Non-integrated horn: power deposition and fluxes

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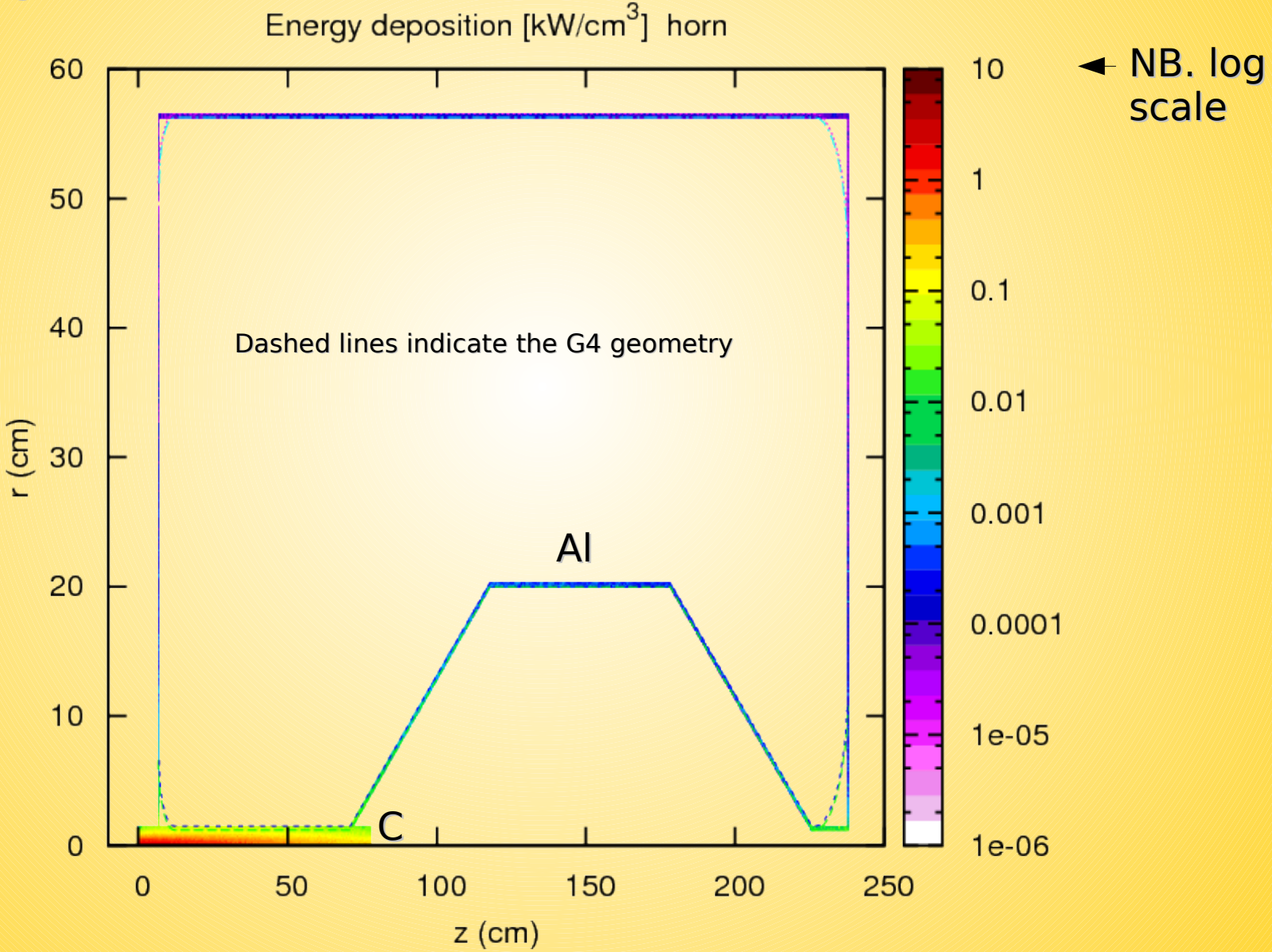
New studies on the separated target solution

- Energy deposition maps with inner conductor radius r=3 cm as proposed in the last meeting (B starts at r = 3.3 cm)
  - A thicker conductor with water gap also studied (suggestion by Piotr/Adam)
  - Cross-check with Christoph's maps
- Neutrino fluxes for this setup and increased current values (up to 400 kA)
- Comparison of sensitivities: work in progress

