

$$1) \text{ ENC (in electrons)} = \frac{1 \phi \text{ mV} \times 10^3 \frac{\text{V}}{\text{mV}} * 1 \phi^9 \frac{\text{eV}}{6 \text{ eV}} \left( \frac{1}{3.62 \frac{\text{eV}}{\text{IP}}} \right)}{1. \phi \phi \text{ V} / 6 \text{ eV}} = 2.76 \times 1 \phi^5 \text{ IP (electrons)}$$

$$2) \frac{dE}{dX} \text{ of } ^{66}\text{Fe} @ 3.66 \text{ Tm from LISETT} = 482.6 \text{ MeV} \quad (\beta = 0.4212, v = 12.627 \text{ cm/ms})$$

$$\text{Preamp } \frac{\text{Signal}}{\text{Noise}} = \frac{482.6 \text{ MeV}}{\frac{1. \phi \text{ mV} \times 10^3}{1. \phi \text{ V} / 6 \text{ eV}}} = \frac{482.6 \text{ MeV}}{1 \text{ MeV}} = 482.6$$

$$3) \text{ cable } 5 \phi \text{ ms long} \rightarrow l = 5 \phi \text{ ms} \times 10^9 \text{ m/s} \times \left( 0.659 \times 3 \times 10^8 \text{ m/s} \right)$$

[see Table 16.1]

$$l = 9.88 \text{ m}$$

attenuation in cable ...

|                |                               |              |               |                      |
|----------------|-------------------------------|--------------|---------------|----------------------|
| @ 1 $\phi$ MHz | $\tau \sim 1 \phi \text{ ns}$ | dB/m = 0.135 | .. dB = 1.334 | $v_o/v_{in} = 0.858$ |
| @ 4 $\phi$ MHz | $\tau \sim 2.5 \text{ ns}$    | dB/m = 0.312 | .. dB = 3.084 | $v_o/v_{in} = 0.701$ |

$$v_{out}/v_{in} = 10^{-dB/20}$$

average attenuation  $\approx 0.78$   
in cable

into TFA

$$\frac{\text{Signal}}{\text{noise}} = \frac{482.6 \times \frac{1}{2} \times 0.78 \text{ MeV}}{1 \text{ MeV}} = 188.2$$

(splitter is bad!)

$$4) \sigma_{\text{TDF}}^2 = \sigma_{\text{START}}^2 + \sigma_{\text{STOP}}^2 \quad ; \quad \sigma_{\text{START}} = 0.25 \text{ ns [given]}$$

$$\text{CFD} \rightarrow \sigma_{\text{STOP}}^2 = \text{rise time} / \text{S/N} = 1 \phi \text{ ns} / 188.2 = 0.531$$

4-continue)

$$\sigma_{TOF}^2 = (\phi.25)^2 + (\phi.531)^2$$

2 of 2

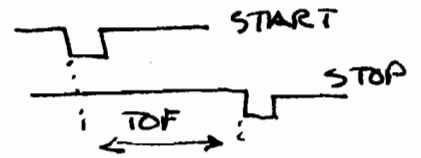
$$\sigma_{TOF} = \phi.59 \text{ ns}$$

$$5) \text{ Resolution} = \frac{\text{FWHM in } t}{\text{total } t} = \frac{2.354 \times \phi.59 \text{ ns}}{2\phi.97 \text{ m} / \phi.12627 \text{ m/ns}}$$
$$R = 8.4 \times 10^{-3}$$

( $R \approx 1/12\phi$ )

↑ from rise  $t$   
for  $^{66}\text{Fe}$

$$6) \text{ TOF} = \frac{2\phi.97 \text{ m}}{\phi.12627 \text{ m/ns}} = 166.1 \text{ ns}$$



middle of scale =  $5\phi \text{ ns}$ , need to delay start  
by  $166.1 - 5\phi = 116.1 \text{ ns}$

$$7) \text{ FWHM in channels} = 2.354 \times \phi.59 \text{ ns} \times \frac{2\phi 48 \text{ chan}}{1\phi\phi \text{ ns}}$$
$$= 28.4 \text{ "channels"}$$
$$\underline{\underline{\approx 28}}$$