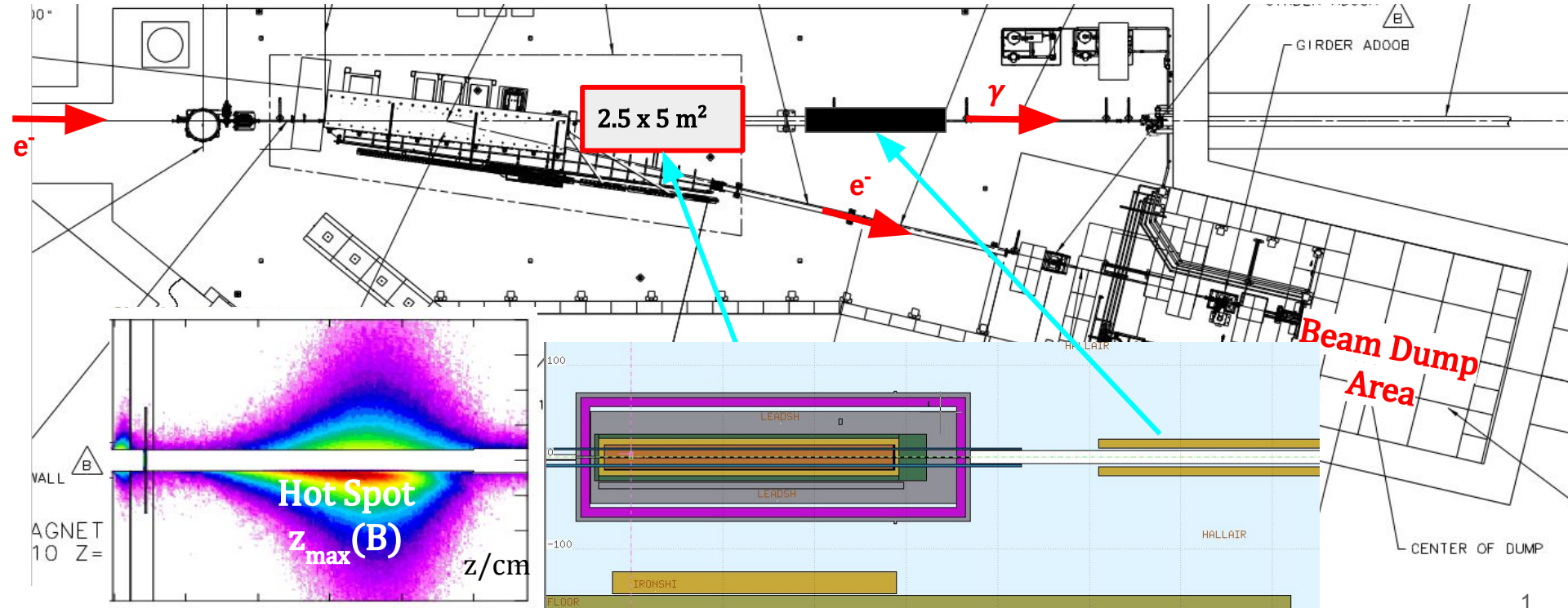


FLUKA Model for CPS-KPT.

3 m Dipole , Round Beam Chan. $r/\text{cm}=0.375 \rightarrow 0.4$ transition at $z=250$ cm.
with Permanent Magnet (.5 T) and Vacuum Beam Pipe (Al) from CPS to KPT.
Photon Radiator = first 0.134 cm of the Absorber. Coil 0.4 m.



Photon Beam Power from the absorbed energy budget And from direct FLUKA scoring (“measurement”).

- Regions of KPT are highlighted with yellow,
- The total energy deposition in KPT is 1.03 GeV.
- Corresponding Power is of 5.1 kW.

