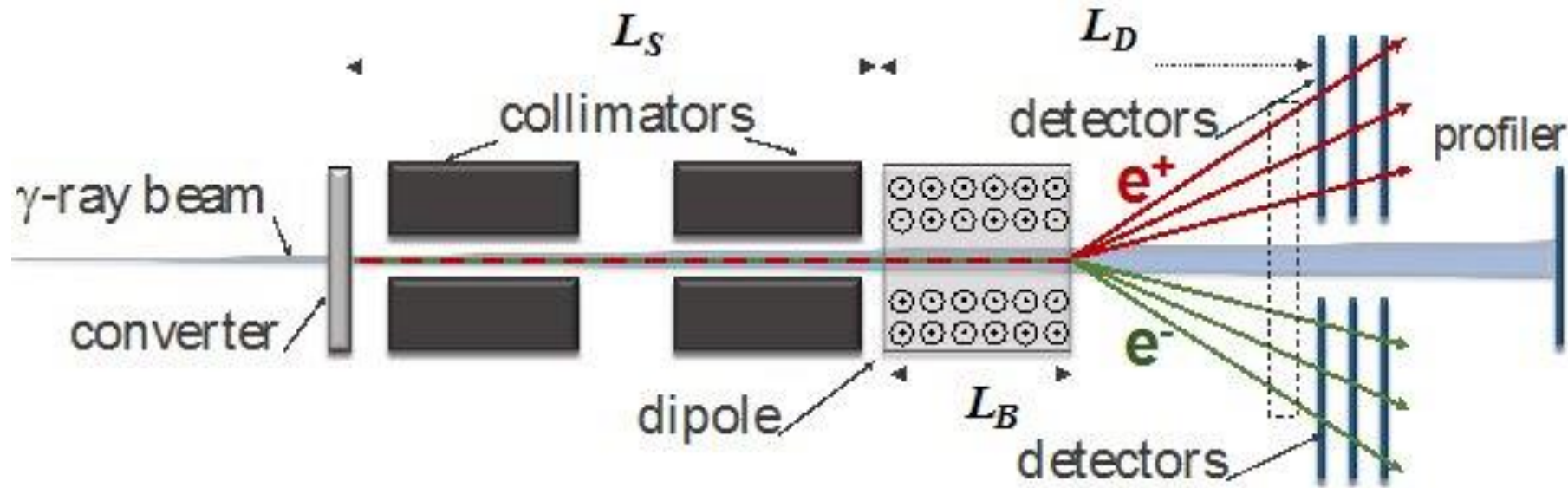


LUXE Gamma Ray Spectrometer

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Proposed Design of the Spectrometer



