

On Quantum Double-Lock Encryption

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Abstract

Cryptography is important for management. Recently new results have posed a serious problem to present cryptography protocols. Quantum Key Distribution (QKD) is one of the most promising solutions to this problem. Some proposed Double-Lock Encryption protocols in QKD assumes that the qbits are 2-component. In this letter we propose a protocol without this assumption.

Cryptography is important for management. Recently it became clear that quantum computers pose a serious threat to the presently used protocols which depend on some difficult mathematical problems e.g. RSA protocol [1]. Quantum Key Distribution (QKD) is one of the most promising solutions to this problem. Its main advantage is that it depends on physical quantum laws e.g. entanglement and uncertainty [2]. Its main disadvantage is that it was difficult to implement in practice. Recently this problem has been solved [3]. QKD has been used for satellite transmission.

Double lock encryption (Zero knowledge) is a protocol that increases the protocol security [4]. Some proposed Double-Lock Encryption protocols in QKD assumes that the qbits are 2-component. In this letter we propose a protocol without this assumption [5,6].

We apply it to the BB84 protocol which is one of the most popular QKD protocols [7].

Quantum Double-Lock (Zero knowledge) Encryption

Recently quantum 3-pass protocol has been proposed [5,6]. It was assumed that the qbits are 2-component hence they use the fact that the group $SO(2)$ is commutative. This is Not true for $SO(n)$, $n > 2$.

Here we propose the following protocol which does not make this assumption:

Assume that sender A sends a string of qbits $\{qba(1), qba(2), \dots, qba(s)\}$ to a receiver B. He receives them which cause some errors according to Uncertainty principle [2]. The receiver B sends back the extended string

$\{qba'(1), qba'(2), \dots, qba'(s), qbb(s+1), \dots, qbb(s+r)\}$. When the sender A receive it the correct subset of $\{qba'(1), qba'(2), \dots, qba'(s)\}$ will form her key. The extended string is sent back to the receiver B and he gets $\{qba'(1), qba'(2), \dots, qba'(s), qbb'(s+1), \dots, qbb'(s+r)\}$. The correct subset of the string $\{qbb'(s+1), \dots, qbb'(s+r)\}$ will be his key. No assumptions are made on the number of components used for each qbit.

These results are also applicable for the E91 protocol.

References

1. Kraft JS, Washington LC. An introduction to number theory with cryptography. CRC publ. 2014.
2. Pade J. Quantum Mechanics for Pedestrians 2: Applications and Extensions, Springer Publisher. 2014.
3. Liao SK, Cai WQ, Liu WY, Zhang L, Li Y, Ren JG, et al. Satellite-to-ground quantum key distribution. Nature. 2017;549:43-47.
4. Feige U, Fiat A, Shamir A. Zero knowledge proofs of identity. Proceedings of the nineteenth annual acm symposium on theory of computing. 1987:210-217.
5. Kanamori Y, Yoo SM. QUANTUM THREE-PASS PROTOCOL: KEY DISTRIBUTION USING QUANTUM SUPERPOSITION STATES. International Journal of Network Security & Its Applications. 2009;1(2):64-70.
6. Chan KWC, Rifai ME, Verma PK, Subhash K, Chen Y. Multi-Photon Quantum Key Distribution Based on Double-Lock Encryption. arXiv:1503.05793 [quant-ph]. 2015;5(3/4):1-13.
7. Giampouris D. Short Review on Quantum Key Distribution Protocols. GeNeDis. 2016:149-157.

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