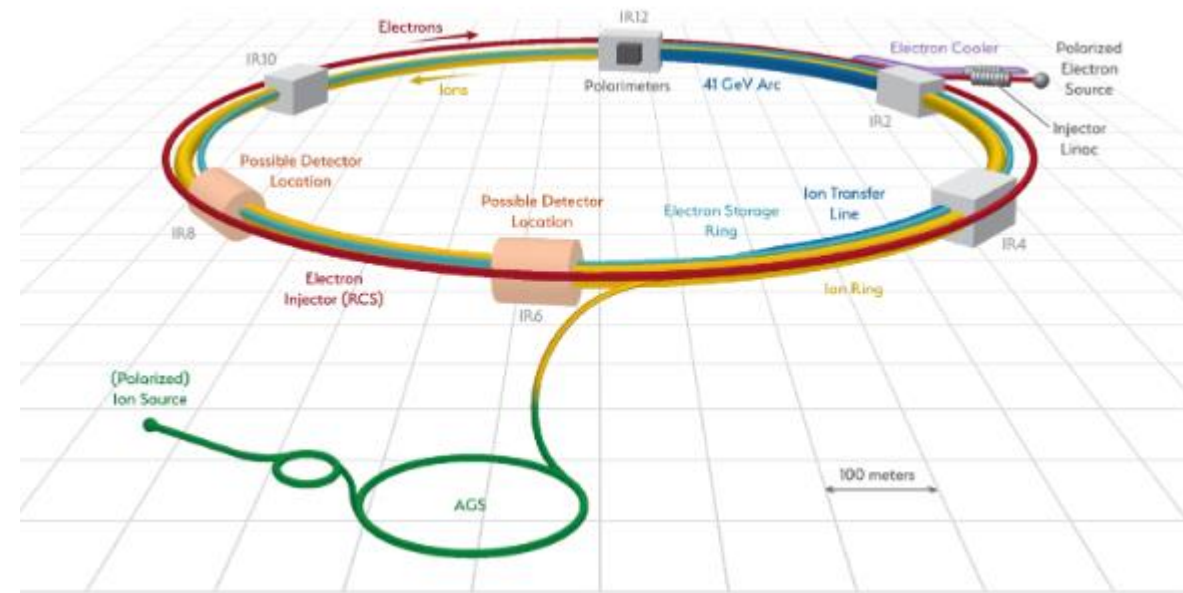


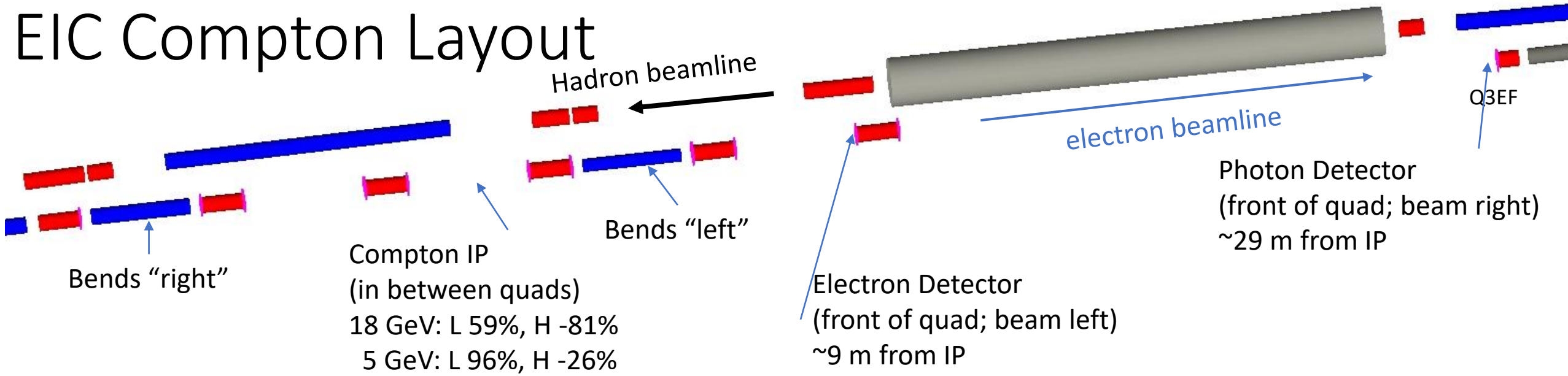
Expected background sources, synchrotron radiation issues at EIC



