

エクストリームフォトリクスセミナー

Extreme Photonics Seminar

No. 8

Language: Japanese

Date: Oct. 29th(Fri), 2010, 15:00 ~ 17:00

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

Title: Recent progress in x-ray nonlinear optics

Speaker: 玉作 賢治 氏 (理研 SPring-8)
Dr. Kenji Tamasaku (RIKEN SPring-8 Center)

X-ray nonlinear optics [1] has been considered as a frontier in both x-ray physics and nonlinear optics, and to be explored with x-ray free-electron lasers (XFEL). Recently, we succeeded in observing parametric down-conversion (PDC) of x-rays into extreme ultraviolet [2], vacuum ultraviolet [3], and soft x-rays [4] using an existing synchrotron-based x-ray source, SPring-8.

Our precision measurements reveal unique features of x-ray nonlinear optics [5]. X-ray PDC is observed indirectly through quantum mechanical interference known as the Fano effect [4].

The nonlinear susceptibility is sensitive to the resonance, and shows strong resonance enhancement. The second order nonlinear susceptibility has microscopic structure, which changes its shape as the energy of down-converted (idler) photon.

We review the physical background of nonlinear optical phenomena in the hard x-ray region, the recent experimental results, and discuss the future perspective.

Title : Development of next generation high power laser system with cryogenic Yb:YAG ceramics

低温冷却Yb:YAGセラミックスを用いた次世代大出力レーザーの開発

Speaker : 古瀬 裕章 氏 (レーザー技術総合研究所)
Dr. Hiroaki Furuse (Institute for Laser Technology)

We are developing the GENBU (Generation of ENergetic Beam Ultimate: 1 kJ, 10 ps, 100 Hz) laser system which was proposed as a milestone in the reactor driver developments at Osaka University. We applied two approaches to reduce the thermal problems in the laser gain media. One was to use cryogenically-cooled Yb:YAG ceramics as laser gain material leading to better thermal properties, reducing the thermal load on the gain medium. The other approach was to use Total-Reflection Active-Mirror (TRAM) configuration which realizes an efficient cooling. Using the cryogenic Yb:YAG TRAM, we obtained a high output power of 273 W with an optical efficiency of 65% in CW operation. We also proposed a monolithic multiple TRAMs design for a 10 kW laser system named ZiZa-AM.

In the presentation, our recent progress about TRAM, ZiZa-AM lasers will be reported. In addition, we would like to introduce a Joule-class CPA system (GENBU-Kid) with cryogenic Yb:YAG TRAMs.