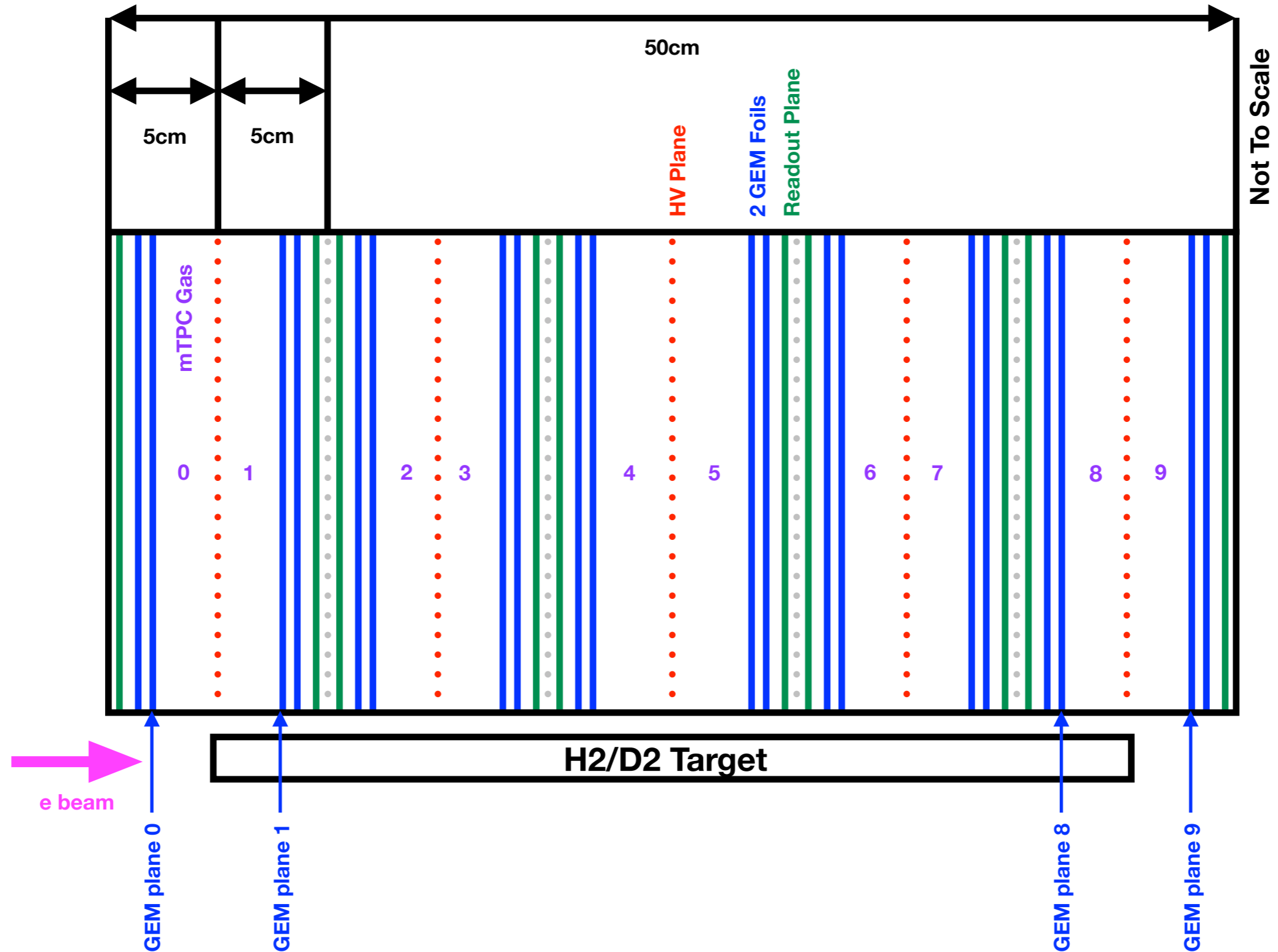


Photon Rates in mTPC GEM planes
R. Montgomery
27/10/20

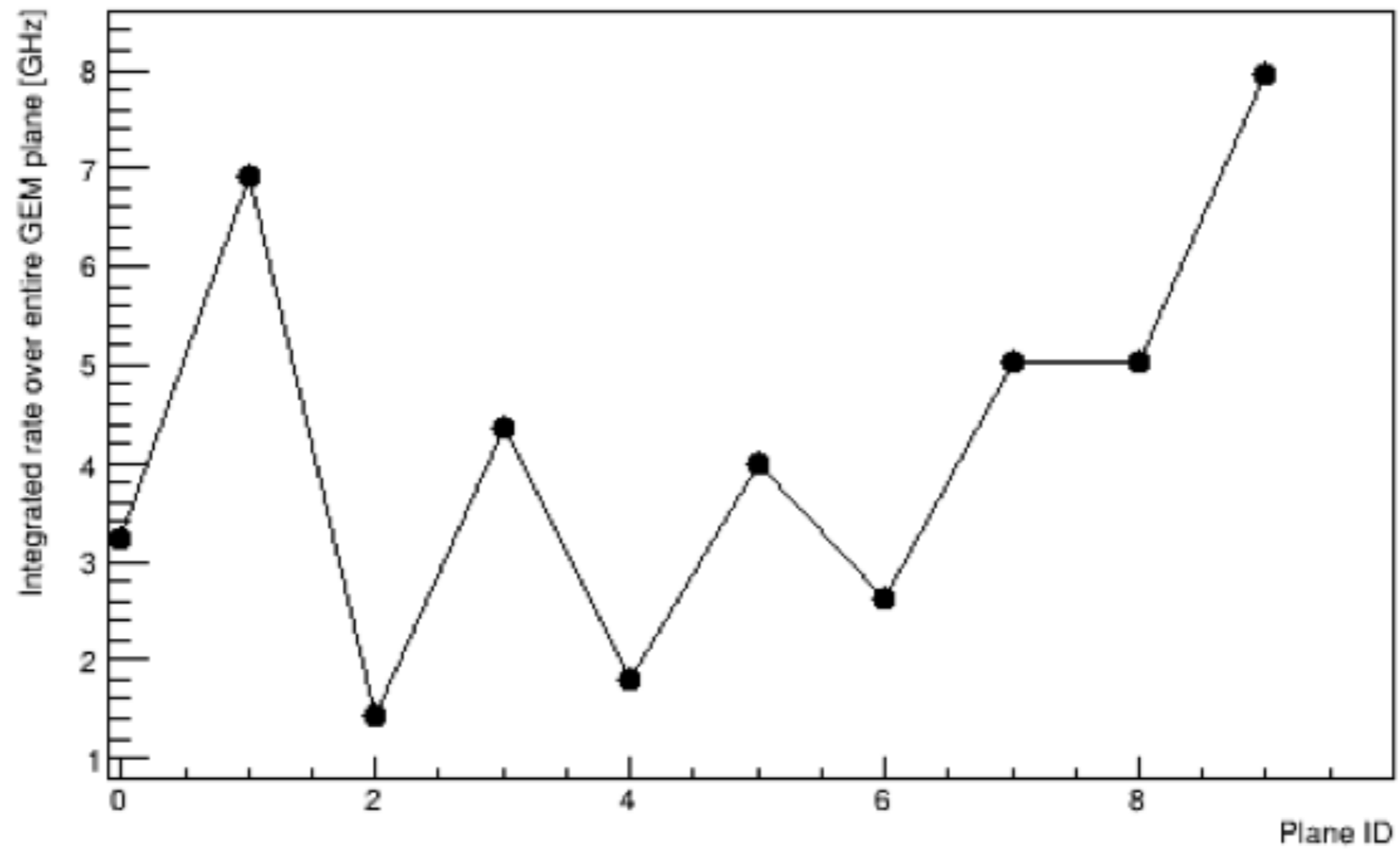
Simulation Set Up and Method for Study



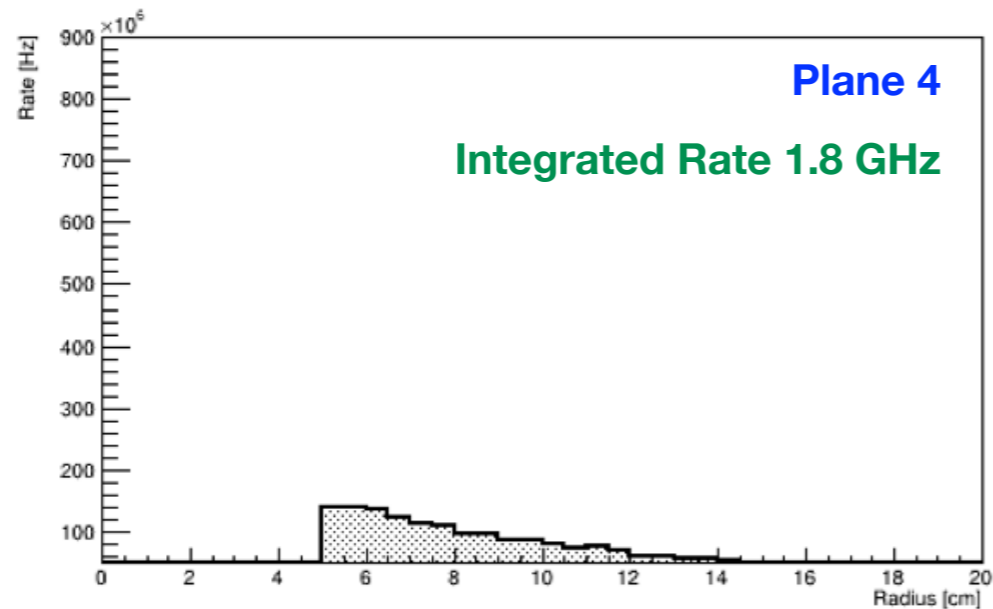
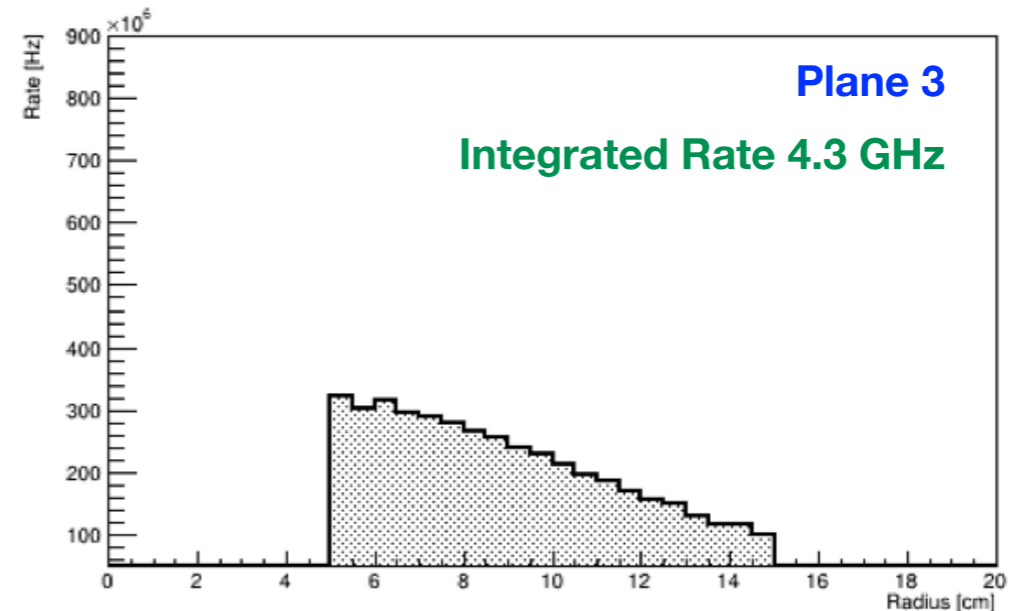
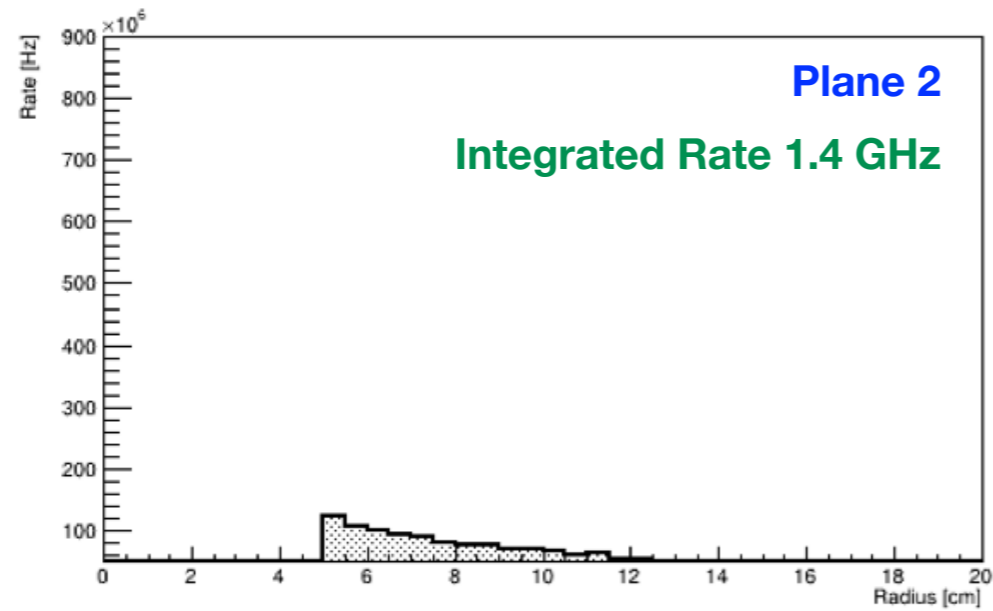
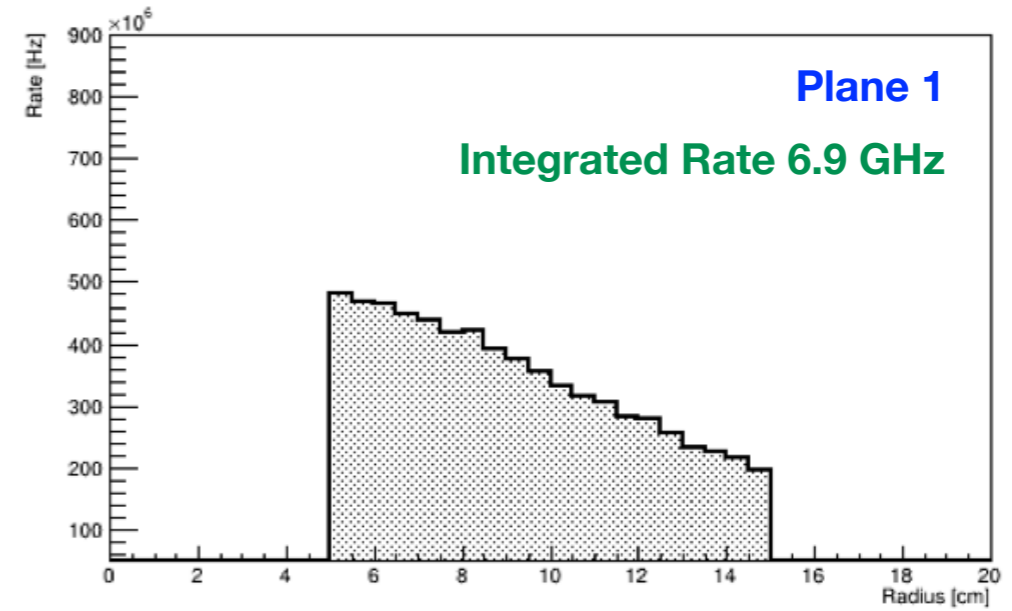
