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Experimental studies on bright quantum states of light - Bhaskar Kanseri - Indian Institute of Technology

Bhaskar Kanseri
Indian Institute of Technology, India

Bright quantum states of sunshine are progressively a topic of intense research due to the very fact that these states can provide much stronger interactions with matter and with one another than the fait (microscopic) stets of sunshine. As they contain large numbers of photons, they resemble with classical systems. Thus it becomes essential to research to what extent such states exhibit “quantumness”. Microscopic Bell states, which are four modes squeezed vacuum states, are one such bright system containing typically 106 photons per pulse. We wish to implement a way namely ‘three-dimensional quantum polarization tomography’ for characterization of polarization and squeezing features of those states. Additionally, we wish to explore the non-classical correlations and entanglement features of those states. In recent years, these bright photon states have found potential applications in fundamental tests, gravitational wave detection, quantum storage, and absolute measurement of detectors’ quantum efficiency. The polarization features of macroscopic Bell states are characterized using the tactic of quantum polarization tomography, which utilizes three-dimensional inverse radon transform to reconstruct the polarization quasi-probability distribution function of a state from the probability distributions measured for various Stokes observables. The reconstructed distributions obtained for these states are compared with those obtained for a coherent state with an equivalent mean photon number.

The human eye contains many rod photoreceptor cells, and every one may be a single-photon detector. Whether people can actually see one photon which requires the rod signal to propagate through the remainder of the noisy sensory system and be perceived within the brain has been the topic of research for nearly 100 years. Early experiments hinted that folks could see just a couple of photons, but classical light sources are poor tools for answering these questions. Single-photon sources have opened a replacement area of vision research, providing the simplest evidence yet that humans can indeed see single photons, and will even be wont to test quantum effects through the sensory system. We discuss our program to review the lower limits of human vision with a heralded single-photon source supported spontaneous parametric down conversion, and present two proposed experiments to explore quantum effects through the visual system: testing the perception of superposition states, and employing a human observer as a detector during a Bell test. The results demonstrate squeezing in one or more Stokes observables (polarization squeezing). Additionally, in these states, photon-number correlation measurements are performed employing a standard Bell-test setup, and explicit quantum correlations are observed for conjugate polarization-frequency modes, as shown within. We also test the entanglement witnesses for these states and it’s observed that these states violate of the reparability criteria, inferring that each one these bright quantum states are polarization entangled. A few of weeks ago, I listed six essential principles everyone should realize physics. A number of those items are pretty weird, though, particularly the duality and non-locality items. Which leads naturally to the question "How can such a wacky theory actually be true?"

Therefore, many defects are generated in GaN epilayers due to the massive mismatches within the lattice constants and within the thermal expansion coefficients between GaN and therefore the sapphire substrate. These defects can dramatically deteriorate the electrical and optical qualities of GaN-based devices. Currently, the only growth method of the pattern edsapphire substrate (PSS) can't only improve internal-quantum efficiency of devices by reducing defects but also enhance the light-extraction efficiency of optical devices [3e8]. Recently, a replacement popular sort of the PSS curving the sidewall surface of every pattern is suggests, well-known because the dome shaped PSS.

Several pioneer works have investigated the consequences of complicated geometrical features of the dome-shaped PSS on the luminous efficiency of optical devices. However, few papers investigate the behaviour of defect reduction inside GaN grown on the dome-shaped PSS. Nevertheless, additionally to defects, residual strains inside GaN grown on the dome-shaped PSS also impact the performance, reliability and stability of devices. Therefore, understanding in physical mechanisms of reducing defects and relaxing strain for the expansion of GaN on the dome-shaped PSS is an urgent and important work. additionally, there are still few papers reporting the experimental correlation among the measurements of high-resolution X-ray diffraction (HRXRD), Raman, transmission micro-scope (TEM) and etch pit density (EPD).

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