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(G*) (POS-5) Transmission of near-infrared time bin encoded entangled photons through a 3.5km telecom fiber

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Integrating single photon sources to existing telecommunication (telecom) networks is an on-going challenge due to the wavelength mismatch between the photon sources and the telecom optical fibers. A solution is to develop frequency conversion devices that can convert the optical frequency of the photon sources to the appropriate telecom frequencies. However, these solutions are difficult to implement and can require a large overhead in equipment and expertise to operate. Here, we demonstrate the direct distribution of near-infrared time bin entangled photons along a telecom fiber for the purpose of quantum key distribution. The near-infrared entangled photon pairs of 785nm and 832nm wavelengths are generated by an entangled photon source. The 832nm photons are sent to a local polarization analyzer. The 785nm photons were coupled into a standard telecom single mode fiber with lengths up to 3.1km and measured using a field widened unbalanced Mach Zehnder interferometer. The results indicate that, despite the multi mode nature of the telecom fibers for the 785nm photons and the associated modal dispersion that the different modes experience when propagating through the fiber, strong quantum correlations can be recovered in both the zeroth order mode and the higher order modes. The direct use of near-infrared quantum sources with the already existing telecommunication infrastructure reduces the need for frequency conversion devices and is thus important for the development of the quantum internet.

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