14/02/23

$$\Gamma_n = \frac{a}{2\pi\hbar |R_p|} |\phi_n^\infty(0,\omega)|^2 \qquad \phi_n(0,\omega) = \frac{R_p K_p}{2\pi a} \bar{p}\cdot\vec{v}_n\, e^{-2K_p z_0}$$

$$\bar{v}_n = \left(\frac{K_{x,n}}{\sqrt{K_p^2 - K_{xn}^2}},\ 1,\ \frac{iK_p}{\sqrt{K_p^2-K_{xn}^2}} \right)$$

$$\Gamma = \frac{2K_p^3}{\hbar}|\bar{p}|^2 \frac{\mathrm{Im}\{G_{self}\}}{K_p^3} \quad (1)$$

$$G_{self} = \begin{bmatrix} G_{\parallel} & & \\ & G_{\parallel} & \\ & & G_{\perp} \end{bmatrix} \qquad G_{\parallel} = \frac{1}{2}\int dK_{\parallel} K_{\parallel}^2 r_{K_{\parallel}p}\, e^{2iK_{\parallel}z_0}$$

$$G_{\perp} = 2G_{\parallel}$$

$$\Gamma_n = \frac{\cancel{a}}{2\pi\hbar|\cancel{K_p}|}\cdot\frac{|R_p|^2 K_p^2}{4\pi^2 a^2}(\bar{p}\cdot\vec{v}_n)(\bar{p}^*\cdot\vec{v}_n^*)\, e^{-4K_p z_0}$$

$$= \frac{R_p K_p^2}{8\pi^3\hbar a}\underbrace{(\bar{p}\cdot\bar{v}_n)(\bar{p}^*\cdot\bar{v}_n^*)\, e^{-4K_p z_0}} \quad (2)$$

$$K_{xn} = \frac{\omega}{v} + \frac{2\pi n}{a}$$

$$K_p \gg \frac{\omega}{v}$$

$$(1):\ \frac{1}{[\hbar]}\cdot[G] = \frac{1}{E\cdot T L^3}$$

OK

$$(2):\ \frac{[K_p]^2}{[\hbar][a]} = \frac{1}{E T L^3}$$

$$2K_p^3 \sim \sum_n \frac{R_p \cancel{K_p^2}}{8\pi^3 a}|\bar{v}_n|^2$$

$$K_p \sim \sum_n \frac{R_p |\bar{v}_n|^2}{16\pi^3 a}$$

$$\sim \frac{R_p}{16\pi^3}\cdot\frac{1}{a}\sum_n |\bar{v}_n|^2$$

$$\sim \frac{R_p}{16\pi^3}\cdot\frac{1}{a}\sum_n\left(1 + \frac{K_{x,n}^2 + K_p^2}{K_p^2 - K_{xn}^2}\right)$$

$$\phi^{dip} = \sum_n \int \frac{dK_y}{2\pi a} e^{i\bar{K}_{\parallel n}\bar{R}}\, \tilde{\phi}_p^{1\,dip}(\bar{K}_{n\parallel})$$

$$= \sum_n \phi_n^\infty(0,\omega)$$

$$E^{dip} = -\bar{\nabla}\phi^{dip}$$

$$= -\sum_n \int\frac{dK_y}{2\pi a} iK_{\parallel n}\, e^{i\bar{K}_{\parallel}\cdot\bar{R}}\, \tilde{\phi}_p^{1\,dip}(\bar{K}_{n\parallel})$$

$$\phi_n^\infty \propto e^{i\vec{K}_p\cdot\vec{R}}$$

$$E^{dip} = -\bar{\nabla}\phi^\infty$$

$$\sim -i\vec{K}_p\,\phi^\infty$$

$$\Rightarrow \Gamma = \frac{I_p}{\hbar\omega} = \frac{1}{\hbar\cancel{\omega}}\cdot\frac{1}{R_p}\frac{\cancel{\omega}\lambda_p^2}{(2\pi)^3}|E_0|^2 = \frac{|E_0|^2}{\hbar R_p\ \ 2\pi K_p^2}$$

$$\rightarrow |E_0|^2 \rightarrow K_p^2|\phi_n^\infty|^2$$

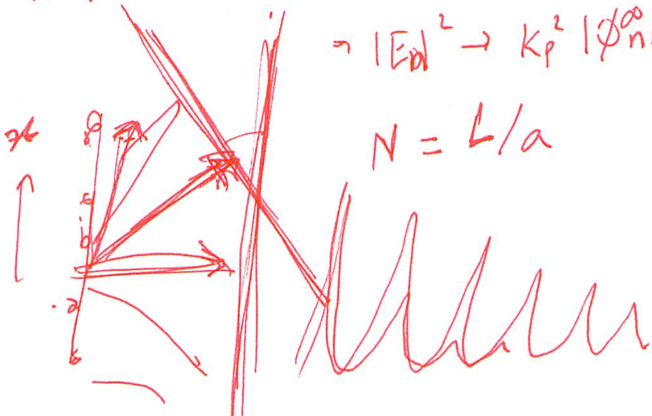
$$N = L/a$$

$$\Rightarrow |E_0|^2 = |\phi_n^\infty(0,\omega)|^2 K_p^2$$

$$K_{xn} = K_p \cos(\theta_n) \qquad \sqrt{K_p^2 - K_{xn}^2}.$$

K_y

$$K_p^2\sin(\theta) \rightarrow K_p\cdot\sqrt{K_p^2-K_{xn}^2}$$



$$(\bar{p}\cdot\bar{v})(\bar{p}^*\cdot\bar{v}^*)$$

$$=(p_x v_x + p_y v_y + p_z v_z)(p_x^* v_x^* + p_y^* v_y^* + p_z^* v_z^*)$$

$$= |p_x|^2 |v_x|^2 + |p_y|^2 |v_y|^2 + |p_z|^2 |v_z|^2 + \ldots$$