Centre DE Nanosciences & DE Nanotechnologies

Seminar

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Amphitheater of C2N

Hectometer Revivals of Quantum Interference

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The Hong-Ou-Mandel (HOM) interference is the most significant photonic effect, one with no counterpart in classical optics. The interference is fragile–it is sensitive to distinguishability in all degrees of freedom–and normally occurs on the order of very short path length differences–micrometers to millimeter. Despite these limitations, HOM interference has proven application in quantum computing, metrology and quantum foundations.

We report HOM interference observed after more than 100m path length difference between photons from a cavity-enhanced spontaneous parametric down-conversion source, equating to the 84th HOM revival. In addition to producing HOM revivals, the source can alternatively generate two-photon NOON states. These two features result from the unique half waveplate 'flip trick' of our source effectively producing two distinct frequency combs, each of which can be temporally accessed. This combination makes our source a novel metrological tool to allow enhanced precision on a sub-wavelength scale in a quantum-secure way.

W. Y. Sarah Lau completed a double degree in Science and Education (secondary) at the University of Queensland (UQ). After working briefly as a high school teacher Sarah has returned to UQ as a PhD student in Andrew White's Quantum Technology Lab. She initially focused on quantum foundations and has since transitioned to work on the narrowband single photon source, which has moved down to the Australian National University in Canberra for integration with their quantum memory setup. Sarah now also works there and is investigating squeezing from the narrowband setup alongside the quantum memory integration.

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