Utilising Second-Order Correlation Algorithms for Improved Single Photon Source Measurements

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Quantum technologies such as quantum computing, quantum sensing, and quantum communications are expected to be a significant technological advancement in the coming decades[1,2]. Essential to many of these technologies are room-temperature stable single photon emitters (SPEs)[1,2]. A standard tool for the identification of these SPEs is the measurement of the second-order correlation function, $g^2(\tau)$[3–5], where a low value for $g^2(\tau)$ is taken to indicate the presence of a SPE.

Given the ubiquity and importance of $g^2(\tau)$ measurements, it is critical to understand and quantify the effects of different algorithms used to generate $g^2(\tau)$ measurements. We present the quantitative comparison of algorithms commonly supplied with time tagging hardware, as well as more sophisticated algorithms presented in the literature[6]. It is apparent that for the same dataset, different signal-to-noise ratios can be achieved through the use of different algorithms. Furthermore, for the same signal-to-noise ratio, the total measurement time differs, depending on the algorithm utilised. Beyond the immediate implications for $g^2(\tau)$ measurements for identifying SPEs, this potential increase in efficiency could represent an increase in the speed of autocorrelation-based superresolution microscopy[3,4].

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