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Long-Distance Continuous-Variable Quantum Key Distribution with Scalar Reconciliation and Gaussian Adaptive Multicarrier Quadrature Division LASZLO GYONGYOSI, Budapest University of Technology and Economics, Hungarian Academy of Sciences, SANDOR IMRE, Budapest University of Technology and Economics — The two-way Continuous-Variable Quantum Key Distribution (CVQKD) systems allow higher key rates and improved transmission distances over standard telecommunication networks in comparison to the one-way CVQKD protocols. To exploit the real potential of two-way CVQKD systems a robust reconciliation technique is needed. It is currently unavailable, which makes it impossible to reach the real performance of a two-way CVQKD system. We propose an efficient logical layer-based reconciliation method for two-way CVQKD to extract binary information from correlated Gaussian variables. We demonstrate that by operating on the raw-data level, the noise of the quantum channel can be corrected in the scalar space and the reconciliation can be extended to arbitrary high dimensions. The results allow to significantly improve the currently available key rates and transmission distances of two-way CVQKD. We show that by exploiting the proposed adaptive multicarrier modulation scheme, two-way CVQKD can be extended to a range of 160 km over optical fiber with improved tolerable loss and excess noise. The proposed scalar reconciliation can also be applied in one-way systems as well, and can be extended for multiuser communication.

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