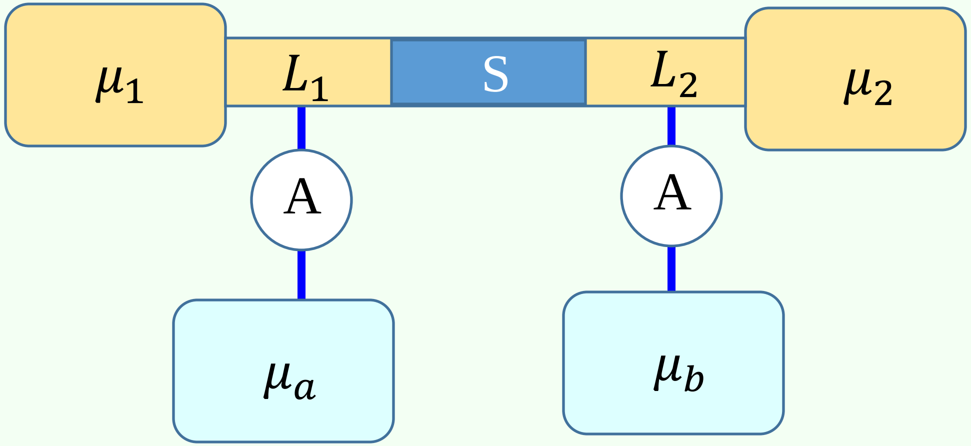
Exercise D-6-27



Consider the four-terminal configuration shown in the right. The transmission coefficient of the sample part is T. The current meters indicate zero.

Assume flux 1 is applied from reservoir 1. $1-T$ is reflected and lead-1 thus contains flux $2-T$. Fermi's golden rule gives the number of electrons go into probe-a as

$$J_{\rm in}/e = (2\pi/\hbar)|t_{1a}|^2 D_a D_1(\mu_1 - \mu_a)(2-T).$$

Here D_x is the density of states in reservoir x, t_{xy} is the transition matrix element between reservoir x and y. The counter flow is

$$J_{\rm out}/e = (2\pi/\hbar)|t_{1a}|^2 D_a D_1(\mu_a - \mu_2)T.$$

Exercise D-6-27 (continued)

Equating these (because the net current is zero) gives

$$\mu_a = \frac{1}{2}[\mu_1(2-T) + \mu_2 T].$$

(1) Express μ_b with μ_1, μ_2 and T as in the above for μ_a.

(2) Obtain the expression for four-terminal conductance .

(3) What happens for $T = 1$?

Submission deadline: 2016.7.11