Compton Optics for NLC
+ Pair Spectrometer for Gammas

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Laser

- Frequency doubled Nd:YAG laser
- 17 hz (fire on every 7th pulse train—every 10sec fire on 6th)
- Laser pulse energy 100 mJ
- Q-switched laser pulse is ~ 6 nsec
- Laser spot size at Compton IP 0.2 mm rms
- Rate is ~500 e/cm at Compton edge E(e^-)=25.1 GeV;
  (8mm/GeV at Compton edge)

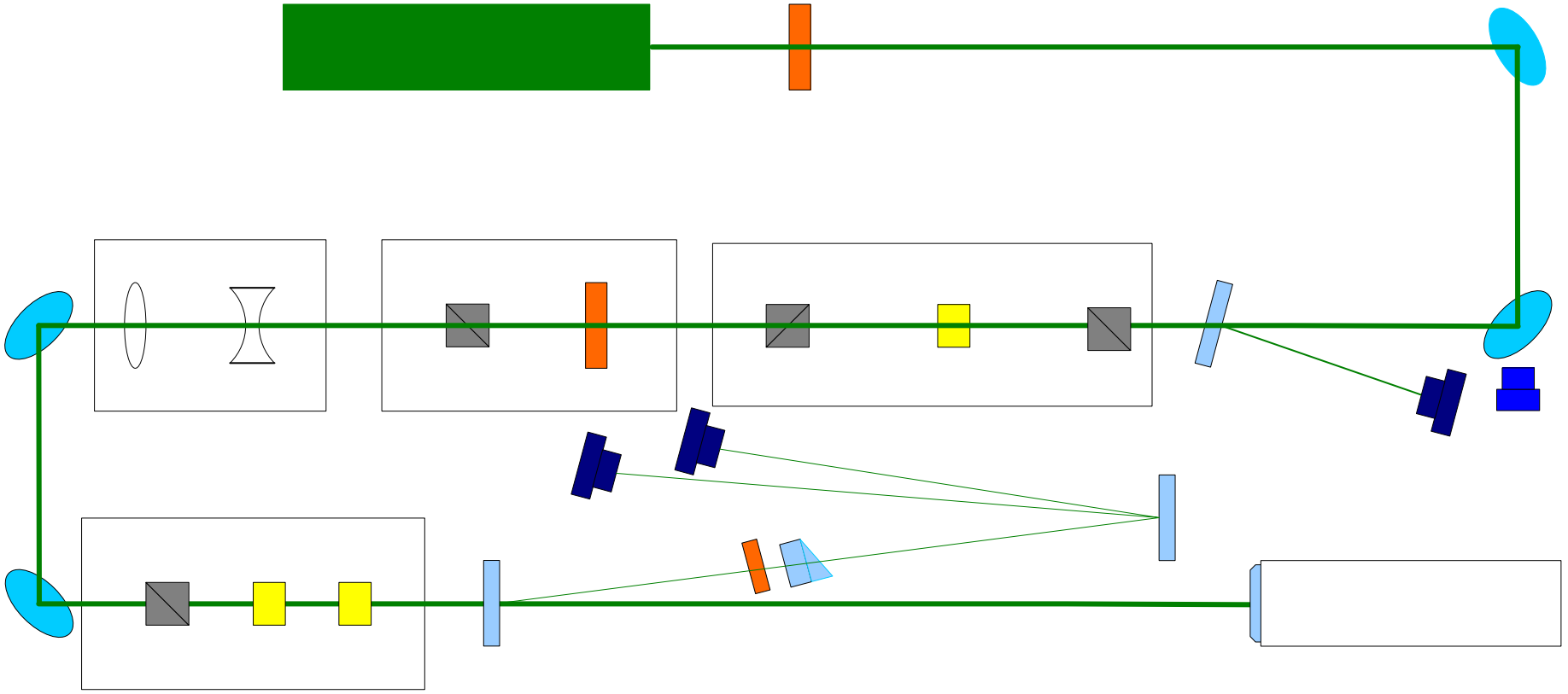
Fraction of laser pulse colliding with electron beam

