Correlated photons produced by noncollinear spontaneous parametric down-conversion

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Diploma thesis abstract

In this diploma work covers basic principles of classical cryptography. It was accomplish detail analysis of quantum cryptographic protocols, which most used in our days. We examined different metods of distribution of cryptographic key for encoding transmitted messages and described their comparative characteristics.

Also we developed new methodology of distribution cryptographic keys between protocol users based on time-encoding corellated photon pairs emitted as a result of spontaneous parametric down-conversion on I-type nonlinear crystal BBO. It was built experimental scheme, which make distribution of key at distance about 8 meters between protocol users. We described main details of our experimental scheme and software application, which processing results of experimets and forming cryptographic key. It was analyzed a possible ways of improvement of experimental system. We researched the effect of such physical factors as deathtime and quatum efficience of detectors, optical adjustments and existence noise level on velocity of distribution cryptographic key between protocol users and bit error rate in key. It was discussed some methods, that can minimizate negative effects, which concerned with this factors.

Moreover, it was proposed method of additional protection of our protocol, which based on control of the violation of Bell's inequality for polarizated entanglement photon pairs. We estimated in our experiments existence phaseshift between polarizated entanglement photon pairs.