

Venue: Lecture Theatre 4 (CTLTT4), Teaching and Learning Building, Nottingham Trent University, Clifton Lane, Nottingham NG11 8NS (see bottom of the flyer)

Lecturer: Professor Anatoly Zayats, King's College London

Lecture title: Nonlinear Optics with Nanoparticles and Metamaterials

Abstract:

Coherent and incoherent nonlinear optical effects play important role in photonics, laser physics and quantum optics. However, nonlinear optical applications are limited by the available choice of naturally occurring materials and their generally weak nonlinear response. Weak nonlinearity of conventional materials can be enhanced by their nanostructuring or through metamaterial approach. Dielectric and plasmonic nanoparticles, nanostructures, metamaterials and metasurfaces provide unique opportunities to design the enhanced nonlinear optical response in the required spectral range and with required parameters. Using complex vector beams with tailored distributions of the electric field amplitude and phase provides additional opportunities to manipulate nonlinear response.



In this talk, I will overview recent developments and trends in engineering nonlinear optical properties in several types of nanostructures. Some of the examples include ultrafast Kerr-type nonlinearity in mesoscopic plasmonic nanocrystals with low free-carrier concentration which exhibit a much faster carrier relaxation than in traditional plasmonic materials, plasmonic hetero-nanostructures which allow tailoring the electron dynamics controlled by hot-carriers injection, meta-nanoparticles with broadband nonlinear response and tailored acousto-optics, hybrid plasmonic/epsilon-near-zero metasurfaces, anisotropic metamaterials enabling enhancing and controlling both magnitude, spectrum and transient dynamics of the nonlinearity, as well as emergent bulk second-order nonlinearity in metamaterials. The applications of metamaterials in shaping and controlling light polarisation and ultrashort pulses will also be discussed.

The requirements for strong light-matter interaction necessitate the use of resonant dielectric, plasmonic or hybrid nanostructures for tailoring nonlinear optical effects. The interplay between resonance responses of nanostructured materials plays an important role in defining nonlinear optical properties. With the development of new atomically smooth plasmonic and two-dimensional materials the resonant interactions can be controlled in a well determined way, providing further opportunities for nonlinearity engineering.

About Lecturer:

Professor Anatoly V. Zayats is a Chair in Experimental Physics and the head of the Photonics & Nanotechnology at the Department of Physics, King's College London, where he also leads Nano-optics and Near-field Spectroscopy Laboratory (www.nano-optics.org.uk). He is a Co-Director of the London Centre for Nanotechnology and the London Institute of Advanced Light Technologies. His current research interests are in the areas of nanophotonics, plasmonics, metamaterials, optical spin-orbit coupling, plasmonically-derived hot carriers, scanning probe microscopy, nonlinear and ultrafast optics and spectroscopy, and optical properties of surfaces, thin films, semiconductors and low-dimensional structures. He is a founding co-editor-in-chief of Advanced Photonics journal. He is a Fellow of the Institute of Physics, the Optical Society of America, SPIE, the Royal Society of Chemistry and elected Member of Academia Europaea.

Registration is required

<https://www.eventbrite.co.uk/e/ieee-seminar-by-professor-anatoly-zayats-kings-college-london-tickets-547403056277>

Venue: CTLTT4 is Lecture Theatre 4 in the Clifton Teaching and Learning Building.

Free pre-booked parking: Please contact claudia.gathercole@ntu.ac.uk to request a car parking space in the visitor parking. It is accessed using the Main Gate. After parking, please make your way through the open plaza: you will find the Teaching and Learning Building ahead of you.