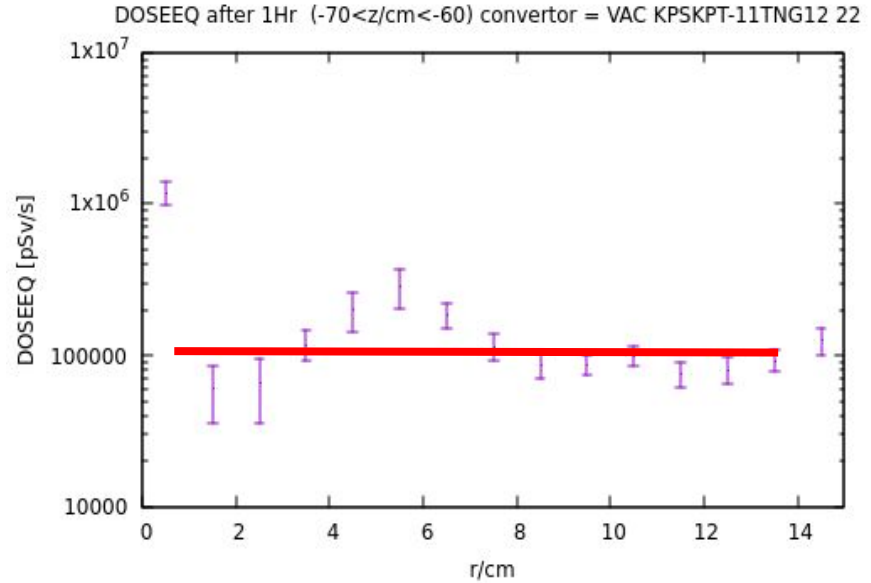
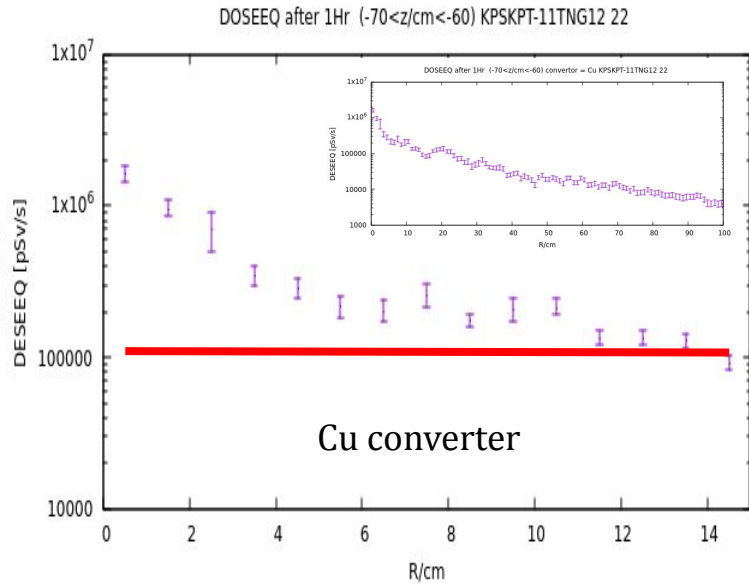


Dose and Energy Deposition  
VS  
Magnet Length and Materials  
May 6 2022

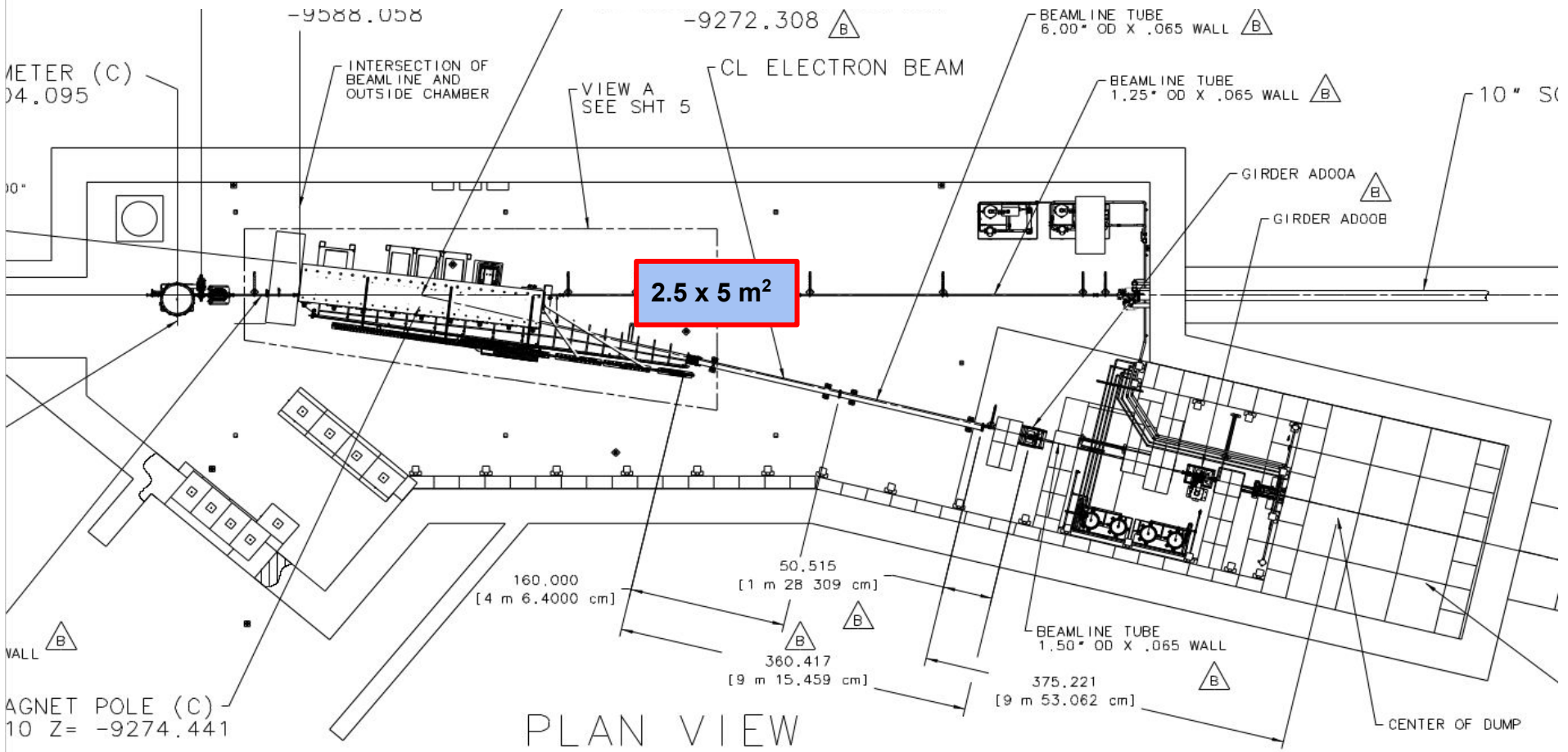
Beam FWHM=0.25 cm. Holes  $1 \times 1 \text{ cm}^2 \rightarrow 0.6 \times 0.6 \text{ cm}^2$

