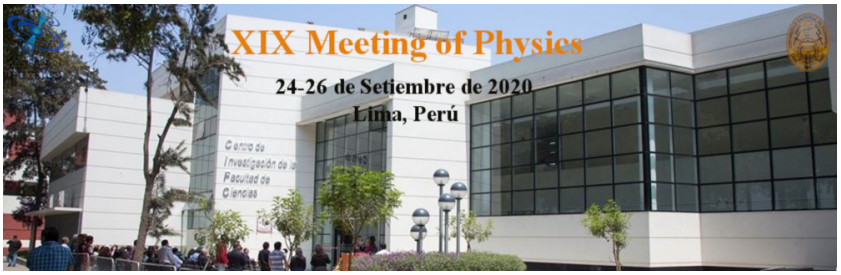

Contribution ID : **99** Type : **not specified**

Quantum information with photons: fractional topological phases of qudits

Saturday, 26 September 2020 09:30 (30)

Quantum optics and quantum information have experienced spectacular progress in the past three decades, both theoretically and experimentally.
Quantum information protocols and foundations of quantum mechanics have been tested with correlated photons. Qudit states (d-level quantum systems), a generalization of qubits, are discrete quantum states with dimension d > 2. Entangled qudit states proved to be more resistant to noise than qubits which stimulated applications of photonic qudits for quantum communication and tests of fundamentals of quantum physics.
An interesting property of qudits is that two-qudit states develop a fractional topological phase when subjected to cyclic and local unitary operations.

In this presentation, I will describe the photon pair source and briefly discuss the generation of the topological phase. I will show how the two-qudit states are prepared by using the photon paths degrees of freedom and how the fractional topological phases are measured. We used two approaches to measure the fractional topological phase of qudits: interferometry with a modified Sagnac interferometer and the use of a hyper-entangled two-photon source (entanglement in more than one degree of freedom). I will also show recent results that demonstrate the robustness of fractional topological phase in qudits to dephasing noise.

Presenter(s) : Dr PADUA, Sebastiao (UFMG - Brasil)

Session Classification : keynote talks