Ciprian Gal

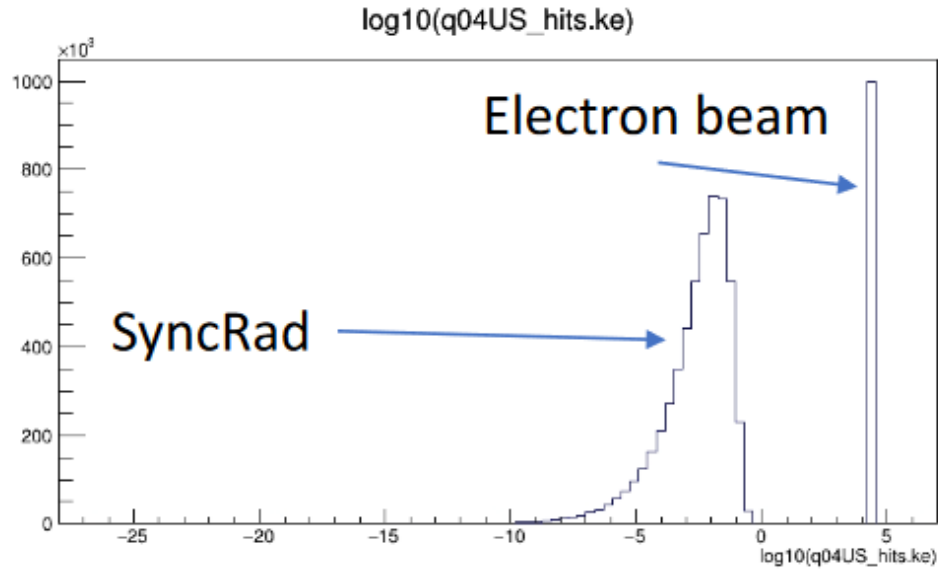


EIC Compton Layout

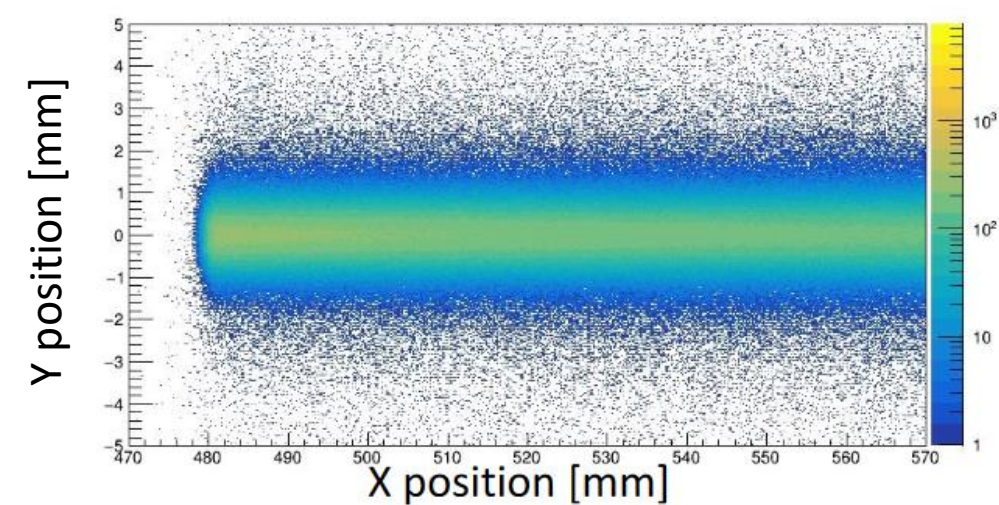
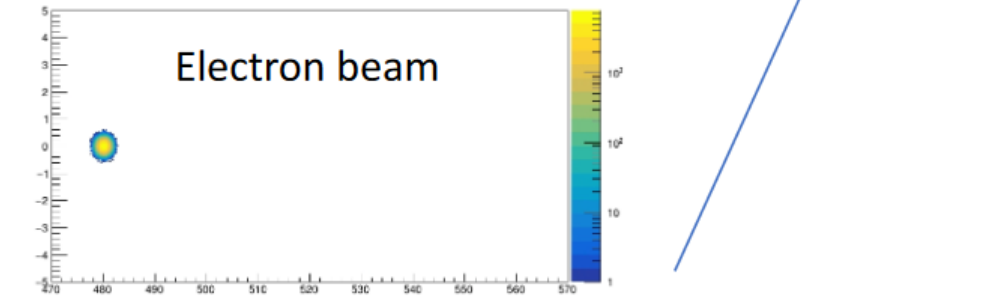
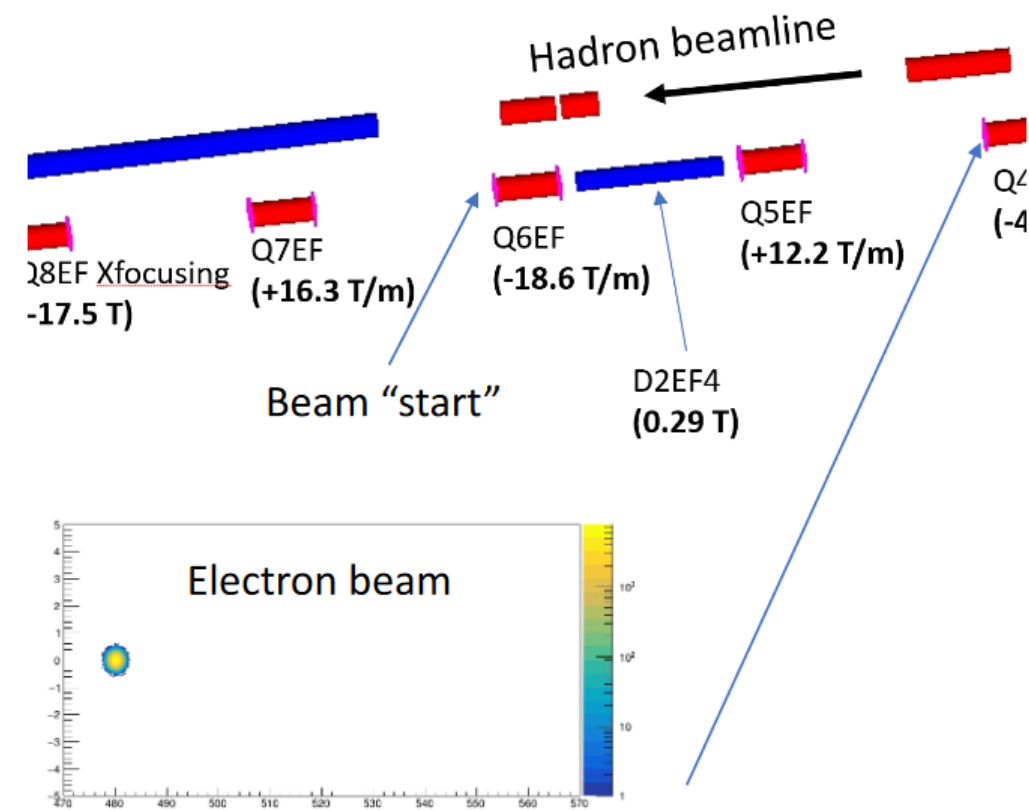


- The biggest concern in terms of backgrounds is the synchrotron light produced by the two dipoles before and after the Compton IP
- The first dipole will "spray" beam left potentially reaching the electron detector
- The second dipole will "spray" beam right reaching the photon detector

