diffusion boosting and sorting concept for lab-on-a-chip platforms	The ever-growing field of microfluidics requires precise and flexible control over fluid flow at the micro- and nanoscales. Current constraints demand a variety of controllable components for performing different operations inside closed microchambers and microreactors. In this context, novel nanophotonic approaches can significantly enhance existing capabilities and provide new functionalities via finely tuned light-matter interaction mechanisms. Here we propose a novel design, featuring a dual functionality on-chip: boosted optically-driven particle diffusion and nanoparticle sorting. Our methodology is based on a specially designed high-index dielectric nanoantenna, which strongly enhances spin-orbit angular momentum transfer from an incident laser beam to the scattered field. As a result, exceptionally compact, subwavelength optical nanovortices are formed and drive spiral motion of peculiar plasmonic nanoparticles via the efficient interplay between curled spin optical forces and radiation pressure. The nanovortex size is an order of magnitude smaller than that provided by conventional beam-based approaches. The nanoparticles mediate nano-confined fluid motion enabling nanomixing without a need of moving bulk elements inside a microchamber. Moreover, precise sorting of gold nanoparticles, demanded for on-chip separation and filtering, can be achieved by exploiting the non-trivial dependence of the curled optical forces on the nanoobjects' size. Altogether, this study introduces a versatile platform for further miniaturization of moving-part-free, optically driven microfluidic chips for fast chemical synthesis and analysis, preparation of emulsions, or generation of chemical gradients with light-controlled navigation of nanoparticles, viruses or biomolecules.	link
2	Parnika Gupta	Heat Dissipation Through Copper Thermal Vias in Glass Interposers for Packaging of Integrated Electronic/ Photonic Devices	Silicon interposers have been widely used for packaging electronic and photonic integrated circuits for signal distribution at higher pitch due to their efficient heat distribution performance. However, silicon has been proving to be mechanically fragile with respect to wafer level packaging processes. For this reason we have developed an alternative technology to solve this challenge by using a glass interposer which has better mechanical properties. We propose as a solution the incorporation of copper thermal vias in silica substrate, that we modeled in COMSOL Multiphysics®, in order to decrease the thermal resistance of glass and improve its thermal conductivity to 80W/mK.	link

3	Dipa Ghindani	Active tuning of Epsilon-Near-Zero and Localized Surface Plasmon coupling	The natural progression in developing the metasurface is to manipulate its optical properties without changing the physical structure. These class of metasurface is termed as “active metasurface”. In this work, we demonstrate an tunable active metasurface comprise of plasmonic nano-antenna and epsilon-near zero (ENZ) material. Our preliminary result shows the active tuning of ENZ-LSP (local surface plasmon) hybrid mode that leverage the outstanding field confinement of plasmonic nanoantenna and distinctive tunable optical properties of ENZ layer	link
4	Roumaissa Derdour	All-Optical Logic Gate with Low Losses Based On Y-Junction	We propose the optimization of a micro-component for the integrated optics which is the All-Optical logic gate formed by a Y-junction based on two-dimensional crystal Photonics with a triangular lattice of air holes in silicon. We chose this structure to improve the transmission of single mode with high power and low losses compared to the AND logic gate classic, by optimizing the photonic crystal geometric parameters, the band gaps wavelength and eliminate the higher order modes in order to realize an optimized All-Optical logic gate.	link
5	Elmanova Anna	Study of silicon nitride O-ring resonator for gas-sensing applications	In this work, we experimentally studied the influence of different gaseous surroundings on silicon nitride O-ring resonator transmission. We compared the obtained results with numerical calculations and theoretical analysis and found a good agreement between them. Our results have a great potential for gas sensing applications.	link
