Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

Nonlinear Absorption of X-ray Free Electron Laser Pulses in Dense Aluminum Plasmas[1] MIN SANG CHO, Department of Physics and Photon Science, Gwangju Institute of Science and Technology (GIST), Gwangju, 61005, M. KIM, Center for Relativistic Laser Science, Institute of Basic Science, Gwangju, Korea, H.-K. CHUNG, Atomic and Molecular Data Unit, Nuclear Data Section, IAEA, Vienna, P.O. Box 100, A-1400, Austria, BYOUNG-ICK CHO, Department of Physics and Photon Science, Gwangju Institute of Science and Technology (GIST), Gwangju, 61005 — XFEL provides unique opportunities to generate and investigate dense plasmas. Here, we present the intensity dependent, nonlinear x-ray absorption in dense aluminum target using the collisional-radiative population kinetic calculations. With high peak intensity of XFEL pulses, even below K-absorption edge, x-ray photons could create excited states of which absorption is larger than the ground state absorption. At the resonant energy of neutral atom, increasing x-ray absorption in the intensity range of 1016˜17 W/cm2 has been observed, and it is the reverse saturable absorption in the x-ray regime. The similar observations have been also made at the other resonant energies of higher charge states. At even higher XFEL intensities, bleaching a specific charge state could lead a transition from reverse saturable absorption to saturable absorption, so thus x-ray absorption is decreasing. Detailed population kinetics of charge states relevant to the absorption of x-ray photons, and fast modulation of XFEL spectrum will be discussed.

[1]This work is supported by Institute of Basic Science (IBS-R012-D1) and National Research Foundation of Korea (No. 2015R1A5A1009962 and 2016R1A2B4009631)

Min Sang
Department of Physics and Photon Science, Gwangju Institute of Science and Technology (GIST), Gwangju, 61

Date submitted: 13 Sep 2016 Electronic form version 1.4