# Homework: Effect of Cu converter in DOSEEQ at the upstream side of the CPS.

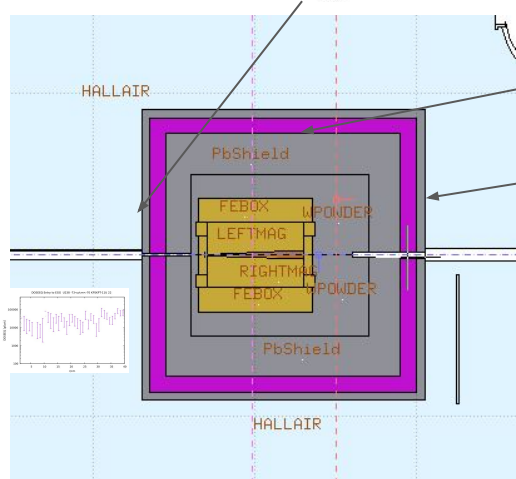
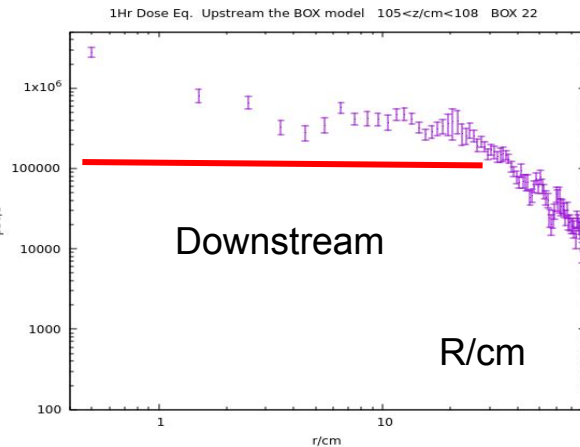
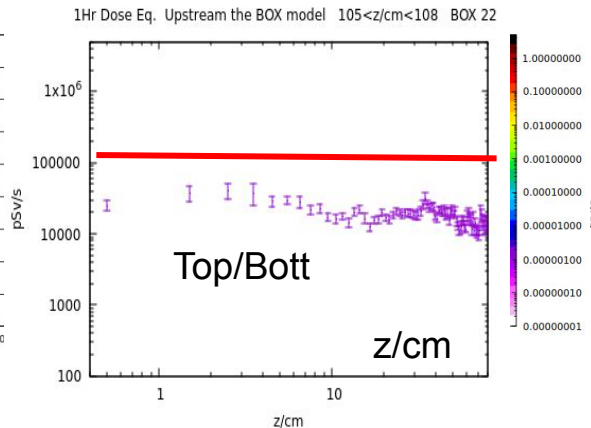
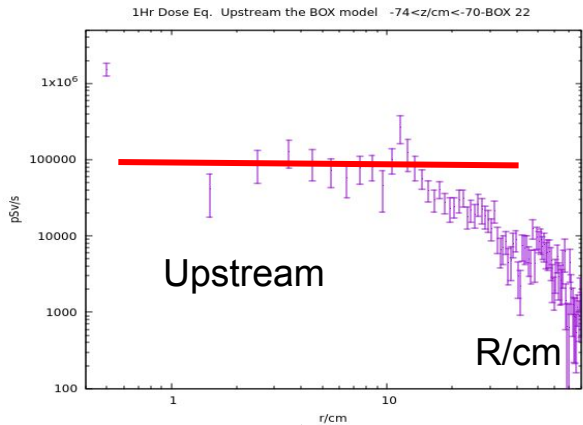


- Significantly higher ( $\sim \times 3$ ) DOSEEQ with Cu converter at  $R/\text{cm} < 5$ .