6	Elena De Vita	Fiber optic sensors for 3D thermal mapping during microwave ablation therapy in bones	Microwave ablation (MWA) is gaining broad clinical acceptance to treat bone tumors, since bones are a frequent site of metastases which cause intolerable cancer-related pain in 90% of patients, making poor their quality of life. So, being able to treat bone oncology patients by means of minimally invasive techniques can be crucial to avoid surgery-related risks and decrease hospitalization times. Despite several feasibility studies have been performed, an experimental analysis of the temperature trends reached into the bone during the MWA has not yet been assessed. In this study an overall of 40 measurement points has been carried out on ex-vivo bovine tibia and femur undergoing MWA, through fiber Bragg grating sensors inserted into the bones around the MW applicator. The knowledge of the three-dimensional temperature map of the thermal lesion lays the foundations for the design of a novel approach to study the effects of MWA on bone tumors, aiming to optimize the treatment effects and to customize them based on the patient and tumor type.	link

7	Olga Sokolovskaya	Efficiency of optical absorption and Raman scattering in suspensions of silicon and rutile micro- and nanoparticles	In random media, multiple elastic scattering can lead to increase in the efficiency of light-matter interaction (in comparison with bulk medium)[1, 2] . In this paper we discuss the effect of light elastic scattering on nano- and microparticles on efficiencies of light absorption and Raman scattering, which, apart from fundamental interest, are basic for sensing, therapy, and lasing efficiency in random lasers. We consider suspensions of rutile and silicon particles, owing to their high refractive indices and different absorption spectral bands. It is worth mentioning that both considered materials have potential for biomedical applications. The present work reports both on numerical simulation of light propagation in a highly scattering medium and laboratory experiments aimed at revealing the effect of scatterers volume fraction on photon dwell time, Raman signal intensity, and absorption in the considered media. The final aim of the study is to figure out the amount of converted energy and its spatial distribution. Experimental part included the study of scattering dynamics of infrared femtosecond pulses in dense suspensions with sub-picosecond resolution. The results of experiments are in a good agreement with Monte-Carlo simulations [3]. Moreover, Monte Carlo confirmed linear dependence between Raman scattering efficiency and mean photon pathlength. Increase in Raman scattering efficiency for rutile suspensions confirmed the theoretical prediction of backscattered Raman intensity growth, which indicates a key role of incoherent scattering effects. Dependences of the absorption volume and absorption efficiency on the wavelength, nanoparticle size and their concentration in suspensions are obtained. This work was supported by Russian Science Foundation (grant №19-12-00192) References [1]Hokr, B. H., J. N. Bixler, M. T. Cone, et al., 2014: Bright emission from a random Raman laser. Nat. Comm. 5, 4356. [2]Hokr, B. H., V. V. Yakovlev, 2013: Raman signal enhancement via elastic light scattering. Opt. Exp., 21(10), 11757-11762. [3]Wang, L.H., S.L. Jacques, L. Zheng, 1995: MCML: Monte Carlo modeling of photon propagation in multi-layered tissues. Comp. Methods Progr. Biomed, 47(2), 131-146	link
8	Mir Ali	Weyl points in Full and Half Heusler materials without SOC	This study aims a form Heusler of three elements XYZ in these two Full and Half Heusler structural configuration with X=Nb, Y=Rh, and (Z=In, Sb and Sn) that have a topological insulator character almost in all configurations. Our idea is to change Z so that the valence layer contains 17, 18 and 19 electrons for both configurations Half-Heusler and Full-Heusler for a comparative study. So the flexibility of code wien2k as tools of calculating gave us this opportunity to combine the DFT with LDA's approximation and the theory of molecular dynamics represented in the Bootstrap code to realize this work.	link

9	Roman Pavelkin	Asymmetric resonances and fi eld enhancement of hybrid plasmon-waveguide modes in CdTe structures	The planar metal/dielectric structures based on a CdTe waveguide separated from a metal layer by a layer of silicon dioxide support excitation of propagating hybrid plasmon-waveguide modes. The mode's intercoupling results in the appearance of asymmetric resonance line shapes in spectra. The field enhancement of the hybrid modes is characterized by the Fano like and plasmon-induced transparency-like line shapes in the attenuated total reflection spectra of the MDD structures. The rigorous electromagnetic theory is used to study the characteristic resonance regions in the infrared region and demonstrate the effects of field redistribution between the coupled modes in a wide region of their propagation constants. In the this paper, it is established that the hybrid plasmon-waveguide modes can be both related to symmetric and antisymmetric modes. Obtained results can lead to development of planar MDD structure applications in sensing and enhanced infrared spectroscopies.	link
