Docket #: S13-111

High-Gain Thompson-Scattering X-Ray Free-Electron Laser by Time-Synchronic Laterally Tilted Optical Wave

SLAC researchers have discovered a novel approach to generating coherent x-rays with 10^9 to 10^{10} photons and femtoseconds duration per laser pulse. This high intensity x-ray source is realized first by the pulse front tilt of a lateral fed laser to extend the electron-laser synchronic interaction time by several orders, which accomplishes the high-gain free-electron-laser-type exponential growth process and coherent emission with highly microbunched electron beam. Second, two methods are presented to enhance the effective optical undulator strength parameter - one is by invoking focusing lenses and the other is by inventing a periodic microstructure.

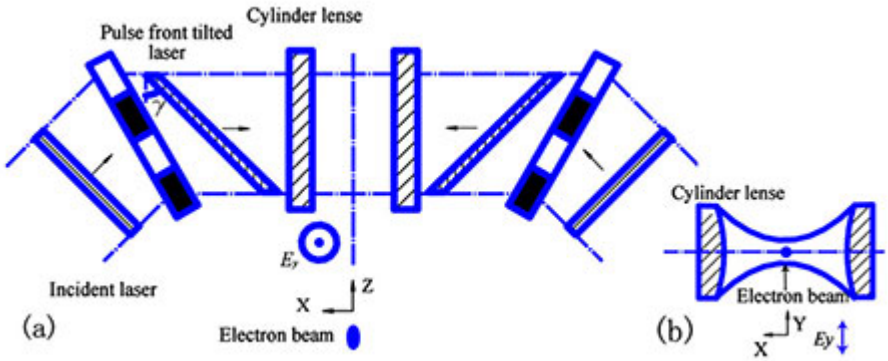

Figure 1. Time-synchronic interaction of electrons with pulse front titled lasers: (a) top view; (b) side view.

Applications

- Various applications including medical purposes

Advantages

- Enable high-gain in Thompson Scattering process leading to exponential growth of the x-ray intensity

Publications

- Chang, C., Tang, C., and Wu, J. “High-Gain Thompson-Scattering X-Ray Free-Electron Laser by Time-Synchronic Laterally Titled Optical Wave”. Physical Review Letters, February 5, 2013.

Patents

- Published Application: WO2014152784
- Published Application: 20160044771

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