Evaluation of Femtosecond X-Rays Produced by Inverse Compton Scattering under Linear and Nonlinear Interactions between a Low Emittance Electron Beam and an Intense Polarized Laser Light*, A. ENDO, T. HORI, M. WASHIO, J. YANG, Simutomo Heavy Industries Ltd., Tokyo - The mechanisms of inverse Compton scatterings under linear and nonlinear interactions are discussed theoretically and used to evaluate characters of femtosecond (fs) X-rays produced by collision between a low emittance electron beam and an intense polarized laser light. In the evaluation, we start from the differetial cross section of the inverse Compton scattering under the linear interaction, and calculate the effects of the interaction angle and the laser light polarization on the production of the fs X-rays. The energy and emission angular distributions of the produced fs X-rays are calculated under the linear and nonlinear interactions between the electron beam and polarized laser light. A 214 keV (0.0058 nm) X-ray beam with a pulse length of 228 fs and an intensity of 3×10^7 photons/pulse is numerically obtained by using the parameters [1] of a 100 fs pulse laser and a low emittance electron beam. The pulse length of the X-rays is expected to be in the duration of 100 fs by developing a 50 fs pulse laser (wavelength of 1 micron) and focusing the beam size down to 20 microns for both electron beam and laser light.

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[1] J. Yang., et al., Nucl. Inst. Meth. in Phys. Res., to be published.