10	Yossef khattab	MoS2 nanostructured thin films for photonics applications	the prototypical transition metal dichalcogenides (TMD) of molybdenum disulfide (MoS2), that consists of two dimensional (2D) molecular layers stacked together by weak interlayer interaction, have received tremendous amount of attention in recent years due to their unique thickness-dependent band gap . Due to that huge research has done for deposition MoS2 films, using many methods like sputtering, evaporation, MBE, CVD and MOCVD. Most of research focused on deposition films with monolayer or few layers. in opposite to bulk MoS2, those films has layers has tunable photoluminescence with reducing intensity by increase number of layers. own to the fact, Bulk MoS2 is an indirect band-gap semiconductor, while MoS2 monolayer exhibits a direct band-gap. In this project on deposition of nanostructured MoS2 thin films for photonics applications, it has been proved for first time that, 3D MoS2 nanostructured is an alternative way for direct tunable bandgap MoS2 and crossing over limitation of monolayer bandgap (1.9 eV), also the power of MOCVD as universal tool to control morphologies of layered materials has been demonstrated. Films with variety of morphologies has been deposited including monolayer, few layer, vertical nanosheets , dendritic structures, vertical cones and nanoparticles. Beside controlling morphology, it is possible to engineer shape, size, lateral distance and number of layers in nanostructures. Nanostructured films characterized SEM, XPS, RAMAN, XRD and TEM and growth mechanism has been proposed, while Absorption and photoluminescence confirm direct band gap of structures with tunable emission cover all visible range of light.	link

11	Ghulam Abbas	Optimizing the optical properties of Silver and Gold nano-ellipsoid	In this work, the optical properties of an isolated nanoellipsoidal particle for the gold and silver cases are studied. We considered the field distribution for three different wavelengths. To study the resonant plasmonic modes excited on nanoellipsoid numerical simulations are performed using finite element method (FEM) with COMSOL Multiphysics. In this study we are addressing 3D configuration. Perfectly-matched-layer boundary conditions are used to terminate the simulation volume. Optical data from Johnson and Christy is used to model the dielectric functions of the both materials, i.e., silver and gold. Electric field enhancement, Absorption and scattering from nanoellipsoid are discussed in detail. The results found in this work will be useful to optimize the optical properties of nanoparticles for applications such as biosensing and in the plasmonic photovoltaic field.	link
12	Deepak Kumar	Novel trends in metamaterials based sensing	Excitation of high-quality factor resonances is very important and becoming useful to realize new trends in the fields of highly sensitive platforms, and nonlinear photonic devices, etc. This is nicely achieved by exploring the inherent characteristics shown by the lattice of artificially designed features known as metamaterials. Here we present the demonstration of high Q factor resonances in metasurfaces. This is being accomplished by tailoring the geometrical array of the proposed design at the unit cell level, followed by the strong interaction of light with the lattice of the metamolecule. The optical observations are recorded in terms of transmission and can pave the path for new avenues for biomedical sensing, narrowband devices, and other commercial photonic applications based on electromagnetic energy.	link
13	Syed Muhammad Anas Ibrahim	Lighttrapping Modesinlossy Plasmonic Waveguides	An array of opportunities for creating novel technologies using tetra hertz frequency band due to the lack of suitable sources, as well as lack of guiding and detecting devices. Since of research in controlling the velocity of light due to its diverse range of applications, plasmonic waveguide can make it potential candidate to exhibit slow light phenomenon approaches: spatial and temporal.	link
14	Anubhav Srivastava	Long Period Gratings in Specialty Optical Fibers	This work reports about the fabrication and characterization of Long Period Gratings in specialty optical fibers. The Long Period Gratings (LPGs) are widely employed as in-fiber devices able to sense several parameters such as temperature, strain, bending and surrounding refractive index etc. The principle involved is an LPG exhibits one or more attenuation bands in the transmitted spectrum, located at the resonance wavelengths, which are dependent on the parameter to be measured. In this work, the sensitivity is measured and reported for different characterization like SRI, Temperature and Strain for different fibers.	link