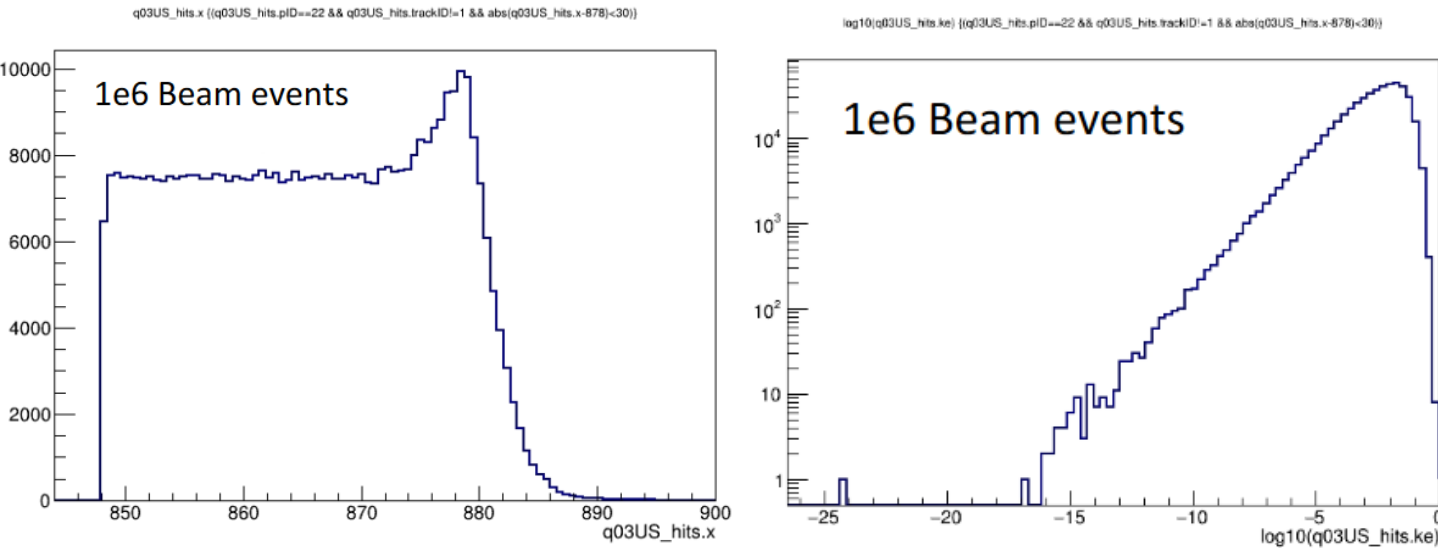
Compton dipole SyncRad



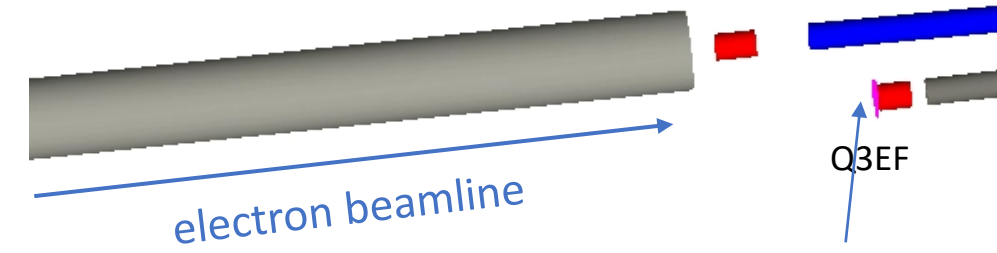
- We are still going through initial studies of synchrotron radiation
 - Fairly straight forward to implement in G4 and use with our main simulation framework
- As expected these photons will have a very small impact on the electron detector but will travel towards the photon detector
- The study for the dipole before the Compton IP is ongoing



