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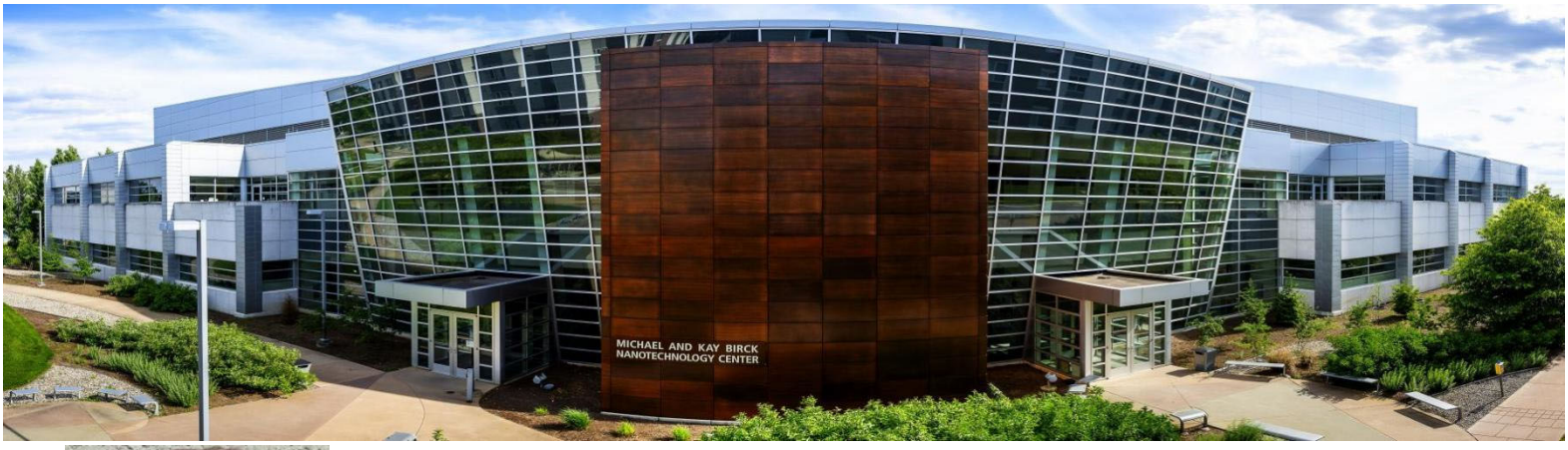

High-resolution frequency comb spectroscopy from 1 THz to 1 PHz

Professor Konstantin Vodopyanov

21st Century Scholar Endowed Chair & Professor of Optics and Physics CREOL,

The College of Optics & Photonics

University of Central Florida, Orlando, FL

October 4, 2024, at 10 am in BRK_2001

Zoom Link: https://purdue-edu.zoom.us/j/97155275388

Abstract:

Dual-comb spectroscopy across electromagnetic spectrum has evolved into a powerful technique that features simultaneously broad spectral coverage, superior spectral resolution, and high speed, and is a spectroscopic method of choice for applications ranging from testing fundamental laws of science to trace gas sensing and astronomical observations. I will present our results on extending the comb spectroscopy both to the mid-IR–THz and to the visible and UV spectral regions. This allowed high-resolution mid-IR– THz measurements with low-pressure gaseous methanol, ethanol, isoprene, and dimethyl sulfide and reveal spectroscopic signatures, all referenced to an atomic clock, that have never been explored before. Our advancement in the UV comb spectroscopy sets the stage for the high-resolution study of molecules, and explore a cutting-edge frontier in UV spectroscopy – the recently discovered isomeric state ultra-narrow optical transition of the 229Th isotope near 148 nm, which is unique among nuclear transitions (due to the incredibly low transition energy) and can be the basis for creating a nuclear clock.

Biography:

Konstantin L. Vodopyanov obtained his MS from the Moscow Institute of Physics and Technology (“Phys-Tech”) and his PhD and DSc (Habilitation) from the Oscillations Lab. of Lebedev Physical Institute (later General Physics Inst.), led by Nobel Prize winner Alexander Prokhorov. Konstantin served an assistant professor at the Moscow Phys-Tech (1985-90), an Alexander-von-Humboldt Fellow at the University of Bayreuth in Germany (1990-92), and as a Royal Society postdoctoral fellow and lecturer at Imperial College, London, UK (1992-98). In 1998, he moved to the United States and became head of the laser group at Inrad, Inc., NJ (1998-2000), and later director of mid-IR systems at Picarro, Inc.,CA (2000-2003). His other industry experience includes co-founding and providing technical guidance for several US and European companies. In 2003 he returned to Academia (Stanford University, 2003-2013) and is now a 21st Century Scholar Chair & Professor of Optics at CREOL, College of Optics & Photonics, Univ. Central Florida. Dr. Vodopyanov is a Fellow of the American Physical Society (APS), Optical Society of America (OSA), SPIE – International Society for Optical Engineering, UK Institute of Physics (IOP). He has > 350 technical publications and is member of program committees for several major laser conferences including CLEO (most recent, General Chair in 2010) and Photonics West (Conference Chair). His research interests include nonlinear optics, mid-IR and terahertz-wave generation, ultra broadband frequency combs and their spectroscopic and biomedical applications.

Hosts: Prof. Alexandra Boltasseva – (aeb@purdue.edu) and Prof. Vladimir M Shalaev – (shalaev@purdue.edu)