

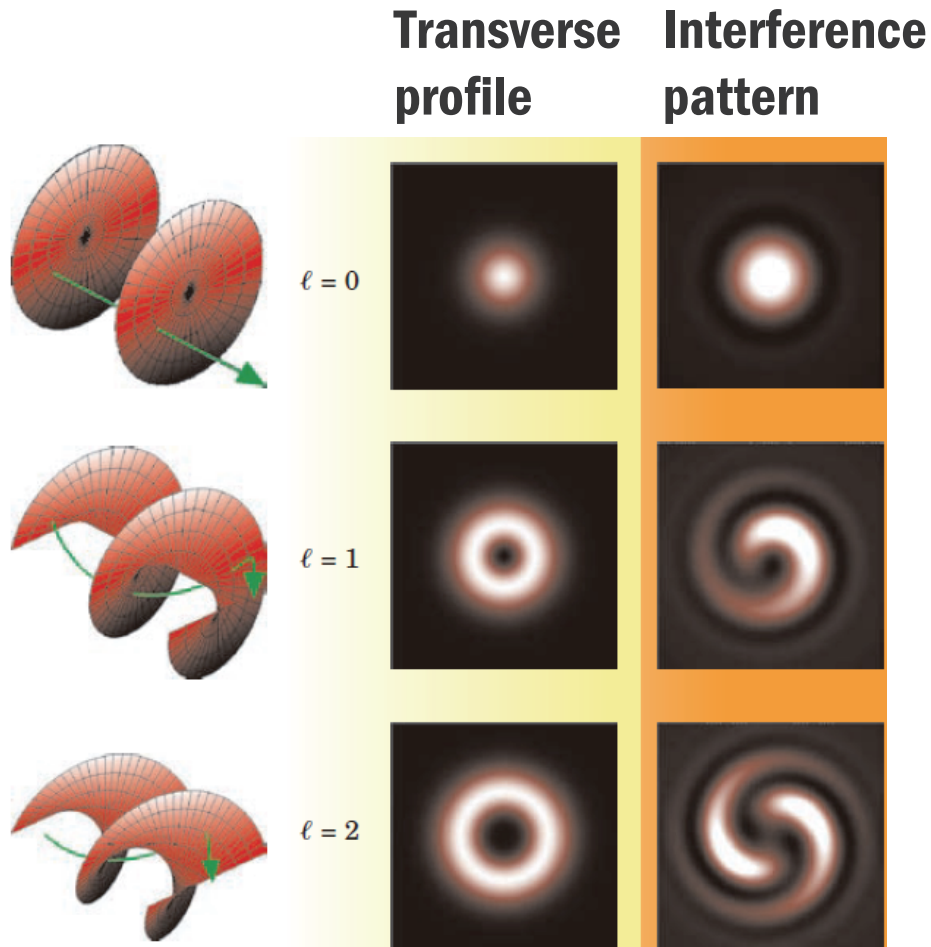
# Gamma-ray vortex generation by inverse Compton scattering

