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Thesis: **"THEORETICAL STUDY OF MULTIPARTITE QUANTUM CORRELATIONS IN A NON-LINEAR SYSTEM "**

Summary:

Structured light is a well-established concept in optics and computer vision for sev- eral decades, but it has been just over a decade ago that the concept re-emerged as a topic of interest. It involves manipulating light properties like amplitude, po- larization, phase, frequency, spin angular momentum (SAM), and orbital angular momentum (OAM) by combining spatial or temporal degrees of freedom (DoFs). In the broader context of optical research, vector beams have emerged as a fascinat- ing and versatile class of structured light. They are characterized by their spatially varying polarization states, which distinguish them from traditional scalar beams. This multifaceted approach to light has led to remarkable applications across fields such as optical tweezers, high-resolution microscopy, and both classical and quan- tum communications.

This master's degree thesis presents a pioneering technique for generating vector beams using complex amplitude modulation in an on-axis configuration, where the holograms are displayed in a reflective spatial light modulator. The primary focus of this research is to address a critical issue in the field: the stability of vector beams during their generation and propagation. In addition to proposing a novel vector beam generation method, this work introduces a quantitative approach to assess their stability.

As a proof-of-concept and a central part of study reported on this work is the creation of Laguerre-Gaussian (LG) vector beams with the proposed experimental set up. The experimental results presented in this thesis demonstrate the effectiveness of the proposed technique in generating vector beams for which the stability is ensure by the fact that the light that superimposes to generate the beams is following always the same optical path. The holograms used to generate the beams were computed using the Mathlab software. To fully characterize the vector beams generated, the Stoke's polarimetry was used.