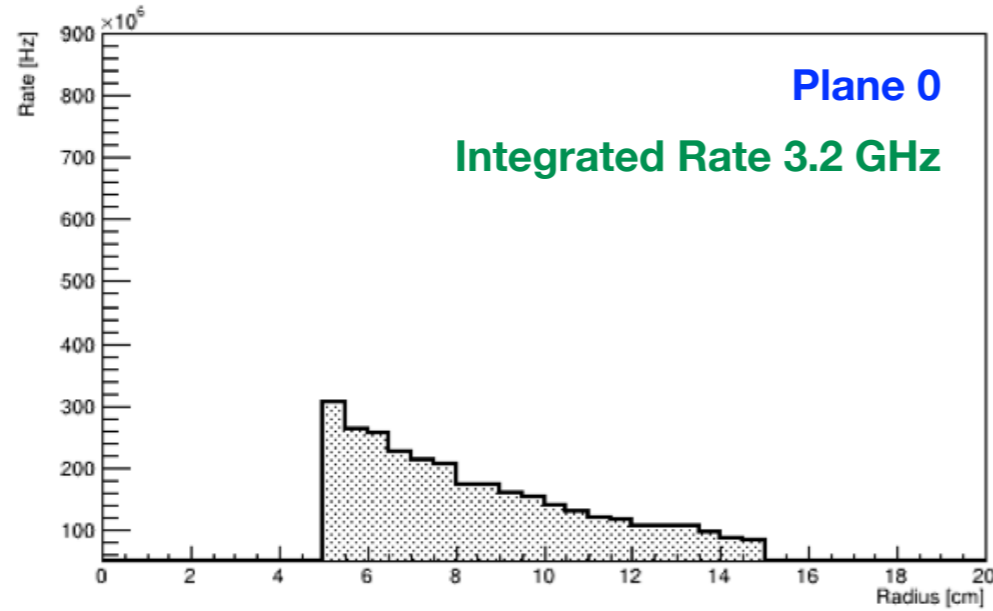
$$R_\gamma = \frac{N_\gamma}{\Delta t} = \frac{N_\gamma}{\frac{N_e \times Q_e}{I_{beam}}}$$

Used g4sbs to run high-stat 11GeV electron beam on target
 First layers of GEM planes set as sensitive detectors and
 photon rates hitting them checked
 Rate calculated as shown left (cheers to Eric)

