

# Robust Interior Point Methods for Key Rate Computation in Quantum Key Distribution

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**Abstract:** We study semidefinite programs for computing the key rate in finite dimensional quantum key distribution (QKD) problems. Through facial reduction, we derive a semidefinite program which is robust and stable in the numerical computation. Our program avoids the difficulties for current algorithms from singularities that arise due to loss of positive definiteness. This allows for the derivation of an efficient Gauss-Newton interior point approach. We provide provable lower and upper bounds for the hard nonlinear semidefinite programming problem. Empirical evidence illustrates the strength of this approach as we obtain high accuracy solutions and theoretically guaranteed upper and lower bounds for QKD. We compare with other current approaches in the literature.

**Talk will take place on July 7, 2021 from 1:00PM - 2:00PM through Zoom.**