Photon Flux/Charge Studies

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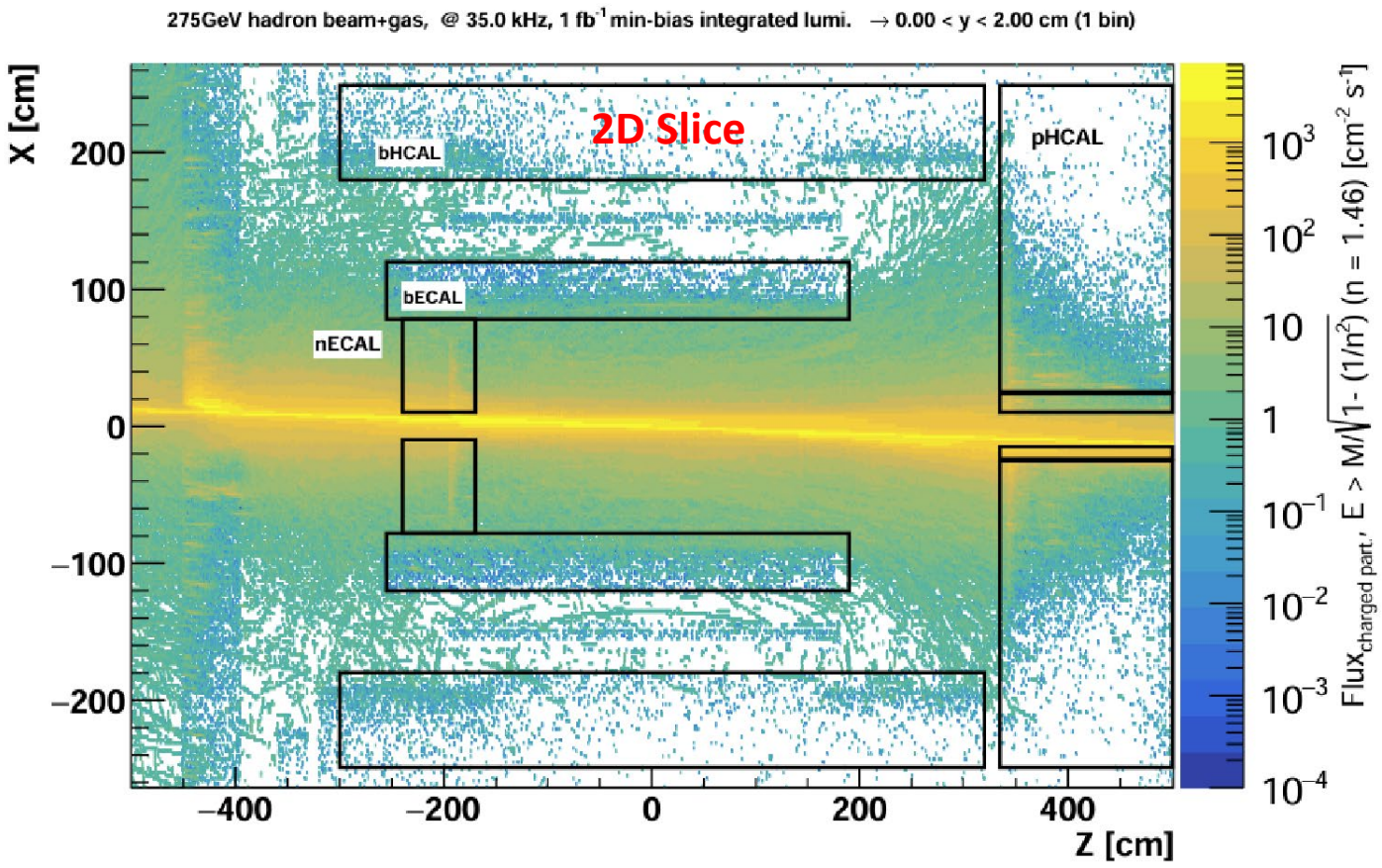
First Radiation Simulations

- Radiation simulations run by Alexander Jentsch, similar to those present on Radiation Doses - Electron-Proton/Ion Collider Experiment (bnl.gov) but with pfRICH specific considerations
- 3D map of Flux of all charged particles that pass Cherenkov cut

$$E > \frac{M}{\sqrt{1-\left(\frac{1}{n}\right)^2}}$$

- Separate histograms for n of aerogel and HRPPD window as well as particles produced via beam-gas interactions and DIS.



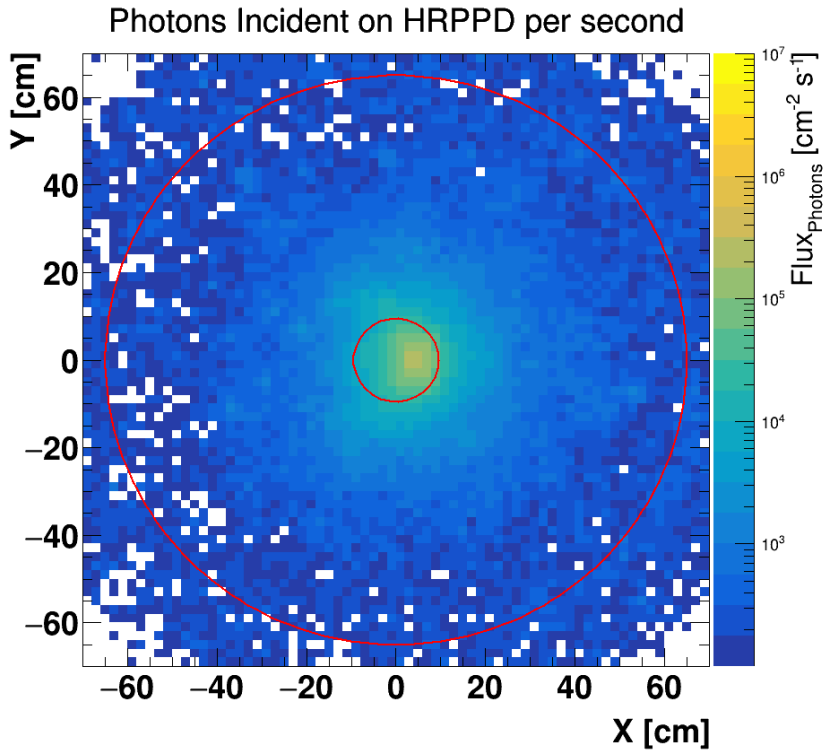
August Update

- New studies, run through pfrich geometry in npsim
- Pfrich geometry in irt-2.0 branch of eic software provided by Alexander Kiselev https://github.com/eic/EICrecon/tree/irt-2.0/sandbox
- Generated DIS hepmc files with 10GeV electron beam and 275GeV proton beam, and a maximum Q^2 of 1 GeV
- Utilizing electron beam-gas files from the wiki https://wiki.bnl.gov/EPIC/index.php?title=Electron_Beam_Gas
- **Mistakenly scaled proton-gas and electron-gas interactions by beam-beam luminosity**
  - Luminosity of 1 x $10^{34} cm^{-2} s^{-1}$

