

Towards continuous-variable satellite-based quantum key distribution

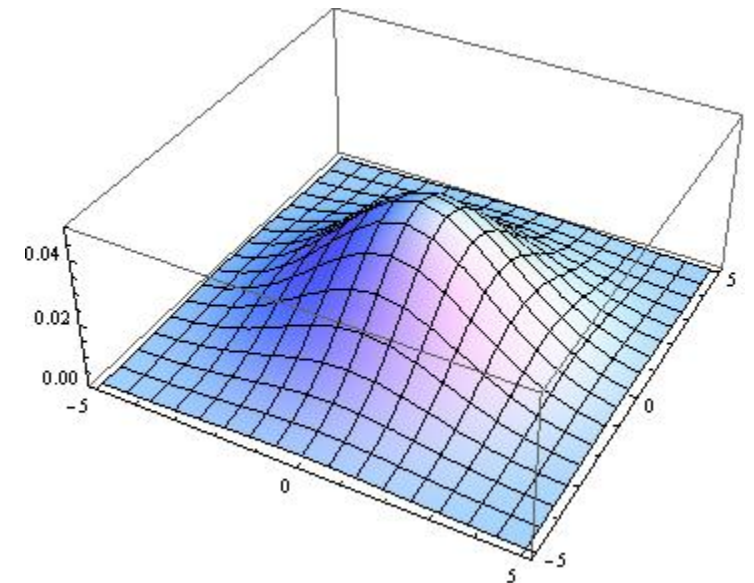
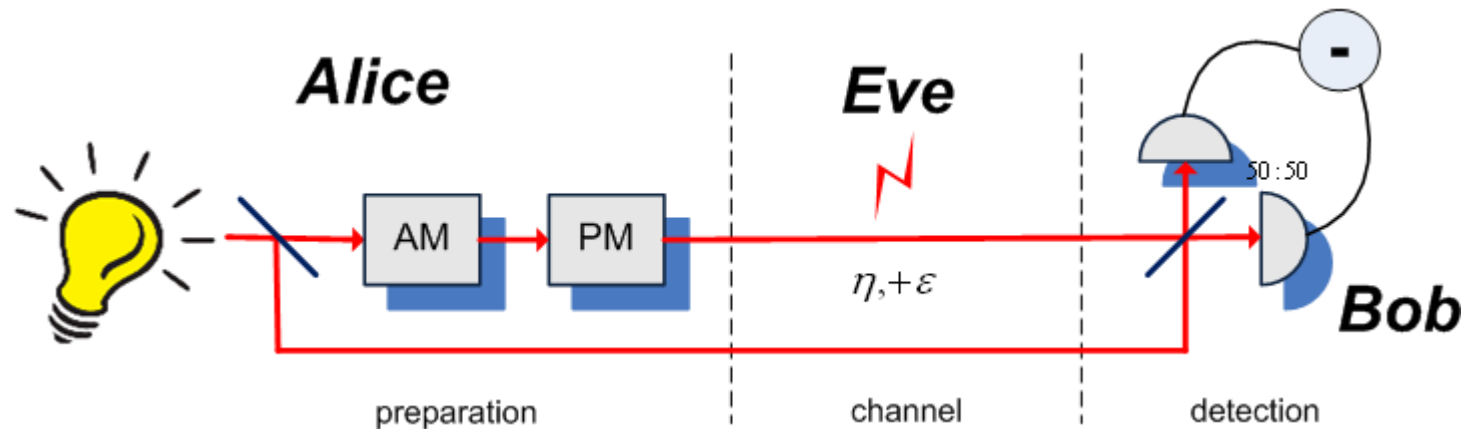
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Continuous-variable quantum key distribution (CV QKD)

- Laser light, homodyne detection
- Amplitude / phase quadrature modulation (Gaussian distributions)



Review: E. Diamanti, A. Leverrier, Entropy, **17**, 6072 (2015)

CV QKD: towards space application

Main alternative: Discrete-variable QKD

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Main alternative: **Discrete-variable QKD**

[DV-CV QKD comparison: M. Lasota, R. Filip, VU, PRA 95, 062312 (2017)]

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Advantages of CV QKD:

- Homodyne detection filters out background radiation
- Bright pulses can simplify targeting
- Large encoding alphabet - potentially higher key rates
- Homodyne detection is more feasible

