13:00-, 4-Feb-2020
G201-KPSI, Kyoto, JAPAN
The 72nd KPSI Seminar, KPSI-QST

Generation and detection of “photon vortex” in quantum level

Takehito Hayakawa

LCS gamma-ray project, QST

Abstract

Recently, optical vortex (light vortex) is one of hot topics in physics. Optical vortices are widely generated using a holographic plate with laser light. Allen et al. (1992) in the pioneering paper pointed out that it is possible to generate “photon vortices” with a wave-function of vortex in quantum level. Such photon vortices are very useful for quantum control of materials such as atoms and atomic nuclei. However, generation methods of photon vortices have not been well studied. There are some candidates for the generation. One of them is synchrotron radiation from charged particle under a uniform magnetic field. We calculated its details using Landau quantization for the first time. We obtained the result that photons generated by high-order harmonic radiation is “photon vortex” with the eigen-state of the z-projection of the total angular momentum when the photon propagates along the z-axis. In addition, we calculated detection methods using Compton scattering with a photon vortex on a rest electron.