

simplejunction

May 20, 2018

1 Simple Junction: {Matsubara Formalism}

First we consider tunneling current in the textbok. First, we repeat his derivation following Mahan's Book, in **page 85, page 207 and page 789**. The Hamiltonian of the junction writes as,

$$H = H_R + H_L + H_T = H_0 + H_T$$

with the Hamiltonians for the left side,

$$H_R = \sum_{\sigma, \mathbf{k}} \xi_{\mathbf{k}} c_{\sigma, \mathbf{k}}^\dagger c_{\sigma, \mathbf{k}} + \sum_{\mathbf{k}} \Delta_R (c_{\mathbf{k}, \uparrow}^\dagger c_{-\mathbf{k}, \downarrow}^\dagger + c_{\mathbf{k}, \downarrow} c_{-\mathbf{k}, \uparrow})$$

the right side

$$H_L = \sum_{\sigma, \mathbf{p}} \xi_{\mathbf{p}} d_{\sigma, \mathbf{p}}^\dagger d_{\sigma, \mathbf{p}} + \sum_{\mathbf{p}} \Delta_L (d_{\mathbf{p}, \uparrow}^\dagger d_{-\mathbf{p}, \downarrow}^\dagger + d_{\mathbf{p}, \downarrow} d_{-\mathbf{p}, \uparrow})$$