

Quantum imaging and sensing: from quantum holography to the fundamental physics of curved space

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Abstract

The development of new quantum technology, both sensors and sources, is providing new and exciting avenues for research in a range of areas. I will discuss recent progress in single photon counting technology and its application to photon pair imaging. Specifically, I will discuss two examples, i.e. quantum holography and Hong-Ou-Mandel interferometry imaging.

I will then show how Hong-Ou-Mandel interferometry that is typically limited to micron-scale (depth) resolution, can be adapted to provide nanometre scale or equivalently, attosecond time-delay sensitivity. Hong-Ou-Mandel interferometry can then also be used to probe some open, fundamental physics questions. I will discuss ongoing work looking at the interplay between entanglement and curved space generated by non-inertial motion. This is tightly related to other recent proposals to perform table-top experiments to probe the quantum nature of gravity.