

Particle-hole thermalization in a composite super and normal conducting nanowire

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The mechanisms by which isolated condensed matter systems thermalize is a topic of growing interest. Thermalization is known to be linked to the emergence of chaos in the dynamics of a system. We show that a solid state scattering system, containing superconducting elements, can thermalize scattered states without affecting the degree of entanglement of the scattered states. We consider a composite NSNSNSNSN nanowire, composed of BSCCO $Bi_2Sr_2CaCu_2O_{8+x}$ superconducting segments (S) and normal conducting segments (N). We consider parameter regimes where all current flow is due to tunneling currents that are facilitated by quasibound state resonances inside the SNSNSNS structure. At certain energies, scattered pure states approach ergodicity, even though they remain pure.