

Superconductor-normal metal single-electron trap in a combined on-chip RC-environment

S.V. Lotkhov^a, A. Kemppinen^b, O.-P. Saira^c, J.P. Pekola^c, and A.B. Zorin^a

^aPhysikalisch-Technische Bundesanstalt, 38116 Braunschweig, Germany

^bCentre for Metrology and Accreditation (MIKES), P.O. Box 9, 02151 Espoo, Finland

^cLow Temperature Laboratory, Aalto University, P.O. Box 13500, FI-00076 AALTO, Finland

Growing interest is observed to single-electron pumping with the help of an rf-driven single electron transistor built on two superconductor-insulator-normal metal (SIN) hybrid tunnel junctions¹. It was shown that the attainable accuracy of such a pump is exposed to a non-equilibrium quasiparticles problem, arising due to the quantum noise of the electromagnetic environment². It was also found that the microwave photons emitted by environment could be efficiently filtered out by either resistive (R) or capacitive (C) passive on-chip elements^{2,3}. In the present work, we will focus on combined effect of different on-chip RC-topologies on the retention time of a two-junction hybrid single-electron SINIS trap, which we adopt as a figure of merit for various experimental environments. Local and global environment is assessed for its significance for quasiparticle generation.

¹J. Pekola, et al., Nature Physics, vol. 4, 120 (2008)

²J. Pekola et al., Phys. Rev. Lett. vol. 105, 026803 (2010)

³S.V. Lotkhov et al., New J. Phys., vol. 13, 013040 (2011)