Developing a More Efficient Quantum Protocol Using Vehicle Signals and Photon Polarization

Meade, Evan (School: Arnold O. Beckman High School)

As information becomes increasingly digitized, it is increasingly important that we are able to securely transfer our data across global networks. Encryption has long been the most efficient compromise between speed and security, but it is generally not impregnable. Recent advances in quantum computing threaten the security of most existing encryption schemes. It is, therefore, necessary to find a new method of secure communication which is resistant to attacks by quantum computers. The most promising types of new encryption schemes use quantum states as the medium of information because they change upon observation. Thus, they reveal eavesdroppers. Some such schemes already exist, such as BB84 and B91. However, these schemes are extremely inefficient because they rely on both parties choosing the same basis of measurement. This only occurs 50% of the time, on average. Additionally, they only distribute a shared encryption key, not the information itself. A fundamentally new type of quantum encryption scheme was developed which encodes information directly onto the quantum state, in this case, the polarization of photons. Also, since vehicle signals are used, each party only measures states they originally prepared. As a result, the correct basis is chosen 100% of the time. In conclusion, this new quantum information protocol is more secure and more efficient than existing quantum information protocols. It is more secure than classical encryption schemes since it is resistant to attacks by quantum computers. It is capable of protecting governments, corporations, and citizens from unwanted surveillance by always revealing eavesdroppers.

Awards Won:

Drexel University: Full tuition scholarship $194,000