15	Ilya Kuk	Mamyshev effect in coherent optical fiber links	The dynamics of the pulse sequence in coherent fiber optic lines with weak nonlinearity is studied. The nonlinear mechanism of energy redistribution in the sequence of pulses leading to an increase in the probability of errors has been studied. This redistribution arises as a result of dispersion broadening and four-wave interaction of spectral components, overlapping pulses.	link

16	Margarita Belali	Photonics as the Communications Light for Deep Space Network	The last years, one of the biggest challenges in the field of Space communications is how to establish high data rate capability over long link distances (Deep Space distances), while maintaining high reliability and signal fidelity in a long system lifetimes .The missions are increased about Near-Earth orbit and Deep space, so the availability in RF Ka-band (GHz) is discreased in capacity and needs to higher Band Width. This can be succeded with optical communications which Space organisations can realize data rates 10-100X better than RF as well as this quality of communications requires less SWap (Size, weight, and power). The science behind this is Photonics. Photonics is the physical science of light (photon) generation, detection, and manipulation through emission, transmission, modulation, signal processing, switching, amplification, and sensing . By studying this direction, it is very important to focus on the Scattering Problems in Photonics through which we can ensure the reduced chances of target failure and the same time the way of its evolution in this field.	link
17	Ilia Fradkin	Plasmonic nanoparticle lattices: Fourier modal method and dipole approximation	Plasmonic nanoparticles lattices in a dielectric environment demonstrate exceptional optical properties due to the combination of plasmonic structures' ability to confine light in deep subwavelength scale and dielectric ones to support high-quality optical modes. However, such structures, especially in the case of the small size of plasmonic particles, are hard for the calculation by the means of the Fourier modal method (FMM) specialized for periodic structures, since their local field is described by high-k harmonics. We propose not to account for a large number of harmonics, but to consider the lattice in discrete dipole approximation (DDA) to construct its scattering matrix. In this work, we apply this approach for different lattices and show its efficiency and accuracy. We consider lattices located in homogeneous environments and on waveguides, lattices of nanodiscs and nanorods, stacks of identical sublattices, and lattices with complex unit cells. The demonstrated examples show that even in dipole approximation plasmonic lattices support very interesting physical phenomena that can be studied and applied in integrated optical devices.	link
18	Dmitriy Nikulin	Evaluation of the morphology of thin nitride film on the leukosphire sudstrates obtained by the pulse laser deposition method with assisting by the ion beam	The morphology of the surface of thin films of gallium nitride obtained by the combined installation of pulsed laser deposition (PLD) and ion-beam deposition, used as a source of atomic nitrogen, was evaluated. The morphology of the obtained films characterize using optical, atomic force (AFM) and scanning electron microscopy (SEM), the stoichiometric composition refines by energy dispersive analysis. It has established that the flow makes a significant influence on the surface morphology of atomic nitrogen	link

19	Lyudmila Basalaeva	Features of resonant light scattering by silicon metasurfaces	During the recent years, silicon metasurfaces attract considerable interest of researchers. It is complex resonant system. In this work, simple metasurfaces –ordered microarrays of silicon nanopillars (Si NPs) were formed and investigated. Si NPs were formed by means of plasmachemical etching of the silicon-on- insulator (SOI) substrates through the mask of a negative electron resist AR-N7520.17new.A wafer was exposed using a electron beam lithography system (Pioneer Raith GmbH). The microarrays of Si NPs 100 to 250 nm in diameter, 0,2 and 0.4 μm high, with the period (pitch) of 400, 500, 600, 700, 800, 900, 1000 nm were formed. The thickness of the inner layer of SiO2 was 300 nm or 500 nm. Resonance and scattering properties of Si NP were investigated. The effect of strong resonance light scattering – change of color of separate Si NPs – was demonstrated. We also measured photoluminescence from Si NPs at the SOI under ultraviolet pumping at room temperature (in the wavelength range 350–1100 nm). He-Cd laser with excitation wavelength of 325 nm was applied as a light source. The gain of the photoluminescence signal from organic film placed on Si NP was investigated.	link

Thursday, July 9th from 17.40 to 19.10

№	Presenters name	Poster title	Poster abstract	Connect via the link