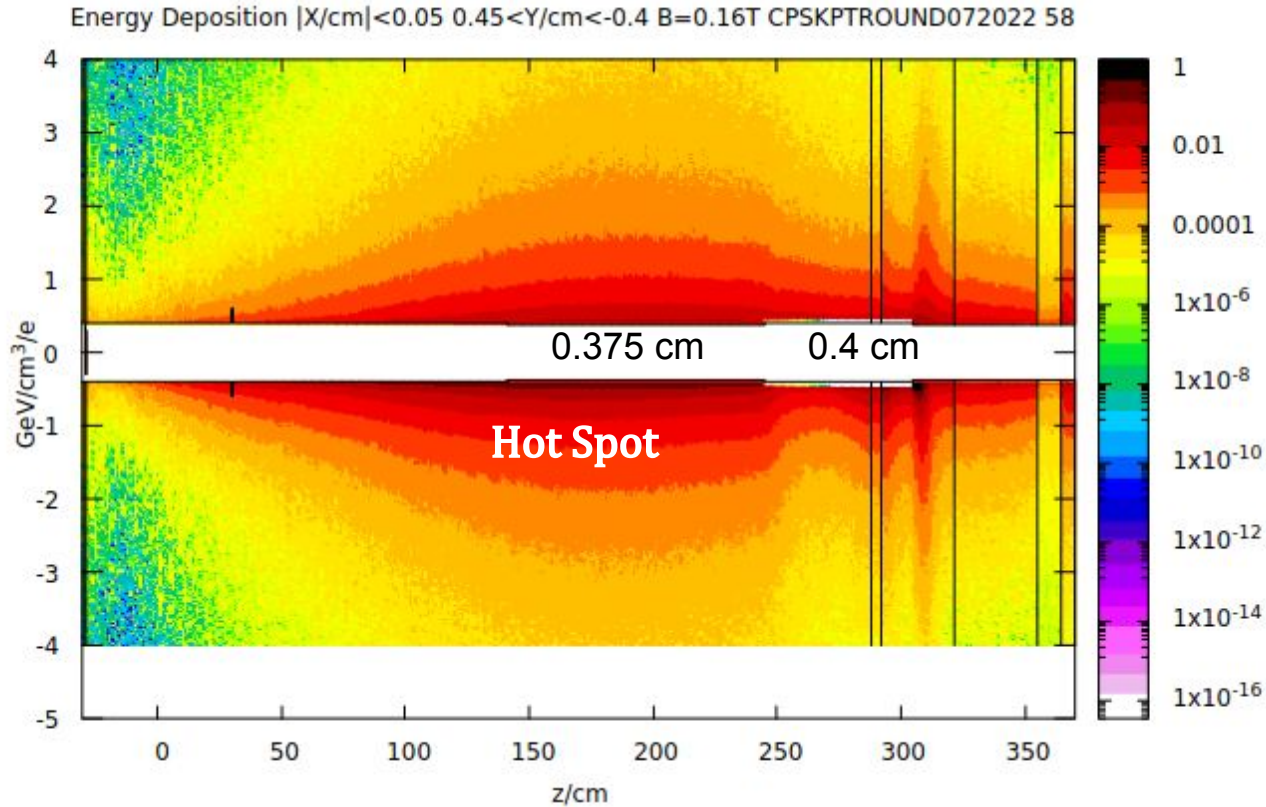
Home work

1. Photon Beam Power estimated 5 kW as Integral of T/GeV spectrum.
2. Elliptical Beam Pipe and PerMag design- new model.
3. Prompt DE Neutron Flux DS CPS - included.

