Polarization dependent quantum correlation measurements of two nitrogen-vacancy color centres in diamond

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Quantum correlation measurements provide qualitatively different insight into the properties of fluorophores than afforded by classical intensity measurements alone. Here we focus on the second order correlation ($g^{(2)}(\tau)$) as a function of emission polarization angle for the determination of two single nitrogen vacancy centers in one point spread function.

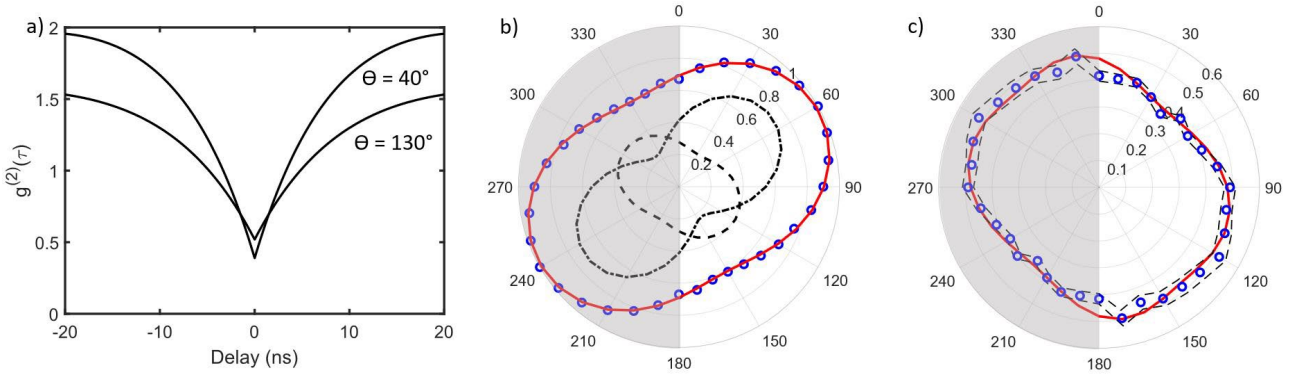

Fig. 1. (a) $g^{(2)}(\tau)$ for two polarizations $\theta = 40°$ and 130° from two differently orientated NV centres within a point spread function. (b) Polarization plot of measured fluorescence intensity (circles) together with the fit of two emitters (solid red line). The relative orientation of the emitters was fitted assuming two emission dipoles (dashed lines). (c) Predicted $g^{(2)}(0)$ value (solid red line) plotted with the experimental data (circles) against emission polarization angle and measurement uncertainty represented in two dashed lines.

Our results highlight the additional information gained from the fluorophores using polarization combined with correlation optics and pave the way for future protocols in sub-diffraction limited particle localization and characterization via quantum imaging.

References

1. J. G. Worboys, D. W. Drumm and A. D. Greentree, Physical Review A 101 (1), 013810 (2020).