

$$|w(t)|$$

$$\frac{\partial^2 w}{\partial k^2}$$

$$w = \frac{2\pi}{T}$$

$$k = \frac{2\pi}{\lambda}$$

$$\frac{w}{k} = \frac{\lambda}{T} = v$$

$$v = \frac{c}{n(w)}$$

$$\rightarrow v(w)$$

$$A \sim b e^{i w t}$$

$$\frac{\partial A}{\partial t} \sim A_0 i w e^{i w t}$$

$$\frac{\partial^2 A}{\partial t^2} \sim A_0 - w^2 e^{i w t}$$

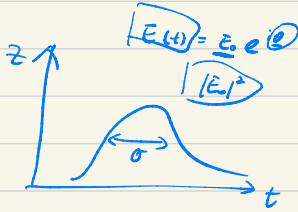
$$i \frac{\partial A}{\partial t} = \frac{\partial^2 A}{\partial x^2}$$



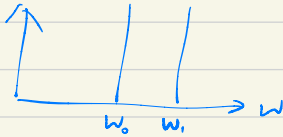
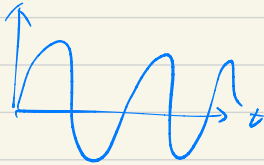
$$i \frac{\partial A_0}{\partial t} = -\frac{\beta_0}{2} w^2 A_0$$

$$\tilde{A}(z, w) = A_0 e^{-i \frac{\beta_0}{2} w^2 z}$$

$$A(z, t) = \tilde{F}[\tilde{A}(z, w)]$$



$$\sin(\omega_0 t) + \sin(\omega_1 t)$$



$$\hat{A} = \langle \hat{A} \rangle + \delta \hat{A}$$

$$\left| \frac{\partial \hat{A}}{\partial \hat{A}} = -\sigma |\hat{A}|^2 \hat{A} \right|$$

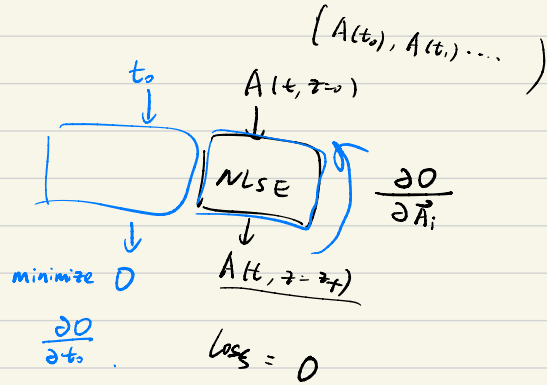
$$\Rightarrow \underline{A = A_0 e^{-i\sigma |A|^2 z}}$$

$$\frac{\partial A}{\partial z} = \frac{\beta}{2} \frac{\partial^2 A}{\partial t^2} - \sigma |A|^2 A$$

$$\frac{\partial A}{\partial z} = 0 \rightarrow \text{soliton.}$$



classical NLSE
↓
quantum
↓
differentiable



$$\hat{A} = \langle \hat{A} \rangle + \delta \hat{A}$$

$$\frac{d\langle \hat{A} \rangle}{dz} = 0 \left(\langle \hat{A} \rangle^2 \langle \hat{A} \rangle, \langle \hat{A} \rangle^2 \delta \hat{A}, (\delta \hat{A})^2 \langle \hat{A} \rangle, (\delta \hat{A})^3 \right)$$

$$\frac{d\delta \hat{A}}{dz} = \dots O(\delta \hat{A})$$