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ENCODING MUTUALLY UNBIASED BASES IN ORBITAL ANGULAR MOMENTUM FOR QUANTUM KEY DISTRIBUTION

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Abstract

We encode mutually unbiased bases (MUBs) using the higher-dimensional orbital angular momentum (OAM) degree of freedom associated with optical fields. We illustrate how these states are encoded with the use of a spatial light modulator (SLM). We demonstrate how (d+1)-mutually unbiased measurements can be made in both a classical prepare-and measure scheme and on a pair of entangled photons. In the entanglement-based scheme we perform mutual unbiased measurements for dimensions ranging from d = 2 to 5. The calculation of the average error rate, mutual information and secret key rate show an increase in information capacity as well as higher generation rates as the dimension increases.