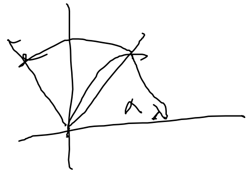
$$(\beta_{m-1}\rho_{\bar n} e^{i\mu} - \theta) e^{-i\alpha} \quad + \theta = \beta_m$$

$$\beta_m = z\beta_{m-1} + \underbrace{\{\theta[1-e^{-i\alpha}]\}}_{K}$$



$$z = \rho e^{i(\mu-\alpha)}$$

$$\sum_{m=1}^{n} \beta_m z^{n-m}$$

$$= \sum_{m=1}^{n} z^{n-m}(z\beta_{m-1} + K)$$

$$(z^{n-(m-1)}\beta_{m-1} + K)$$

$$\beta_n \cdots \cancel{\beta_1 z^{n-1}}$$

$$= z^n\cancel{\beta_0} + z^{n-1}\cancel{\beta_1} \cdots + \cancel{z\beta_{n-1}}$$

$$= K\sum_{m=1}^{n} z^{n-m} = K(1+z \cdots z^{n-1})$$

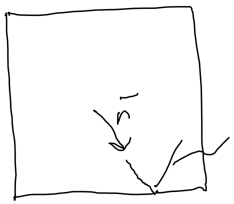
$$\beta_n = K\left(\frac{1-z^n}{1-z}\right)$$

$$\beta_n = \theta(1-e^{-i\alpha})\frac{\{1-\rho_{\bar n}^n e^{in(\mu-\alpha)}\}}{\{1-\rho_{\bar n} e^{i(\mu-\alpha)}\}}$$

$$\beta_{n\to\infty} = \frac{\theta\{1-e^{-i\alpha}\}}{1-\rho_{\bar n} e^{i(\mu-\alpha)}}$$

$$\beta_{n\to\infty} = \frac{\theta\{1-e^{-i\alpha}\}}{\{1-\rho_n e^{i(\mu-\alpha)}\}}$$

$$|\beta_{n\to\infty}| = \frac{\theta\, 2 \sin \alpha/2}{\sqrt{1+\rho^2-2\rho\cos(\mu-\alpha)}} \qquad |\beta_\infty|^2$$



$|\rho_n|^2$

$$(1-\rho_n^2)|\beta_\infty|^2\left(\frac{T}{\tau_c}\right) = N_{\bar{n}}(T)$$

measuring time

T

free experiment $\quad \epsilon^2 \tau_{eff}^{\alpha} \frac{T}{\cancel{\alpha}} =$

$$\tau_{eff} = \frac{(1-\rho^2)(\beta_\infty)^2}{\epsilon^2\tau_c^2} = G\, \cancel{\alpha}$$

$$\alpha = \omega_L \tau_c$$
$$= 2 B_0 \tau_c$$

$$\frac{\epsilon}{B_0} = \theta$$

$$G = \frac{(1-\rho^2)|\beta_\infty|^2\, 4}{\theta^2 \alpha^2}$$

$$\epsilon\tau_c = \theta \frac{\cancel{B_0}\,\alpha}{2\cancel{B_0}}$$

$\epsilon = 10^{-23}$ eV $\rightarrow 2 \times 10^{-9}$ Hz $\rightarrow \tau_{n-n} \rightarrow 5 \times 10^{8}$ sec

1 eV $= 2 \times 10^{14}$ Hz

$\epsilon^2 \tau T \rightarrow (4 \times 10^{-18})(3 \times 10^{7})\, 10^{-1}$

$v = 400$ m/sec $\quad L = 50$ m $\quad \rightarrow (10^{-11})$ $\quad 10^{9} \times 10^{2}$

$\tau = (.125)$

UCN $- \tau \sim .200$ $\qquad \dfrac{3 \times 10^{7}}{300} = 10^{5}$

10^{11} UCN/year $\rightarrow$ 10^{6} UCN/cycle

$G = 7$

$R = .3$ m

$\frac{4}{3}\pi\, (30)^3$

$3 \times 10^{4} \sim 10^{5}$ cc $\qquad (10^{4}$ UCN/cm$^{3})$