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Secure Quantum Communications using Two-Mode Squeezed States ALBERTO M. MARINO, C.R. STROUD, JR., University of Rochester — The field of secure quantum communications has gained a lot of interest in recent years. The main protocols that have been proposed to date for quantum key distribution (QKD) rely on single-photon sources and detectors. In practice weak coherent pulses are used instead of single photons, making the system vulnerable to attacks. The major difficulties with these schemes are the lack of good single-photon sources and the low quantum efficiency of single-photon detectors. We propose a scheme that uses the squeezing phase of a two-mode squeezed state (TMSS) to securely transmit information between two parties. The basic principle behind this scheme is that the reduced density matrix of each of the modes of a TMSS does not contain any information about the squeezing phase θ, only regarding the degree of squeezing r. The squeezing phase can only be obtained through a combined measurement of the two modes. The fact that it is possible to perform remote squeezing measurements allows for the implementation of a secure quantum communication protocol in which information can be transmitted directly between two parties while the encryption is done automatically by the quantum correlations present in the TMSS. In general, the main advantage gained by using squeezed light for QKD is that both sources of squeezed light, such as optical parametric oscillators, and high quantum efficiency detectors are readily available.

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