Correction of turbulent effects in free-space quantum communications

Quantum communications in free space are affected by atmospheric effects, such as beam wandering, which can considerably impact the performance of a link. Beam wander is originated by variations in the air's refractive index, which causes random deflections of the beam at the receiver's end. Urban scenarios are particularly vulnerable to these effects, due to the higher presence of thermal fluctuations in the air. A larger area of the receiver's *field of view* is necessary to accommodate for these pointing deviations, which causes an increase in the amount of solar background coupled into the detectors and thus a higher value of the *quantum bit error rate* (QBER) of the system. A system that efficiently corrects for these fluctuations enables the reduction of the field-of-view at the receiver, hence reducing the QBER due to solar background, and provides an around-the-clock operation of the system, since the alignment is maintained. We will describe several techniques to achieve beam wander correction in QKD systems along with considerations for their experimental implementation in urban locations.

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