#electron bunches hit

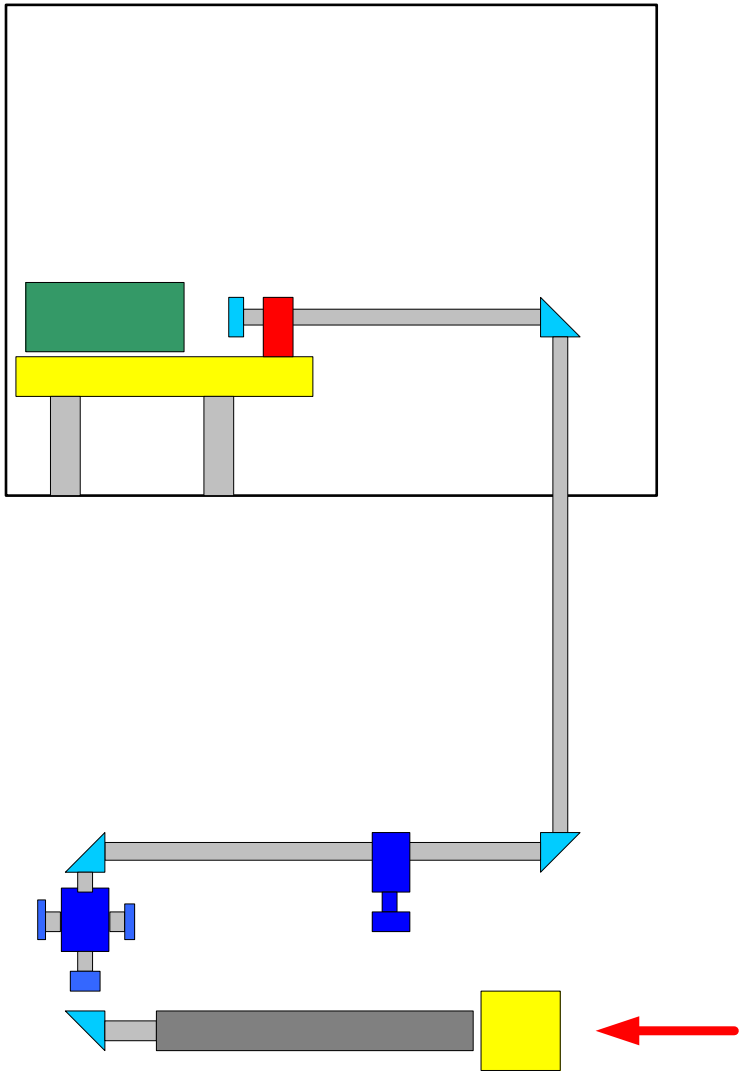
$$R = \sigma_C \cdot \frac{N_e N_\gamma}{\pi \sigma_x \sigma_y} \cdot \left[\frac{2.35\sigma_x}{\tan\theta_C} \right] \cdot \left[\frac{6ns}{1.4ns} \right]$$