1	Pavel Trofimov	Hybrid Si/phase-change metasurfaces and nanoantennas for active nanophotonics	Optical metasurfaces (MS) have attracted a lot of attention because they are compact multifunctional devices and are perfect to control light at the nanoscale. But dielectric MS are in particular interest due to their high electric and magnetic dipole polarizability. Their subwavelength resonant building blocks (meta-atoms) made of high-index dielectric materials, such as silicon, allow engineering of both effective permittivity and permeability of the structure. This leads to such interesting applications as holograms, achromatics flat lenses, lasing and multicolor generation. However, usually the functionality of such structures is locked on the fabrication stage. The implementation of dynamic and reconfigurable control of the properties of such structures would open a route towards vast range of new applications such as lidars and tunable holograms. On the other hand, there exist family of phase-change materials (PCM) - chalcogenide PCM which are non-volatile in nature. This means that such materials which have two different phase states - amorphous and crystalline don't require constant flux of energy to preserve these states. Moreover, they can be reversibly switched between these two states applying optical or electrical pulses. Importantly, this switching results in a huge contrast in the complex refractive index, which makes PCMs very attractive for the creation of active optical devices and metasurfaces. And in our work, we suggest another concept which combines properties of PCM and all-dielectic structures. We propose two exemplar hybrid all-dielectric/phase-change devices based on silicon nanoresonators with subwavelength inclusions of chalcogenide PCMs. Such inclusions provide active non-volatile control over the optical response of these nanoresonators. To prove our concept we develop and experimentally demonstrate a reconfigurable spectral filter based on a Si nanocylinder/Ge2Sb2Te5 metasurface working in the telecom range. Moreover, we also numerically demonstrate a single hybrid subwavelength nanoantenna that provides complete switching (forward to backward direction) of surface plasmon polariton directivity pattern in the near-infrared.	link

2	Muhammad Qasim Mehmood	Breaking Polarization-Bandwidth Trade-off to Realize Broadband Methologram for Unpolarized Visible Light	Optical metasurfaces have gained attention due to their significant prospects, which can benefit consumers and industries in terms of virtual reality devices and digital displays in various multimedia and entertainment-related applications. To date, most of the metasurface optimisation strategies involving isotropic or anisotropic nanoantennas encounter a tradeoff between polarisation insensitivity and operating bandwidth under unpolarized white light, which is a fundamental requirement for many applications in digital displays. We presented a novel technique to break the trade-off between polarisation insensitivity and bandwidth by engineering the displacement dependent phase delay of the adjacent parallel and perpendicular anisotropic nanoantennas in a dielectric metasurface. As a result, we numerically demonstrate a highly efficient metasurface operating at an almost entire visible domain (wavelength of 450 nm–650 nm) while maintaining a constant phase modulation under all polarisation states, thus enabling the polarization-insensitive metadevices for unpolarized white light.	link
3	Vishal Vashistha	Recent Developments in Color Filtering using Symmetric and Antisymmetric Cross-Shaped Si Nanoresonator	A new era in printing technology has begun thanks to plasmonics based color printing. It offers several advantages over the conventional, i.e., pigment based color printing, such as very small thickness, eco-friendliness, and superior quality of colors also below diffraction limit~\cite{review_1}. Recently, many new results have been reported regarding the theoretical aspects and practical implementation of the concept of plasmonics based printing. Most of them are related to the nanostructures containing metallic components. The most recent trend is the use of dielectric nanoantennas~\cite{bonad}, which may enable high-quality colors~\cite{vashistha_1,vashistha_2}. In this study, we experimentally demonstrate high-quality colors obtained by using arrays of cross-shaped Si nanoantennas. Functionality and characteristics achieved with the aid of symmetric and asymmetric nanoantennas are compared. Si nanoantennas typically show two strong resonances: electric and magnetic dipole ones. They can be tuned by adjusting the size and shape of the nanoantennas throughout the whole visible spectrum.	link