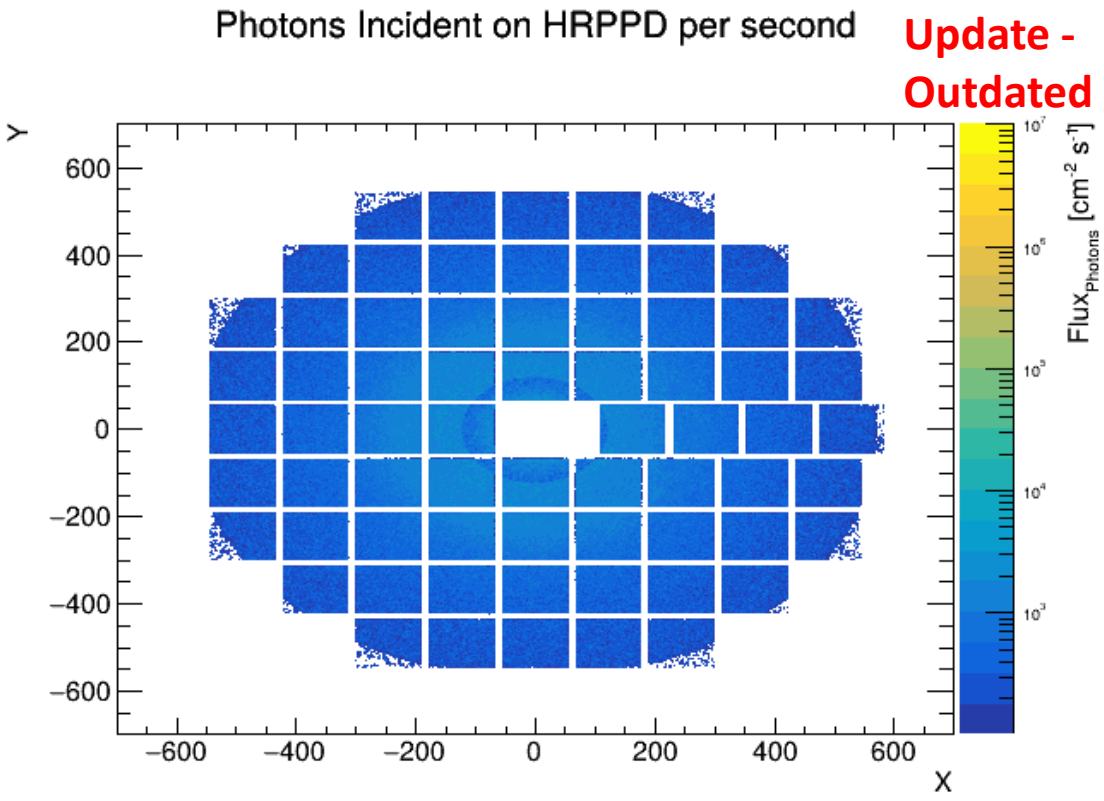
Flux Studies - DIS

- Running using only pfRICH geometry reproduces order of magnitude of previous results