H2 Target (50uA): Integrated Rates Over Each GEM Plane Area



H2 Target (50uA): Rate Versus Radius for each GEM plane

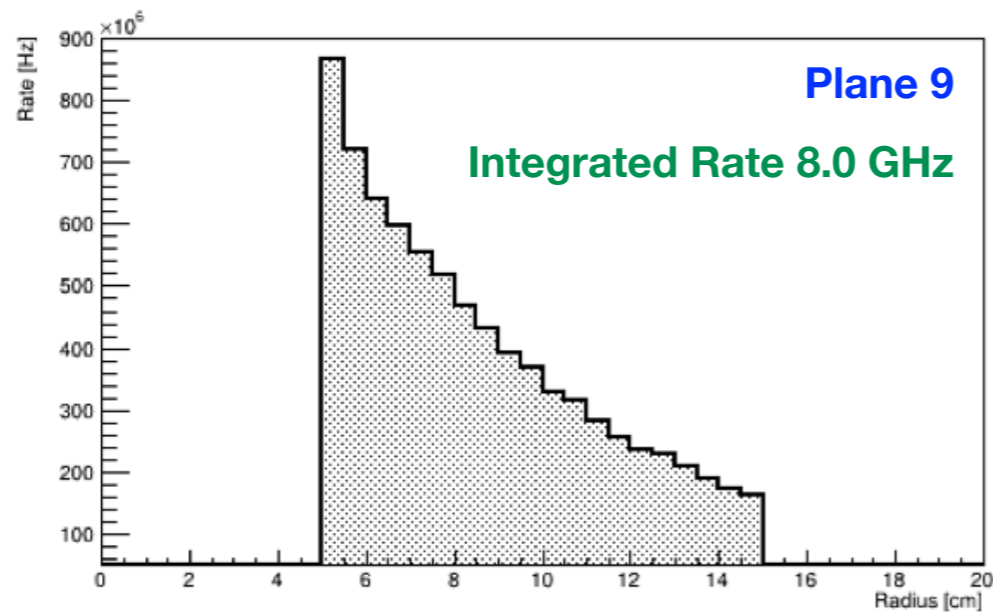
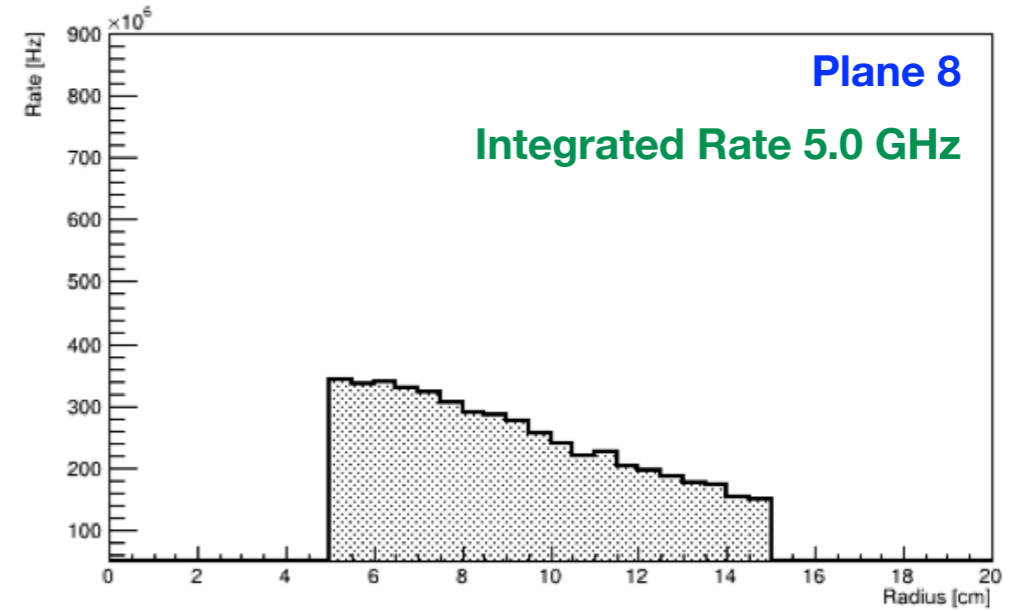
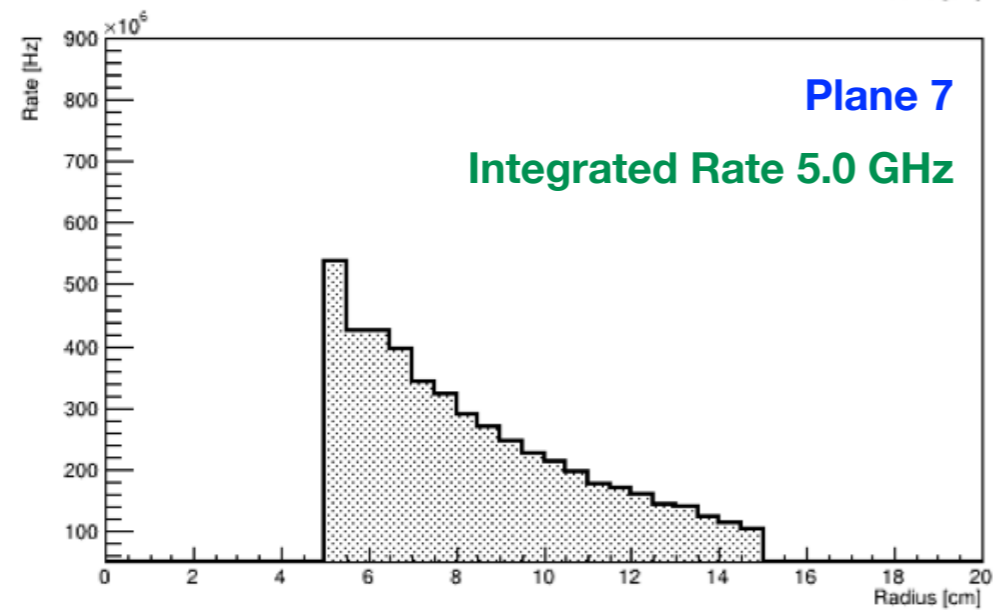
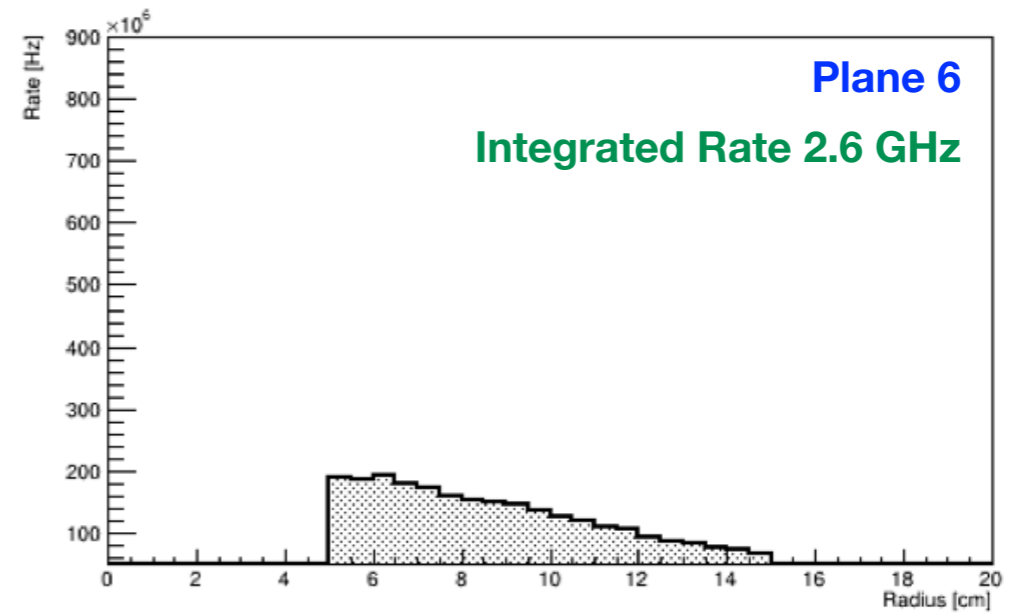
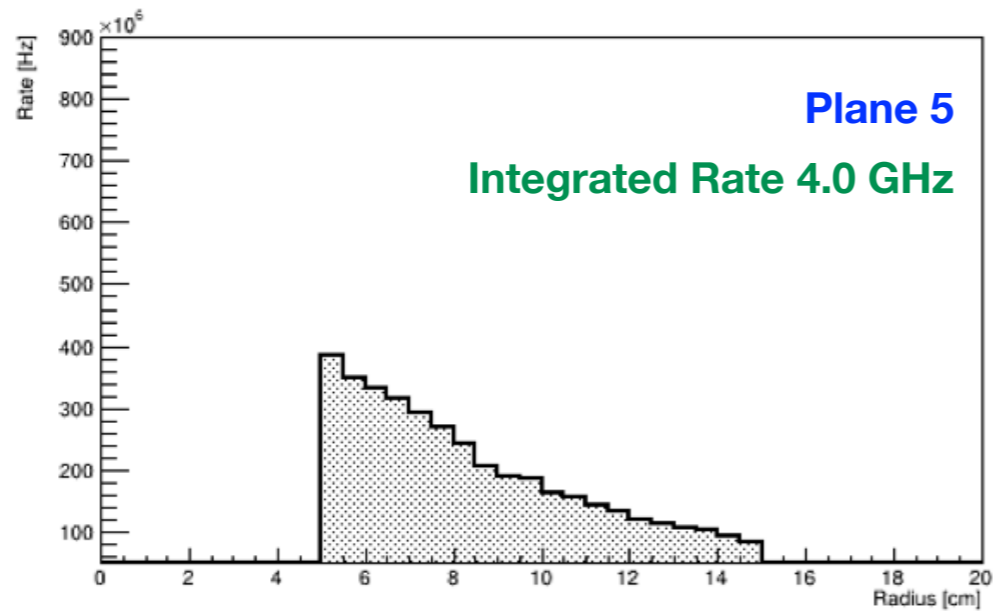


