Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Visible Quantum Imaging of Infrared Ghost[1] FELIX JAETAE SEO, QUINTON RICE, DULITHA JAYAKODIGE, TIKARAM NEUPANE, BAGHER TABIBI, Hampton University, HAMPTON UNIVERSITY TEAM — Quantum imaging is of great interest due to unique characteristic interaction and measurement with nonlocal correlation that provides higher accuracy, sensitivity, and security. For quantum ghost imaging, two non-linear crystals in a double Mach-Zehnder interferometer produce a signal beam for the measurement and an idler beam for the interaction with an object through spontaneous parametric down conversion (SPDC) with momentum and energy conservations. The idler in the invisible spectrum interacts with the object, and experiences various optical processes including transmission, scattering, reflection, and phase change. Since the signal beam in the visible spectrum does not interact with the object, the object is a ghost to the signal beam. If the signal beam has a spatial entanglement with the idler beam, the information of idler is the measurement of signal. Since two nonlinear crystals are employed in the interferometer, the indistinguishability with no-which-source provides the interference of two signal beams through a half silver beam splitter while the idlers are completely overlapped through optical parametric generation, not amplification. If the homodyne of the signal probabilities of two interferences is unity, the heterodyne of the signal probabilities will be the product of transmittance coefficient and sinusoidal phase shift of idler through the object. Therefore, quantum ghost imaging may be utilized for secure surveillance of potential threats and noninvasive quantum microscopy.

[1]Acknowledgement: This work is supported by NASA NNX15AQ03A, NSF HRD-1137747, and ARO W911NF-15-1-0535.

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Date submitted: 27 Jan 2017 Electronic form version 1.4