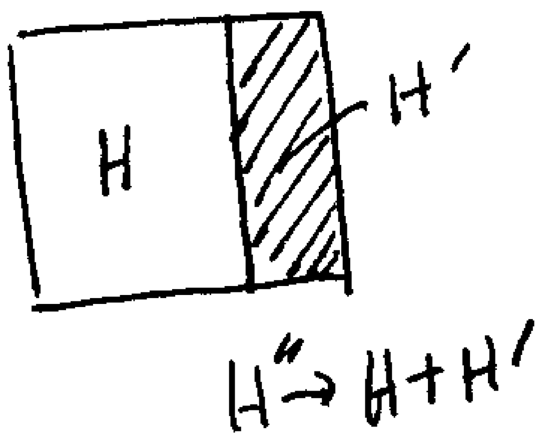



$$\hat{H} = \begin{pmatrix} H_{ss} & \tau_{sz} \\ \tau_{zs} & H_{ll} \end{pmatrix} = \begin{pmatrix} H & \tau \\ \tau^{+} & H_R \end{pmatrix}$$

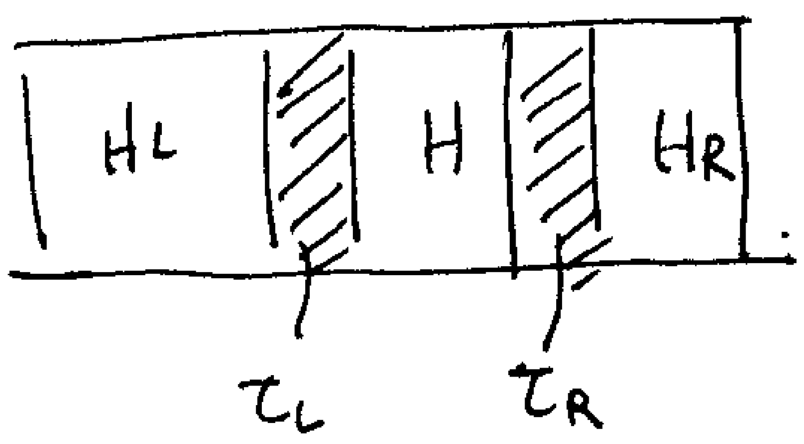
$$\hat{E}I = E\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, \quad EI - H \Rightarrow \begin{pmatrix} E-H, & -\tau \\ -\tau^{+} & E-H_R \end{pmatrix}.$$

$$G(E) = (EI-H)^{-1} \Rightarrow \begin{pmatrix} E-H, & -\tau \\ -\tau^{+}, & \underbrace{E-H_R}_{G_R(E)^{-1}} \end{pmatrix}^{-1} \Rightarrow \begin{pmatrix} E-H. & -\tau \\ -\tau^{+}G_R(E), & I \end{pmatrix}^{-1} \Rightarrow \begin{pmatrix} E-H. & -\tau \\ -\tau^{+}G_R(E)\tau & \tau \end{pmatrix}^{-1}.$$

$$= \begin{pmatrix} E-H-\Sigma_1. & 0 \\ 0 & . E-H_R-\Sigma_1^{R} \end{pmatrix}^{-1}$$

self-interaction. → $\tau^{+}G_R(E)\tau$.

$\Sigma_1^R$ → $\tau^{+}G(E)\tau$.




$$L\begin{pmatrix} H & \tau_L & \tau_R \\ \tau_L^{+} & H_L & \tau_{LR} \\ \tau_R^{+} & 0 & H_R. \end{pmatrix} = E\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \qquad (EI-L) = \begin{pmatrix} E-H, & \tau_L, & \tau_R \\ -\tau_L^{+}, & E-H_L. & 0 \\ -\tau_R^{+}, & 0. & E-H_R \end{pmatrix}^{-1}$$

$$\Downarrow$$

$$\begin{pmatrix} E-H-\Sigma_L-\Sigma_R & 0 & 0 \\ 0 & E-H_L-\Sigma_1^{L} & 0 \\ 0 & 0 & E-H_R-\Sigma_1^{R} \end{pmatrix}^{-1}$$

$\Sigma_L$ → $\tau_L^{+}G_L(E)\tau_L$

$\Sigma_R$ → $\tau_R^{+}G_R(E)\tau_R$

$\Sigma_1^L$ → $\tau_L^{+}G(E)\tau_L$.

$\Sigma_1^R$ → $\tau_R^{+}G(E)\tau_R$.

$$G(E) = E-H-\Sigma_L-\Sigma_R.$$

$$\begin{cases} \Sigma_L = \tau_L^{+}G_L(E)\tau_L. \\ \Sigma_R = \tau_R^{+}G_R(E)\tau_R. \\ G_L(E) = (E-H_L)^{-1} \\ G_R(E) = (E-H_R)^{-1} \end{cases}$$

$I = 2(-q)\,\mathrm{Trace}(\rho J).$

$$\rho = \int_{-\infty}^{\infty} dE\, f(E-\mu)\, \delta(EI - H)$$

$A(E).$

$$= \int_{-\infty}^{\infty} f(E-\mu)\, \frac{i}{2\pi}\Big[\big(G(E+i0)I - H\big) - G\big((E-i0)I - H\big)\Big]$$

$\downarrow$ Reservoirs.

$$\int_{-\infty}^{\infty} dE\, f(E-\mu)\, \frac{i}{2\pi}\big( G'(E) - G'(E)^{\dagger}\big).$$

$$G'(E) = (E+i0)I - H - \tau_1 - \tau_2 .$$

$\mu_1, \mu_2.$

$$I = 2\times(-q)\sum\{ f(\varepsilon_k - \mu_1)J_L + f(\varepsilon_k - \mu_L)J_R]$$

