Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Control of High Harmonics Radiation from Plasma Dipole Oscillation[1] MIN SUP HUR, TEYOUN KANG, HYUNG SEON SONG, SALIZHAN KYLYCHBEKOV, UNIST, KWANGMIN YU, BNL, SAMUEL YOFFE, BERNHARD ERSFELD, DINO JAROSZYNSKI, SUPA and Univ. Strathclyde, HYYONG SUK, GIST — Recently we reported a novel idea of generating a localized bunch of electrons oscillating in-phase, named plasma dipole oscillation (PDO), by colliding two detuned laser pulses in a plasma. From a series of two-dimensional particle-in-cell (PIC) simulations and theoretical analysis, we verified that PDO oscillates with the local plasma frequency and emits a strong dipole radiation at the same frequency. Such a property of PDO enables it to be used as a light source in terahertz band (Kwon et al., Sci. Rep. 2018) and also as a novel diagnostic method of reconstructing non-uniform plasma densities (Kylychbekov et al., PSST 2020). In this paper, we present our new calculation, where we find that the PDO is not just a linear harmonic oscillator as described in the slab-model of the plasma oscillation, but has a high nonlinearity, which yields high harmonic radiations. The second harmonic radiation emitted from the nonlinear PDO can be a new model of 2fp radio-burst from solar plasmas, which is conventionally explained by two-plasmon merger. Since the harmonic radiations are strongly dependent on the shape of PDO, the high harmonics of PDO can be controlled by manipulation of frequency chirp and profiles of the driving laser pulses.

[1]supported by NRF of Korea, grant number NRF-2016R1A5A1013277, NRF-2017M1A7A1A03072766

Min Sup Hur
UNIST

Date submitted: 28 Jun 2020 Electronic form version 1.4