skQCI Entanglement-based QKD national test-bed

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Quantum Key Distribution (QKD) promises an unconditional security based on the laws of quantum physics that eavesdroppers cannot retrieve key information without introducing detectable errors. This allows for two remote parties to share sequences of private random bits which are primitives to implement secure communication protocols that do not rely on the assumption of a bounded computing power for the attacker. As of late, one recent in 2020[1] has demonstrated that entanglement-based QKD serves as one of the most suitable candidates for creating fully connected topologies, which greatly reduces the overhead cost of adding a new user. In this work, we plan for the deployment of the backbone infrastructure of the national Slovak quantum network. We report the design of a broadband entangled pair generator using spontaneous parametric down conversion process within a Sagnac interferometer configuration[2] that has shown polarisation entanglement with a near perfect visibility of 99% in the lab settings.

References

[1] S. K. Joshi, D. Aktas, S. Wengerowsky, M. Lončarič, S. P. Neumann, B. Liu, T. Scheidl, G. C. Lorenzo, Ž. Samec, L. Kling, et al., Science advances, vol. 6 (2020) 36.

[2] B. S. Shi, A. Tomita, PRA, vol. 69 (2004) 013803

Figures

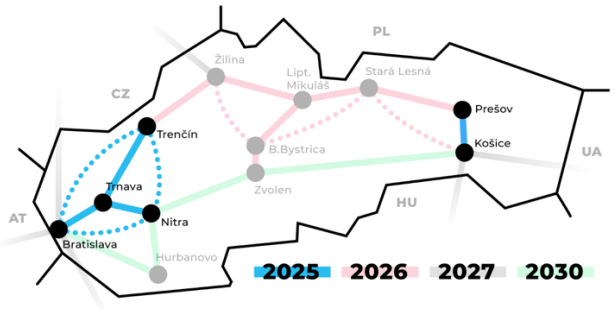

Figure 1: Slovak QKD national test-bed provisional map.

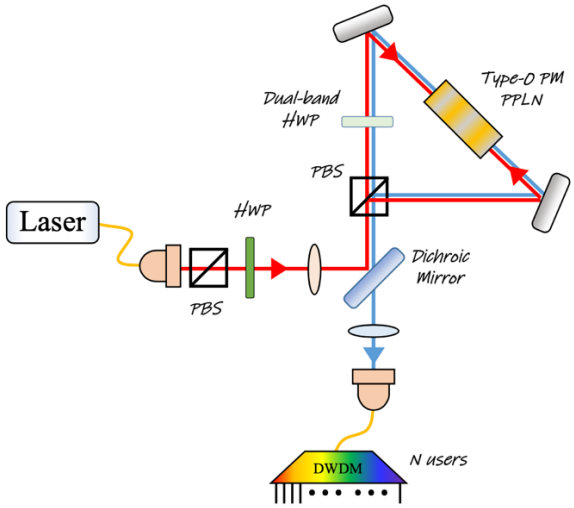

Figure 2: Entangled-photon pair source demultiplexed for fully-meshed networks.

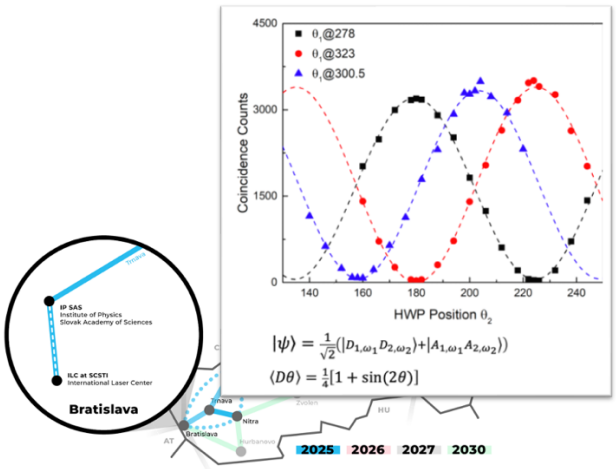

Figure 3: High visibility figure of merit deployed in Bratislava metropolitan area.