Radius binned in 5mm "rings"
(roughly allows to get ~3.2k pads per plane)

Rates in first 5 "rings" (ie smallest radii) in first five planes range from ~100MHz to ~500MHz

Rates at outer radii lower

H2 Target (50uA): Rate Versus Radius for each GEM plane

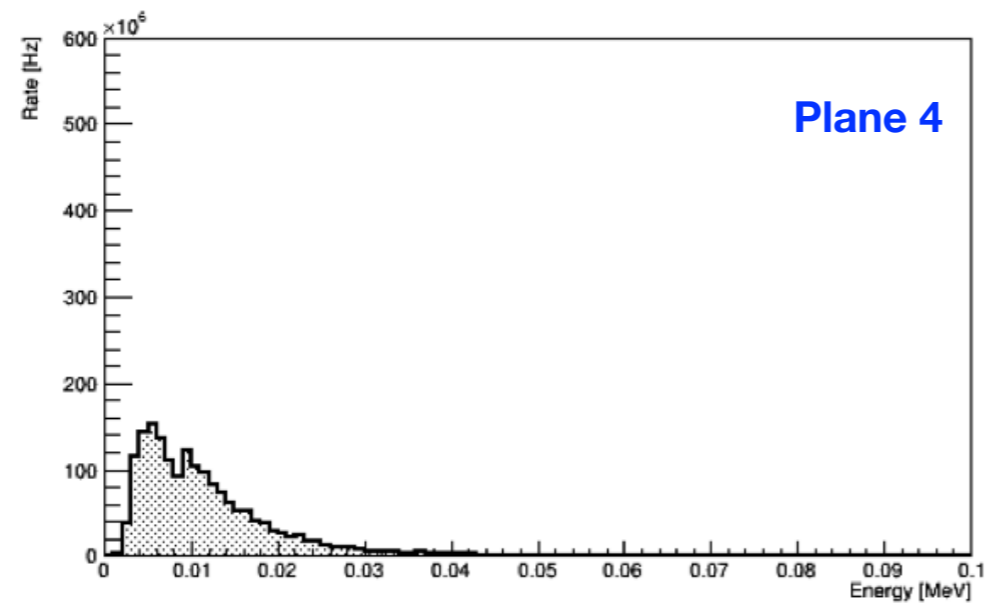
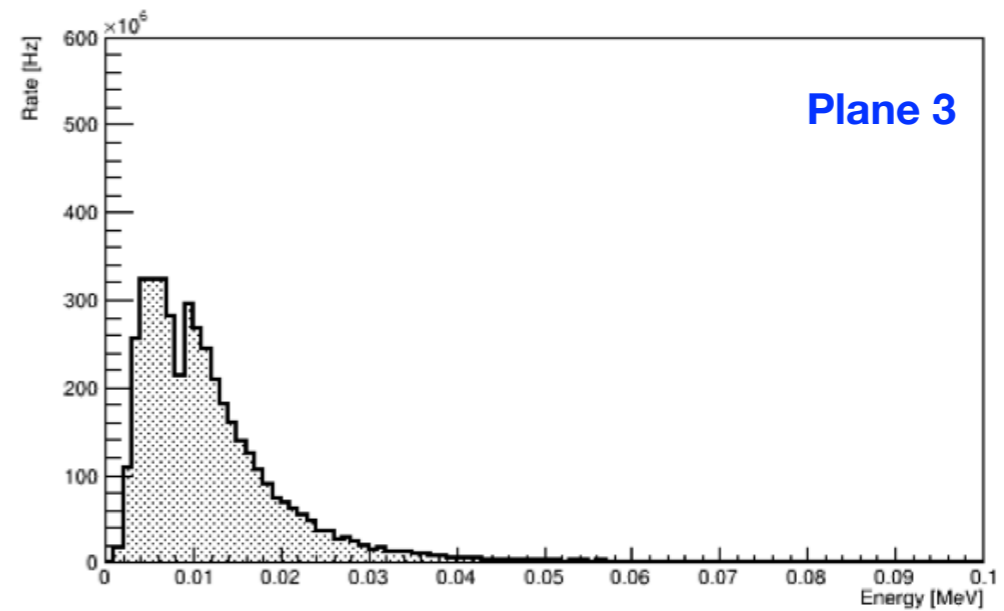
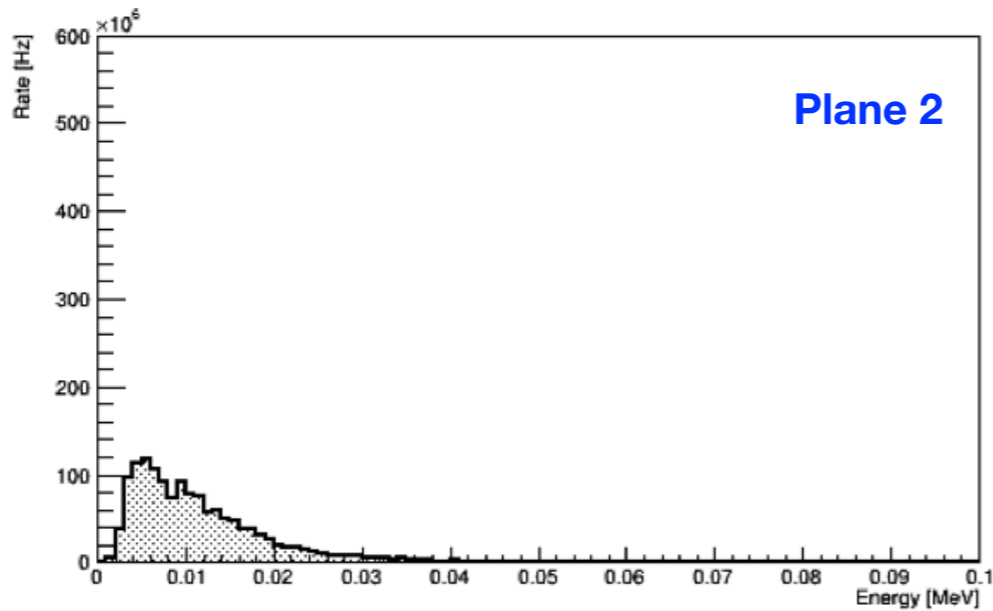
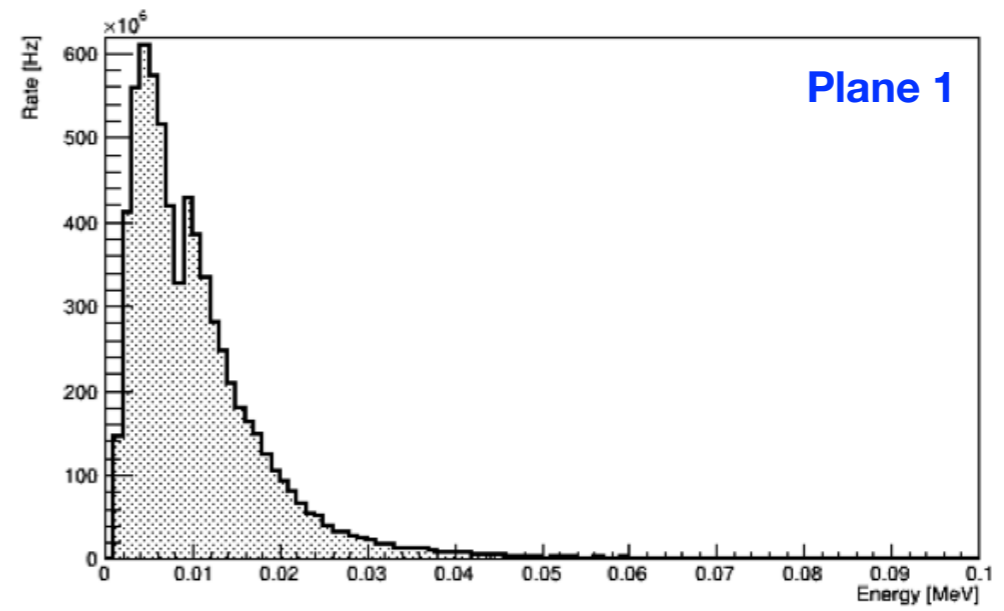
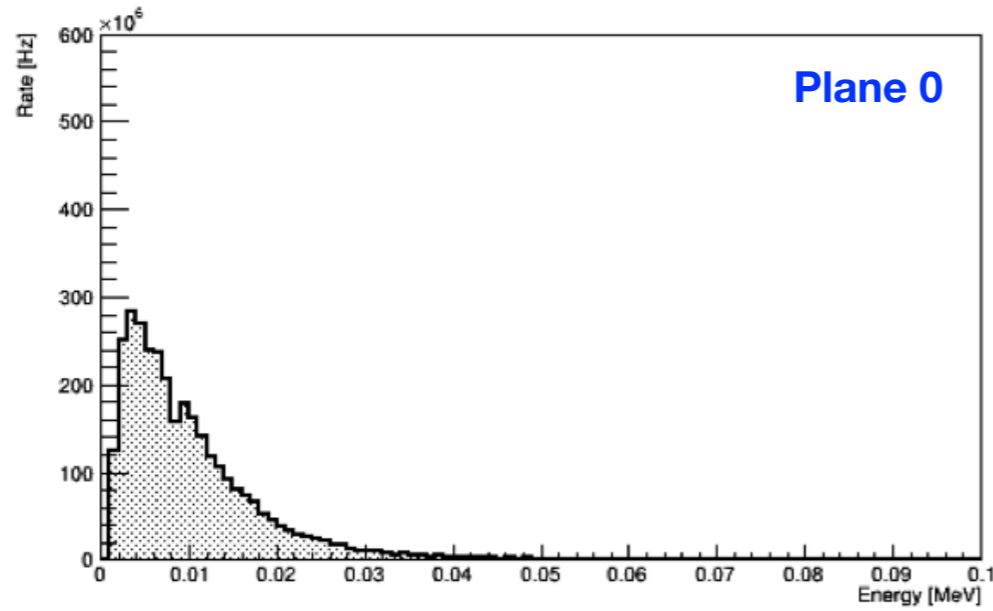


