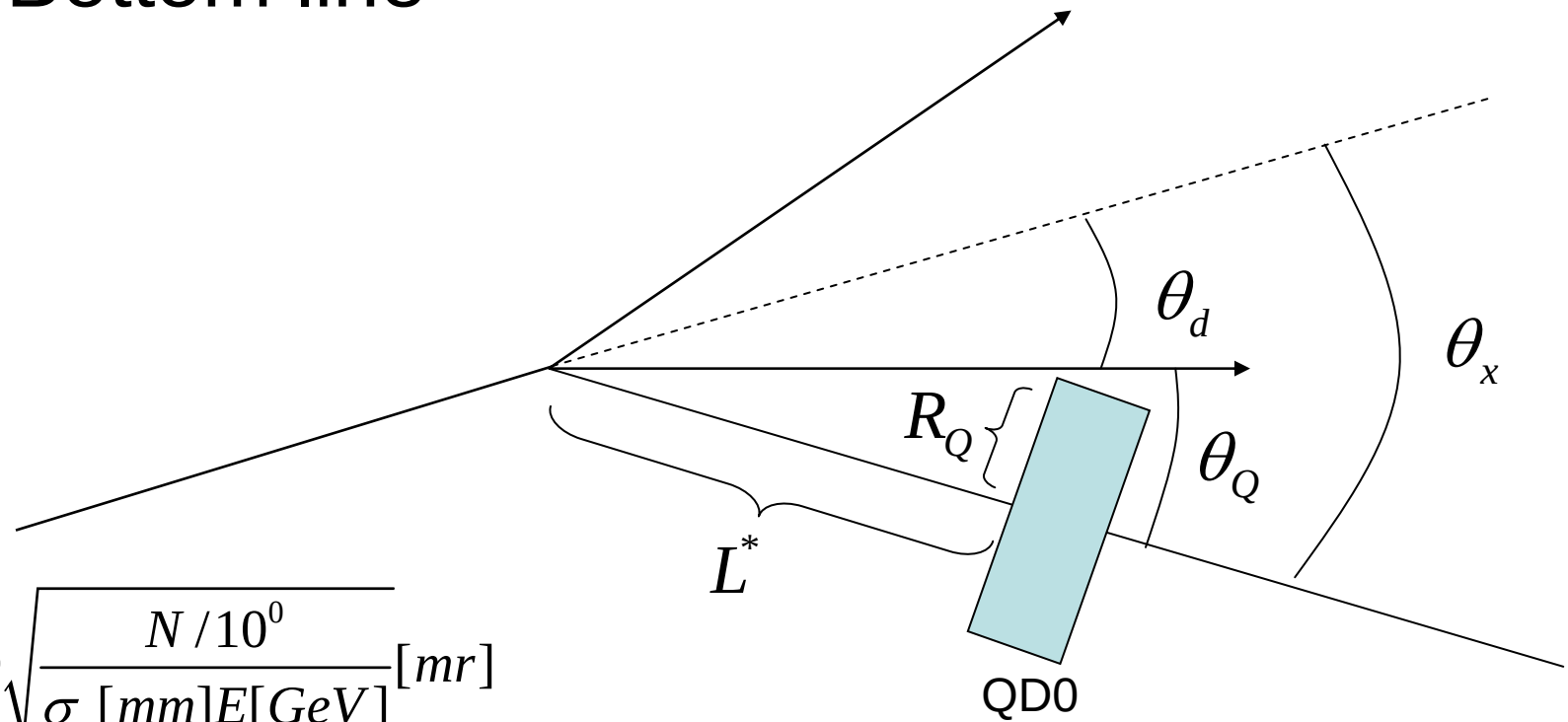
Crossing angle consideration for $\gamma\gamma$

- Bottom line



$$\theta_d \approx 9\sqrt{\frac{N/10^0}{\sigma_z[mm]E[GeV]}}[mr]$$

$$\theta_Q = \frac{R_Q}{L^*}$$

$$\theta_x = \theta_d + \theta_Q$$

How to reduce crossing angle

- Disruption angle

$$\theta_d \approx 9\sqrt{\frac{N/10^0}{\sigma_z[mm]E[GeV]}} \approx 10mr \qquad \text{for} \quad \begin{cases} N = 2\times10^{10} \\ \sigma_z = 0.3mm \\ E_{\min} = 5GeV \end{cases}$$