$\downarrow$ 구하기 위해 self-interaction 도입 ..

$$\Rightarrow 2\times(-q)\big[\mathrm{Trace}(\rho J)_L + \mathrm{Trace}(\rho J)_R\big].$$

$\rho$ 자유도움.

when $|\varepsilon_K - \varepsilon_{K-1}|$.

can be assumed to be continuous.

$$\rho_L = \int_{-\infty}^{\infty} dE\, f(E-\mu_1)\,\frac{A_L(E)}{2\pi}$$

$$\rho_R = \int_{-\infty}^{\infty} dE\, f(E-\mu_2)\,\frac{A_R(E)}{2\pi}.$$

$$A_L(E) = i \times \big( G(E+i0)I - \tau_1) - G(E-i0)I - \tau_1)\big).$$

$$A_R(E) = i\times\big(G(E+i0)I - \tau_2) - G(E-i0)I - \tau\big).$$

강제

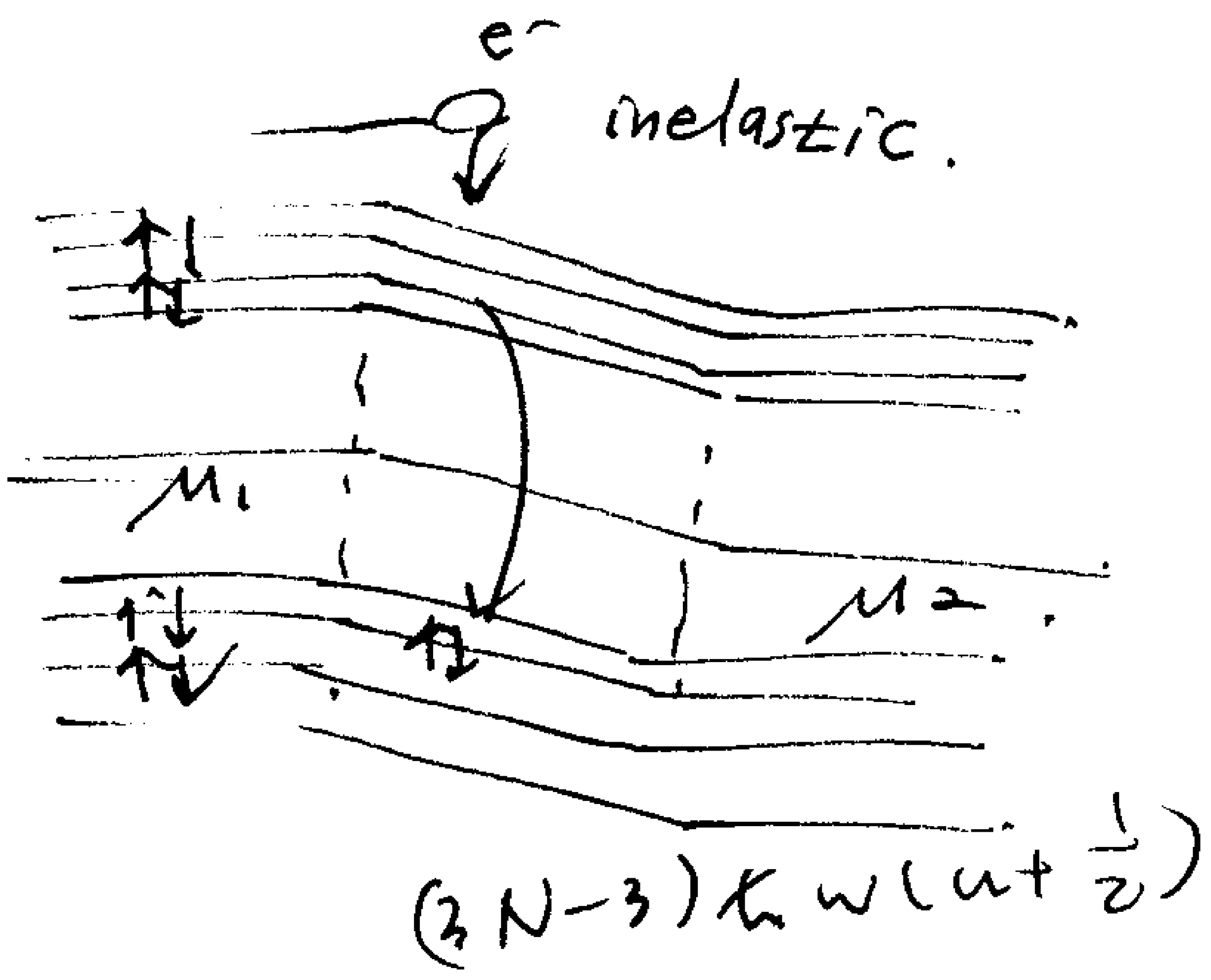
$$\rho_L = \left( \frac{\int f(E-\mu_1)\,\delta((EI - \varepsilon_1))}{f(\varepsilon_1 - \mu_1).} \right).$$

$$(H + \Sigma_2)\psi = E\psi$$

$$\tau^{+} G_R(E)\tau.$$

$$I = 2x(q)\ \mathrm{Trace}\left[ (\rho J)_L + (\rho J)_R \right)$$

$$= 2x(q)\ \mathrm{Trace}\left[ J\left( \rho(E-\mu_1) - \rho(E-\mu_2) \right) \right]$$




$-I_{\text{scattering}}$.

$H \to H + \Sigma_1$

$H \to H + \Sigma_1 + \Sigma_S$.

x. $\dfrac{d|\psi_{a\to b}|^2}{dt} = \dfrac{2\pi}{h} |\langle a|V|b\rangle^2| \delta(E_a - E_b)$.

$H \to H + \Sigma_L + \Sigma_R + \bigcirc$.