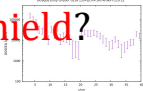
# Possible location for CPS.



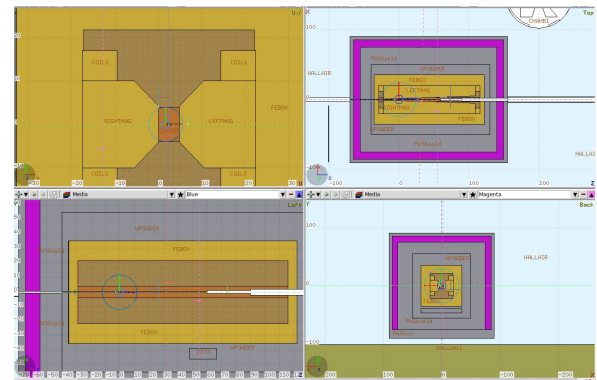
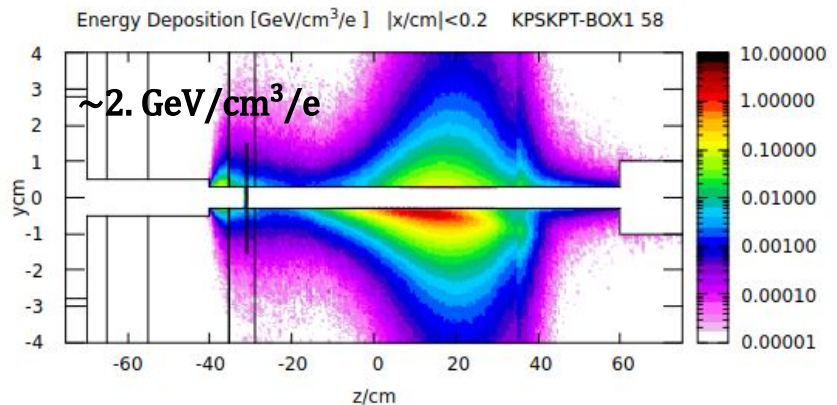
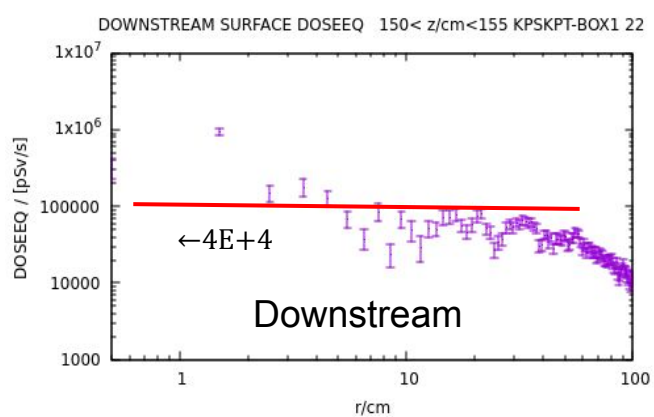
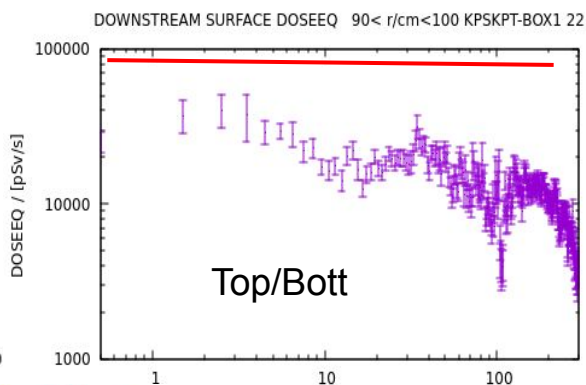
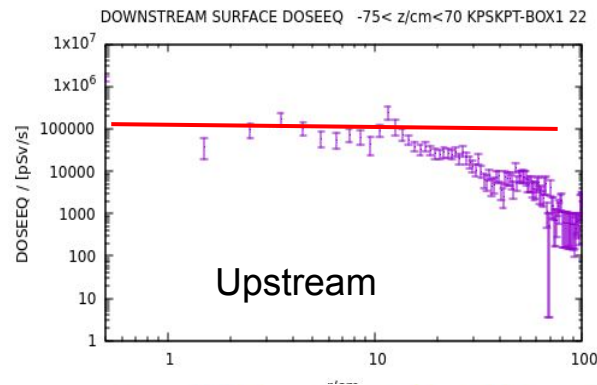
# “Practical” model. $W$ replaced with **Cu (insert) & Pb (shield)**. Reference **75 cm magnet** and field map. Beam pipe included. No Tungsten.



