Continuous-Variable Quantum Key Distribution (CV-QKD) system demonstration

Kaiserslautern, Germany, April 02, 2025 – In an era where data security is paramount, the advent of quantum computing poses significant threats to traditional encryption methods. Continuous-Variable Quantum Key Distribution (CV-QKD) emerges as a robust solution, leveraging the principles of quantum mechanics to ensure secure communication. Unlike classical encryption, CV-QKD offers information-theoretic security, making it impervious to the computational power of quantum computers.

CV-QKD is particularly advantageous due to its compatibility with existing telecom infrastructure, utilizing commercial lasers and homodyne detectors. This seamless integration facilitates widespread adoption across various industries, including finance, healthcare, and government sectors, where the protection of sensitive information is critical.

By implementing CV-QKD, organizations can safeguard their communications against future quantum threats, ensuring long-term security and privacy. This innovative approach not only addresses current security challenges but also paves the way for a secure digital future.

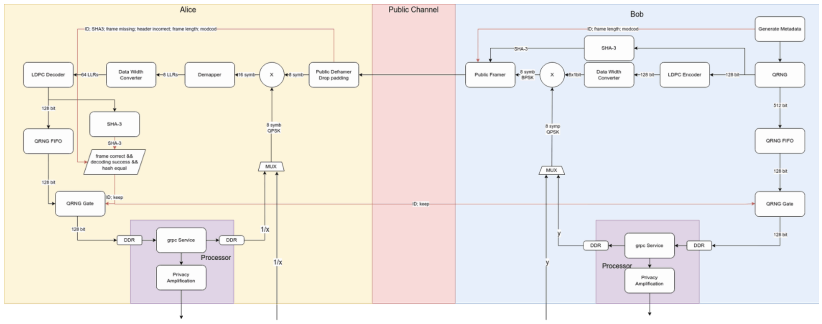

Figure 1 Reverse reconsilliation system

Forward error correction (FEC) is essential in CV-QKD to correct errors that occur during the transmission of quantum states over a noisy channel. During the reconciliation phase, Alice and Bob use error-correcting low-density parity-check (LDPC) codes, to

About Creonic GmbH

Creonic is an ISO 9001:2015 certified provider of ready-for-use IP cores for wired, wireless, fiber, and free-space optical communications.

All relevant digital signal processing algorithms are covered, including, but not limited to, forward error correction, modulation, equalization, and demodulation.

The company offers the richest product portfolio in this field, covering standards like 3GPP 5G, DVB-S2X, DVB-RCS2, CCSDS, and WiFi.

The products are applicable for ASIC and FPGA technologies and comply with the highest requirements with respect to quality and performance.

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align their raw keys and eliminate discrepancies. This process ensures that the final key is identical for both parties and secure from eavesdropping. Effective error correction enhances the secret key rate and overall performance of the CV-QKD system.

We are thrilled to announce that we will be demonstrating a fully operational CV-QKD system in collaboration with our partners within the DE-QOR project, which is funded by the Federal Ministry of Education and Research. This demonstration will showcase the seamless integration of Creonic's advanced LDPC codes, capable of operating in extremely low noise environments, down to -20 dB. Together with our partners, we aim to highlight the practical applications and robust security features of CV-QKD technology, paving the way for its widespread adoption across various industries. This collaborative effort underscores our commitment to advancing quantum communication and ensuring secure data transmission in the quantum era.

Figure 2: Full CV-QKD Demonstration Setup

Creonic's engineering team is excited to announce the development of new versions of LDPC implementations designed to operate efficiently in extremely low noise environments, down to -20 dB. These advanced LDPC implementation address the challenges of error floors, convergence speed, and robustness to noise, ensuring reliable performance even under the most demanding conditions. Our breakthrough technology significantly enhances the secret key rate and overall efficiency of CV-QKD systems, paving the way for secure communication in the quantum era.

DE-QOR

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