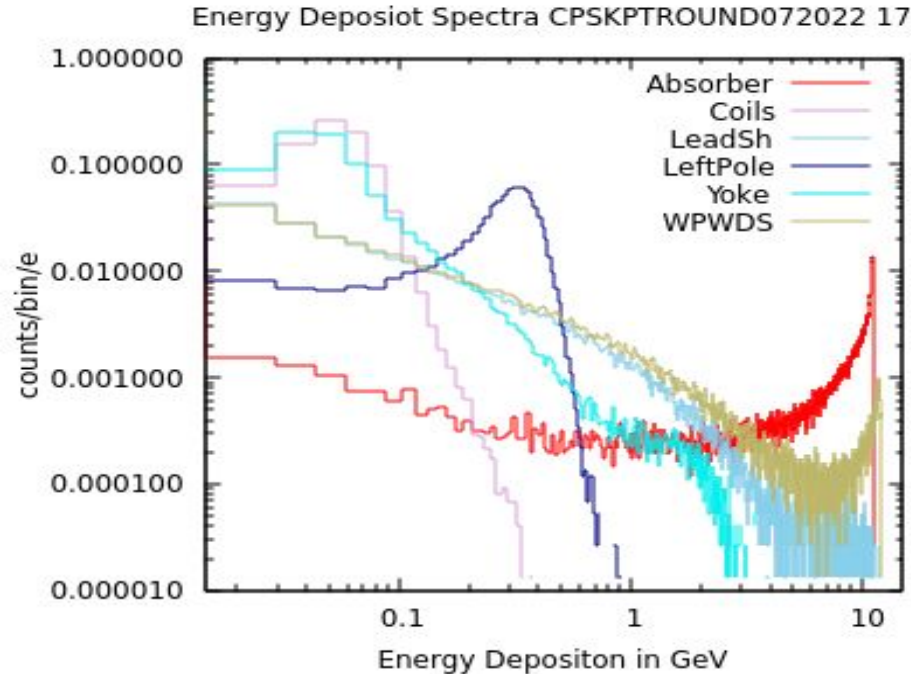
Region FLUKA	Energy/GeV SUM=	EM Energy/GeV SUM=	Photon Beam deposition/GeV	Photon Beam Power/kW
	1.20E+01	1.1958E+01	1.03	5.14116535
22RIGHTMAG	0.2597	0.2588		
23LEFTMAG	0.2609	0.2600		
24CUCORE	7.9566	7.9462		
25COILS	0.0495	0.0490		
26TUNGCU	0.0000	0.0000		
27FEBOX	0.1064	0.1054		
28DET1	0.0014	0.0014		
29DET2	0.0015	0.0014		
30DET3	0.0037	0.0036		
31DET4	0.0037	0.0036		
32DET5	0.0000	0.0000		
33DET6	0.0001	0.0001		
34WENTDET	0.0000	0.0000		
35LEADSH	0.3461	0.3456		
36PbShield	0.0000	0.0000		
37BORETHYL	0.0126	0.0103		
38PbSkin	0.0789	0.0788		
39DUMP	0.0000	0.0000		
40HALLAIR	0.0130	0.0130		
41HALLWALL	0.0760	0.0757		
42CHAMENT	0.0000	0.0000		
43CHAMWIN	0.0000	0.0000		
44CHAMBO	0.0000	0.0000		
45TGCOIL	0.0000	0.0000		
46CHAMBI	0.0000	0.0000		
47HETUBE	0.0000	0.0000		
48HEBATH	0.0000	0.0000		
49TARGET	0.0000	0.0000		
50VOID	0.0234	0.0232		
51BLKBODY	0.0000	0.0000		
52DUMP2	0.0000	0.0000		
53DUMP3	0.0034	0.0034		
54DUMP4	0.0032	0.0031		
55DUMP5	0.0039	0.0038		
56CUCORE1	1.79E-02	1.78E-02		
57CUCORE2	1.75E-02	1.75E-02		
58IRONSHI	1.36E-05	9.71E-06		
1BORATE	3.64E-05	2.07E-07		
2PERMAG	3.14E-01	3.13E-01		
3WPSHDS	1.32E+00	1.32E+00		
4WPSHUS	2.57E-03	2.56E-03		
5BEP1P1	2.81E-10	2.15E-10		
6BEP1P2	6.59E-02	6.58E-02		
7DUMP1	7.98E-03	7.94E-03		
8WTRP1	3.51E-04	2.93E-04		
9FLOOR	2.21E-03	2.19E-03		
10CONVE1	1.68E-03	1.68E-03		
11WTRP2	3.82E-04	3.22E-04		
12BEVAC1	0.00E+00	0.00E+00		
13BEVAC2	0.00E+00	0.00E+00		
14LEAD	1.16E-03	1.10E-03		
15BERILL	5.16E-02	5.11E-02		
16TUNGSTEN	9.32E-01	9.31E-01		
17KPTAIR	4.37E-02	4.18E-02		
18BEAMHOLE	0.00E+00	0.00E+00		
19BEAMHOL1	0.00E+00	0.00E+00		
20RADIATOR	0.00E+00	0.00E+00		
21RADIAT	0.00E+00	0.00E+00		

FLUKA Model for CPS-KPT.

