

Physics Department Seminar

11 am March 15, Science Building Room 250



Zoom link

Entangled and individual photons: Generation and use in the laboratory

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Light, and mainly laser light, has made it possible to study fundamental concepts of physics and develop new technologies in various fields. Within a topic as general as light, quantum optics has been of great interest due to its fundamental role in the understanding of quantum mechanics and its applications such as quantum computing, metrology and quantum cryptography, among others. In this talk I will discuss the generation, characterization and manipulation, at the quantum level, of various light sources. In particular, sources of entangled and individual photons. Light can be characterized by different degrees of freedom: time-frequency, position-transverse momentum and polarization. In this talk, I will describe the research carried out in our group studying these different variables. I will describe all-optical experiments in which we simulate

open quantum systems and study measurement theory. Specifically, I will report the implementation of a dephasing channel [1] and simulate different quantum dynamics [2] considering the polarization of light as a quantum system and the transverse momentum of light as an environment. Additionally, I will describe our efforts to describe light in phase space performing homodyne detection [3].

- [1] "Controlling non-Markovian dynamics using a light-based structured environment" D. F. Urrego, et.al, Phys. Rev. A 98, 053862 (2018)
- [2] "A weak values approach for testing simultaneous Einstein-Podolsky-Rosen elements of reality for non-commuting observables" Omar Calderón-Losada et.al. Communication Physics 3, 117 (2020)
- [3] "Measuring Wigner functions of quantum states of light in the undergraduate lab" Juan-Rafael Álvarez, et.al, arXiv:2310.17525 (2023)