CONFOCAL NANOSCOPY AND NANOBIOSENSING

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Abstract

Nanophotonics is an emerging field in modern science and technology that has opened up new horizons for many unique practical applications in various areas ranging from biomedicine to nanoelectronics and material science. The presentation will cover fundamental principles, recent developments and trends in advanced nanophotonics techniques. It will be presented a novel concept for ultrahigh-resolution non-invasive confocal biosensing and imaging in sub-wavelength nanoscale range beyond the theoretical diffraction limit. The method is based on simple apertureless fiber-optic confocal designs that include either dual-confocal or single-fiber sensor/imaging systems. This method can be employed for either minimally invasive diagnostics/imaging in biomedicine at cellular/intracellular level or development of nanobiosensors and nanostructured materials.

Dr. Ilko Ilev has over 20 years of experience in the USA, Europe and Japan in the field of quantum physics and laser technologies, fiber optics, laser medicine, non-invasive optical diagnostics and biosensing, and high-resolution optical imaging. He received M.S. and Ph.D. degrees in Laser Physics from Sofia University, Bulgaria, in 1983 and 1992, respectively. He has worked in the Optoelectronics Division at the Strathclyde University, Glasgow, UK, in 1995, and in the Laser Technology Laboratory at the Institute of Physical and Chemical Research (RIKEN), Japan, Tokyo, from 1995 to 1997. From 1998 to 2001 he was an American Academy of Science/National Research Council (NRC) Research Associate in U.S. Food and Drug Administration. Since May 2001 he is with the Center for Devices and Radiological Health at U.S. FDA. Dr. Ilev has produced more than 200 papers in peer-reviewed journals and presentations at major national and international conferences and meetings. His current research interests include development of novel and simple minimally invasive photonics techniques including smart fiber-optic structures and nanobiosensors for investigation of single cell and intracellular chemical analytes, mechanisms of light-tissue interactions and ultrahigh-resolution confocal imaging beyond the diffraction limit in the subwavelength nanoscale range.