# The Unpredictability of Photons

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As technology increases in function and ability, threats against security and privacy also grow. The results of this project could better refine the ability of sending undecryptable messages. The relationship between the number of polarizing lenses, in addition to the angles of those lenses, and the luminosity of the light passing through lenses was tested to determine potential mathematical relationships in one of four models: linear, exponential, quadratic, and sinusoidal. A single lens was used as a control. When working with two lenses, tests were performed at 1° increments rotating a full 360°, relative to the bottom lens. When working with three lenses, tests were performed at 15° increments for a full 360° rotation, changing the middle and top lenses between different tests. For all data sets, a line, curve, parabola, and sine wave of best fit were applied. A regression analysis for each data set was performed, indicating that the sine wave and parabola of best fit modeled the data closest, concluding the equations are too flawed to use in practical application. By increasing the efficiency of quantum cryptographic key distribution using photons, communication technology would be revolutionized. All messages, especially those containing sensitive information, would be maximally secure as eavesdropping on the key would be detected. If a one-time pad was used, the key would be impossible to decrypt as it would be the same length as the message itself. Technology hardware could potentially become more efficient by incorporating quantum particles in future development.

**Awards Won:**