Effect of 0.375 cm \rightarrow 0.4 cm transition at Z=250 cm/



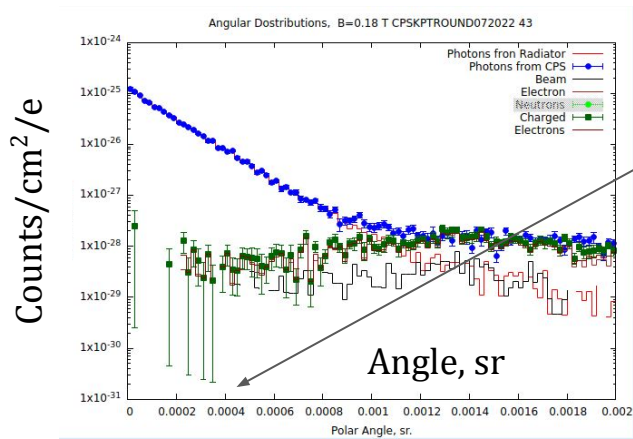
Energy Deposition Spectra in CPS parts. Round beam channel $r=0.375$ cm.



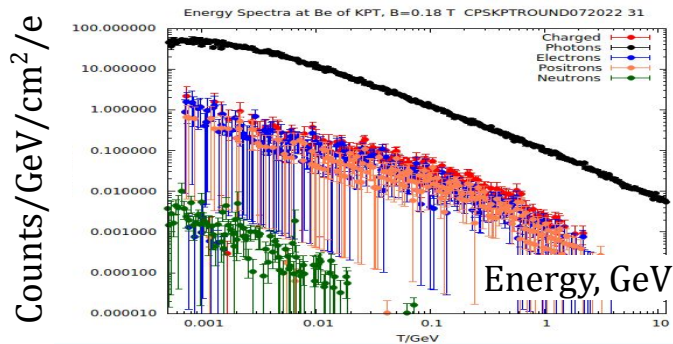
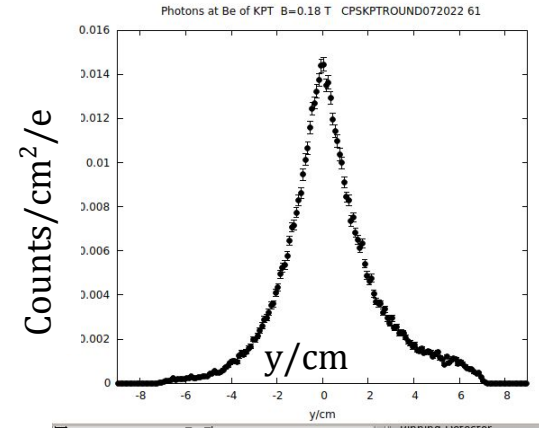
1 BORATE	1.000000000D+00	0.000000000D+00	3.698459538D-05
2 PERMAG	1.000000000D+00	6.076559895D-02	3.334726216D-01
3 WPSHDS	1.000000000D+00	3.523454764D-01	1.207746487D+00
4 WPSHUS	1.000000000D+00	1.623755089D-03	5.635708121D-03
5 BEPIP1	1.000000000D+00	0.000000000D+00	1.005963809D-09
6 BEPIP2	1.000000000D+00	1.699526618D-02	6.852670872D-02
7 DUMP1	1.000000000D+00	0.000000000D+00	8.108775427D-03
8 WTRPI1	1.000000000D+00	6.641723802D-05	4.170173690D-04
9 FLOOR	1.000000000D+00	4.072932749D-04	2.163544766D-03
10 CONVE1	1.000000000D+00	6.998641598D-05	1.683055400D-03
11 WTRPI2	1.000000000D+00	6.135694232D-05	3.954379211D-04
14 LEAD	1.000000000D+00	2.352919900D-03	1.145687546D-03
15 BERILL	1.000000000D+00	1.303095679D-02	5.136931069D-02
16 TUNGST	1.000000000D+00	2.645317132D-01	9.129917674D-01
17 KPTAIR	1.000000000D+00	0.000000000D+00	4.413590652D-02
22 RIGHTMA	1.000000000D+00	4.237465552D-02	2.633628902D-01
23 LEFTMAG	1.000000000D+00	4.319759141D-02	2.632272385D-01
24 CUCORE	1.000000000D+00	1.751203501D+00	8.039825409D+00
25 COILS	1.000000000D+00	1.626591076D-02	5.042978578D-02
27 FEBOX	1.000000000D+00	3.667430206D-02	1.133913809D-01

- About 46 KW (FLUKA estimate) of beam energy is deposited in the Absorber and DS Tung. Pow. Shield.
- About 1.3 kW is deposited in One Magnet Pole 3 m long and 0.5 kW in Magnet Yoke. Total about 3.5 kW in Magnet.