Compton dipole SyncRad

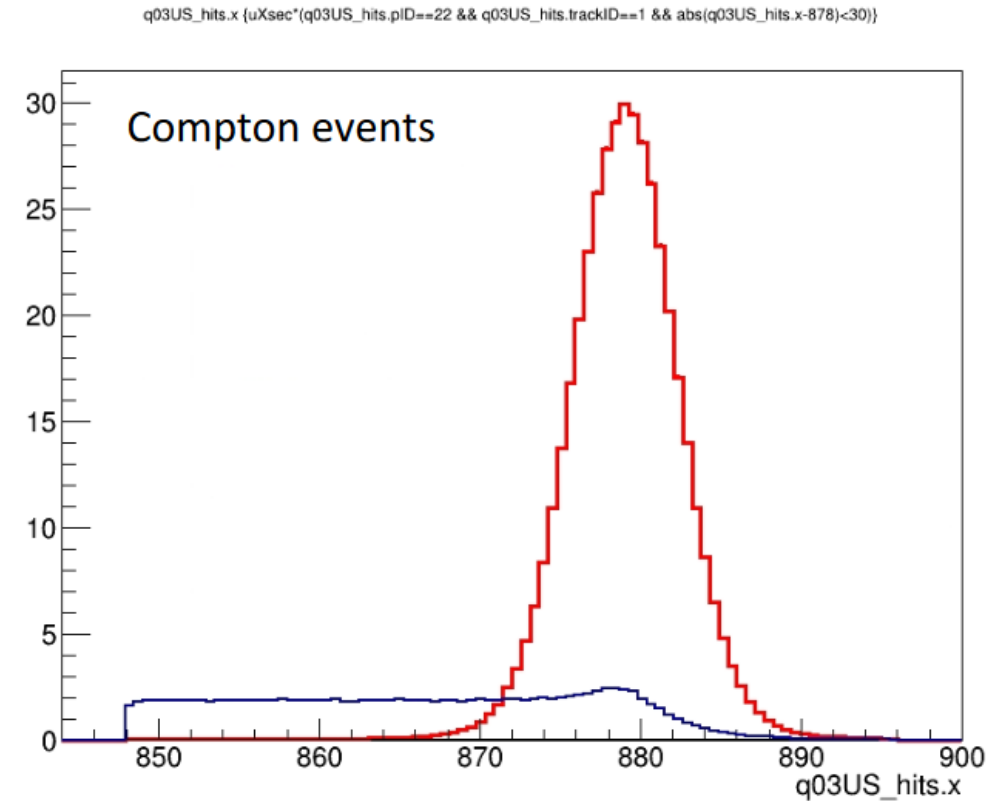


- The SR from the Compton scattered electrons is going to be a negligible fraction of the overall SR background at the photon detector location



electron beamline

Photon Detector
(front of quad; beam right)
~29 m from IP



SR Analytical calculations (M Sullivan)