Previous



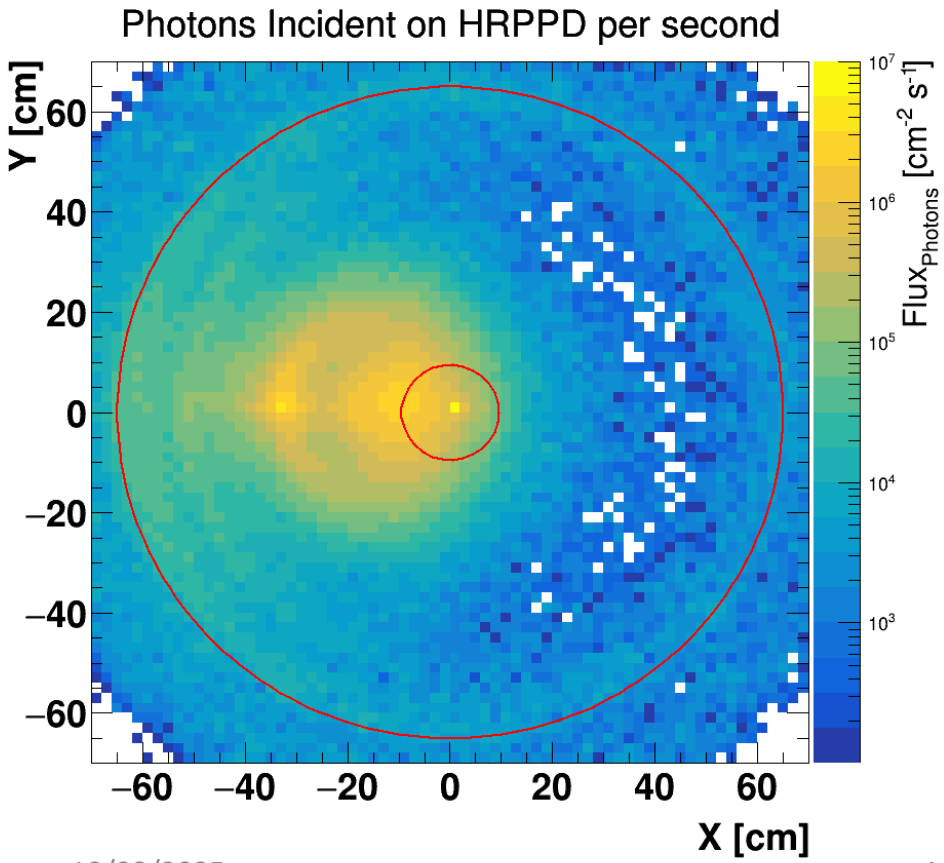
August Update - Outdated



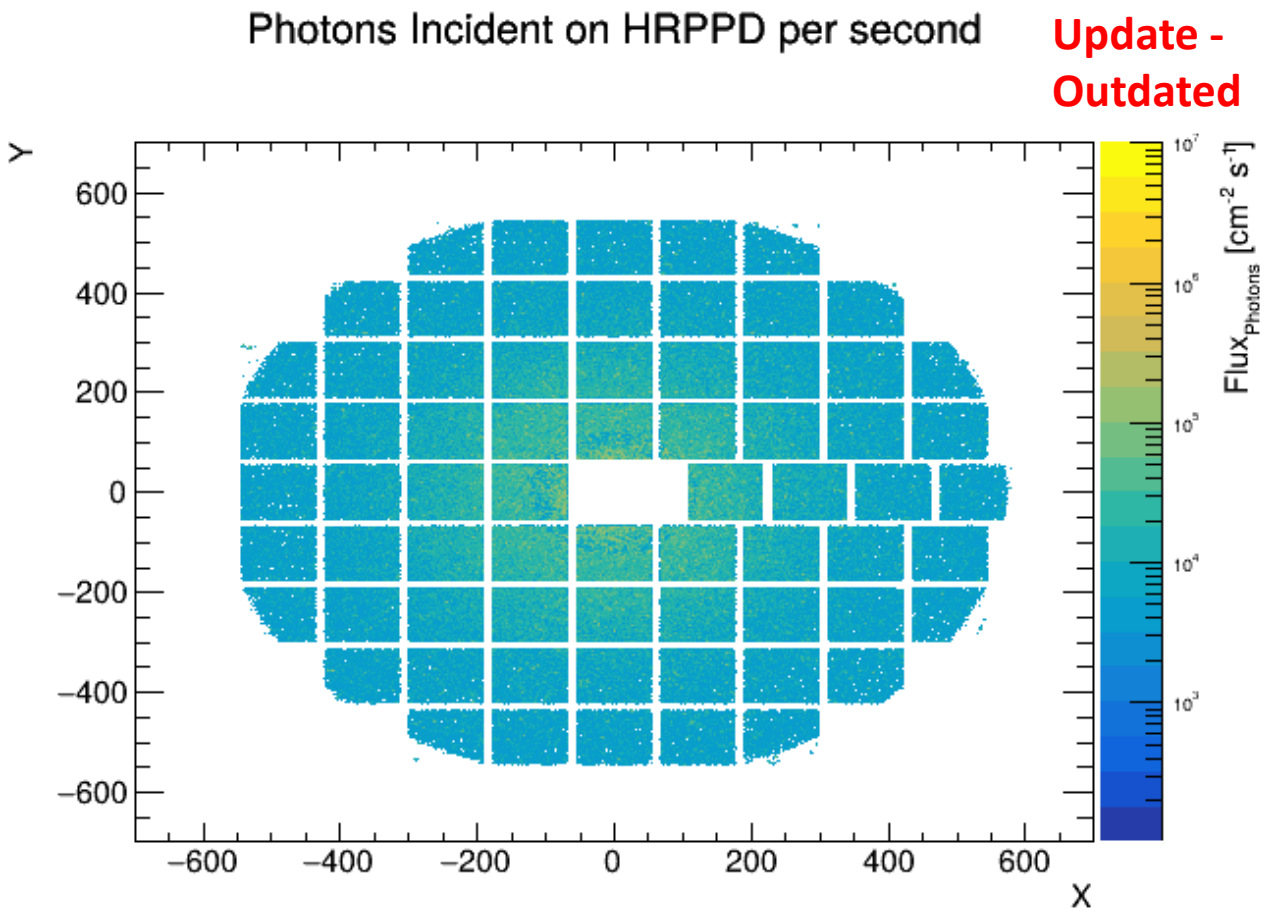
Flux Studies – Electron Beam Gas

As only pfRICH geometry, no contribution yet from electrons deflected by B0 magnet