Radius binned in 5mm “rings”
(roughly allows to get ~3.2k pads per plane)

Rates in first 5 “rings” (ie smallest radii) in
second five planes range from ~200MHz to
~900MHz

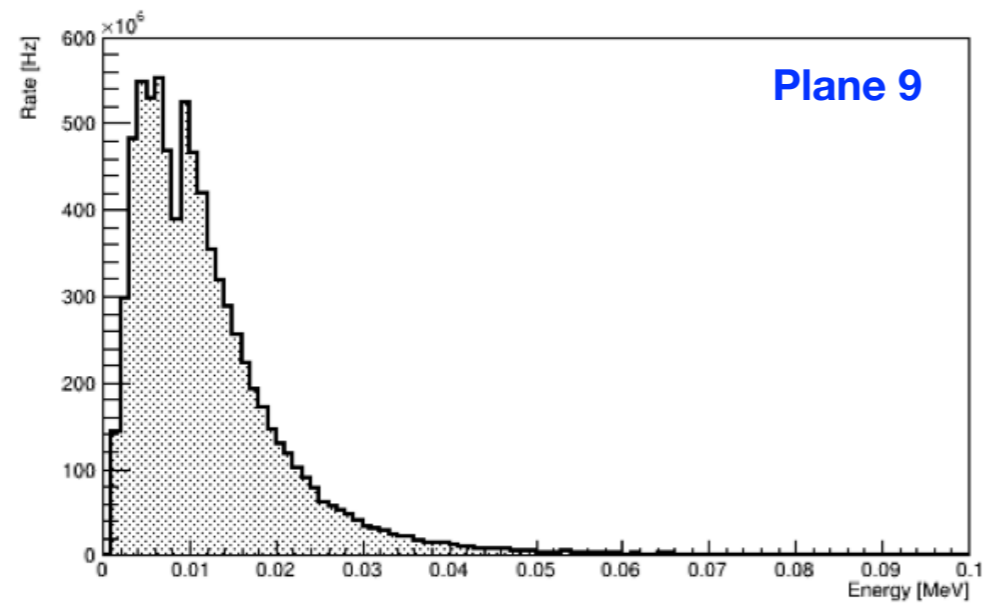
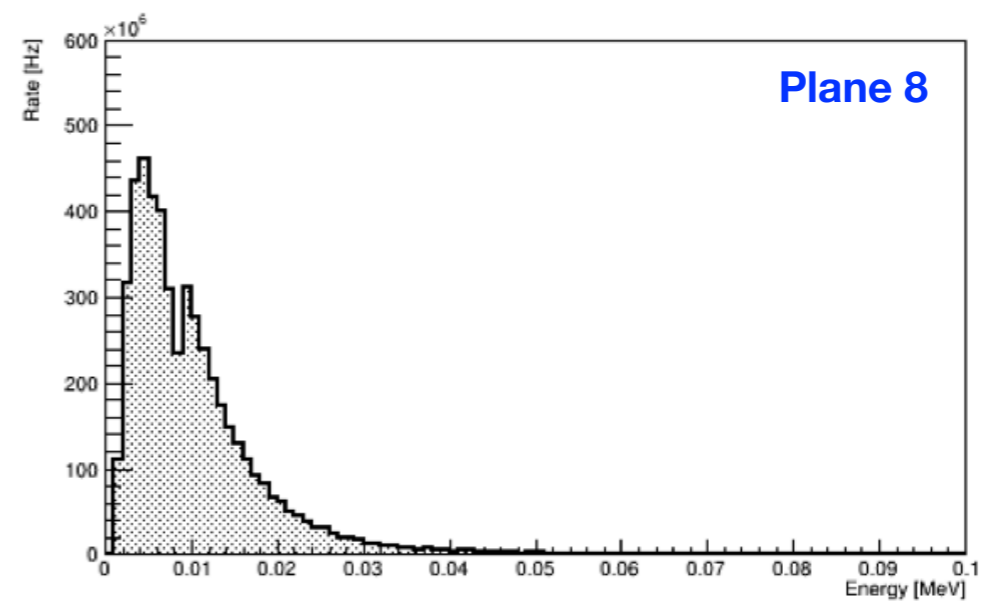
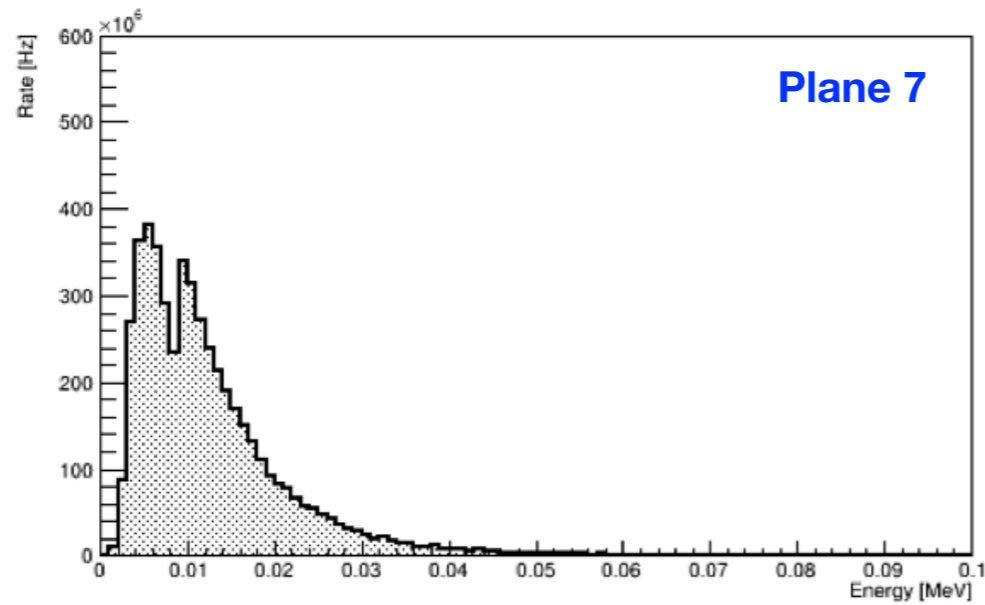
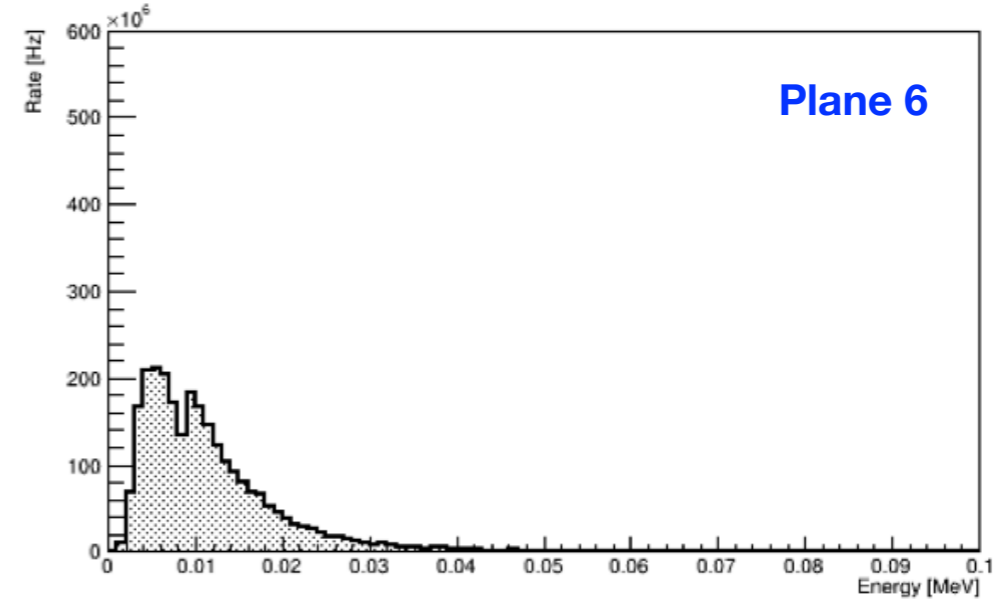
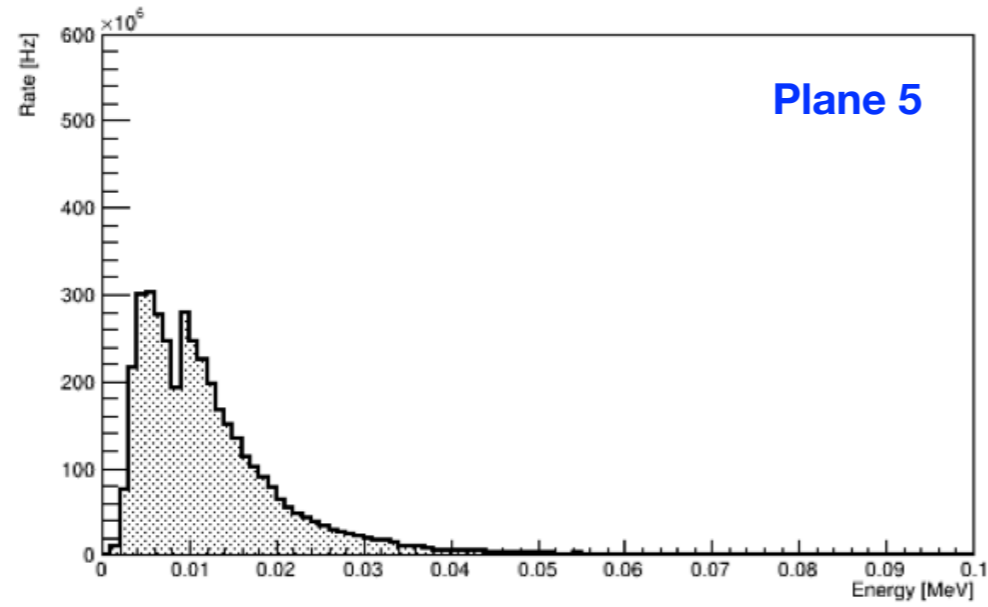
Rates at outer radii lower again