**Yoshitaka Taira**

**National Institute of Advanced Industrial Science and Technology (AIST), Japan**

**Visiting scientist: Mississippi State University and Jefferson Lab.**

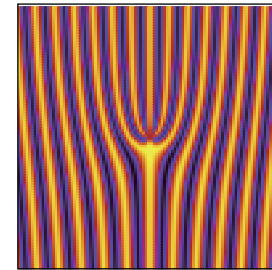
# Orbital angular momentum beams



M. Padgett et al., Phys. Today 57 (2004) 35.

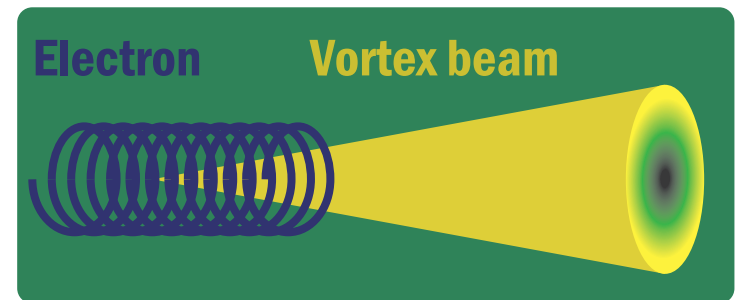
## Generation

### Special filters

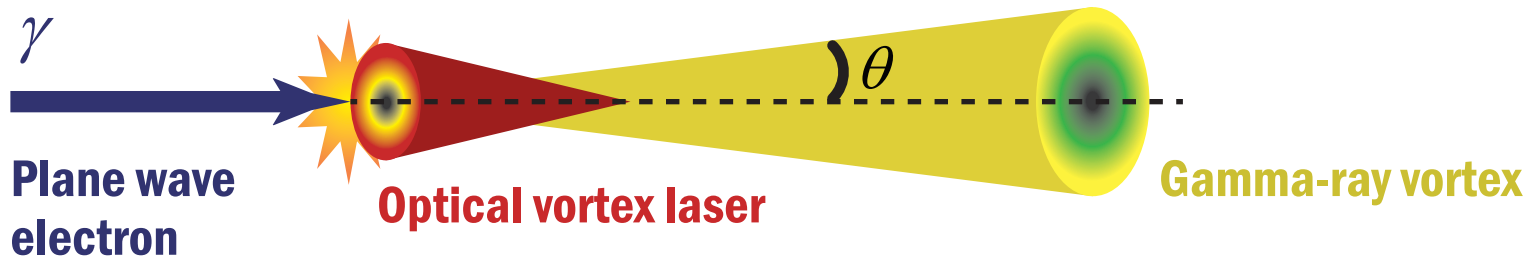


Hologram

### EM radiation from an electron



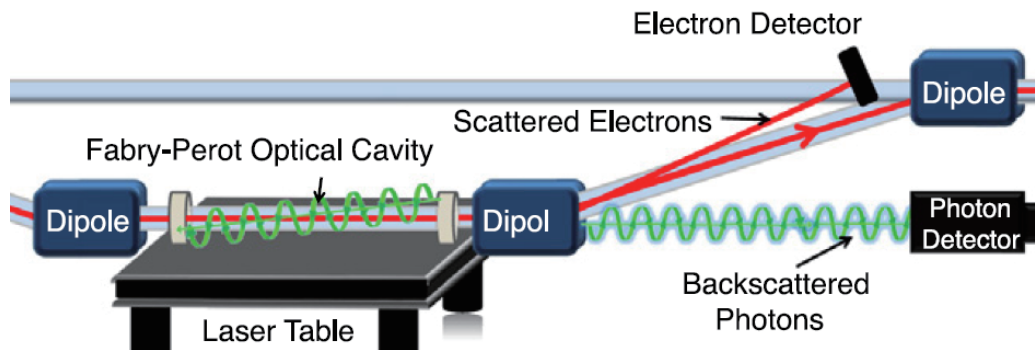
# OAM gamma-rays generation



**CEBAF injector:  $E_x = 10 - 100$  keV**

**Interferometry can be used in this energy range.**

**JLab Compton polarimeter at Hall A and C:  $E_x = 0.1 - 3$  GeV**



# Tasks

---

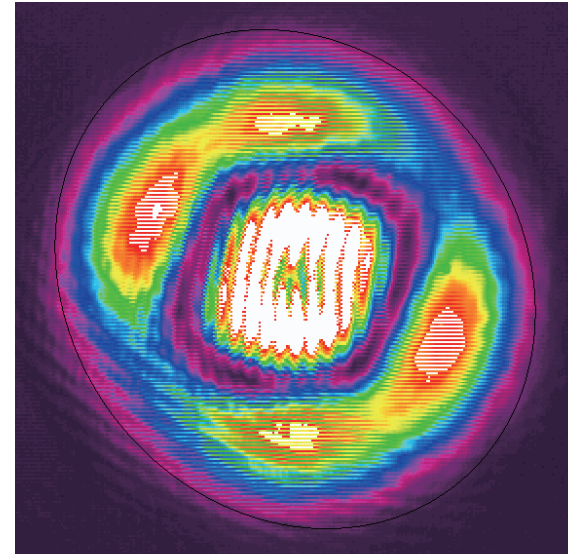
## OAM laser (high power, pulse) development

Preliminary experiment was done. 

Demonstration that laser after passing through 2 cavity mirrors still carry OAM.

Constructing a test cavity.

Measurement of storing power, beam size, etc.



## Calculation

Spatial distribution of OAM gamma-rays.

Measurement method of OAM gamma-rays.

# Manuscripts submitted to the Journal

---

**Y. Taira, T. Hayakawa, M. Katoh, *Gamma ray vortices from nonlinear inverse Compton scattering of circularly polarized light*, submitted to Phys. Rev. Lett. (2016).**

**Y. Taira, S. Zhang, *Split in phase singularities of an optical vortex by diffraction through a simple circular aperture*, submitted to Opt. Lett. (2017).**