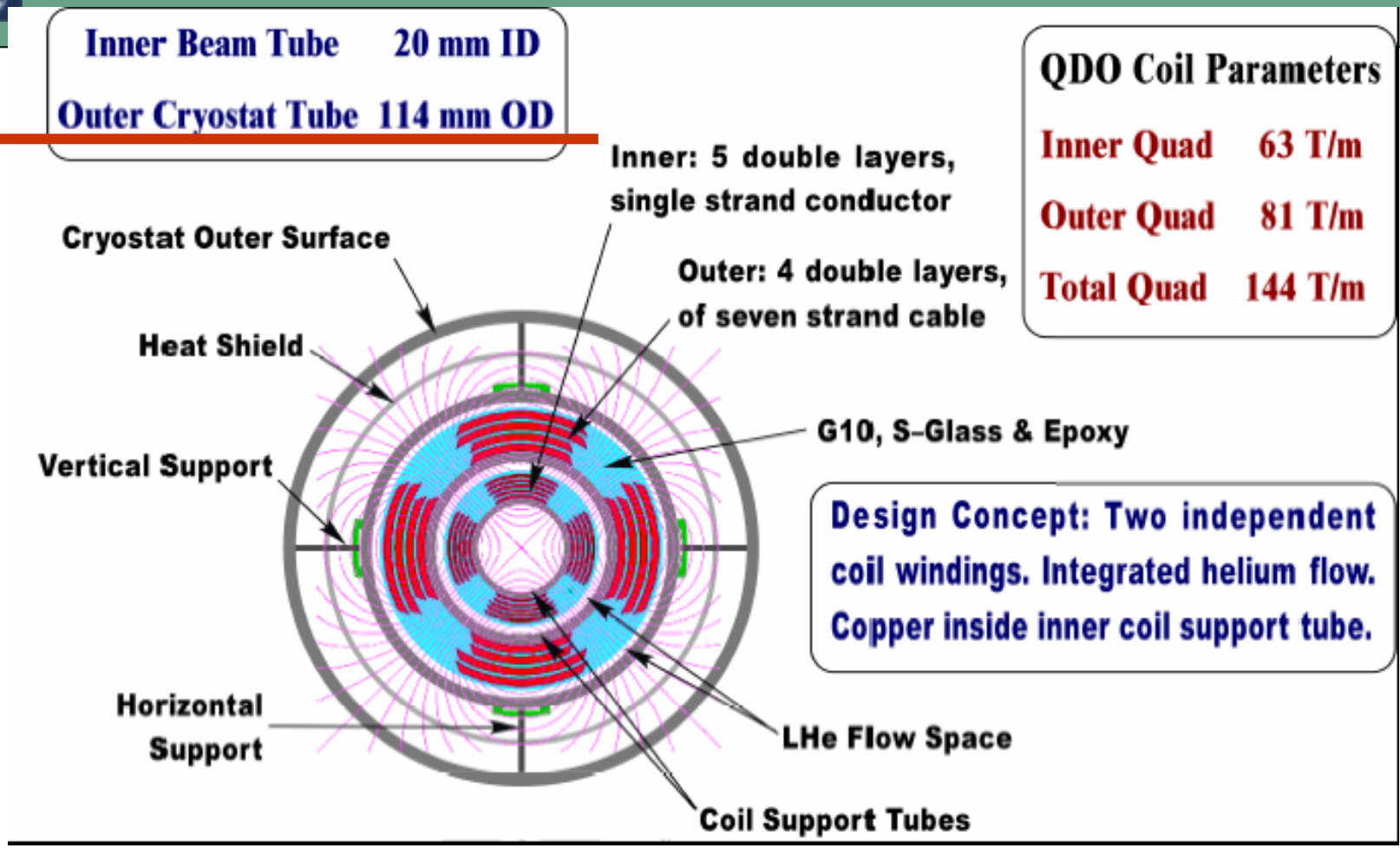
$E_{\min}$: physics of Compton scattering

N :controllable but reduce luminosity significantly

$$\frac{1}{2}\theta_d \Rightarrow \frac{1}{4}N \Rightarrow \frac{1}{16}L$$ not acceptable