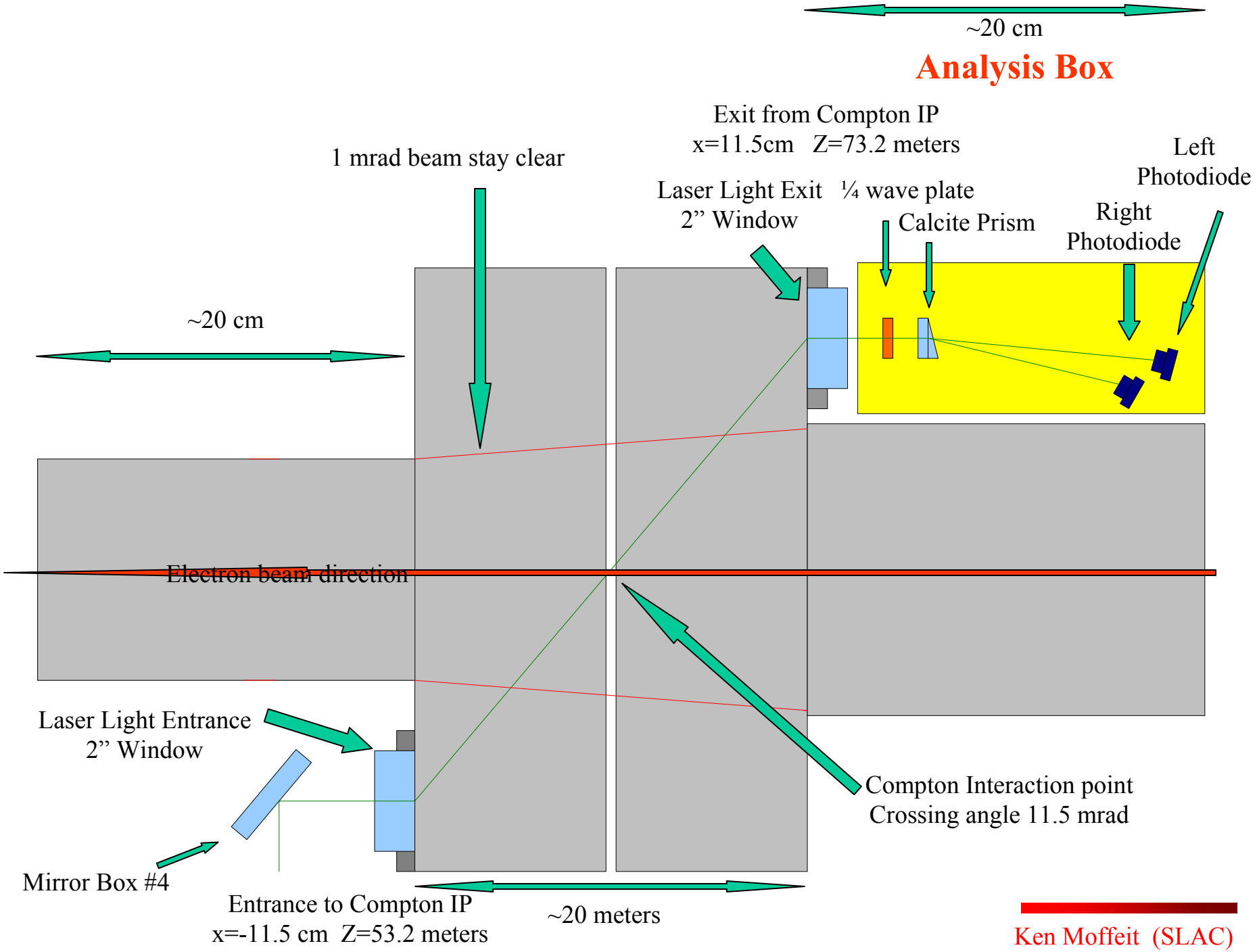
$$R \approx 500\, cm^{-1} \cdot \left(\frac{200\mu m}{\sigma_y} \right) \cdot \left(\frac{0.01rad}{\theta_C} \right) \cdot \left(\frac{E_{laser}(mJ)}{100mJ} \right)$$

