



Director de tesis: Dr. Roberto Ramírez Alarcón

Sinodales: Dra. Laura Elena Casandra Rosales Zárate
(Sinodal Interna, Presidenta del Jurado)

Dr. Carmelo Guadalupe Rosales Guzmán
(Sinodal Interno, Secretario)

Dr. Carlos Herman Wiechers Medina
(Sinodal Externo – DCI UGTO, Vocal)

"ENTANGLED TWO PHOTON STATE IN A HELICAL INCE-GAUSS BASIS"

Tesis:

Resumen:

Spontaneous Parametric Down Conversion (SPDC) is a process that generates photons pairs that are entangled in several degrees of freedom, in particular, the entanglement given by the conservation of Orbital Angular Momentum (OAM) is one of the most explored nowadays, given its infinite-dimensional basis of the Hilbert space. Since the natural basis of the OAM are the Laguerre-Gauss modes, the OAM entangled state of this process is described in these modes. Since it has been suggested that these modes have the capability to tune the probability detection of the entangled photons, in this thesis we perform a change of basis of the photon-pair entangled state, generated by SPDC, and describe it in terms of Helical Ince-Gauss modes. With this change of basis, we are able to describe how the probability detection of the photon pair can be tuned with the ellipticity parameter of these modes. We also found that, on this basis, the state has two different Bell states, and it is possible to switch from one Bell state to another. In order to verify that it is possible to tune the probability detection, and also, that we can switch from one Bell state to another, we build a source of entangled photon pairs, and measure the tuning of the probability detection and confirm the entanglement of the state with a Bell-type inequality test.