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Investigating Second-Order Correlation of a Single-Photon Source NV Centre under CW Excitation

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In this work, we investigate the quantum light emission properties of single nitrogen-vacancy (NV) centres in diamond under continuous-wave (CW) excitation at a wavelength 532 nm while the emitted photons have a wavelength of 637 nm. Using Hanbury Brown and Twiss (HBT) interferometry, we measure the second-order correlation function ($g^2(\tau)$) to characterize the photon statistics of the single-photon source confirming the emission of one photon at a time, i.e. antibunching. NV centres are known for their exceptional stability at room temperature and their ability to emit single photons. These capabilities are driven by a high-power green laser, ensuring efficient excitation while minimizing multi-photon emission. Our findings reveal strong antibunching at zero-time delay in the HBT interferometer, indicative of single-photon emission, with detailed insights into the temporal coherence of the emitted photons. The study highlights the potential of NV centres as a robust source of quantum light for applications in quantum communication, quantum cryptography, and quantum information processing. Additionally, we discuss the effects of CW excitation on the photon emission dynamics and explore strategies to enhance the purity of emitted single photons in future applications.

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Primary authors: DAKA, Chisomo (The University of the Witswatersrand); NAPE, Isaac (University of the Witwatersrand); BHATTACHARYYA, Shaman

Co-authors: DIANTANTU, AIME Diakanwa; WAMWANGI, Daniel (School of Physics, University of the Witwatersrand); VAN RENSBURG, Roger (University of the Witwatersrand); ERASMUS, Rudolph (University of the Witwatersrand, Johannesburg); BHATTACHARYYA, Somnath (The University of the Witswatersrand)

Presenter: BHATTACHARYYA, Shaman

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