Proposal for an optical laser producing light at half the Josephson frequency

F. Godschalk[a], F. Hassler[b, a], and Yu.V. Nazarov[a]

[a]Kavli Institute of Nanoscience, Delft University of Technology, Delft, The Netherlands
[b]Instituut-Lorentz, Universiteit Leiden, Leiden, The Netherlands

We study the emission of visible laser light by a superconducting device at half the Josephson generation frequency. The device consists of a single mode optical cavity containing a p-n semiconductor nanowire that is attached to superconducting leads. Two quantum dots are embedded in the nanowire via which emission of photons by electron-hole recombination can occur. The cavity induces a phase locking between optical phase and superconducting phase difference. Spontaneous switchings within the device are studied as a source of decoherence. These switchings guarantee stationary lasing states for suitable parameter regimes.