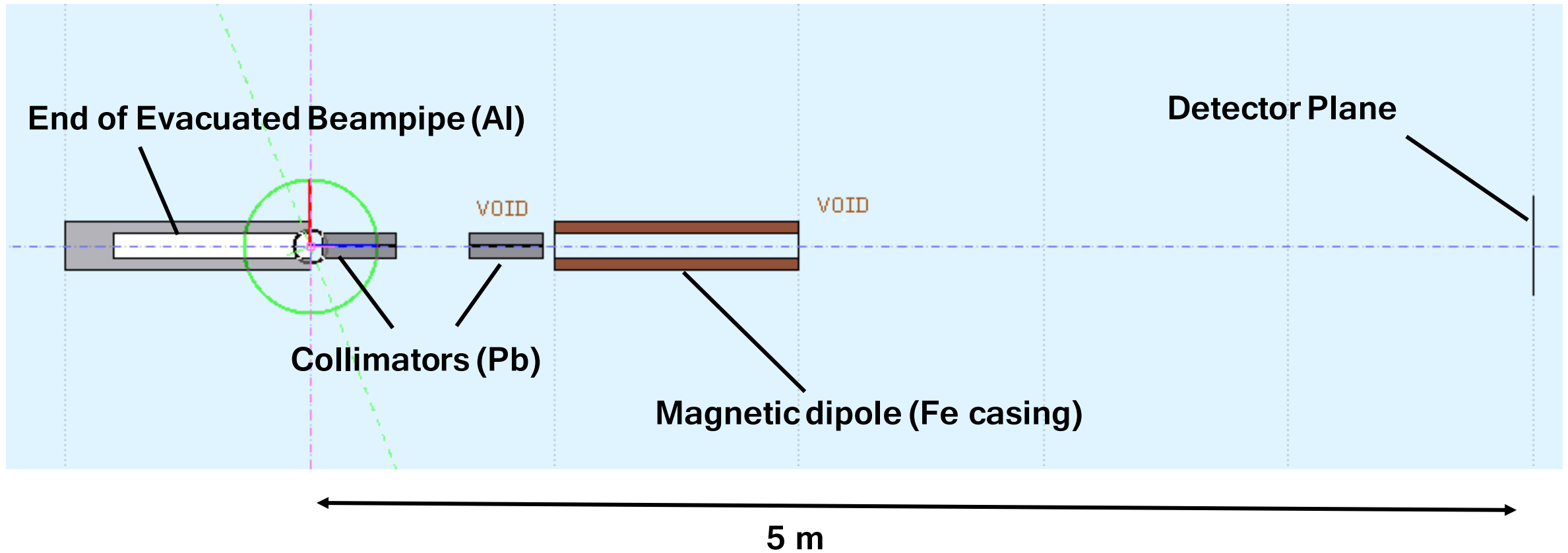
- Converter target: 10 micron thick tungsten foil?
- Dipole magnet: 0.5 T, $L_B = 1$ m
- Distance converter – magnet: $L_S = 1$ m
- Distance magnet – detector plane: $L_D = 4$ m
- Detector transverse size: 20 x 2 cm

Overall length of the system: ~ 5 m

Issues with Current Design

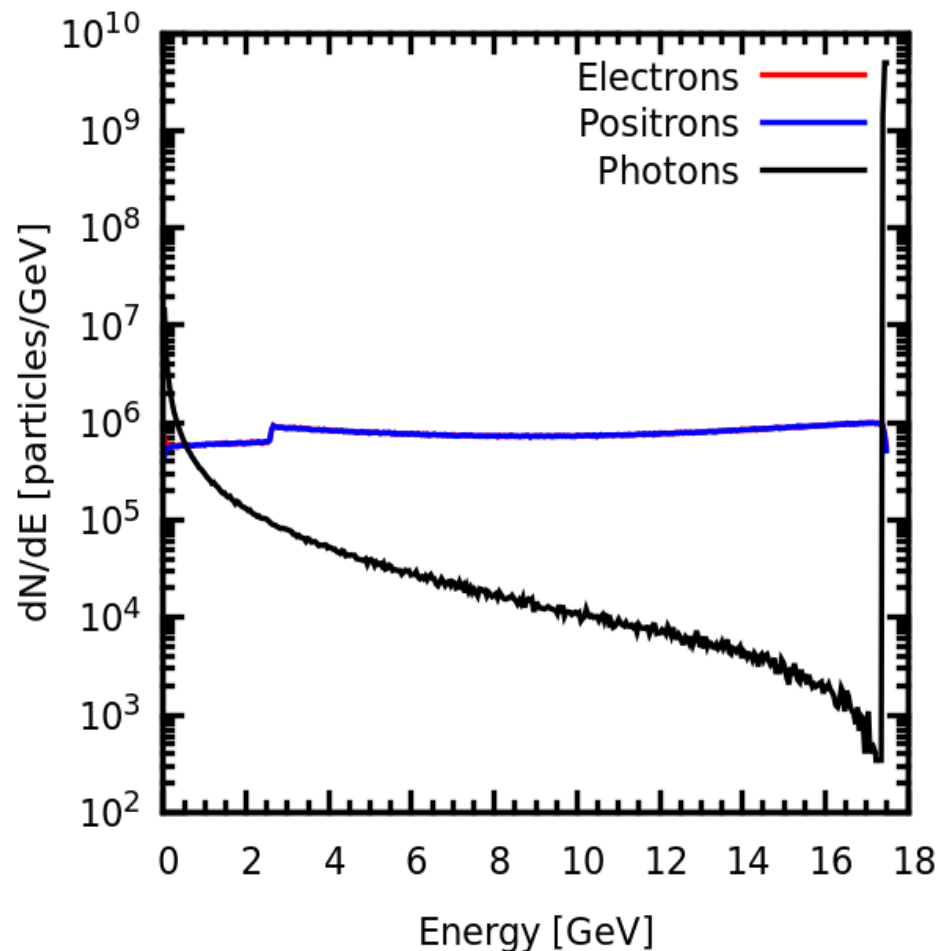
- IP chamber and associated beampipes to be evacuated
- Gamma ray spectrometer to be in air – how to transition from vacuum to air
- Not feasible to place thin targets inside vacuum
- Use target as window is a possible solution
- Or use window with target placed in air