Round beam channel $r=0.375$ cm. Photon Beam Quality.



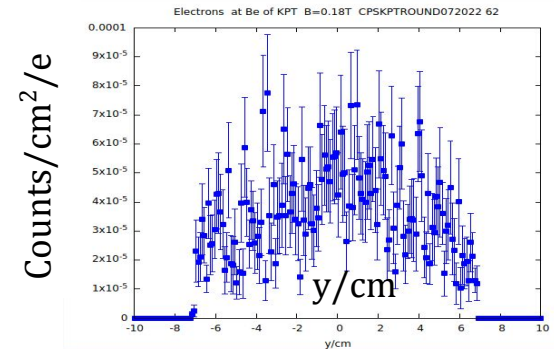
Acceptance of KPT $r=2.5$ cm
or
 0.004 rad



Integrated Photon Spectrum yields

1.0071515647 GeV/electron

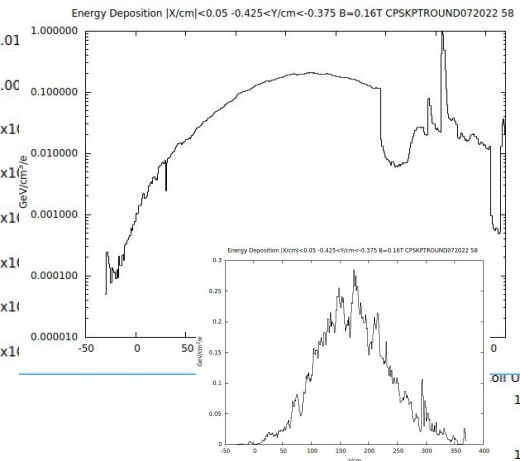
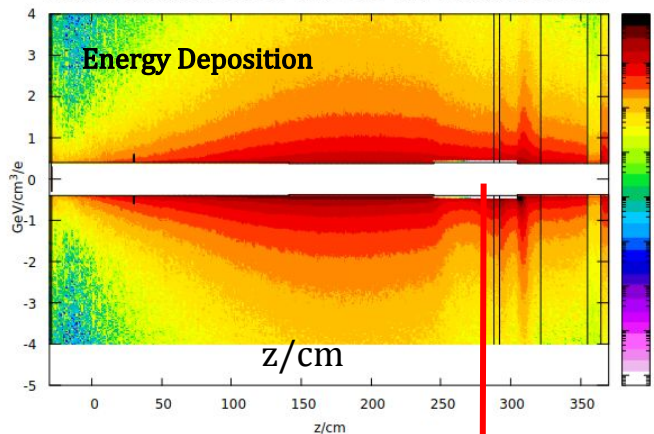
That corresponds to
 5 kW
of photon beam.



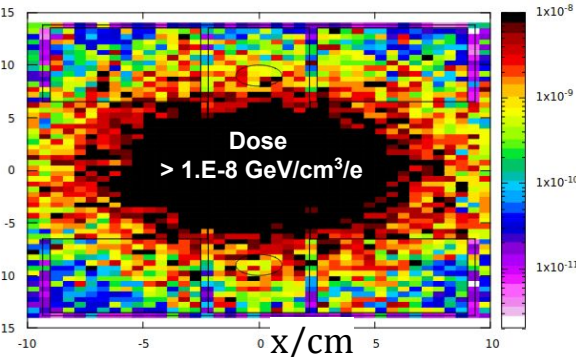
- Photon Beam profile is OK. Little shoulder at positive “y” out of the KPT acceptance.
- **Background** of Charged Particles at KPT $\sim 1\text{-}3\%$. Same **true** for Reference Hall C design. Effect of **beam pipe**?

Round beam channel $r=0.375$ cm. Energy Deposition & Insulation Lifetime.

