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Advances in Quantum Key Distribution: Protocols and Real-World Implementations for Secure Communications

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Quantum Key Distribution (QKD) is a mature and reliable technology for establishing symmetric encryption keys between two distant parties with unconditional security. Several QKD protocols, such as BB84, form the foundation of this technology, ensuring secure communication through quantum principles. These protocols have been successfully implemented in real-world applications, including cross-border networks, underwater links, and Metropolitan Area Networks (MANs). We will explore the latest advancements in QKD technology and its protocols, highlighting recent real-world implementations that showcase its adaptability, robustness, and effectiveness in diverse environments.

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