

Cooling and Thermometric Performance of Non-ideal SINIS Tunnel Junction Devices

S. Chaudhuri and **I. J. Maasilta**

Nanoscience Center, Department of Physics, University of Jyväskylä, Jyväskylä, Finland

We have investigated two distinct aspects associated with electronic conduction, cooling and thermometry of superconductor-insulator-normal metal-insulator-superconductor (SINIS) based tunnel junction devices. First, we address the effect of asymmetry of tunneling resistances of the individual junctions. By solving the electrical and heat flow equations numerically, we find that asymmetry gives rise to many new interesting features like appearance of an excess sub-gap current, negative differential resistance and temperature sensitivity differences of the individual junctions. Moreover, the total cooling power of a SINIS can be enhanced by asymmetry. Second, we discuss how finite resistivity of the normal metal electrode modifies the performance characteristics. In this case, as well, the individual junctions can exhibit negative differential resistance if normal metal resistivity is high enough.