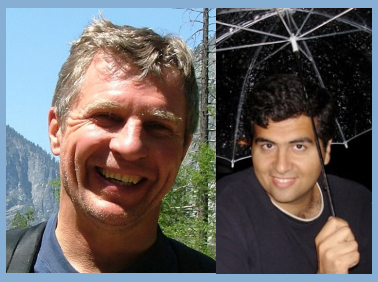

SU2P Staff Exchange

Case Study:- Konstantin Vodopyanov, Alireza Marandi

Title:Nonlinear Optics, ultra-short pulse lasers and frequency combs

Introduction

Following an introductory visit by Konstantin Vodopyanov his PhD student Alireza Marandi visited Scotland for 2 months. This is a summary of his academic activities He visited University of St. Andrews for more than three weeks, Strathclyde University for one week, and Heriot-Watt University for about three weeks. He had the chance to learn about the optical research in Scotland, and obtain valuable skills by working on several experiments.

University of St. Andrews

The extensive visits were with the Nonlinear Optics and Ultra-Short Pulse Laser groups. In the Ultra-Short Pulse Laser group experiments with a mode-locked Cr:YAG were conducted with Drs. Brown and Metzger. The hosts at University of St. Andrews were Profs. Sibbett and Dunn, and Dr. Brown.

University of Strathclyde

During the one-week stay at the University of Strathclyde, several research laboratories were visited. These were including but not limited to a comprehensive tour of IoP by Drs. David Burns and John-Mark Hopkins, labs of Prof. Erling Riis, Prof. Geoffrey Duxbury, and Dr. Neil Hunt. Intriguing discussion with Prof. Gian-Luca Oppo regarding Stanford's degenerate OPOs raised the potential for quantum optical experiments. There were also initial discussions and calculations for designing a tunable CW terahertz source based on Orientation Patterned GaAs (OP-GaAs) and the 2 -µm disk laser at IoP with the Strathclyde host, Dr. Ackemann.

Heriot-Watt University

At the first day at Heriot-Watt university, Prof. Reid gave Alireza two boxes full of parts for building an external cavity laser diode (ECDL) locked to one of Rubidium spectral lines. This ECDL is to be used to stabilize a frequency comb generated by an optical parametric oscillator pumped by a fs Ti-Sapphire laser. The second-harmonic of the generated frequency comb will then be locked to the reference frequency from the ECDL. The idea for such an ECDL is based on dichroic-atomic-vapor laser lock (DAVL) which is based on the Zeeman splitting effect. Unlike conventional locking methods, DAVL does not require modulation on the laser frequency. A weak magnetic field applied along the direction of the beam in the gas splits the spectral line for left-hand and right-hand circular polarizations. An error signal then can be generated by subtracting the signals at these two polarizations.

Benefit

During Alizera's two-month visit to Scotland he had the chance to meet with several outstanding researchers and work with a few of them. Alireza commented that he was really fascinated with the depth and breadth of the research in optics in Scotland both towards commercialization and academic goals. He was fortunate to extend his experimental skills by working on systems which were closely related to his PhD research at Stanford such as a high-repetition rate mode-locked laser and an ECDL.