Previous



August Update - Outdated

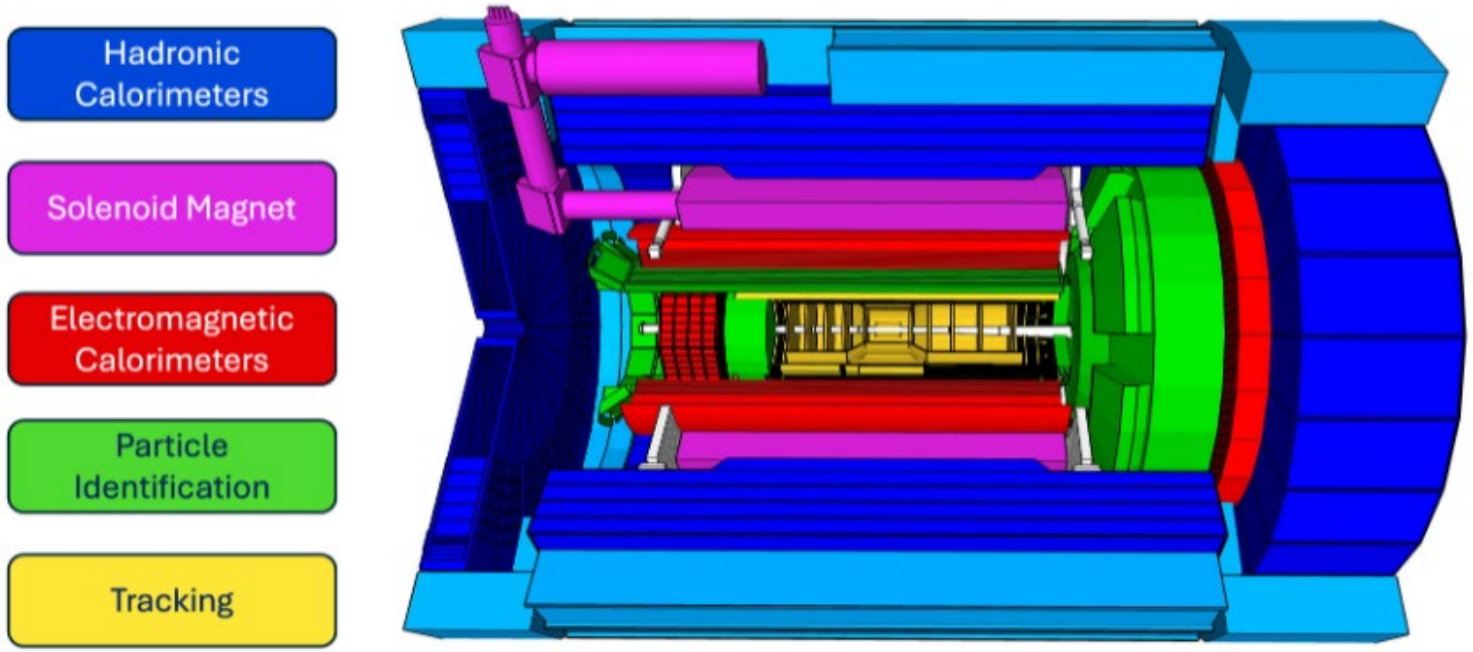


https://wiki.bnl.gov/EPIC/index.php?title=Electron_Beam_Gas

https://wiki.bnl.gov/EPIC/index.php?title=Hadron_Beam_Gas

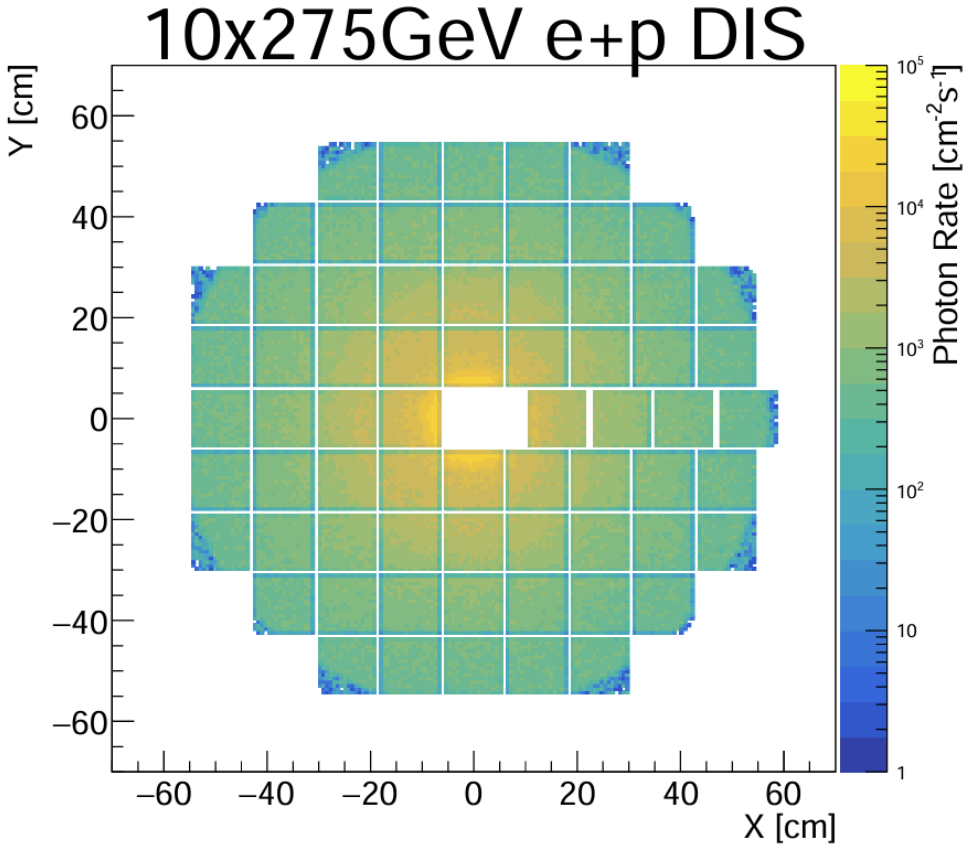
New Update

- Using irt-2.1b branch of EICrecon
- Have included pfrich+tracking geometry
- Scaled beam-gas interactions by their respective event rates given on wiki
  - Electron: 3.177 MHz
  - Proton: 22.5 kHz