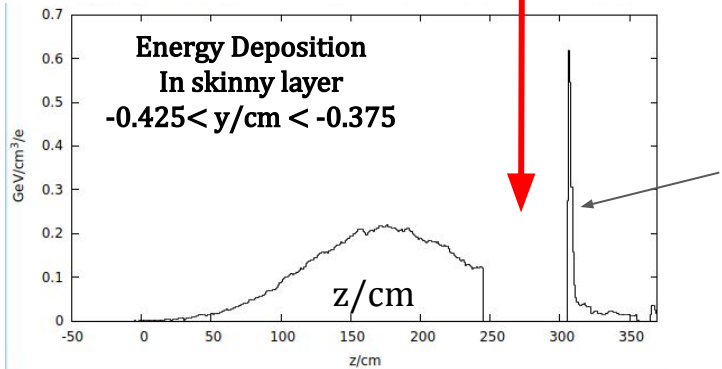
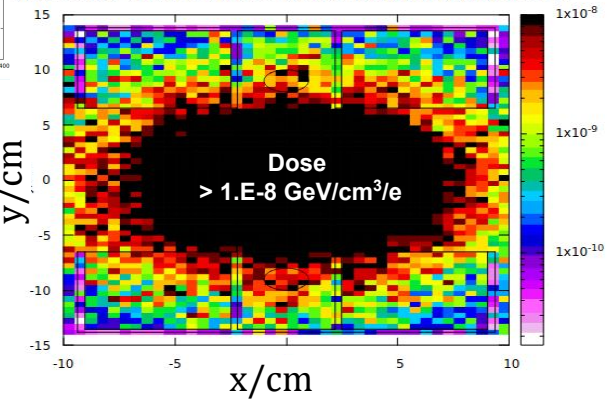
Energy Deposition $|X/cm| < 0.05$ $0.45 < Y/cm < -0.4$ $B=0.16T$ CPSKPTRROUND072022 58



Coil US $B=0.18 T$ $-25 < Z/cm < -20$ Black = $1.E-8$ $[GeV/cm³/e]$ CPSKPTRROUND072022 28