- DoseEq is below 36 [mrem/hr] =  $1.E+5$  [pSv/s] **except of DS** surface: 150 [mrem/hr]. Is it too high?
- May be longer Pb shield downstream helps?
- May Pb work? What would be the **Temperature of Pb shield?**

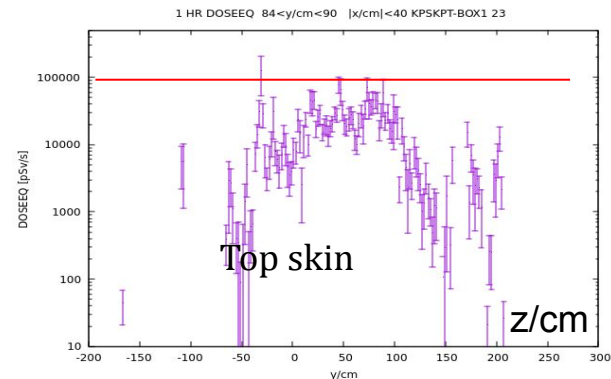
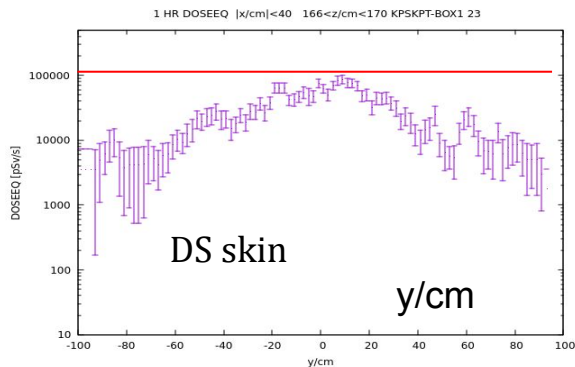
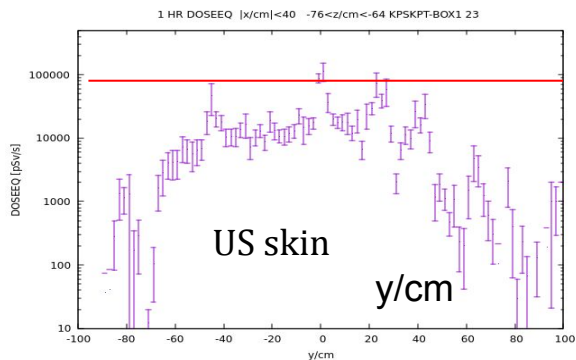
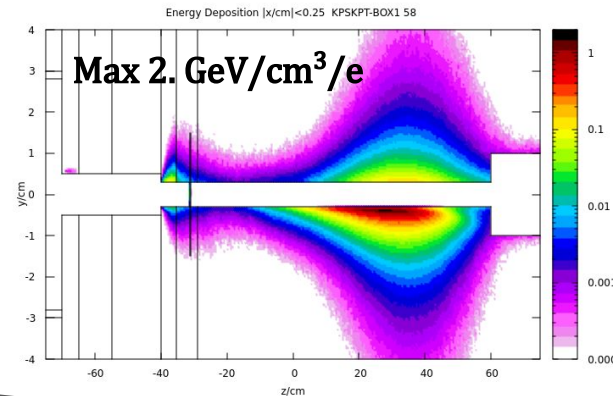
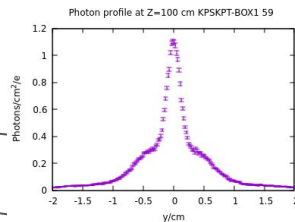
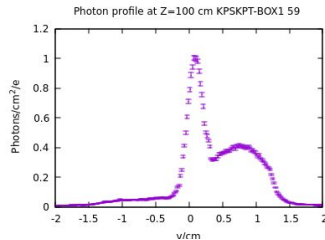
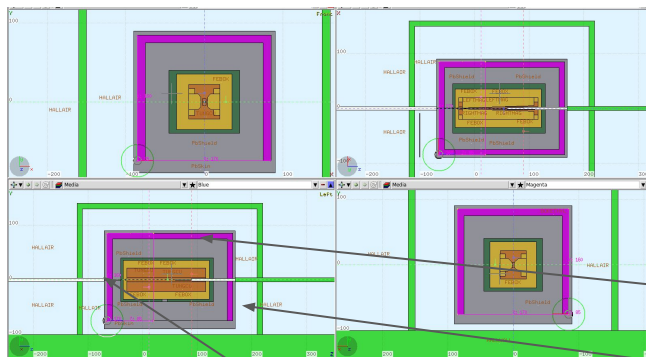


# “Practical” model. Dipole 145 cm long. Nominal field. No tungsten.



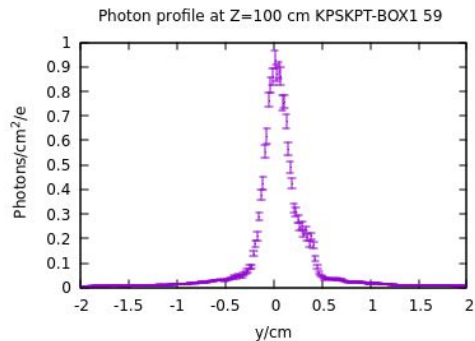
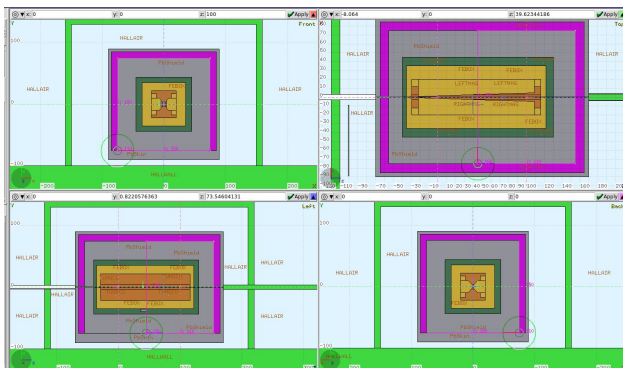
- Results in 10 times lower DOSEEQ at the downstream surface.