Simulation Setup

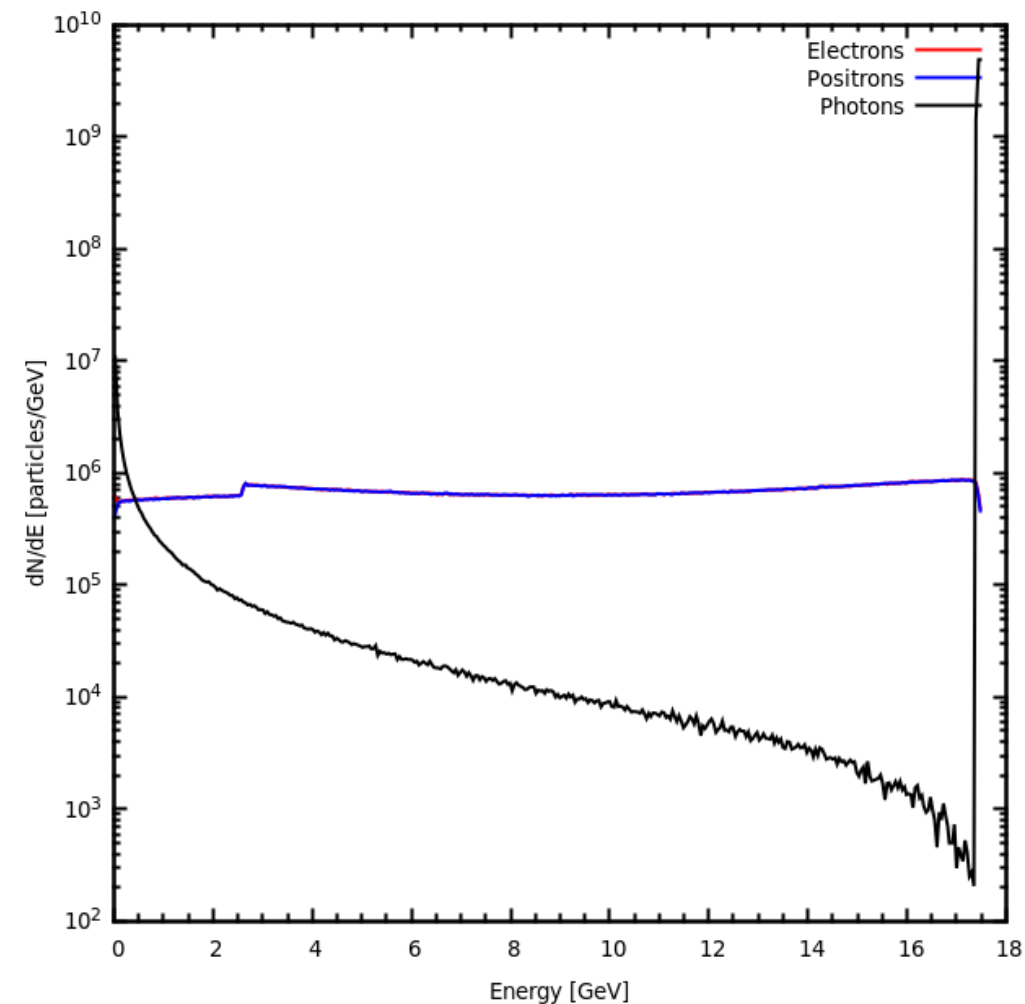


Comparison of Energy Spectra

Energy Spectra At Detector Plane (17.5 GeV photon beam , 10 μm Tungsten)