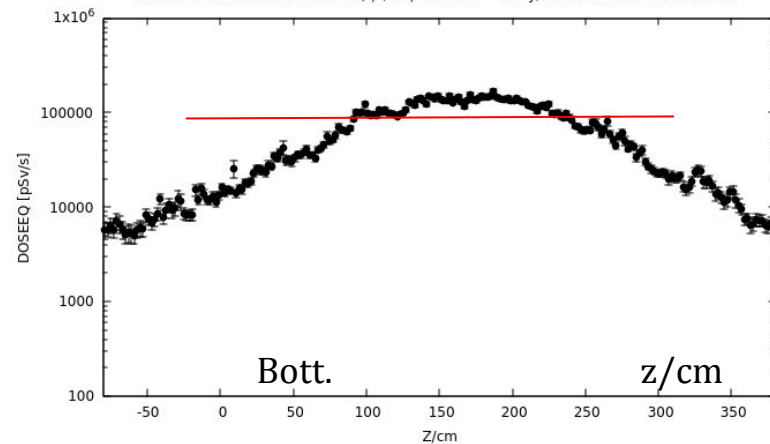
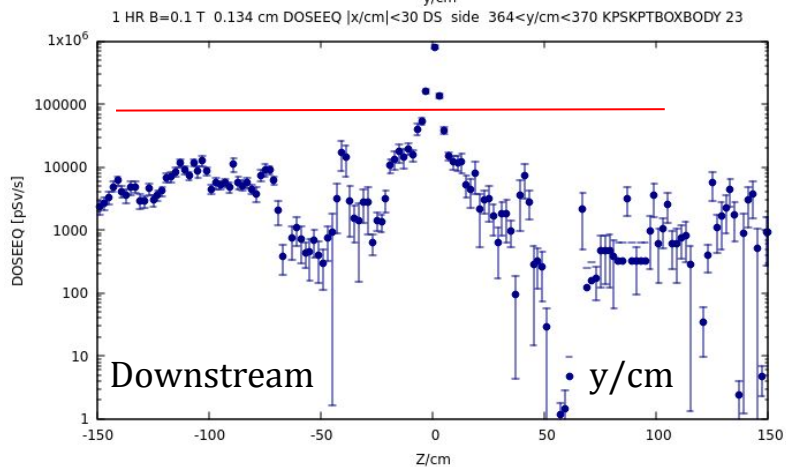
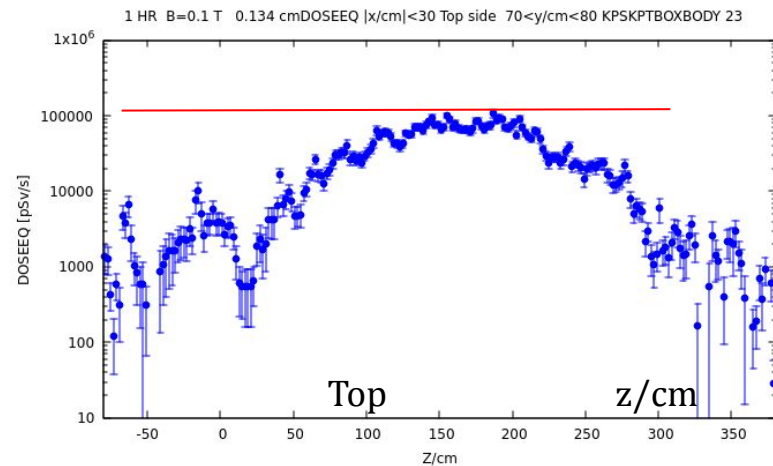
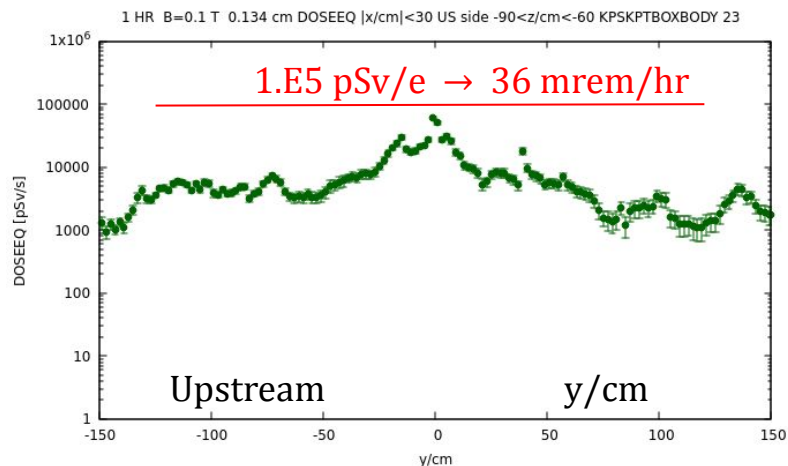
Coil US $B=0.18 T$ $+10 < Z/cm < +15$ Black = $1.e-8$ $[GeV/cm³/e]$ CPSKPTRROUND072022 28



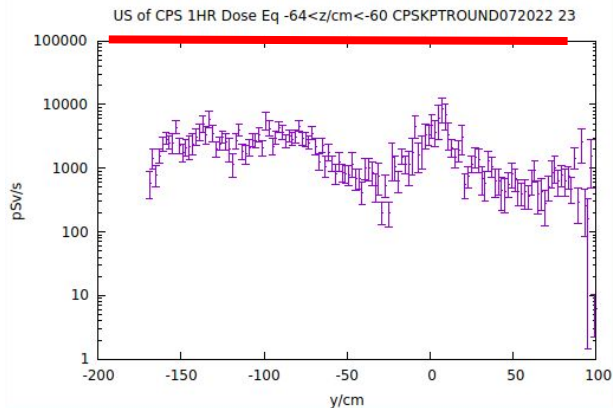
This spike
Results in higher Dose
Downstream the CPS.
To be fixed.

- Max. Energy Dep. is **consistent** with that given for **squared beam** channel in ["https://www.overleaf.com/project/62acf5358f0842034a10659b"](https://www.overleaf.com/project/62acf5358f0842034a10659b)
- From this draft it follows that Insulation **Lifetime** ~ 1160 days at $2.E-8$ $GeV/cm³/e$.
- In this case we expect ~ 2300 days if continuous operation.

After One Hr Dose Equivalent is below 100 mrem/hr . Dipole 3 m \times 0.1 T.



After One Hr Dose Equivalent is below 100 mrem/hr . Dipole 0.4 m × 0.18 T. Round Beam Channel.



1.E5 pSv/e → 36 mrem/hr

