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Quantum Entanglement as a Resource for Secure Navigation

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Secure Position, Navigation and Timing (PNT) is of critical importance in modern day to day life and the contemporary state-of-the-art radio frequency-based systems are vulnerable to various intercept and signal jamming attacks. Thus, the need for development of more secure alternative PNT capabilities. Quantum entanglement provides an elegant way of sharing tightly correlated time synchronization capabilities at arbitrary long distances whilst allowing the authenticated parties to perceive unauthorised intercepts via Bell tests. Long distance photon entanglement distribution in free space is affected by high optical link losses and background counts, requiring high spectrally bright entangled photon sources. Contemporary workhorse photonic entanglement technologies rely on spontaneous parametric down conversion (SPDC) process in bulk crystals having high second order nonlinearity coefficients like Periodically Polled Potassium Titanyl Phosphate (PPKTP). In this poster, we present the design and field results of such a PPKTP based entangled photon source configured in a Sagnac interferometer which aims to demonstrate quantum secured time synchronization protocols over a 7 km free space optical link.

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