Laser Driven Gamma Ray Vortices Based on Nonlinear Thomson/Compton Scattering

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Thomson/Compton scattering is well-known as a scattering process between electromagnetic radiation and charged particles, which is found in laboratories and nature. Here, we investigate the radiative properties of nonlinear Thomson scattering with arbitrary incident angle. Based on classical and quantum electrodynamics, the analytical universal expressions of the electric field and energy spectrum of the radiation emitted by a relativistic electron scattering of circularly polarized laser field are derived. It is shown that the spatial distributions of the radiation energy of high-order harmonics have annular shapes and the symmetry of the annular shapes is strongly affected by the incident angle, which may relate with the angular momentum of twisted high-order harmonics. These results would help the understanding of the properties of twisted γ/X-ray and high energy electron-laser scattering experiments in laboratory.

References

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