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*Creating A Quantum Optical Source Using Laser Pointers And Parametric Down Conversion*

This project is to develop, create, and test a quantum optical source with a relatively high efficiency, high quantum optical flux, and low cost. In order to create a quantum optical source for a relatively low cost, parametric down conversion was performed using a KTP nonlinear crystal that was extracted from a 532nm (green) 30mW laser pointer. Tests were performed on the laser pointer in order to reverse engineer the frequency/energy conversion process that occurs inside the device in order to create an energy conversion setup that performs parametric down conversion, thus yielding quantum optical light. The out-coming light in the signal and idler beams were tested for their frequency using a reflective diffraction grating in order to determine whether parametric down conversion was achieved. A spectrometer was then used to confirm all frequency measurements. When the KTP was pumped with a 30mW 532nm laser pointer, the light coming out was observed to be in the infrared spectrum. Diffraction grating analysis confirmed that the resulting wavelength is approximately 1064 nm, or about twice the wavelength of the pump beam, strongly suggesting that parametric down conversion was achieved. An approximate conversion efficiency was deemed to be at a maximum of 11% and the output light has an approximate quantum optical flux on the order of 10^15 photons/sec, which is very high. The entire setup, by reverse engineering a laser pointer, cost about $45.00, thus keeping the device at a very low cost. By keeping costs low, relatively inexpensive quantum optical source was created which is very promising. Strong qualitative and quantitative analysis indicates the output light is from a result of parametric down conversion, meaning that the output light is very likely to be quantum optical light, in the form of degenerate entangled photon pairs. Quantum optical light is very useful in future applications such as quantum computing, quantum cryptography, and environmental sensing. While these technologies are yet to come, advances in creating a device like this while maintaining a relatively low cost is invaluable for further development and experimentation, such as EPR experimentation, in these fields.