エクストリームフォトニクスセミナー

Extreme Photonics Seminar

No. 4

Language: Japanese

Date: June 23 (Thu), 2011, 15:00 〜 17:00

Location: Cooperation Center, 5F Meeting Room, W524
(研究交流棟5階会議室 W524)

Title: Development of CEP-stabilized high energy CPA/OPA lasers and generation of highly phase-matched isolated attosecond pulses

Speaker: Dr. Tsuneto KANAI (RIKEN)

One of the most crucial issues for the present attophysics is to increase the pulse energy of isolated attosecond pulses (IAP's). For this purpose, there are two crucial experimental challenges to demonstrate; one is to develop multi-mJ few cycle lasers with a stabilized carrier-envelope phase (CEP) and the other is to achieve the phase-matching highly between the few cycle pulses and high harmonics of them.
In this talk, I will present our research activities on both challenges. First, I will present our recent results of RIKEN based on our TW-class 2-cycle laser system (5 fs, 5 mJ, 1 kHz). The CEP of this system has been stabilized with two feedback loops and through the phase matching process, we could select the supercontinuum component of the harmonics without any use of bandpass filters such as Mo/Si mirrors. Second, I will introduce our recent results at Imperial College London on construction of a CEP-stabilized high power OPA (optical parametric amplification) laser. CEP-stabilized seed pulses were generated using type II DFG of different frequency components of the supercontinuum generated with a hollow fiber compression technique, and the seed pulses were amplified by two-stage OPA's. Final output pulses had a pulse energy of 500 □J, pulse duration of 40 fs, and tunable wavelength from 1300-1800 nm. As the first demonstration of this handmade laser, we generated high harmonics up to 47th using a tube target filled with Xe gas.

Title: X-ray microscopy reveals nano-resolution 3D brain structure for neuronal Networks

Speaker: Dr. Haruo MIZUTANI (The University of Tokyo)

Neural circuits in the central nervous system are the substrate of various high-order brain functions. Anatomical and functional graph structures of neural networks with actual connections will provide us with perspectives to elucidate the brain complex system. Here, we aim to develop a three-dimensional mouse brain atlas of neural circuits using high resolution X-ray microscopy by synchrotron radiation or laser-produced plasma light source. In addition to identifying a large number of synapses, our research will also clarify the part of structure of neuronal networks for understanding a variety of brain functions. In this study, a nano-resolution full-field X-ray microscopy revealed nerve fibers (axons and dendrites) and organelles including mitochondria and synapses in the mouse cerebral cortex. We demonstrated soft X-ray micrograph of the neural tissue slice with 25 nm spatial resolution and indicated possibility of high speed imaging with nano-second order exposure time. Moreover, high sensitive hard X-ray phase contrast nano-tomography unveiled 3D structure of the mouse brain tissue with isometric 22 nm voxel sizes. In the near future, we will utilize that information to begin deciphering the wiring diagram of the brain by applying the nano-resolution and high-speed X-ray microscopy.

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