simplejunction

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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,

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

the right side

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

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