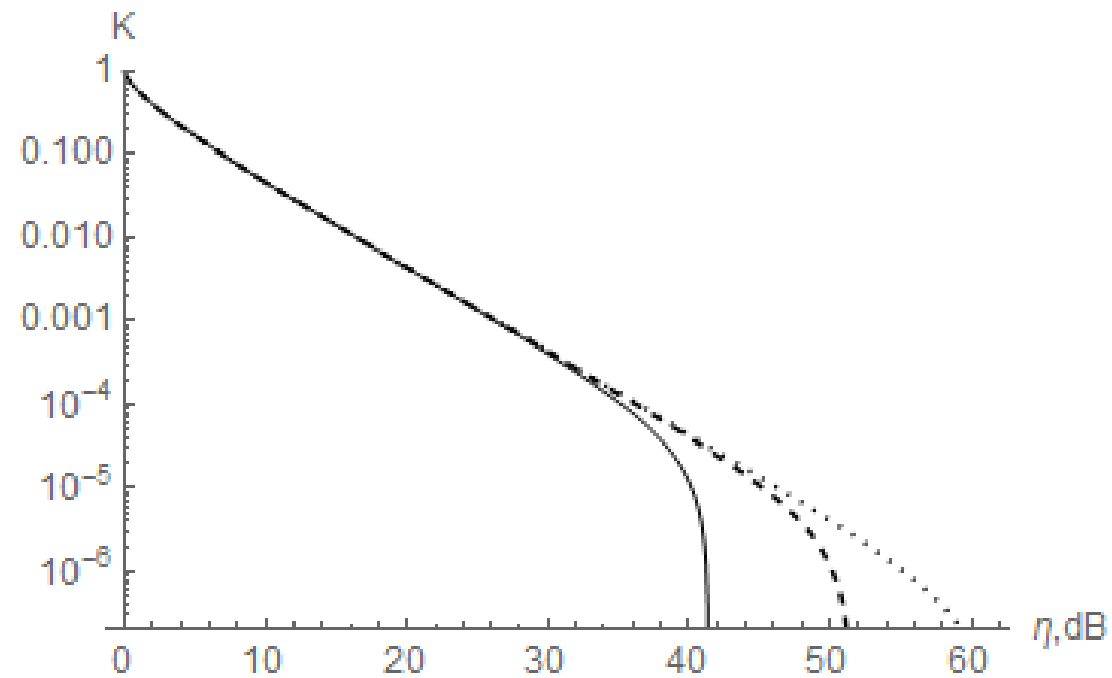
CV QKD: towards space application

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Drawbacks of CV QKD:

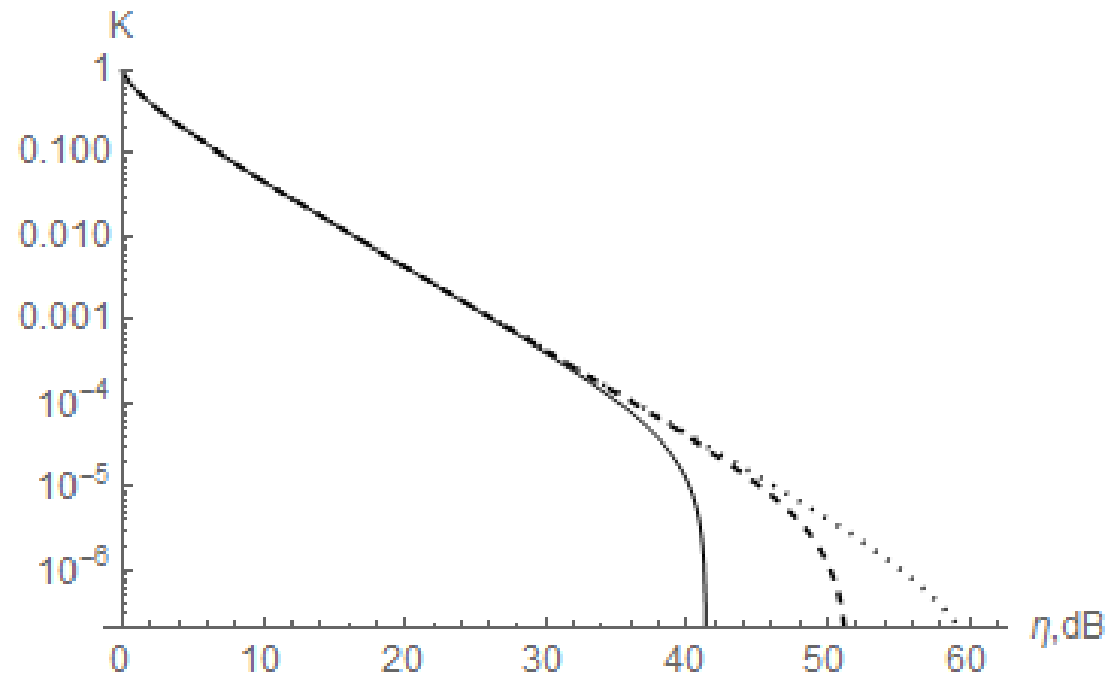
- Necessity of phase locking
- Sensitivity to channel fluctuations
- Gaussian modulation - demanding post-processing algorithms
- Finite-size effects on channel estimation

CV QKD: towards space application



Key rate as a function of channel loss for different data sizes: $10^{\{12,14,16\}}$ (from left to right) for coherent-state protocol

CV QKD: towards space application



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With the use of -3 dB squeezed states roughly the same results are achievable with 1 order of magnitude less data.

CV QKD: towards space application

Possible counter-measures for CV QKD:

- “Local local oscillator” [PRX 5, 041009 / 041010 (2015)]
- Channel post-selection [NJP 14, 093048 (2012)]
- Squeezed states [NJP 13, 113007 (2012)]
- High repetition rate [Opt. Lett. 40, 3695 (2015)]
- Discrete modulation [PRL 102, 180504 (2011)]

Thank you for attention!

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