4	Dr Zeeshan Mahmood	Expoliting the sensing performance of Gold Nanorods Dimmer by tunning their aspect ratio and junction length	We have explored the optical behaviour of gold nanorod dimmer (AuNR) bridge by thin silica junction to sub-nanometer regime, where light−matter interactions have been anticipated in which quantum nature of free electrons in metals might be strongly affected. To probe this model, nanorod dimers were simulated using the finite element method in frequency domain based on COMSOL Multiphysics. In FEM simulation, the nanorod surface was divided into small tetrahedral mesh with finer size. Our results reveal that an increase in aspect ratio causes a red shift in dimer connected mode, leading to significantly higher sensitivity 717 nm/RIU and figure of merit 16.9 compared to a single dimer having 300 nm/RIU sensitivity with similar dimensions. These findings suggest that using end to end linked nanoscale structures could significantly play an important role in tuning far field spectral responses of plasmonic metal nanostructures for applications in LSPR sensing.	link

5	Deepanshu Baisoya	Realization of Orbital Angular Momentum for Wired Optical Communication	Optical transmission of data has proven to be fast and efficient and to avoid any bottleneck, various encoding schemes are being experimented by exploiting different properties of the laser beam. One encoding scheme which has proven promising and can be extended for the future tech such as quantum cryptography, uses orbital angular momentum of photons in a laser beam, and this quantum mechanical feature of photon beam is more substantial and stable in comparison to spin angular momentum but traditional ways of generating different OAM modes in laser beam use bulky components such as spiral phase plates and grating. In our work, we propose a simple photonic circuit carrying out multiplexing and demultiplexing of different OAM modes generated using VCSEL lasers and brief study of eigenfunctions related to operator constructed for the total angular momentum J = L + σ (L – orbital angular momentum and σ- spin angular momentum) is provided to corroborate our theory before moving on towards experimental realisation of our simulated photonic circuits in a practical environment for future extension.	link
6	Anton Utyushev	Nanoparticle arrays as narrowband selective tunable optical filters: from visible to near-IR	Nanoparticle arrays can exhibit collective effects that are associated with the interaction of electromagnetic fields created by constituting nanoparticles. In this case, ultra-narrow resonances (in transmissions or reflection spectra) are caused by the interference of the fields of individual particles at the wavelengths close to Wood-Rayleigh anomaly. In a general case, the phase of the external field of a plane wave near an individual element coincides with the phase of the field created by the neighboring element. If this condition is satisfied within the entire structure, then a high-Q resonance is observed at corresponding wavelength. In this work, we utilize this effect to engineer tunable devices which select an ultra-narrow spectral line in a reflection mode from the spectral continuum with 100% efficiency.	link
7	Aqsa Ehsan	Exploring the Space-Fractional Nature of Cylindrical Bessel Beams	Bessel Beams are of great interest to the researchers because of their unique localization properties. They have been largely employed in applications involving lasers where a highly focused beam is required. During the recent times, the researchers are trying to investigate the fractional nature of these beams. This is important not only to understand them better but also we can achieve complete control of their behavior by studying their fractional nature. Tao and his teammates introduced fractional Bessel Beams in terms of fractional order Orbital Angular Momentum but this solution did not represent exact solution of cylindrical wave equation. Vega also introduced his solution by superposing multiple Bessel beams but its scalar nature also made it unsuitable for Electromagnetics. Later Mitri and Caloz introduced vector solutions by making use of the Maxwell's vector equations and the Hertz vector potentials, but they did not clearly define their propagation characteristics. Hereby, we will explore the behavior of these beams in fractional dimensional space and will completely define their propagation characteristics in fractal media. Currently scalar solution will be discussed and complete vector analysis will be shown later on. The results are promising and will help in applications such as optical communications and optical microscopy.	link

