

DAMOP17-2017-000581

Abstract for an Invited Paper  
for the DAMOP17 Meeting of  
the American Physical Society

**Practical applications of compressed sensing in quantum state tomography**

CARLOS RIOFRIO, Freie Universitt Berlin

As quantum systems get closer to technological applications, the problem of identifying, certifying, and characterizing them becomes more daunting. In fact, a complete characterization of a quantum system requires determining a number of parameters that grow exponentially with the system size. New paradigms that allow for efficient signal processing must be developed and tested to overcome this roadblock. In this talk, we present an overview of the most recent developments in quantum state tomography via compressed sensing. We show a complete analysis based on experimental data from two different systems: First, a photonic circuit that prepares highly entangled photons corresponding to 4-qubit states, which we use as a testbed to showcase our tomographic procedure in a variety of scenarios; Second, a 7-qubit system of trapped ions which encodes a single logical qubit via a color code, in which highly incomplete data is observed. We show how compressed sensing and model selection ideas can be combined in practice.