Nonlinear Compton scattering

Long wavelength CO₂ laser effectively induce nonlinear motion



Nonlinear ICS: $a_L > 1$: Transverse motion induce nontrivial longitudinal oscillation (Multi photon process in dense photon field)

7.6 keV < Fe *k*-edge Off-axis component





Redshifting (mass shift) to 5-6 keV



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Harmonics emitted from the *Figure of 8 motion(linear)* or *Helical motion(Circular)*



Al 1000 µm









OAM ?

Details of the fundamental spectrum (Redshifting)

Mo/Si curved Multi-layer spectrometer





Single shot, double differential spectral measurements of inverse Compton scattering in the nonlinear regime, Phys. Rev. ST Accel. Beams in press

Complete AE70: nonlinear Compton, @ 10keVX-ray



Extend nonlinear ICS, @ 100 keV, X to y-ray regime

(For Medical, Nuclear Photonics application etc.)

Compton interaction in multi photon fields



Controlling radiation kinetics at hv = 100s keV

Bi-Harmonics case (Two wavelengths mixing)

Pulsed waveform modulation at < as time scale

(a)

Harmonic spectrum:



Numerically calculated Lienard-Wiechert potential $E_{LW,x}(t_{screen})$ on (x, y, z) = (0, 0, 0)

<u>@ X to Gamma ray regime, in ATF II</u>