Coherent superconducting thermoelectrical nanodevices

Alessandro Braggio
Francesco Giazotto
Fabio Taddei
Federico Paolucci
Giampiero Marchegiani
Gianmichele Blasi
Gaia Germanese

NEST, Istituto Nanoscienze-CNR and Scuola Normale Superiore, Piazza San Silvestro 12, I-56127 Pisa, Italy

alessandro.braggio@nano.cnr.it

Abstract

Superconducting nanodevices have been recently identified as strong thermoelectrical engine.
We will explore different examples where the thermoelectricity in linear and nonlinear regimes is generated even in a particle-hole symmetric systems. We discuss how phase-dependent Andreev reflections[1] or even non-equilibrium spontaneous symmetry breaking[2,3] would generate strong and phase controlled thermoelectrical effects. We successfully report also different applications such as current-controlled superconducting thermoelectric memories[4], broadband single-photon detectors, microwave assisted generator[6]

References

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[4] G. Germanese, F. Paolucci, G. Marchegiani, A. Braggio, F. Giazotto Patent, Filling number: 102021000032042 (21/12/2021)
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Figures

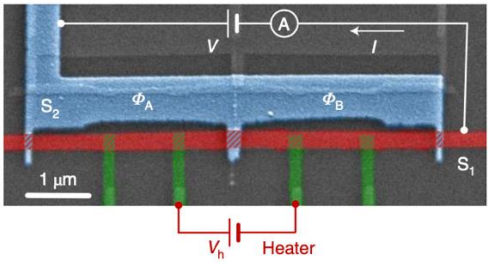

Figure 1: Bipolar thermoelectric Josephson engine. Pseudo-colour scanning electron micrograph of the engine. In red Al istand tunnel coupled to Cu/Al bilayer to realize a double-loop SQUID.

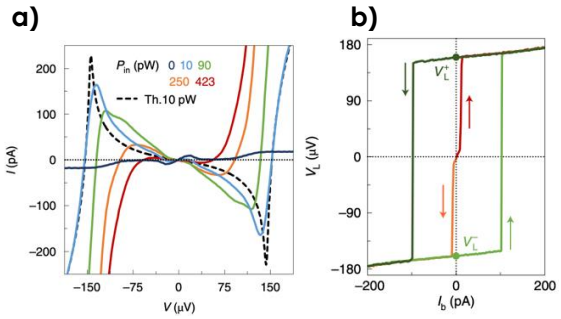

Figure 2: a) Reciprocal IV characteristic of the superconducting thermoelectrical engine. b) Hysteresis cycle spontaneous symmetry-breaking of the particle-hole symmetry at the base of the effect.