Generation of THz CSR with laser-bunch slicing in UVSOR-II electron storage ring

A. Mochihashi[1]*, M. Shimada[1], M. Katoh[1], S. Kimura[1], M. Hosaka[2], Y. Takashima[2], T. Hara[3], T. Takahashi[4], S. Bielawski[5], C. Szwaj[5] and C. Evain[5]

[1] *UVSOR Facility, Institute for Molecular Science, Japan*

[2] *Graduate School of Engineering, Nagoya University, Japan*

[3] *RIKEN/SPring-8, Japan*

[4] *Research Reactor Institute, Kyoto University, Japan*

[5] *Universite des Science et Technologies de Lille, France*

* *Prsent affilation : JASRI/SPring-8, Japan*

abstract

We have performed experiments for generation of THz CSR with laser-bunch slicing in UVSOR-II electron storage ring. A mode-locked Ti:Sa laser system generates femto-second high power laser pulse and injects the pulses into an undulator section of the UVSOR-II electron storage ring. The laser pulse induces energy modulation on an electron bunch in the undulator section and the energy modulation changes to longitudinal density modulation on the bunch by passing through a bending magnet section which is beyond the undulator section. The THz radiation generates at the bending magnet section where infra-red beam line (BL6B) is settled. Quadratic dependence of the intensity of the intense THz radiation on the peak bunch current indicates the coherent synchrotron radiation (CSR). Spectral measurement with an interferometer settled in the beam line shows dependence of the bandwidth and spectral range on the laser pulse duration; that indicates possibility to control the frequency and bandwidth of the THz CSR. To control both the frequency and the bandwidth of the THz CSR, we have performed a bunch-slicing experiment with amplitude-modulated laser pulse. The amplitude-modulated pulse laser is generated by ‘chirped pulse beating’ method[1]. The THz CSR spectral bandwidth by the modulated laser pulse becomes narrower than that by single laser pulse. Because the spectral peak frequency and the bandwidth depend on the modulation of the laser pulse, it is possible to tune the THz CSR frequency and bandwidth only by adjusting the optics for the laser modulation. Introduction of the laser-bunch slicing system in UVSOR-II, experimental results of the bunch-slicing with single and amplitude-modulated laser pulses are presented in the workshop.

[1] Weling, A.S. & Auston, D. H., J. Opt. Soc. Am. B **13**, 2783-2791 (1996)