# “Practical” model with W shield, Cu insert, and 145 cm Dipole at 1/2 nom. B.



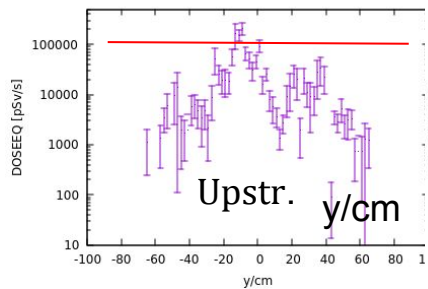
1. **Simpler magnet with twice lower field and with Cu between poles.**
2. **Dose at the surfaces is below 36. [mrem/hr] = 1.E+5 [pSv/s]. Limit: 5 [mrem/hr].**
3. **Steering field is wrong! Corrected at the next slide.**

# “Practical” model with W shield and 145 cm Dipole at $\frac{1}{2}$ nominal field.

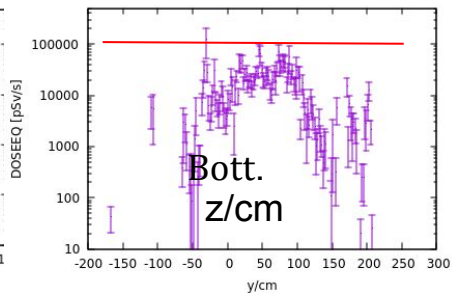


Photon Beam profile at z=100 cm

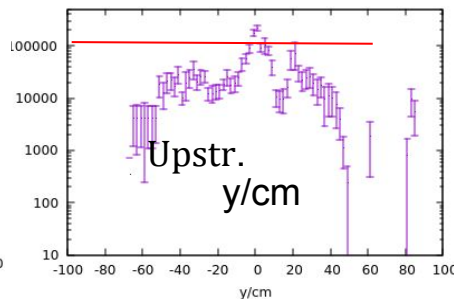
1 HR DOSEEQ  $|x/cm| < 20$   $-76 < z/cm < -60$  KPSKPT-BOX1 2



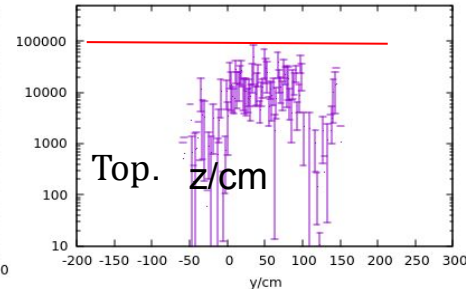
1 HR DOSEEQ  $84 < y/cm < 90$   $|x/cm| < 40$  KPSKPT-BOX1 23



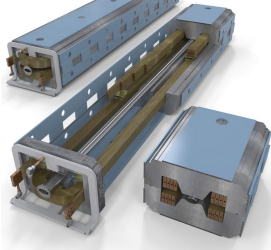
1 HR DOSEEQ  $|x/cm| < 40$   $156 < z/cm < 170$  KPSKPT-BOX1 23