H2 Target (50uA): Rate Versus Energy for each GEM plane



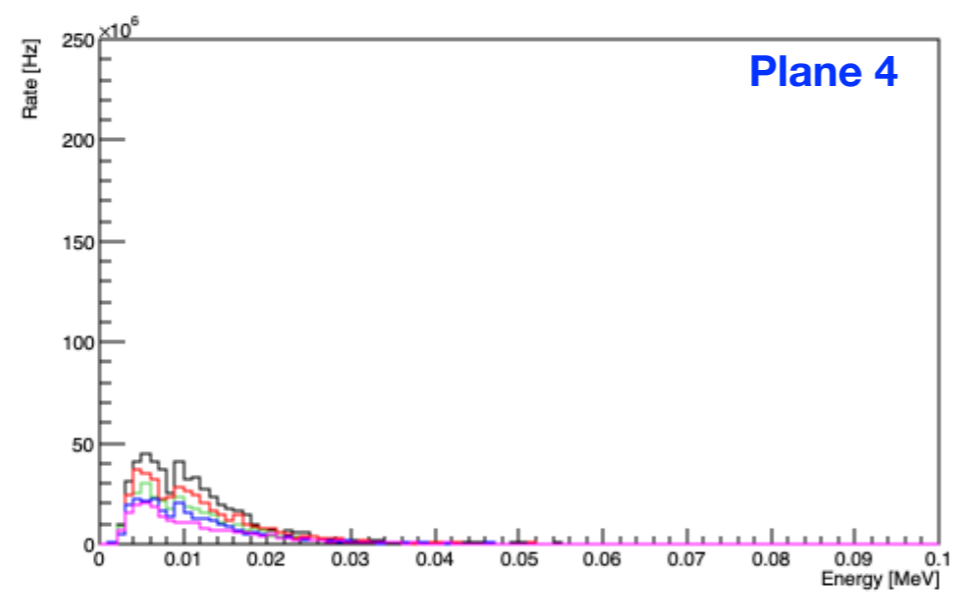
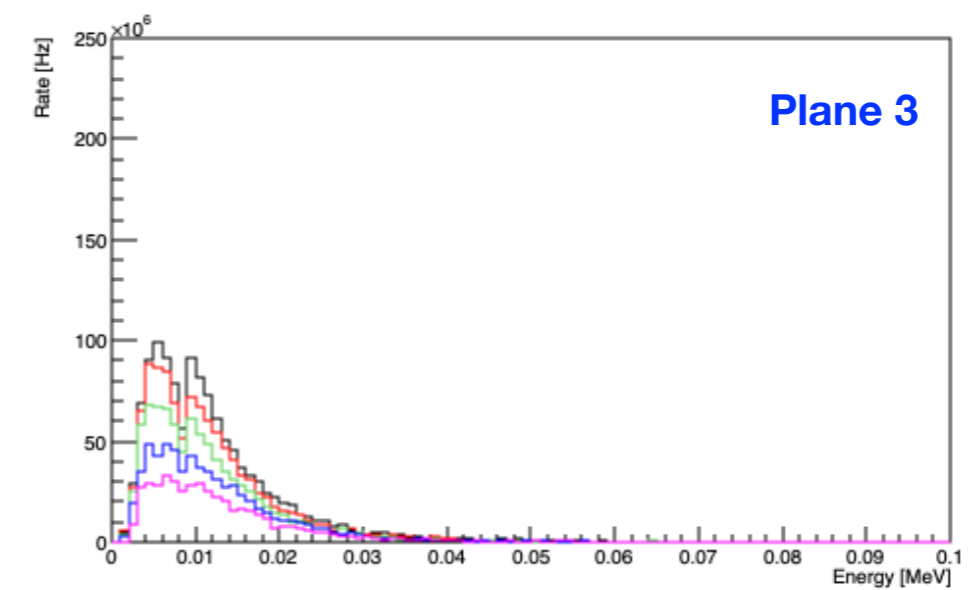
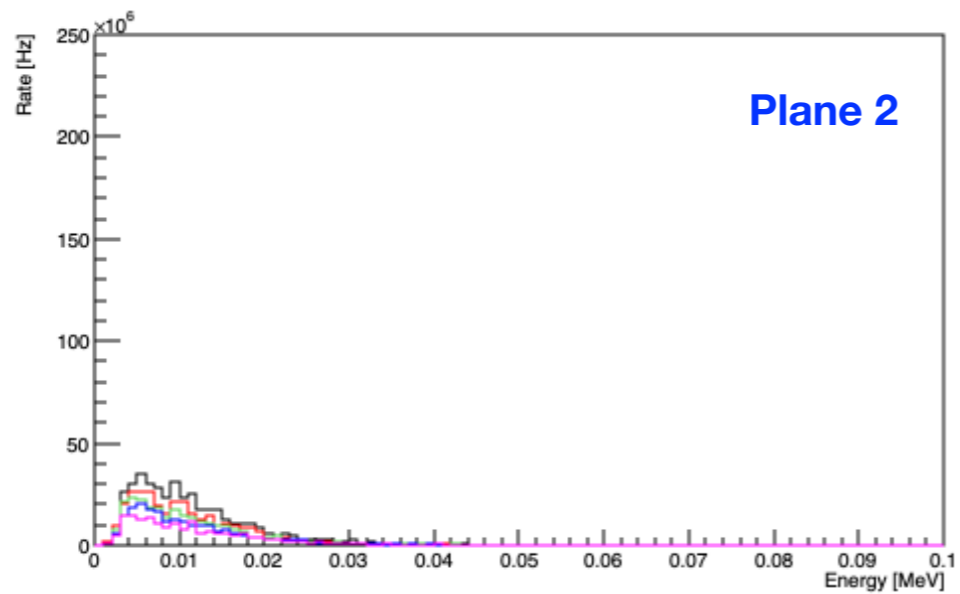
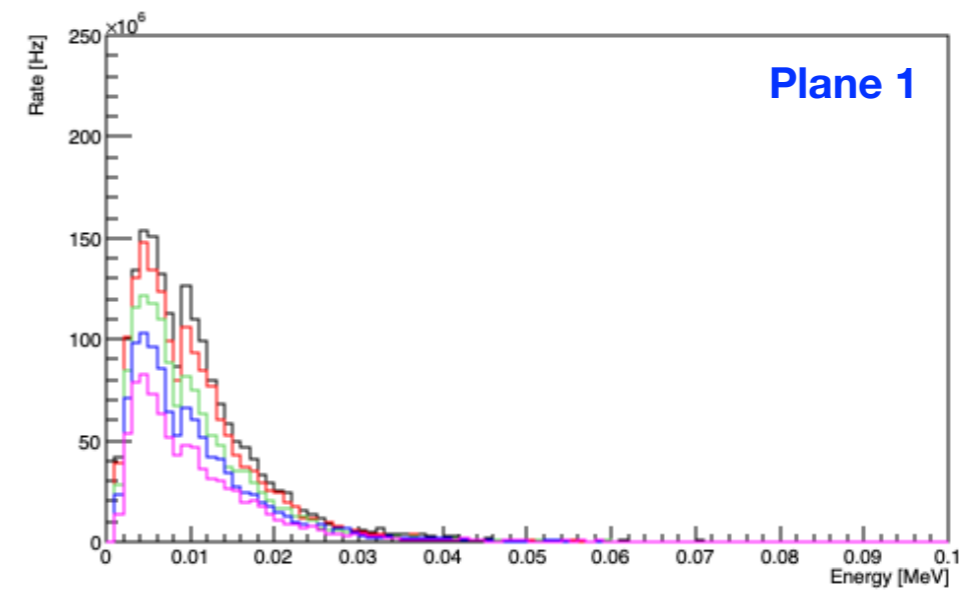
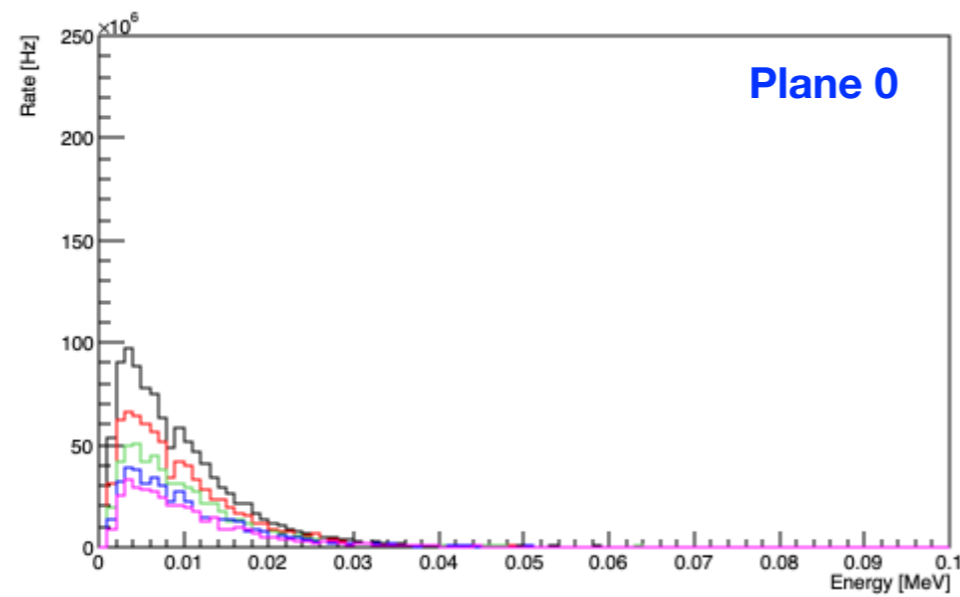
Energy of photons peaking at $\sim 5/6$ keV (with another peaking value of ~ 10 keV in some planes), with tail

