Abstract:
Compressive sensing utilizes sparsity to realize efficient image reconstruction. It is a valuable processing technique when cost, power, technology or computational overhead are limited or high. In the quantum domain technology usually limits efficient acquisition of weak or fragile signals. I will discuss the basics of information theory, compression, and compressive sensing. I will then discuss our recent work in compressive sensing. The topics of discussion include low-flux laser Radar, photonic phase transitions, high resolution biphoton ghost imaging, Ghost object tracking, 3D object tracking and high dimensional entanglement characterization. I will touch lightly on our current work of rapid wave function reconstruction and wave front sensing. As an example (shown below), we were able efficiently and rapidly reconstruct high dimensional joint probability functions of biphotons in momentum and position. With conventional raster scanning this process would take approximately a year, but using double-pixel compressive sensing, the pictures were acquired in a few hours with modest flux.

Bio: Prof. Howell's research interests are in the areas of Quantum Optics and Quantum Physics. His recent work includes both theoretical and experimental investigations of the foundations of quantum mechanics, entanglement measures, continuous variable entanglement, discrete entanglement, quantum communication/information and weak field detection in coherent atomic media. [http://www.pas.rochester.edu/~jhgroup/]