1 HR DOSEEQ  $-80 < y/cm < -90$   $|x/cm| < 40$  KPSKPT-BOX1 23

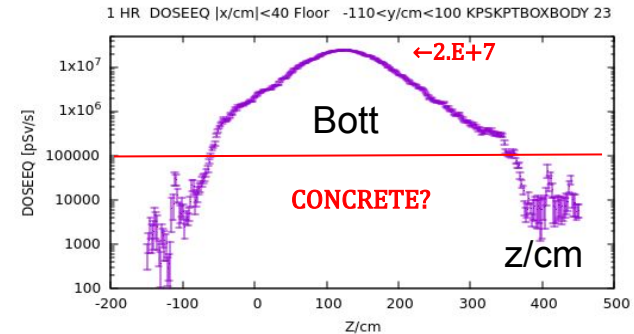
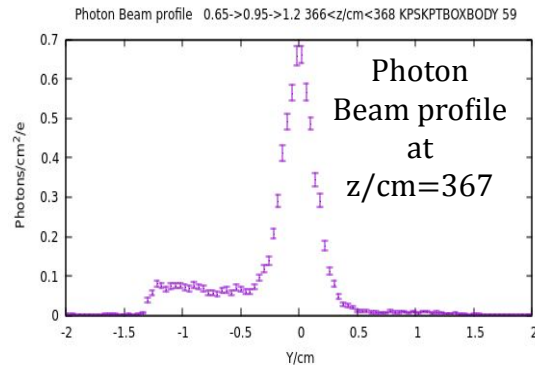
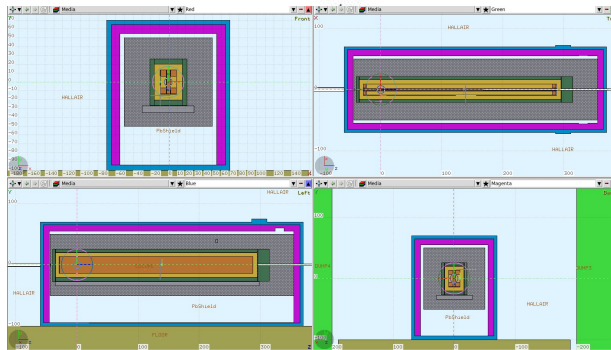
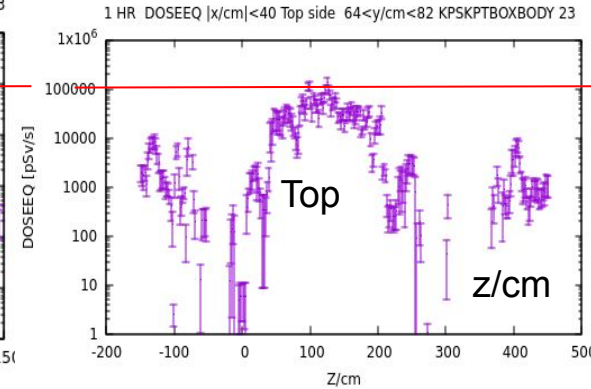
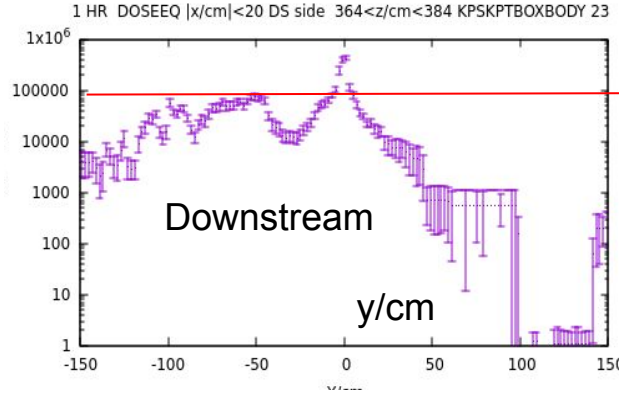
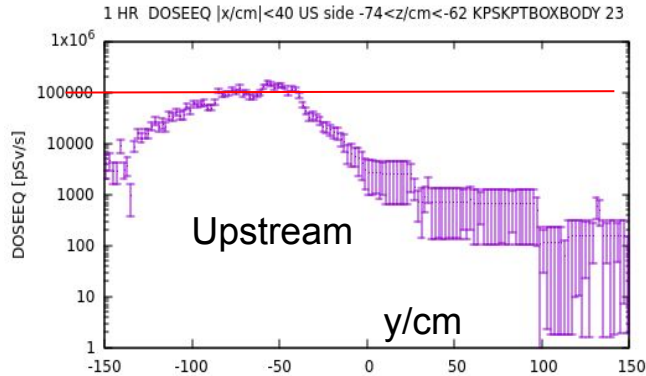


1. **Simpler magnet with twice lower field and with Cu between poles.**