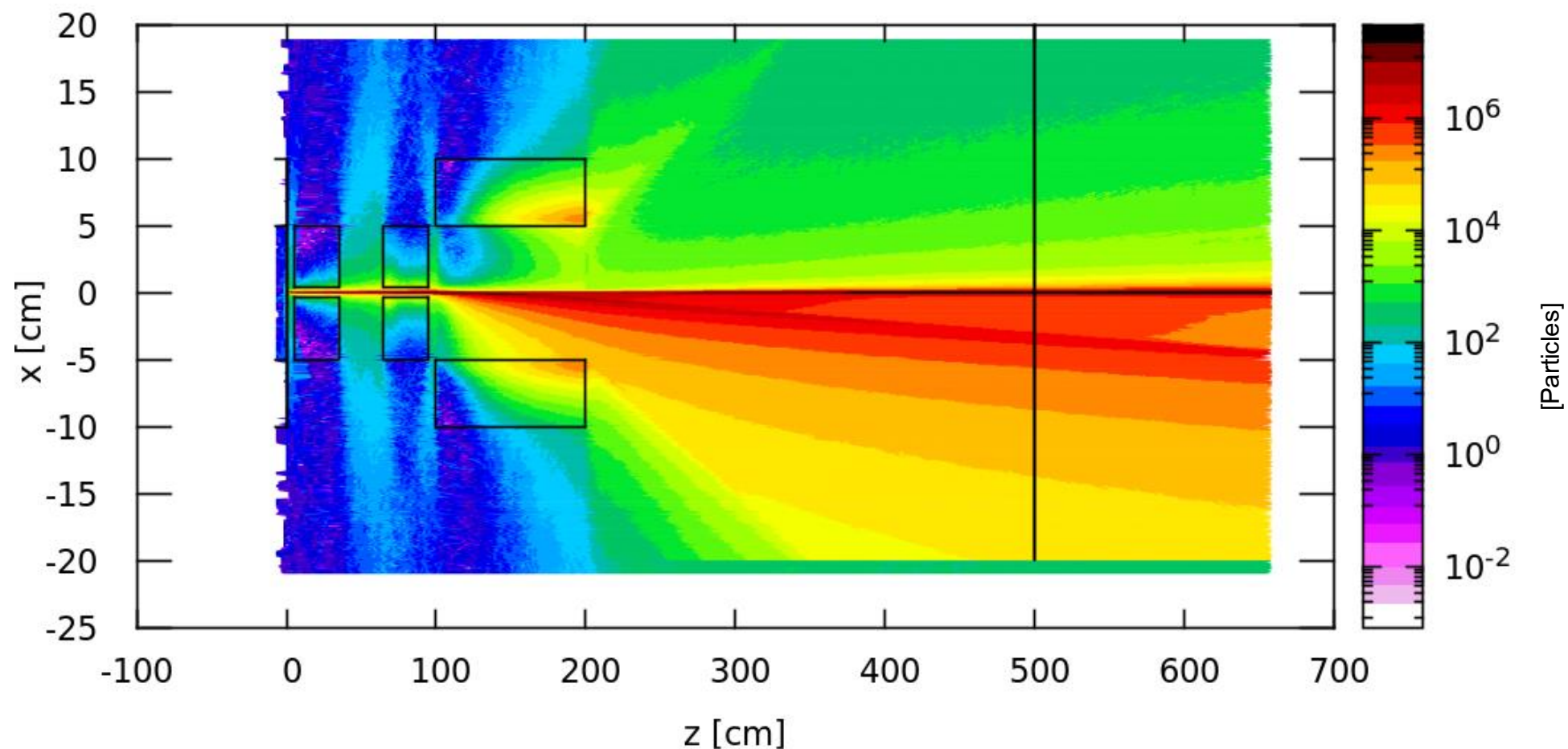


Energy Spectra At Detector Plane (17.5 GeV photon beam , 200 μm Kapton)

