ABSTRACT
We implement 5 GHz clocked polarization-based simplified BB84 protocol. Secret keys can be distributed over 151.5 km of standard telecom fiber at a rate of 54.5 kbps. The high clock frequency might give rise to correlations between the pulses. We characterize the correlations in decoy intensity, polarization and in the phase between the pulses and discuss their impact on the security of the protocol.

IMPLEMENTATION
Alice uses a phase modulator (PM) together with highly birefringent fiber (HiBi Fiber) to prepare the three polarization states of the simplified BB84 protocol [1].

An intensity modulator (IM) is employed to prepare the decoy states. We use an electronic polarization controller (EPC) to compensate for polarization drift in the quantum channel (QC).

Bob uses in-house made superconducting nanowire single-photon detectors (SNSPDs) to distinguish the polarization states $|0\rangle$, $|1\rangle$, $|+\rangle$ and $|-\rangle$.

CONCLUSION
- We realized a 5 GHz clocked BB84 implementation and reached a SKR of 54.5 kbps at 150 km of standard single mode fiber.
- We characterized the relevant parameters connected to potential security loopholes.
- Further research has to be done on the impact of the three types of correlation in terms of security.

REFERENCES

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