reduce R/L*

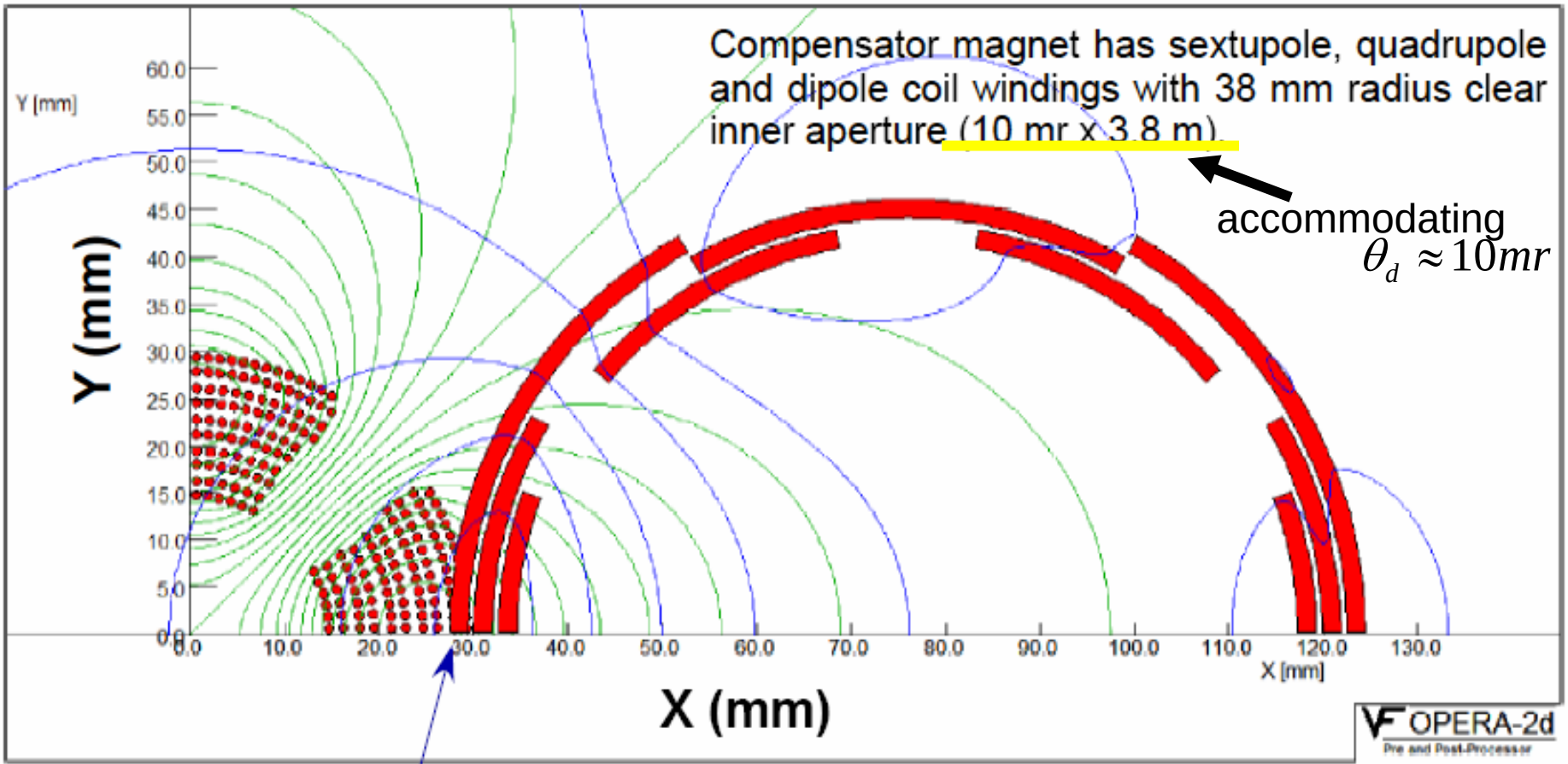
Compact SC Quad



$$\frac{R}{L^*} = 11.4mr$$ at L*=5m

QD0 Quadrupole Coil Overlaid with Compensation Coils

Brett Parker



Found that dipole coil can be made half as thick as shown.

Zero Field Point is at X = 76 mm (i.e. 3.8 m x 20 mr)

L*=3.8m, $\theta_x \approx 20mr$

What these effort means?

- $\gamma\gamma$ w/ 22mr crossing angle may be possible

If the beam parameters (beta-x/y at the IP) are the same as e+e-

Price to pay: $L_{\gamma\gamma} \approx 0.1 L_{e+e-}$

minor change of beta-x could help

remember: photon collider wants/allows highest possible geometric luminosity as beamstrahlung is not problem.

What has to be done (for productive discussions)

- 22mr case
  - make sure it is really possible accommodate $\gamma\gamma$ w/ e+e- parameters
  - try to find FF optics to maximize the geometric luminosity with the same L*
- 25~30mr
  - provide realistic FF design
    - both for $\gamma\gamma$ and e+e-