

# Multi-Parameter Quantum Imaging

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Spontaneous parametric down-conversion has been a workhorse in the generation of entangled photons, producing hyper-entanglement photons across various photonic degrees of freedom such as time, spectrum, position and momentum. Here, I will introduce multi-parameter quantum imaging, wherein the intrinsic correlations across multiple entangled degrees of freedom are simultaneously exploited to extract additional information about a target or scene. This can be the concurrent acquisition of position and momentum information, enabling 3D and quantitative phase imaging. Or, the simultaneous capture of position and spectral information enabling snapshot hyperspectral imaging. Compared to the classical counterparts, which typically require scanning or sacrifice imaging resolution to obtain information in the additional degrees of freedom, the quantum approach can achieve a higher combined resolution without such complexities.