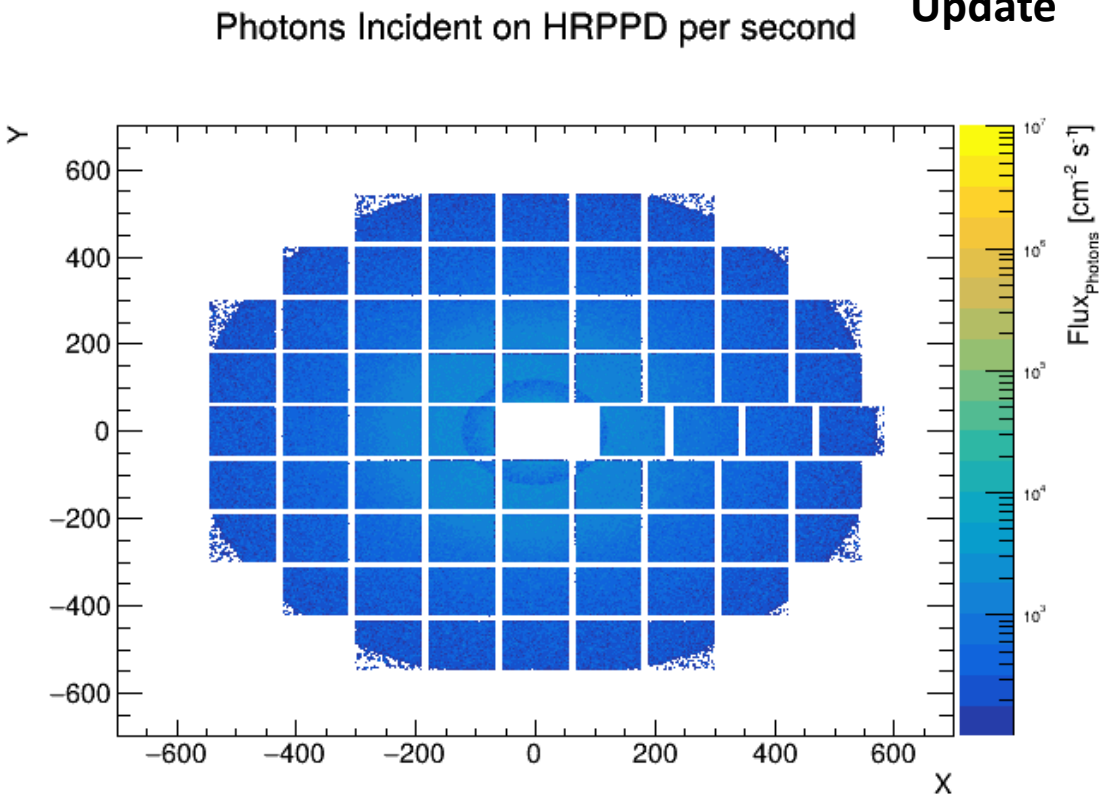
Flux Studies - DIS

- Determined from average of 15,000 events



$\sim 10^4 - 10^5$

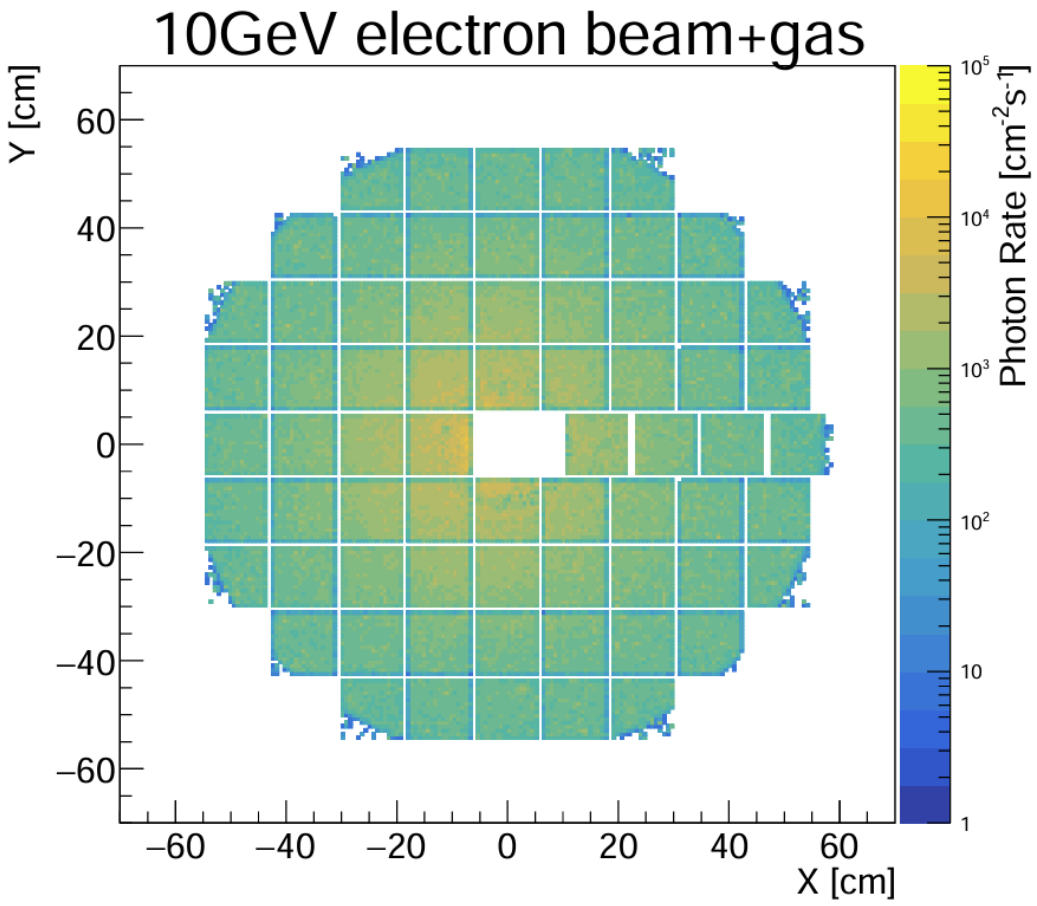
August Update



$\sim 10^3 - 10^4$

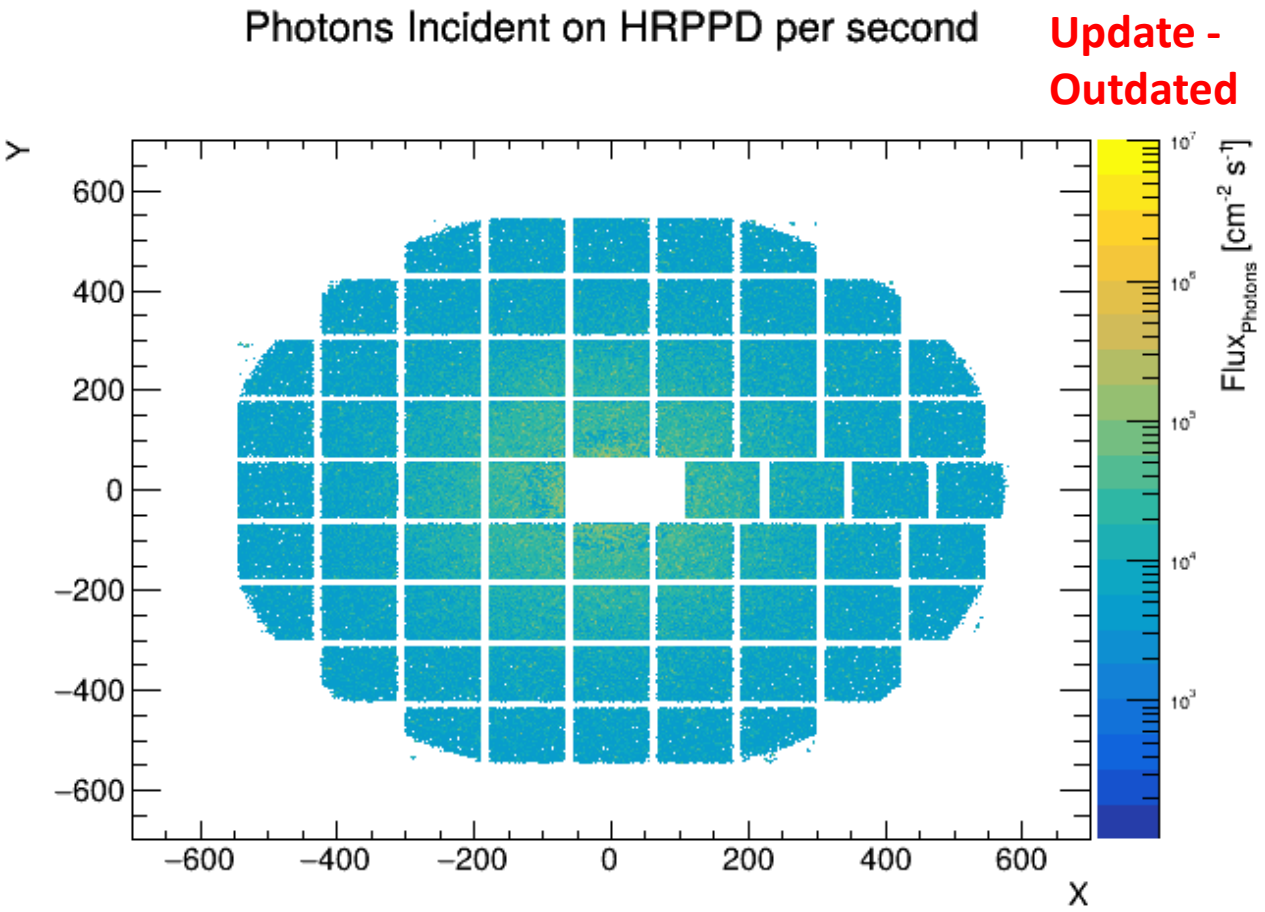
Flux Studies – Electron Beam Gas

Determined from average of 1,000,000 events