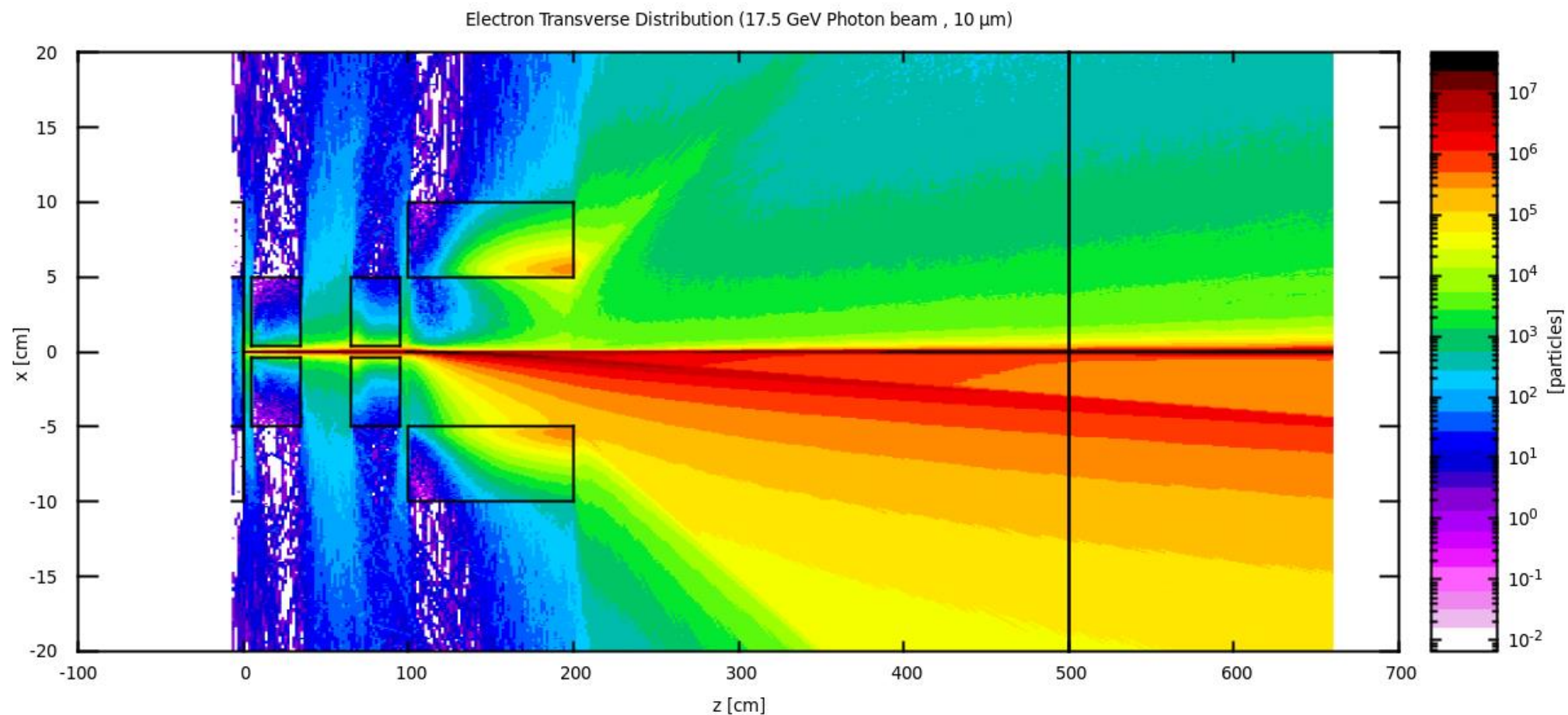


Electron Distribution - Kapton

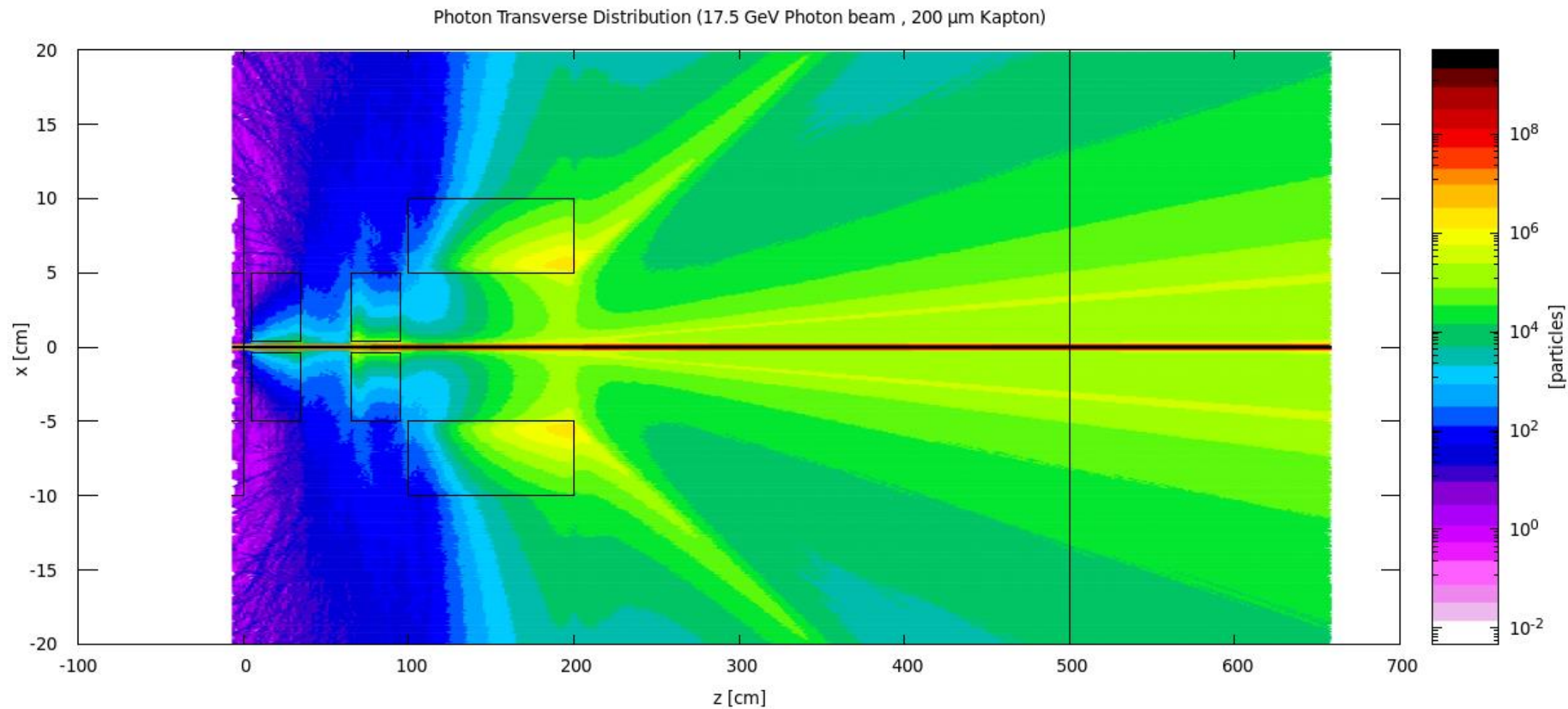
Electron Transverse Distribution (17.5 GeV Photon beam , 200 μm Kapton)