H2 Target (50uA): Rate Versus Energy for each GEM plane



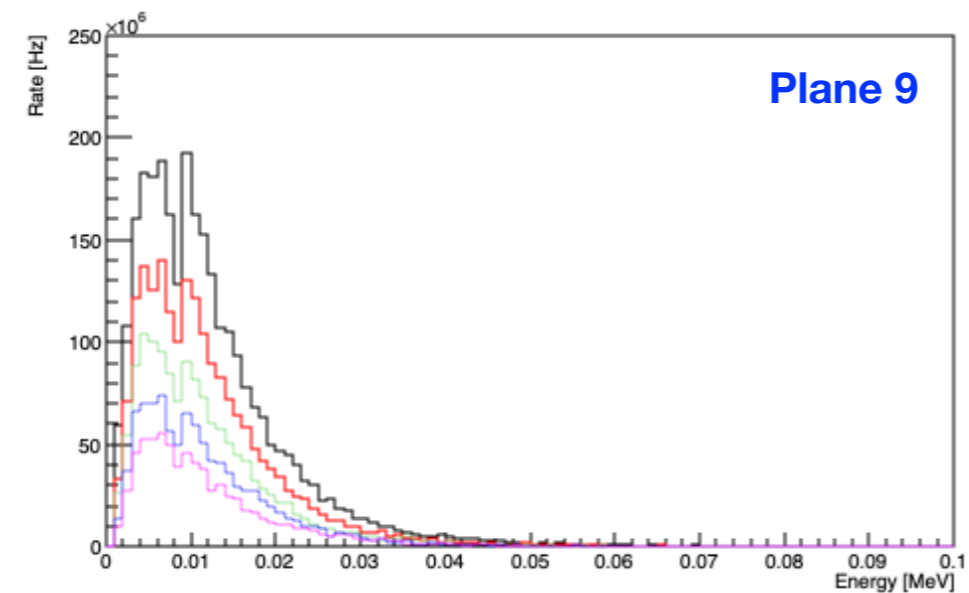
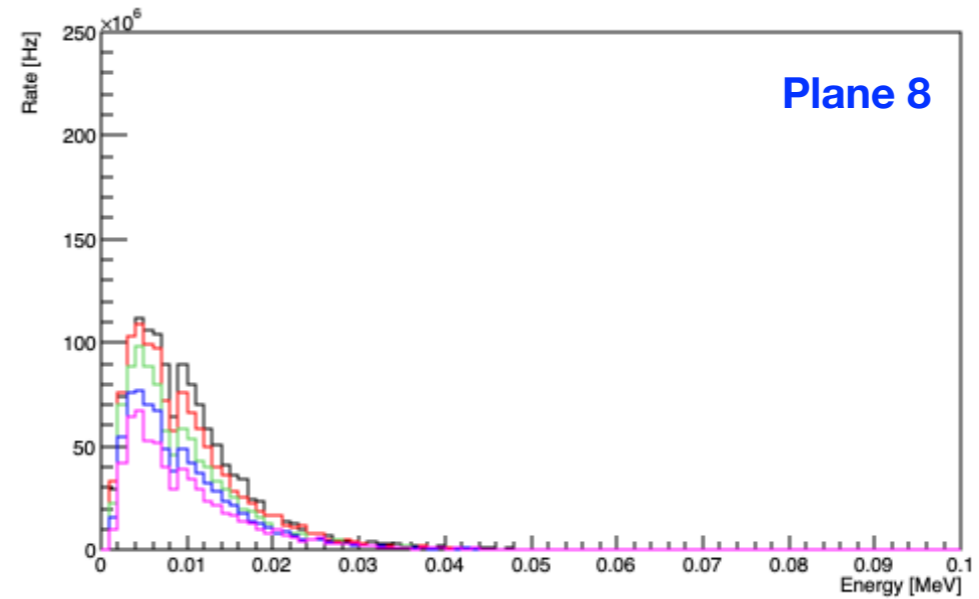
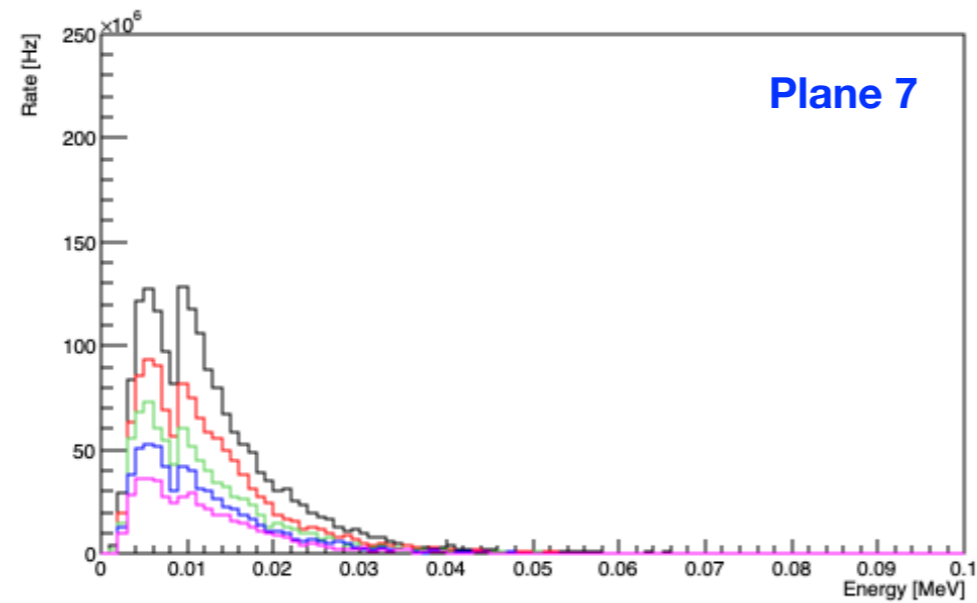
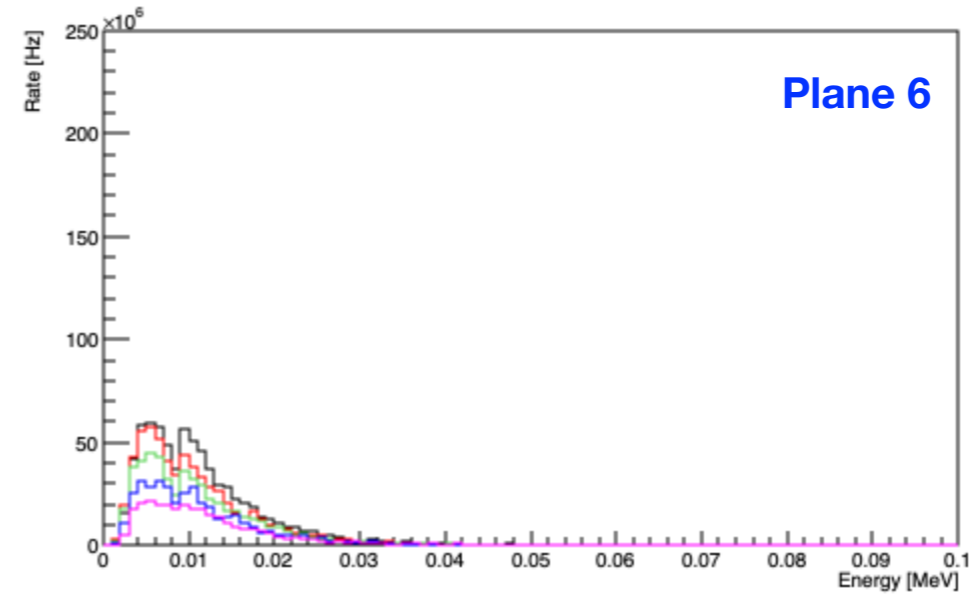
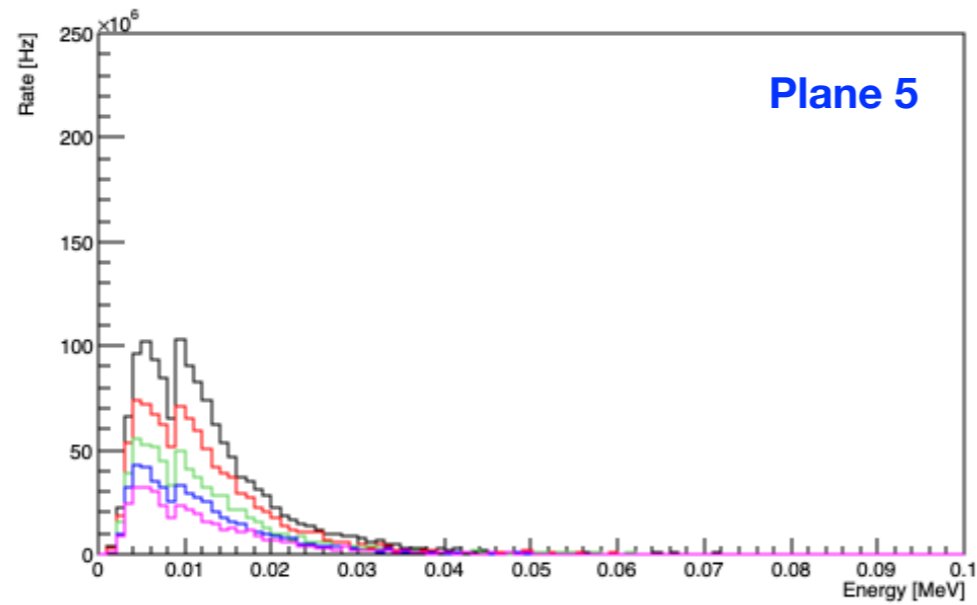
Energy of photons peaking at $\sim 5/6$ keV
(with another peaking value of ~ 10 keV
in some planes), with tail

