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Simulation study of radiation enhancement through an interaction between periodically aligned carbon nanotubes and an intense laser[1]
TOSHIHIRO TAGUCHI, MASAHIKO INOUE, Setsunan University, THOMAS ANTONSEN, University of Maryland — Interaction between ultra-intense laser and solid material has a lot of applications. One is an emission of electromagnetic wave in a wide range of wavelength, which is from THz to X-ray. In order to select the wavelength, one of interesting target materials is single-walled carbon nanotube. Huge number of carbon nanotubes can be grown vertically on a substrate and they can be aligned periodically on the substrate. Once an ultra-intense laser is irradiated on the nanotubes, the strong electric field of the laser forcedly oscillates electrons in each nanotube and they irradiate electromagnetic wave. Waves emitted from periodically aligned nanotubes are expected to interfere each other, and then the amplitude of the output radiation is to be enhanced. In order to analyze such radiation processes from the laser-matter interaction, we have been developing an electromagnetic particle-in-cell (PIC) code including collisional and ionization processes. We will present recent results about an interaction between strong laser and carbon nanotubes analyzed by the PIC code. In the presentation, we will show the radiation spectrum and its enhancement due to the periodic structure.

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