$\sim 10^4 - 10^5$

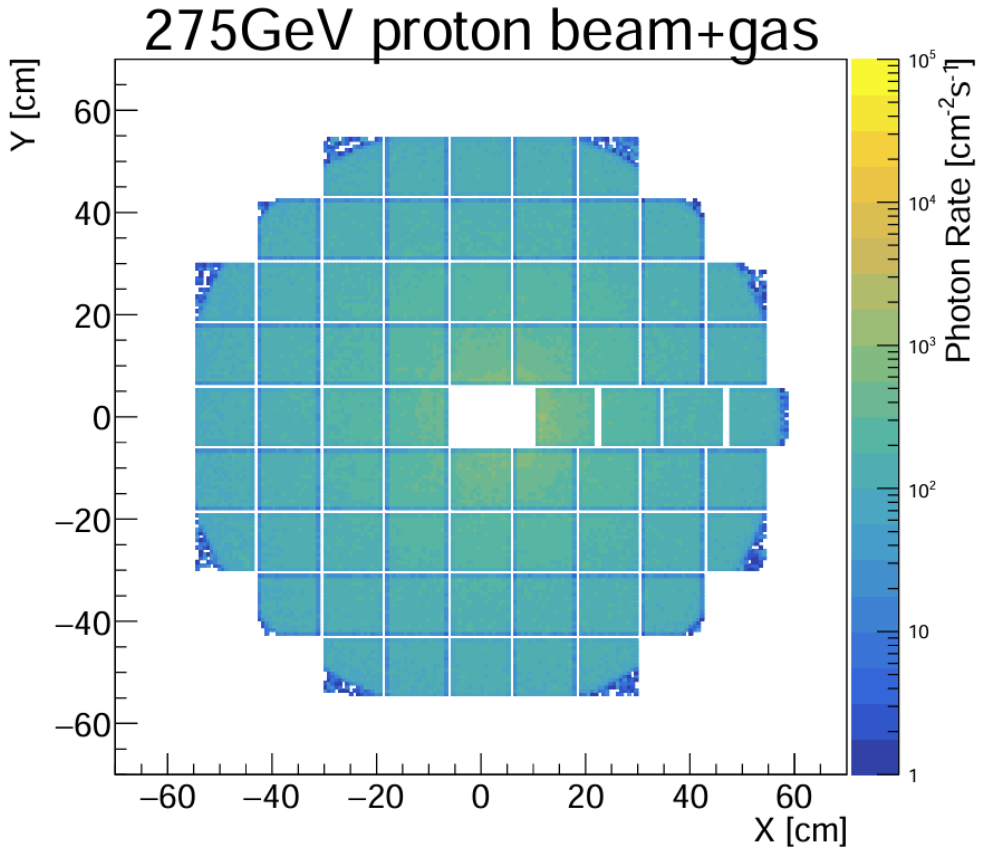
August Update - Outdated



$\sim 10^5 - 10^6$

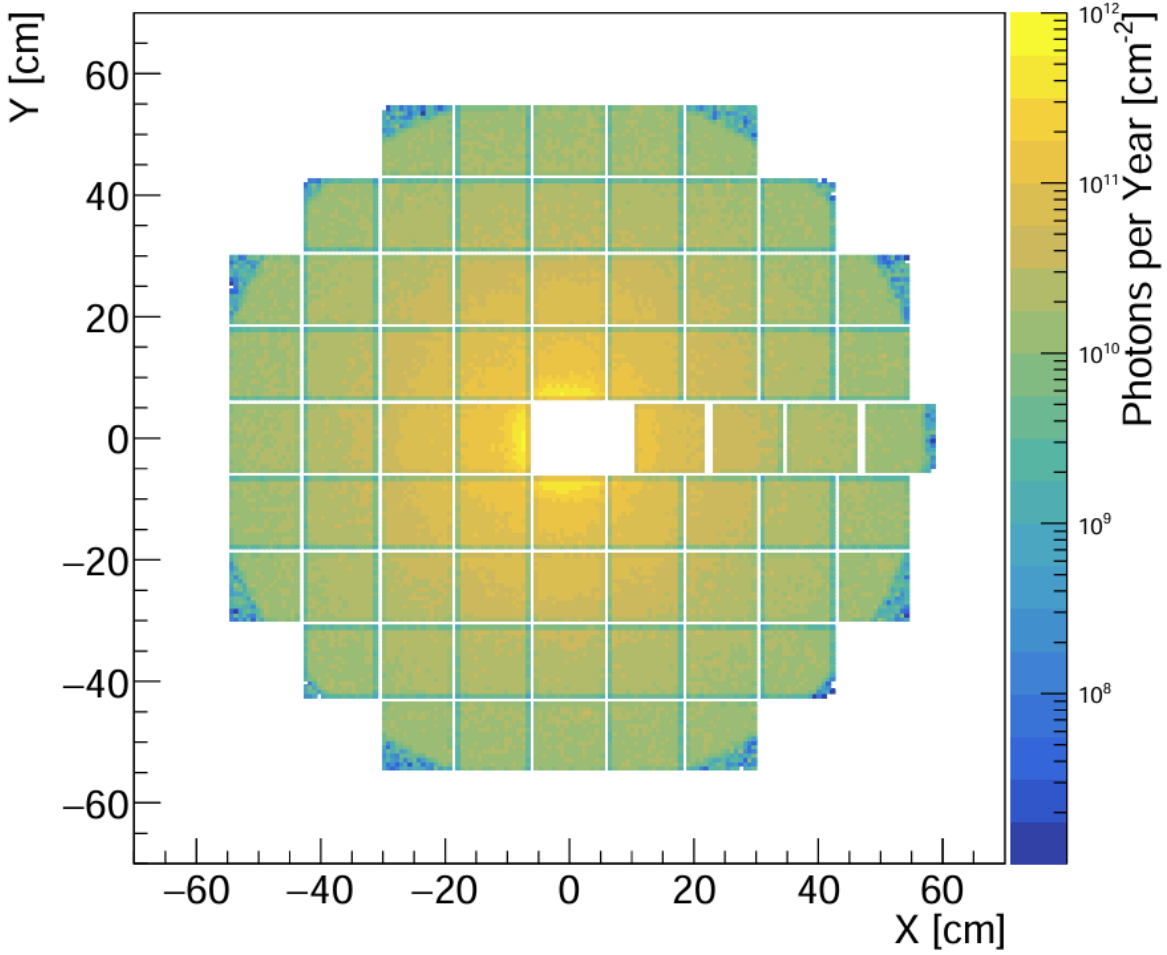
Flux Studies – Proton Beam Gas

- Determined from average of 100,000 events



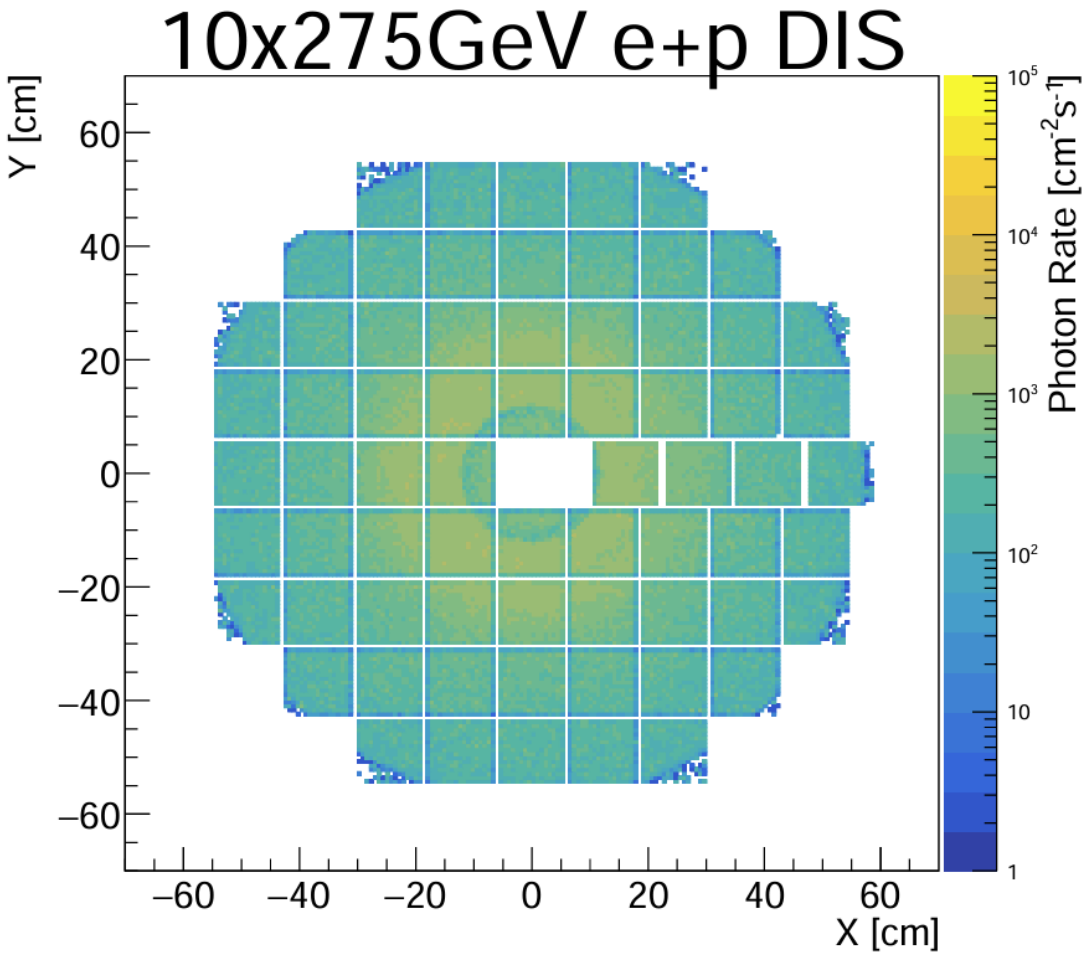
Total – One Year

- Updated previous estimates, original estimate correct given files used, while august update incorrectly determined
- Order of magnitude decrease from original estimate, most likely due to angle of incidence effects and updated geometry (Lack of BO magnet effect)
- 10^{13} -> 10^{12} Photons /year /cm^2



