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Abstract

We first investigate quantum noise effect on the teleportation of nonlocal Cooper pairs across the realistic Andreev entangler, which consists of an s-wave superconductor coupled to two small quantum dots at resonance which themselves are coupled to normal leads. In the ideal noiseless case, the setup provides a trustable source of mobile and nonlocal spin-entangled electrons and allows the injection of two spin-entangled electrons into different leads at the same energy [2]. We seek to revisit the transport of those nonlocal Cooper pairs when including the quantum noise (decoherence) [1].

To explore another entanglement mechanism, one can also use a mounting between a double-dot charge qubit, formed by two strongly capacitively coupled dots, and a spin qubit. By placing these qubits between two superconducting leads, this prolific setup can be seen as a resonating valence bond (RVB) system [3].

[1] É. Dupont and Karyn Le Hur, Phys. Rev. B **73**, 045325 (2006).

[2] P. Recher, E. V. Sukhorukov, and D. Loss, Phys. Rev. B **63**, 165314 (2001).

[3] K. Le Hur, P. Recher, E. Dupont, and D. Loss, Phys. Rev. Lett. **96**, 106803 (2006).