Proceedings of the 9th International Conference on Theoretical and Applied Nanoscience and Nanotechnology (TANN 2025)
July 13, 2025 - July 15, 2025 | Imperial College London Conference Center, London, United Kingdom
DOI: 10.11159/tann25.003

Trends in Quantum Networking using Continuous Variable Modulation Techniques

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Abstract – Much focus in recent years has been placed on the use of photonics in quantum systems, with applications ranging from computing and communications through to sensing. Here research has used the direct measurement of the properties of single photons in such systems across all application areas.

In addition, much research has focussed on Continuous Variable Quantum schemes such as Continuous Variable Quantum Key Distribution (CV-QKD). This scheme is analogous to conventional coherent communication schemes, but uses weak coherent signals of a few photons per pulse and involves vacuum noise sensitive - often referred to as shot noise limited - coherent detection. CV schemes have advantages therefore in using similar equipment to that in conventional communication systems, and as a result successful research has been carried out to determine whether a single laser system could be used to transmit both classical and quantum signals. Such a system has potential cost savings over conventional quantum systems. In addition, given the feasibility of the co-existence of quantum and classical systems, work has been carried out to determine whether CV quantum approaches can be used for security monitoring, a 'Quantum Alarm' having been successfully demonstrated to provide this functionality.

This paper will therefore review the relative performance of conventional and CV Quantum Systems and then explore the potential benefits that might result from new developments in photonic devices, fibers and sub-systems. The paper will conclude by considering whether CV approaches are relevant for more advanced quantum functionality such as in Quantum Networking.