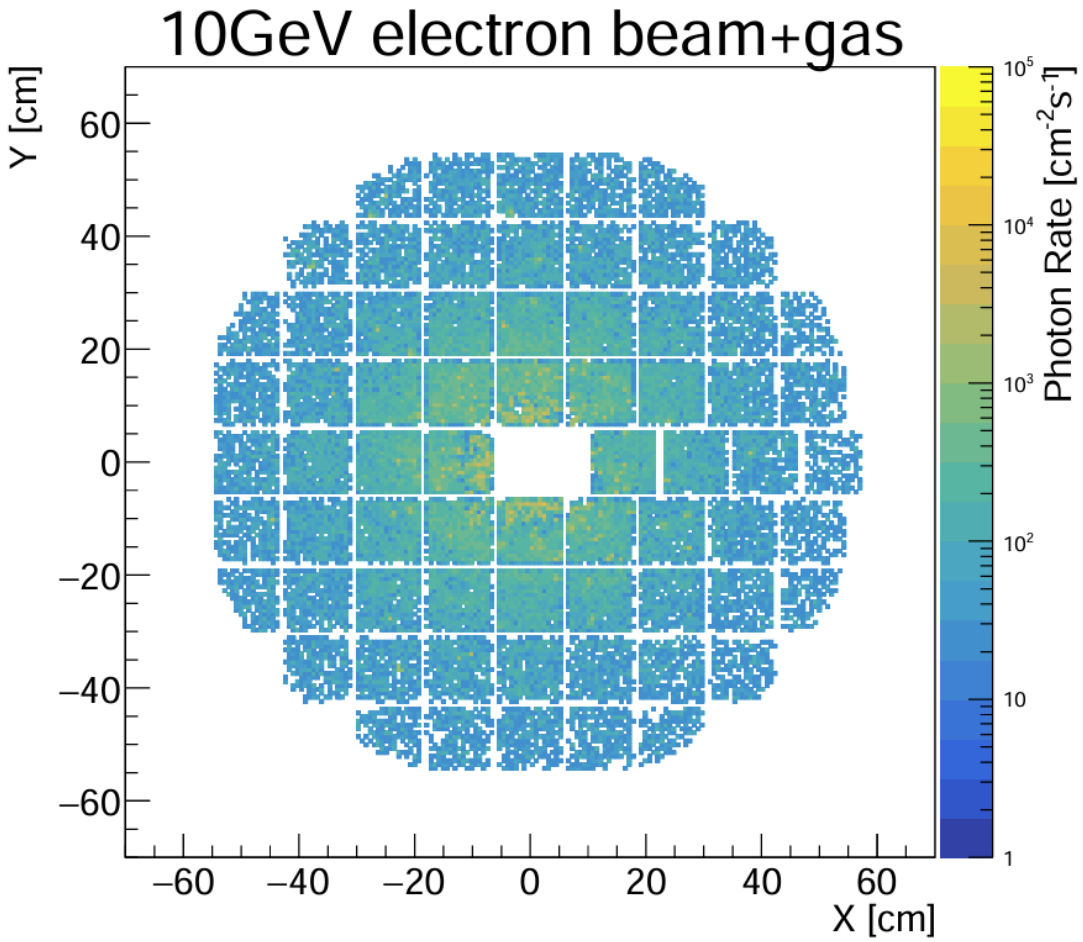
Backup

DIS – PfRICH only

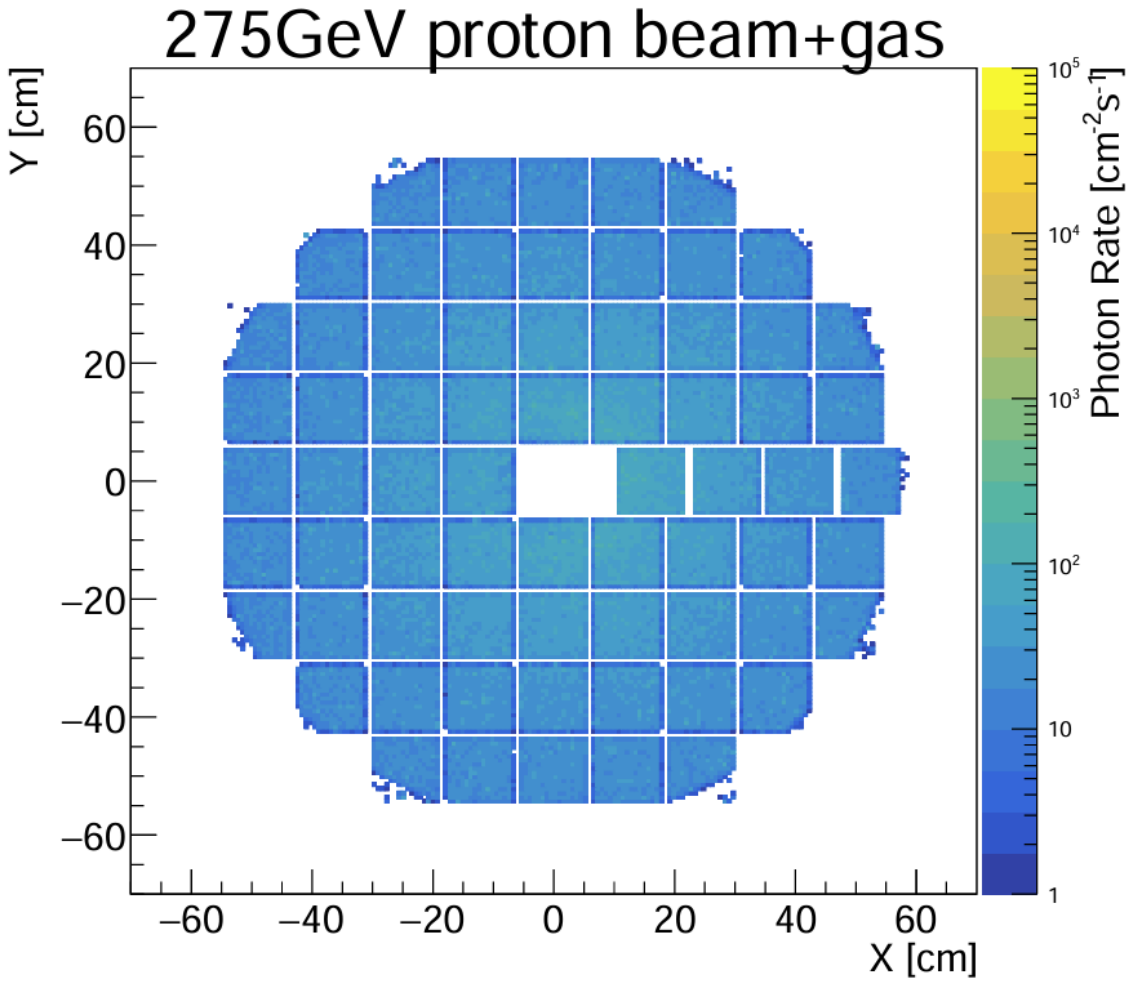


Electron beam-gas: pfRICH only

- Only 250,000 events



Proton beam-gas: pfRICH only



Total – One Year: pfRICH only