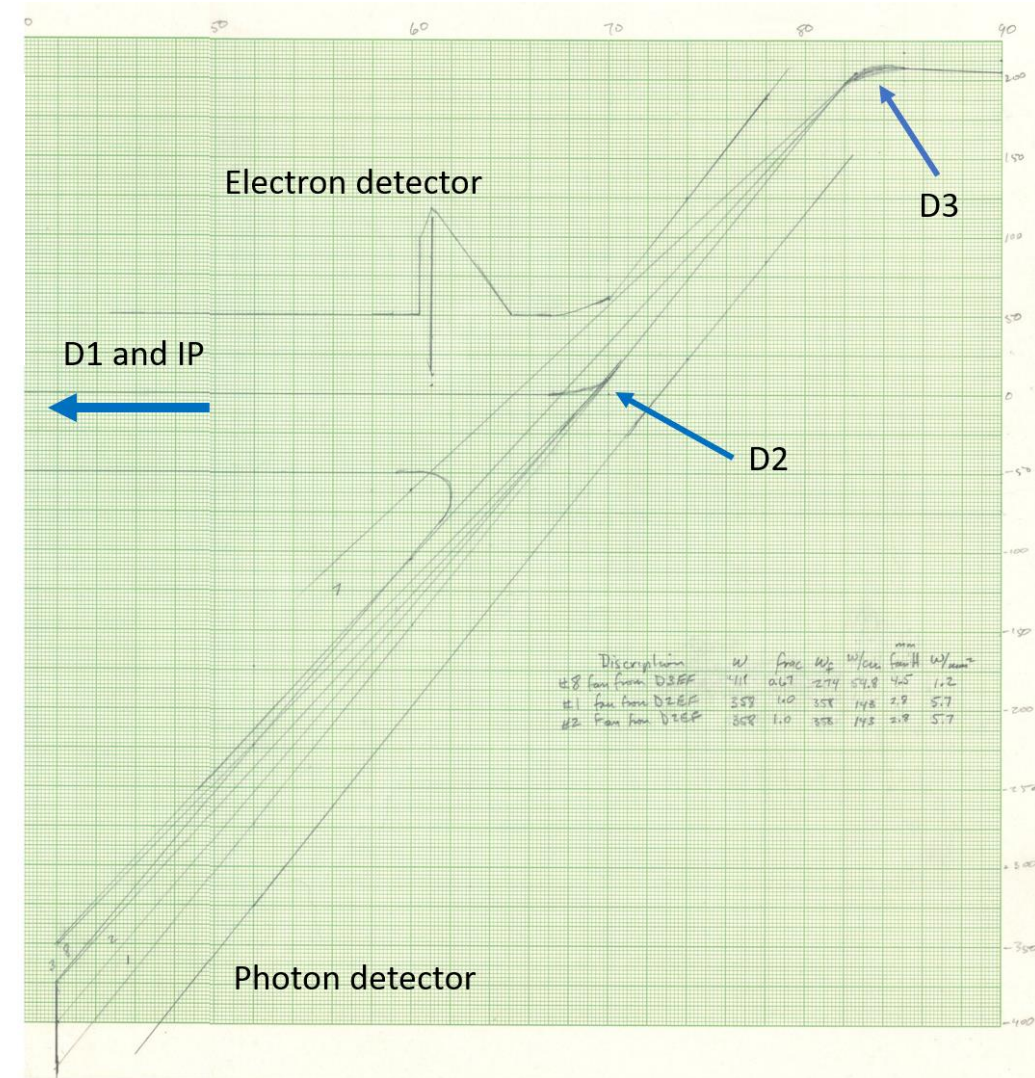
- Estimate of the bend radiation power

- 5 cm of photon detector window

| | W | fan ht (mm) | W/mm ² | Kc (keV) | E/bun (keV) | #γ/bun | #γ>20 keV |
|---------|-----|-------------|-------------------|----------|-------------|--------|-----------|
| From D3 | 274 | 4.5 | 1.2 | 67 | 1.7e11 | 1.7e10 | 5.1e9 |
| From D2 | 716 | 2.8 | 5.7 | 63 | 4.5e11 | 2.3e10 | 6.1e9 |

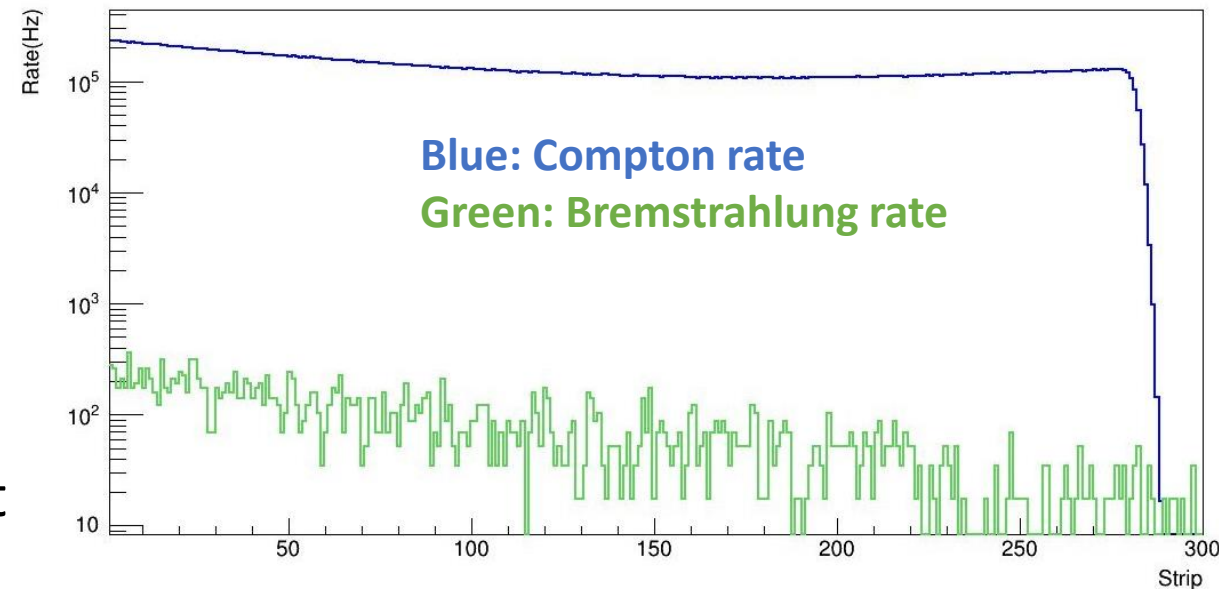
- Using an analytical approach Mike Sullivan (JLab) performed a preliminary calculation of the power deposition in a potential photon detector window/pre-radiator and we believe we can engineer the component to withstand the heat load

- Note that this takes into account the entire produced SR so it should be an upper limit



Other backgrounds to consider

- Bremsstrahlung and other beam related backgrounds
 - Will have a good handle on them by making measurements with laser off (as long as the asymmetry is not too large)
 - Having the ability to measure a coincidence event between the electron and photon detector will significantly reduce overall backgrounds
 - Initial studies for the JLEIC design suggested the Brem background rates would be very small (more studies will be needed in the future)
- Beam related false asymmetries should not be an issue
 - Having the Pockels Cell inside the laser setup will give us the chance to flip the laser polarization
 - Monitoring of beam properties close to the Compton IP will still be very important



Backup