Physics Division Seminar

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Eden Figueroa, Stony Brook University and Brookhaven National Laboratory

Building an entanglement-sharing quantum network in New York

The goal of quantum communication is to transmit quantum states between distant sites. The key aspect to achieve this goal is the generation of entangled states over long distances. Such states can then be used to faithfully transfer classical and quantum states via quantum teleportation. This is an exciting new direction which establishes the fundamentals of a new quantum internet. The big challenge, however, is that the entanglement rates generated between two distant sites decreases exponentially with the length of the connecting channel. To overcome this difficulty, the new concepts of entanglement swapping, and quantum repeater operation are needed.

In this talk we will show our progress towards building a quantum network of many quantum devices capable of distributing entanglement over long distances connecting Stony Brook University and the Brookhaven National Laboratory on Long Island, New York. We will show how to produce photonic quantum entanglement in the laboratory and how to store it and distribute it in telecom networks by optically manipulating the properties of room temperature atomic clouds. Finally, we will discuss our recent experiments in which several quantum devices are already interconnected forming elementary quantum cryptographic and quantum repeater networks. Finally, we will discuss how these milestones can form the backbone of a future quantum-information-enhanced internet in the state of New York.

To meet with the speaker (remotely), please contact the host Matthew Dietrich.