H2 Target (50uA): Rate Versus Radius Energy with Radius Cuts for each GEM plane



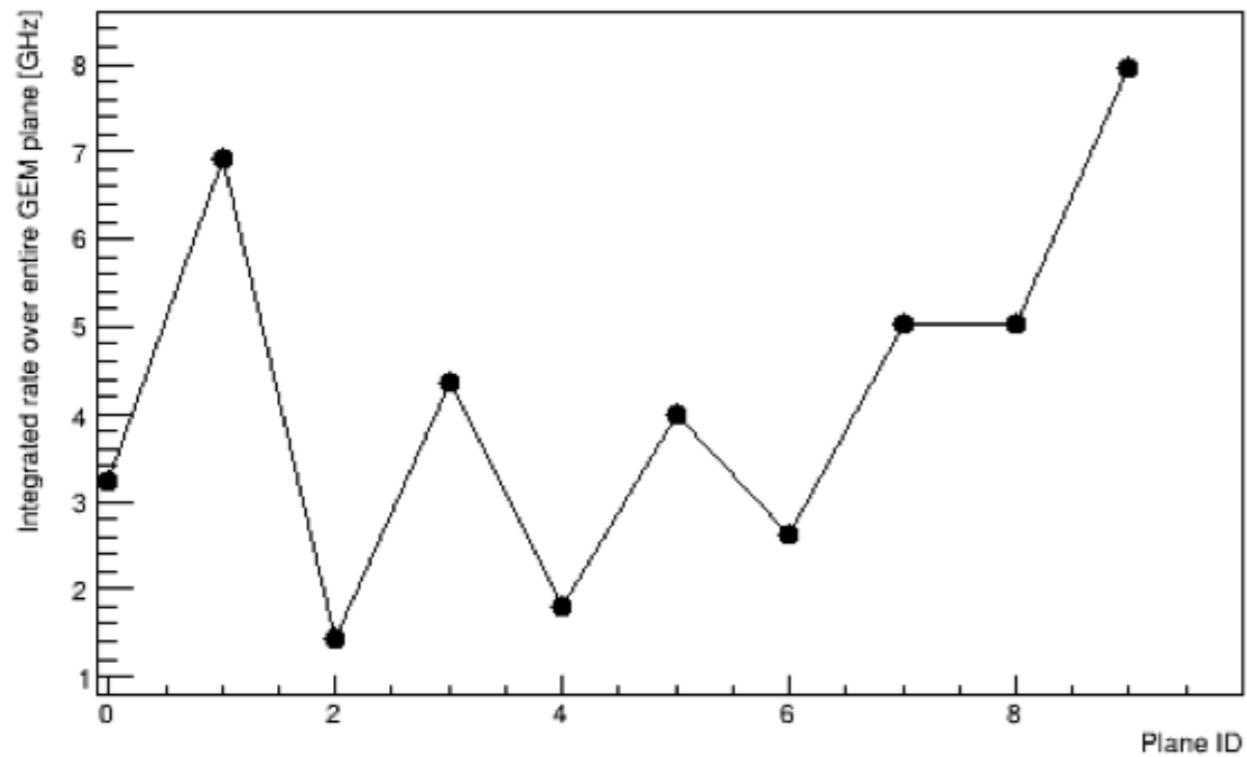
$r > 5\text{cm} \ \&\& \leq 7\text{cm}$
 $r > 7\text{cm} \ \&\& \leq 9\text{cm}$
 $r > 9\text{cm} \ \&\& \leq 11\text{cm}$
 $r > 11\text{cm} \ \&\& \leq 13\text{cm}$
 $r > 13\text{cm} \ \&\& \leq 15\text{cm}$

H2 Target (50uA): Rate Versus Radius Energy with Radius Cuts for each GEM plane



$r > 5\text{cm} \ \&\& \leq 7\text{cm}$
 $r > 7\text{cm} \ \&\& \leq 9\text{cm}$
 $r > 9\text{cm} \ \&\& \leq 11\text{cm}$
 $r > 11\text{cm} \ \&\& \leq 13\text{cm}$
 $r > 13\text{cm} \ \&\& \leq 15\text{cm}$

Summary



Integrated rates on the GEM planes are between 1.4GHz and 8GHz

The highest rates are at the inner radii (if binning in 5mm rings they range from 100 to 900MHz at inner most radii)

Majority of photons have energies <20/30keV

Initial cross-check with D2 seemed to agree but more refined cross check underway