Compton Laser Bench

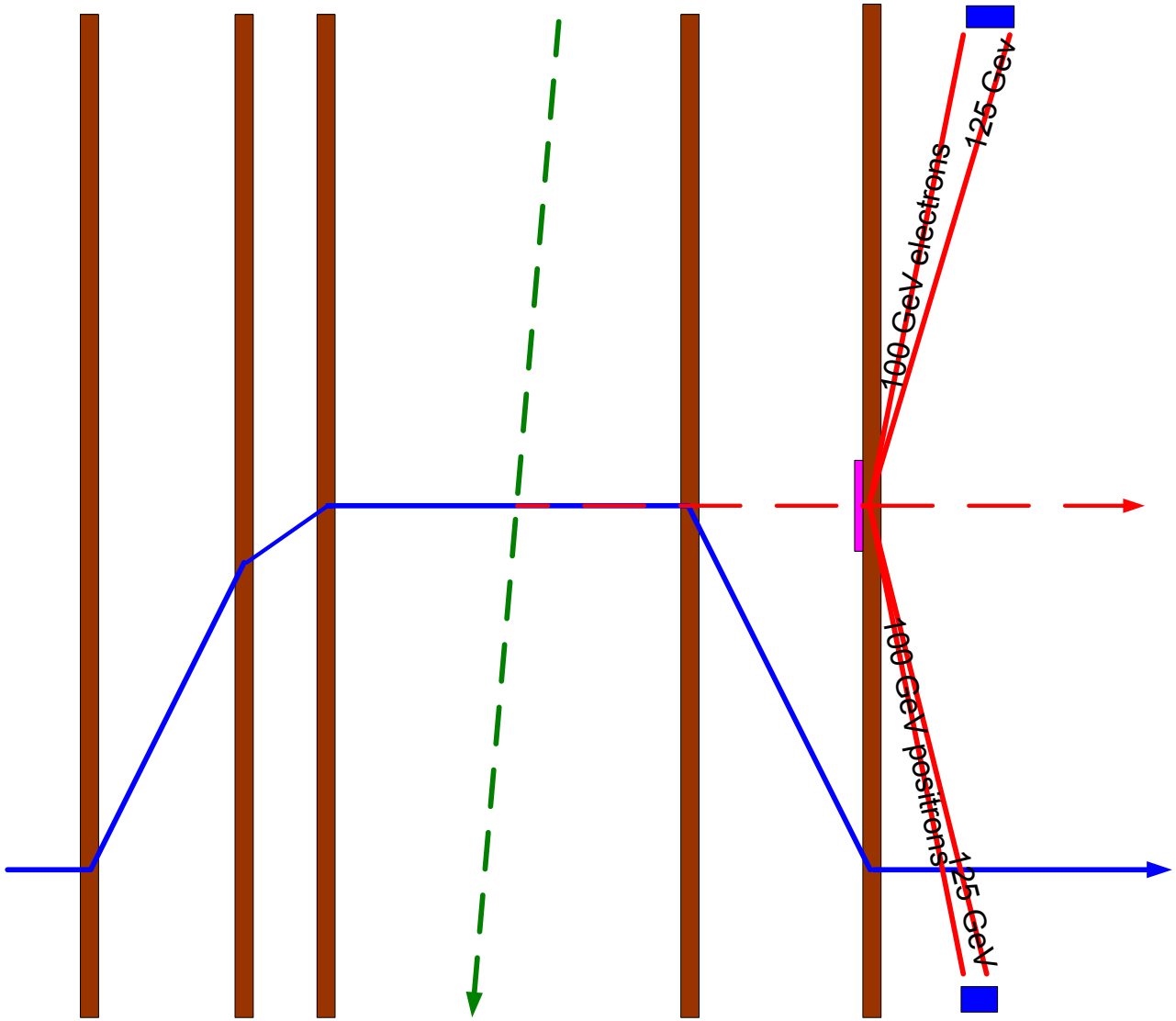


Compton Laser Transport System

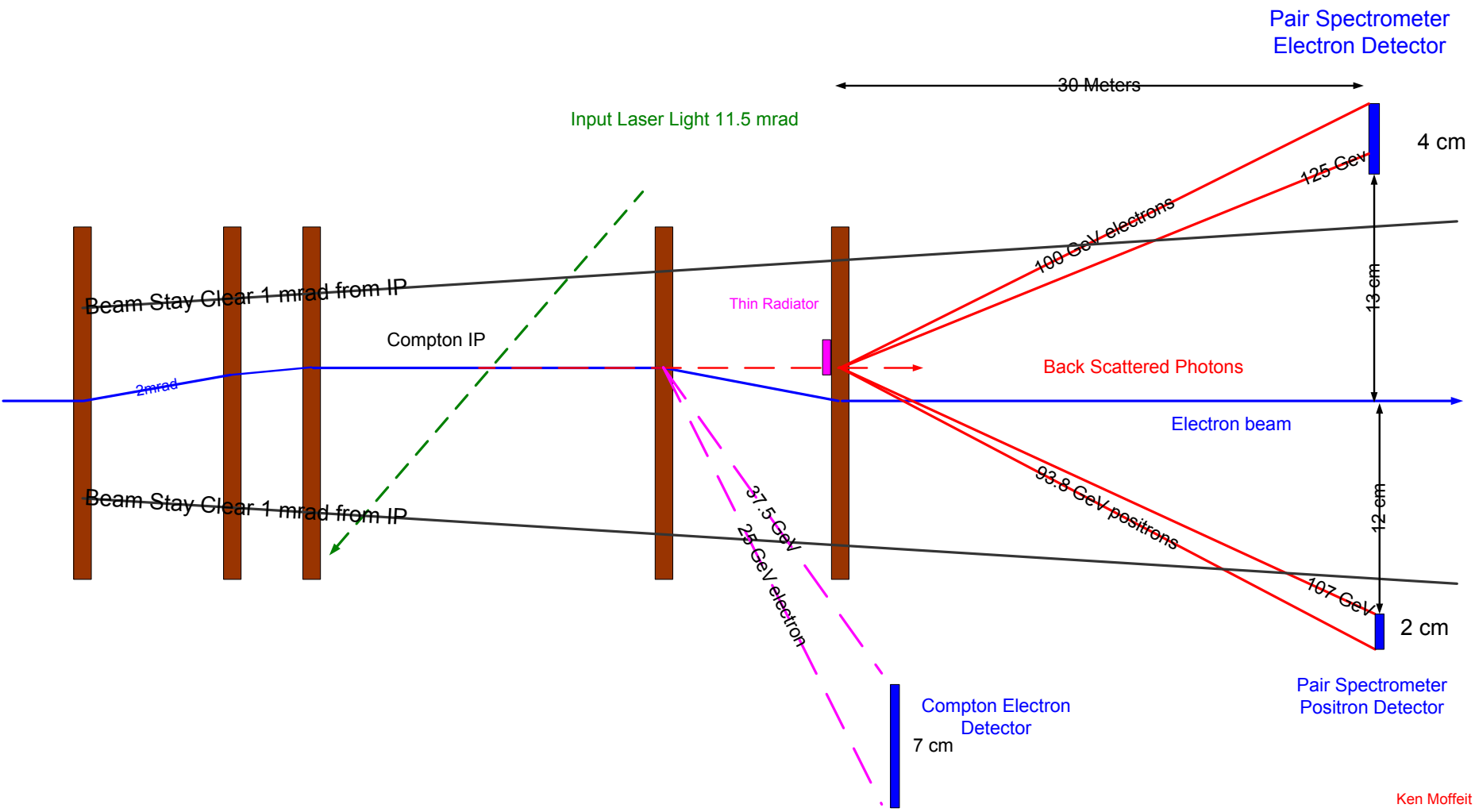



~20 cm
Analysis Box
Exit from Compton IP
x=11.5cm Z=73.2 meters
1 mrad beam stay clear
Laser Light Exit
2" Window
¼ wave plate
Calcite Prism
Left
Photodiode
Right
Photodiode
~20 cm
Electron beam direction
Laser Light Entrance
2" Window
Compton Interaction point
Crossing angle 11.5 mrad
Mirror Box #4
Entrance to Compton IP
x=-11.5 cm Z=53.2 meters
~20 meters

Chicane



Compton e- and gamma detector



Pair Spectrometer

- Backscattered Gamma endpoint is ~225 GeV Analyzing power ~98%
- Large analyzing power >40% for Gammas with E >212 GeV
- Pair Spectrometer

Electron arm ~100GeV to 130 GeV

Positron arm ~94 GeV to 110 Gev

Measure momentum well and rough energy of e+ and e-

Require Coincidence

Fast electronics ~1 nsec to only see one bunch of train

Use thin radiator to get desired rate

Measurement averaged over minutes