8	Masoud Hamidi	Dyadic Green's Function of Cylindrical Isotropic Metasurface	In this work, dyadic Green’s function (DGF) of an In this work, dyadic Green’s function (DGF) of an isotropic cylindrical metasurface is presented. The DGF is constructed from cylindrical vector wave function and appropriate scattering coefficients which are derived using the scattering superposition method. The metasurface is modeled using the Generalized Sheet Transition Conditions (GSTCs). The electric field due to a vertical electric dipole (VED) in the farfield is obtained and compared with the results of a commercial package. The results are in good agreement with each other.	link
9	Denisenko Roman	Smart Heart	The goal is to develop a device that will process data of cardio-respiratory synchronism. Smart heart	link
10	Abdulkareem Mas-ud Ayodeji	Non-linear plasmonics of square array of gold nanoparticles.	The plasmonic resonance from array of square gold nanoparticle was obtained numerically using FDTD with the view of optimizing the particle dimensions and tuning the resonance to optical range. The obtained experimental result is in good agreement with numerical calculation and a resonance was observed at the predetermined range.	link
11	Sergei Gladyshev	Symmetry analysis and multipole decomposition of eigenmodes of optical resonators	The most common way to enhance interaction of electromagnetic waves with matter at the nanoscale is to use microresonators and resonant optical nanoantennas. In virtue of small size their optical properties are well described in terms of multipole decomposition, namely, by first several terms in the multipole expansion. The multipole expansion is a powerful tool explaining Kerker effect, anapole, supercavity mode, invisibility, transverse scattering and other beautiful optical phenomena. The specific multipole content of the mode is completely determined by its symmetry and shape of the resonator. Therefore, the classification and determination the multipole content of the eigenmodes in resonators depending on their symmetry is a task of great significance for modern nanophotonics.	link

12	Aleksandra Furasova	Dielectric nanostructures influence on perovskite solar cells performance	Thin film perovskite solar cells (PSCs) present one of the most promising tools to get fast, cheap and environment friendly electricity sources. Despite their repid efficiency growth due to the perovskite composition choice and engineering cell design the problem with the charge generation and effective charge separation is not solved yet. In this work, we summarize our knowledge about PSCs mechanisms improvement by various high refractive index nanostructures: pristine and doped silicon nanoparticles, GaP nanowires. We present our calculations of devices electromagnetic field distributions which confirm experimentally received photovoltaic parameters.	link
13	Dmitry Zhirihin	High-order topological states in photonic Kagome lattice	In this work photonic high-order topological states were investigated in a two-dimensional perturbed Kagome lattice. We predict the emergence of new type of topological states induced by long-range interactions, specific to photonic systems, and verify it numerically and experimentally in microwave frequency range using near-field scanning technique.	link
14	Jeena Varghese	Mechanical reinforcement of polymer colloidal crystals by supercritical fluids	Colloidal crystals realized by self-assembled polymer nanoparticles have prominent attraction as a platform for applications from assembling photonic and phononic crystals to organic electronics, surface coatings to drug delivery systems. In this work we report mechanical reinforcement of polystyrene colloidal crystals by means of “cold soldering” that results from nanoscale plasticization at high hydrostatic pressure of N2 and Ar. We employed Brillouin light scattering to monitor the mechanical vibrations of the crystal and thereby determine preferential conditions for soldering, i.e., formation of physical bonding among the nanoparticles while maintaining the shape and translational order of the nanoparticles.	link
15	Viktoriia Rutckaia	Luminescence Enhancement of Si Mie-Nanopillars with Quantum Dots	I will present theoretical considerations and experimental observations on three mechanisms of photoluminescence enhancement of light emission from quantum dots embedded in cylindrical Mie-resonators. This includes excitation efficiency, Purcell effect and out-coupling efficiency.	link
16	Yali Sun	Linear and circular scattering of a single plasmonic helix in visible range	Optical resonant properties of a single plasmonic helix fabricated by focused ion beam induced deposition have been investigated in scattering with both experiments and simulations. The resonances have been studied under different polarizations of the incident light, demonstrating a significant polarization dependent behaviour as well as size dependence of these nanostructures in the visible spectral range.	link