2. **Dose at the surfaces is below 72. [mrem/hr] = 2.E+5 [pSv/s]. Limit: 5 [mrem/hr].**
3. **Steering field is corrected . Narrower area for  $|X|$  : 20 vs 40 cm.**



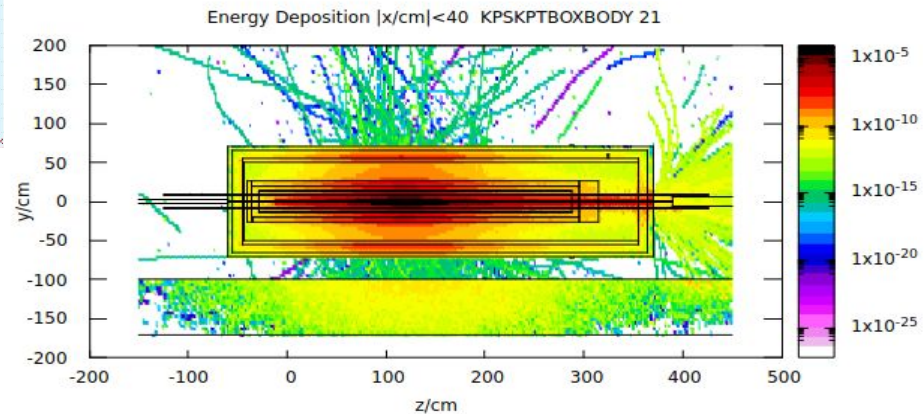
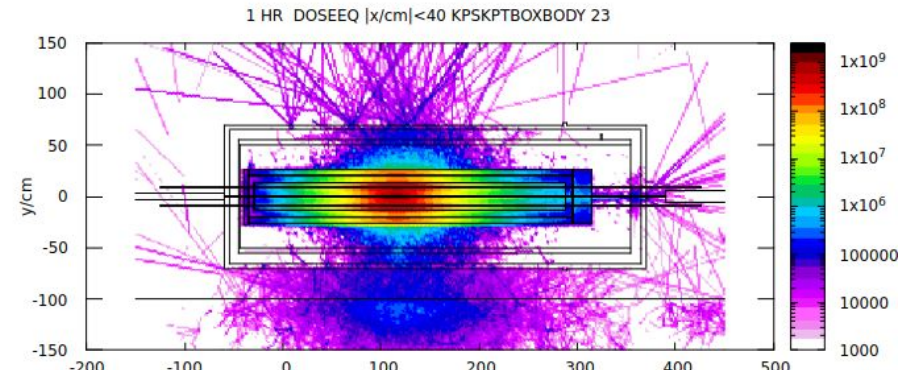
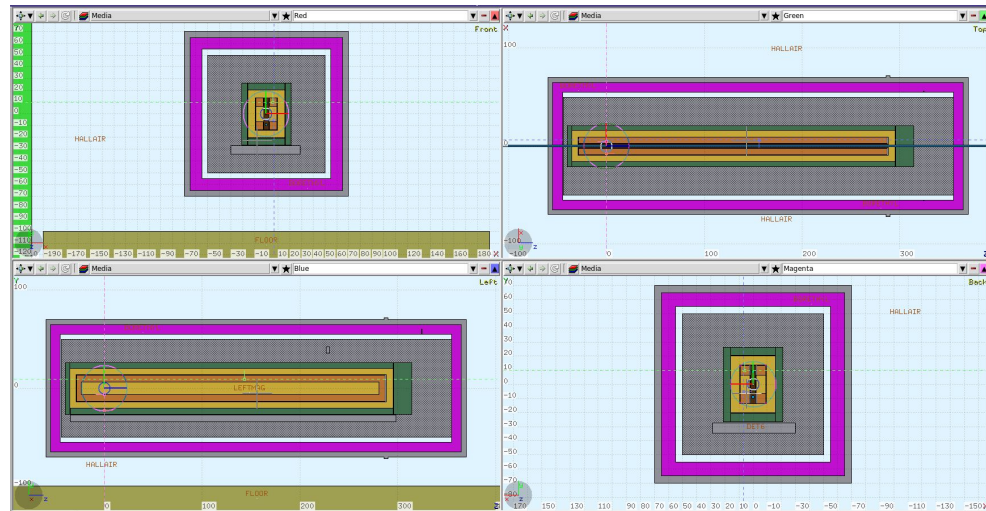
# Model with 300 cm Dipole $B=0.35$ T (Fermilab prototype).