Electron Distribution - Tungsten

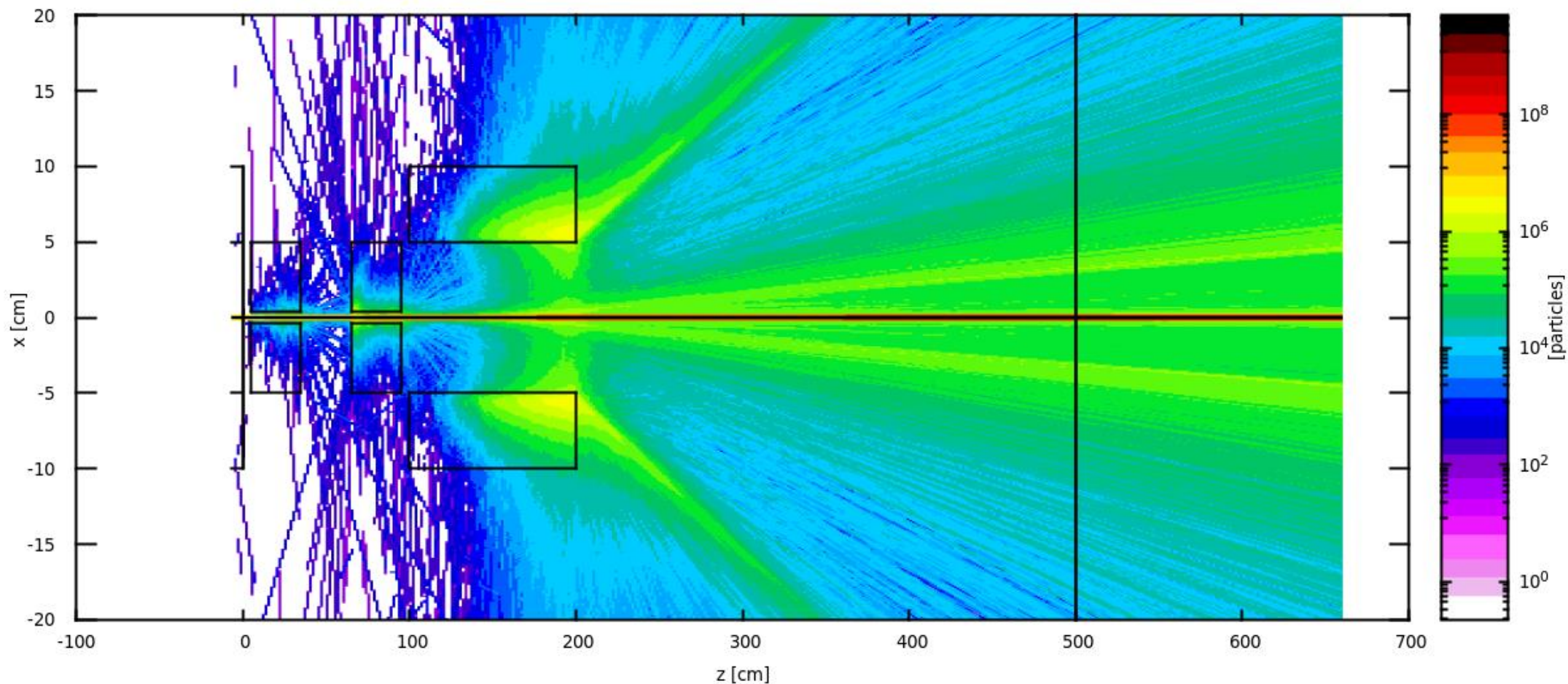


Photon Distribution - Kapton



Photon Distribution - Tungsten

Photon Transverse Distribution (17.5 GeV Photon beam , 10 μm)



Conclusions

- Not possible to mechanically place the target within the vacuum
- Placing a window with target in air produces too much background noise for measurement of electrons/positrons generated
- Target could be used as the window itself – this limits the thickness to maintain the vacuum
- In turn affects the number of e^+/e^- pairs produced for measurement
- Need to model different scintillator types to determine best response to signal