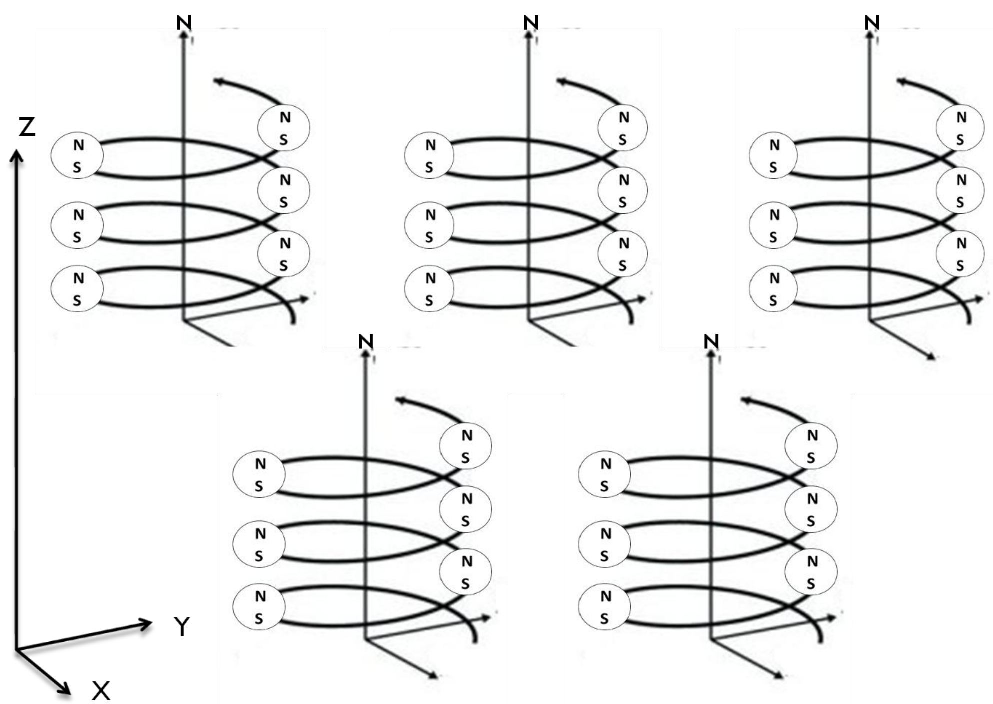
Circular Polarization, Graphical Representation

"If I can't picture it, I can't understand it." Albert Einstein.

In circular polarization the transverse magnetic (H) and electric (E) field vectors rotate rather than oscillate as in linear polarization. In both cases the transverse magnetic (H) and electric (E) fields are orthogonal and in phase quadrature. The magnetic field energy plus electric field energy is always a constant. This contributes to the electromagnetic inertia, SHM oscillations of the photon.

In a ray of circular polarized light, photons travel along a circular (clockwise or anti-clockwise) helix or spiral path of wavelength diameter, or radius equal to the amplitude. All photons in a ray have their magnetic polarity (NS or SN) parallel to the centerline of the spiral. The magnetic dipoles of all circular polarized photons, add up to give a net resultant magnetic field along the centerline of the spiral.



Above figure shows a *beam* of light consisting of 5 *rays* of circular polarized light. All 5 rays are travelling in the +Z-axis direction. The magnetic dipole photons in each ray with their magnetic polarity NS along the Z-axis add up so that circular (or elliptical) polarized light acts as a magnet upon interaction with matter. This is the *'inverse Faraday effect' (IFE).*

This also explains the *'optical Faraday effect' (OFE)* and similar magneto-optical effects. The OFE is the rotation of the plane of polarization of a linear polarized probe beam by a second, circular polarized, pump laser. The latter substitutes for the magnetic field of the ordinary Faraday effect.

This magnetization is proportional to the light intensity, and the light intensity is proportional to the photon flux density, as per Einstein's correlation of the number of photons in a light beam with its intensity. A circular polarized laser beam of intensity 10^4 W m^-2 (1 W cm^-2), the magnitude of the longitudinal magnetic field is about 10^-5 Tesla or about 0.1 G, roughly a tenth of the earth's magnetic field.

Above is an extract from:
www.physicsphotons.org/Wave-Particle19.pdf