**Cu insert. W shield. Concrete Floor.**



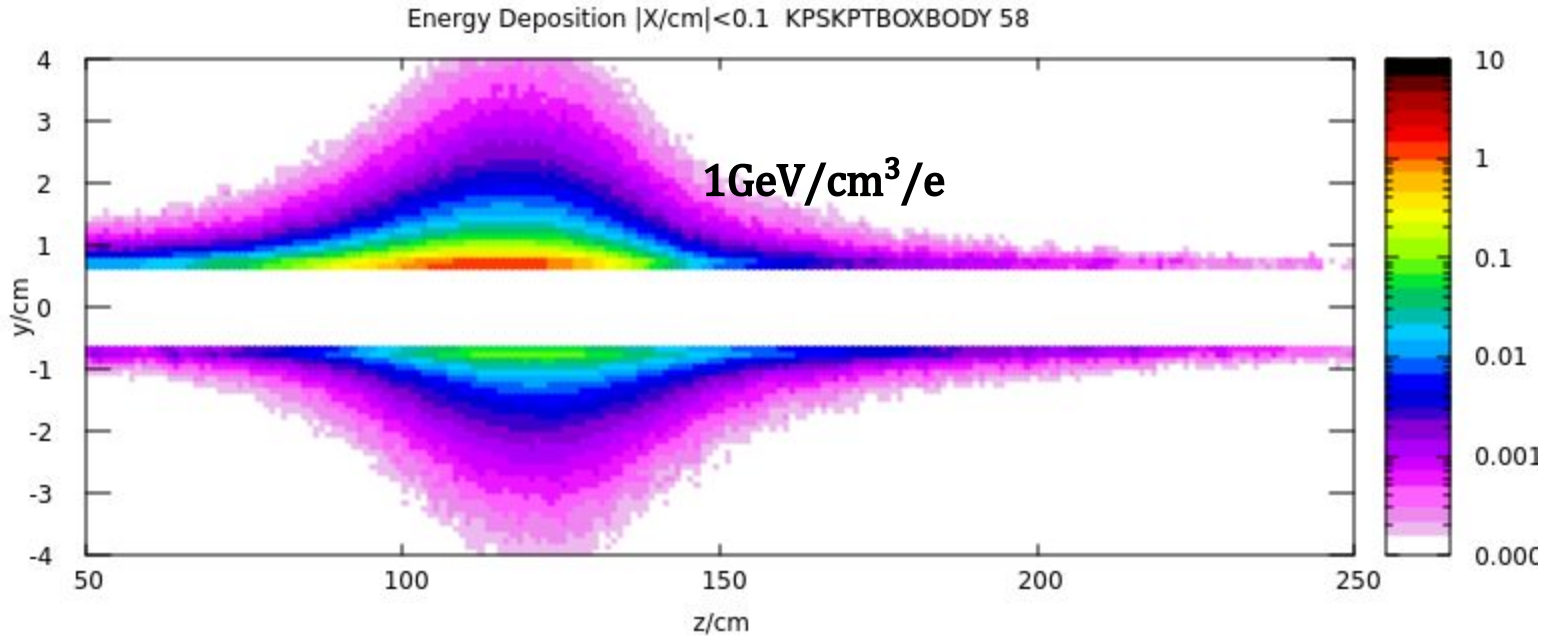


# Model with 300 cm Dipole B=0.35 T. WCu insert. W shield. Effect of Concrete Floor.



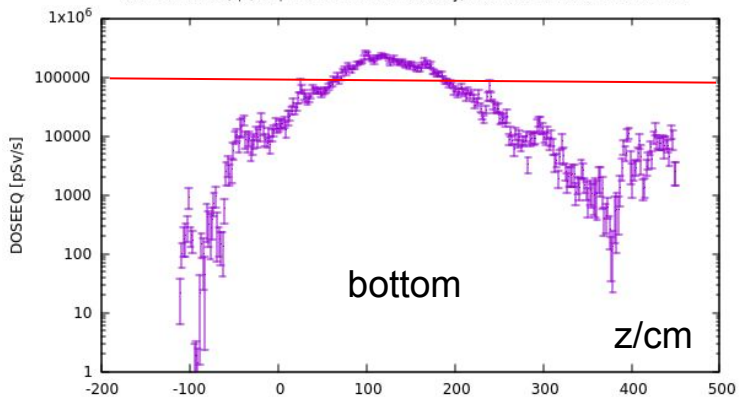
- Will check with opposite magnetic field.

Model with 300 cm Dipole  $B=0.35$  T. WCu insert. W shield.  
Energy Deposition. Beamhole  $0.65 \times 0.65$  cm<sup>2</sup>

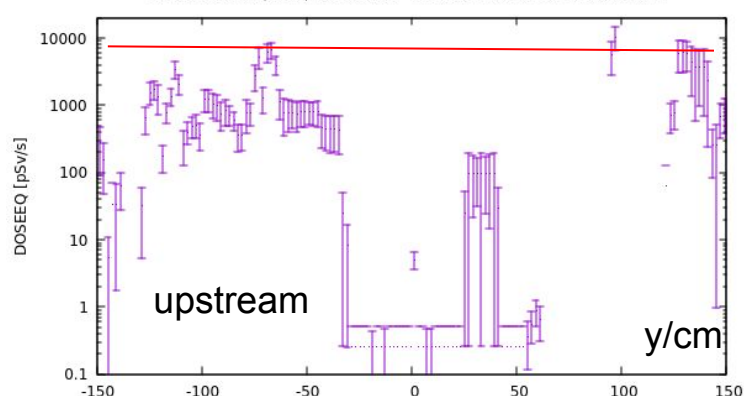


# Model with 300 cm Dipole B=0.35 T. WCu insert. W shield. Concrete Floor.

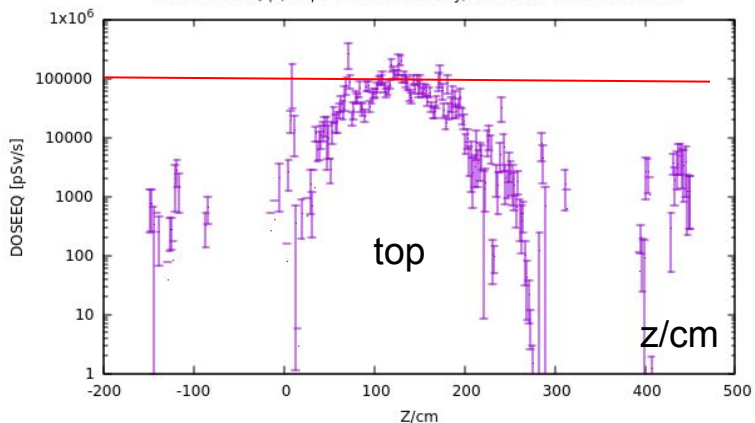
1 HR DOSEEQ  $|x/cm| < 40$  Botom side  $-110 < y/cm < -100$  KPSKPTBOXBODY 23



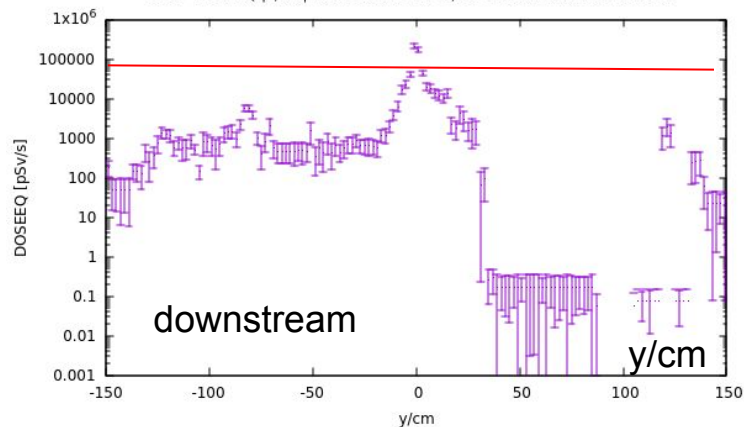
1 HR DOSEEQ  $|x/cm| < 40$  US side  $-74 < z/cm < -62$  KPSKPTBOXBODY 23



1 HR DOSEEQ  $|x/cm| < 40$  TOP side  $62 < y/cm < 72$  KPSKPTBOXBODY 23



1 HR DOSEEQ  $|x/cm| < 40$  DS side  $364 < z/cm < 384$  KPSKPTBOXBODY 23



# Future plan

- **Simple Dipole** Magnet ( **1.5 T × 1.5 m**). Design and field map using OPERA.
- Whether **W-shield** around magnet may be replaced with Pb. Temperature calculations.
- Include **concrete floor** in all FLUKA models.