17	Zeying Zhang	Real-time detection of single-molecule reaction by plasmon-enhanced spectroscopy	Determining structural transformations of single molecules (SMs) is an important fundamental scientific endeavor. Optical spectroscopies are the dominant tools used to unravel the physical and chemical features of individual molecules and have substantially contributed to surface science and biotechnology. In particular, Raman spectroscopy can identify reaction intermediates and reveal underlying reaction mechanisms; however, SM Raman experiments are subject to intrinsically weak signal intensities and considerable signal attenuation within the spectral dispersion systems of the spectrometer. Here, to monitor the structural transformation of an SM on the millisecond time scale, a plasmonic nanocavity substrate has been used to enable Raman vibrational and fluorescence spectral signals to be simultaneously collected and correlated, which thus allows a detection of photo-induced bond cleavage between the xanthene and phenyl group of a single rhodamine B isothiocyanate molecule in real time. This technique provides a novel method for investigating light-matter interactions and chemical reactions at the SM level.	link
18	Farhan Ali	Dual-narrowband Plasmonic perfect absorber at visible-NIR frequenices	We propose and numerically demonstrate a dual-narrowband metamaterial absorber based on a Metal-Insulator-Metal configuration, where a thin sheet of MgF2 is sandwiched between a bottom gold mirror and a top 2D periodic array of gold nanodisks. The proposed metamaterial structure comes up with two narrow-band absorption peaks at visible and near-infrared region of electromagnetic spectrum with near unity absorption efficiency. The physical origin of these absorption peaks is found as the excitation of Propagating and Localized surface plasmon resonances at certain individual frequencies. Moreover, these plasmonic resonances are insensitive to polarization angle, without effecting resonant wavelength and absorption efficiency for both polarization states of the incident light. By engineering geometrical parameters of the device, resonance wavelength and the absorption efficiency are tuned to achieve optimum results. Also, an effective-medium approach and critical coupling phenomenon is described to explain the perfect absorption of the proposed metamaterial absorber. On the other hand, a nearfield analysis is made, showing a large field enhancement at resonant frequencies making such a platform suitable for SERS, Refractive index based sensing, and Biosensing applications.	link

19	Jorge Fernández	Sensing performances for monometallic configurations in multimode fiber-based SPR sensors	This work presents an analysis of different possible combinations of a monometallic layer (Au or Ag) with N-layers graphene coating for multimode-fiber based SPR sensors. We know that Au and Ag for plasmonic sensors present high sensibilities (S) and good Figure of merit (FoM) values (S/FWHM), some previous results show its advantages and applications. These sensors can be modeled using the multilayer reflection approach (transmission and reflection matrices or Fresnel matrices) with good agreement with experimental results. We have developed a numerical code able to assess the most efficient combination for N-sensors, in cascade configuration using different types of multimode fibers. Each sensor must exhibit a distinctive resonance frequency. We set two restrictions in order to get efficient cascade configurations: first, the FWHMs related to two consecutive resonance frequencies must be narrow enough to avoid resonance interference and second, the resonance's dips have to be greater than 1dB so that can be clearly detected. As a result, we present the case of three sensors in cascade configuration: with silver and single-layer graphene, gold with no graphene layer and gold with four-layer graphene, which presents the higher potential of sensitivity, FoM and multiplexing sensing using a 105/125um (NA 0.10) multimode fiber.	link
20	Ilya Pleshanov	Development of position-sensitive luminescent spark detectors	Optical glass has many advantages. One of the most important for us is immunity to electromagnetic fields. In addition, optic sensors meet such requirements as high reliability, durability, reliability, small size, weight, power consumption, compatibility with microelectronic devices with low complexity of information processing, manufacturing and low cost. An important task is to search for sensitive sample with good performance. One of the promising materials are glass containing molecular clusters of metals. The use of molecular clusters of silver perspective for the development of sensitive elements of position-sensitive luminescent spark detectors. The study was developed and studied position-sensitive luminescent spark detectors based oxyfluoride glass with molecular clusters of silver and samarium ions.	link