Single Photon Atmospheric Turbulence Simulator Buildup

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The Air Force Institute of Technology (AFIT) is building a quantum optics and quantum information laboratory to study single photon phenomena and its applications. Examples of applications include the storage of light in electromagnetically induced transparency and the free space propagation of qubits through a turbulent atmospheric turbulence. This presentation details the current equipment available at AFIT, some initial experiments conducted with the equipment, and the plan for building an atmospheric turbulence simulator that statistically represents ground-to-space quantum communications. Currently, the lab contains QuTool's QuEd kit and IDQuantique's Quantum Key Distribution (QKD) system. Both an interference pattern and a HOM dip were measured using QuTool's Michelson Interferometer and Hang-Ou-Mandel modules. A visibility of 83% and a coherence length of 1.5mm were recorded. IDQuantique's QKD system successfully generated secret keys and measured the quantum bit error rate. A quantum bit error rate of 1.18% was measured and the secret key generation rate was on 32761 bits per second.