Integrated target

R_1 = 1.2 cm
R^{tg} = 1.2 cm
t_1 = 3 mm Al skin

1.3 MW at 4.5 GeV proton energy. Gaussian beam with σ = 4 mm
Same as in my last presentation.



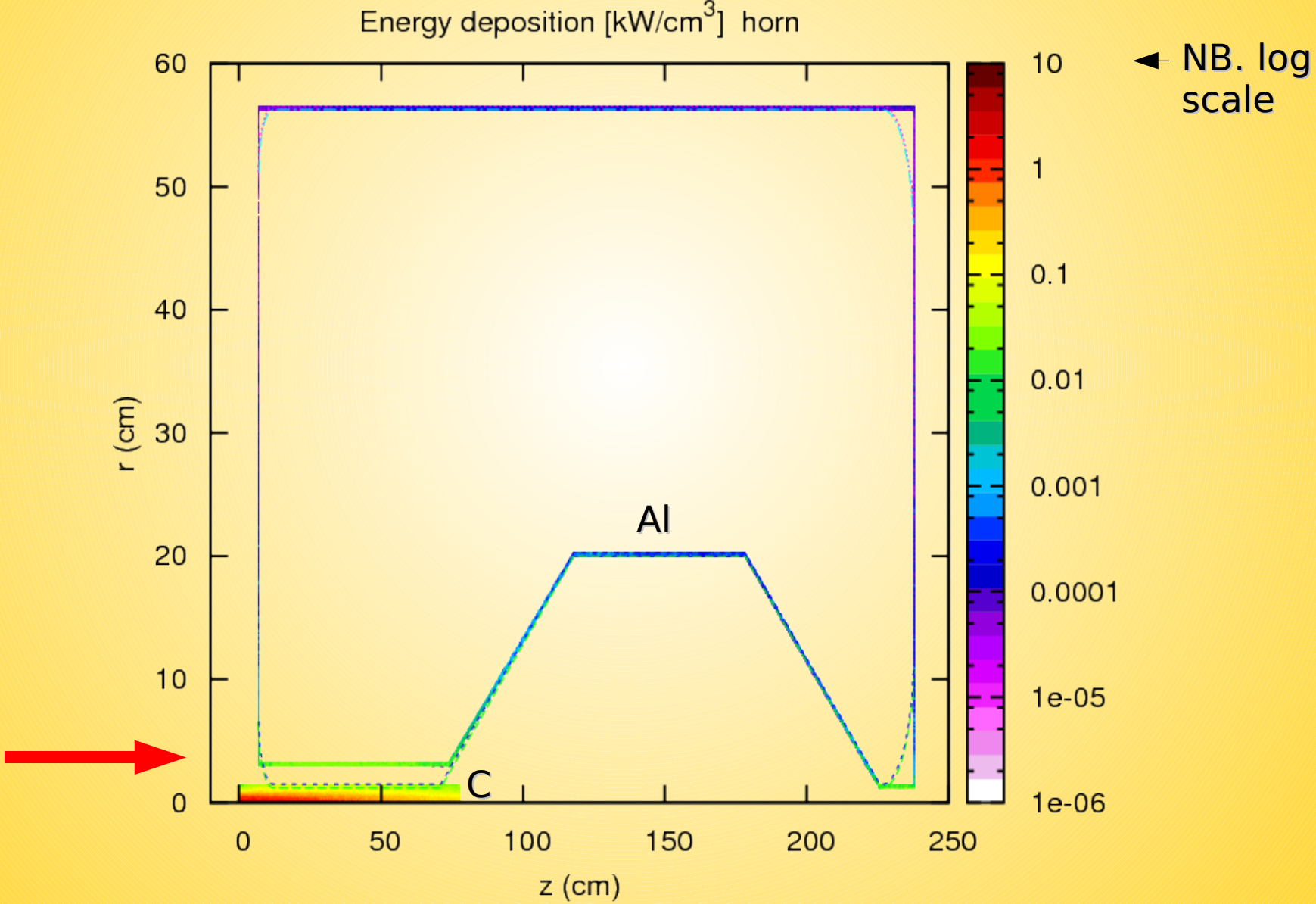
◄ NB. log scale

Separated target

R_1 = 3 cm as agreed during the last phone meeting in december

R^{tg} = 1.5 cm

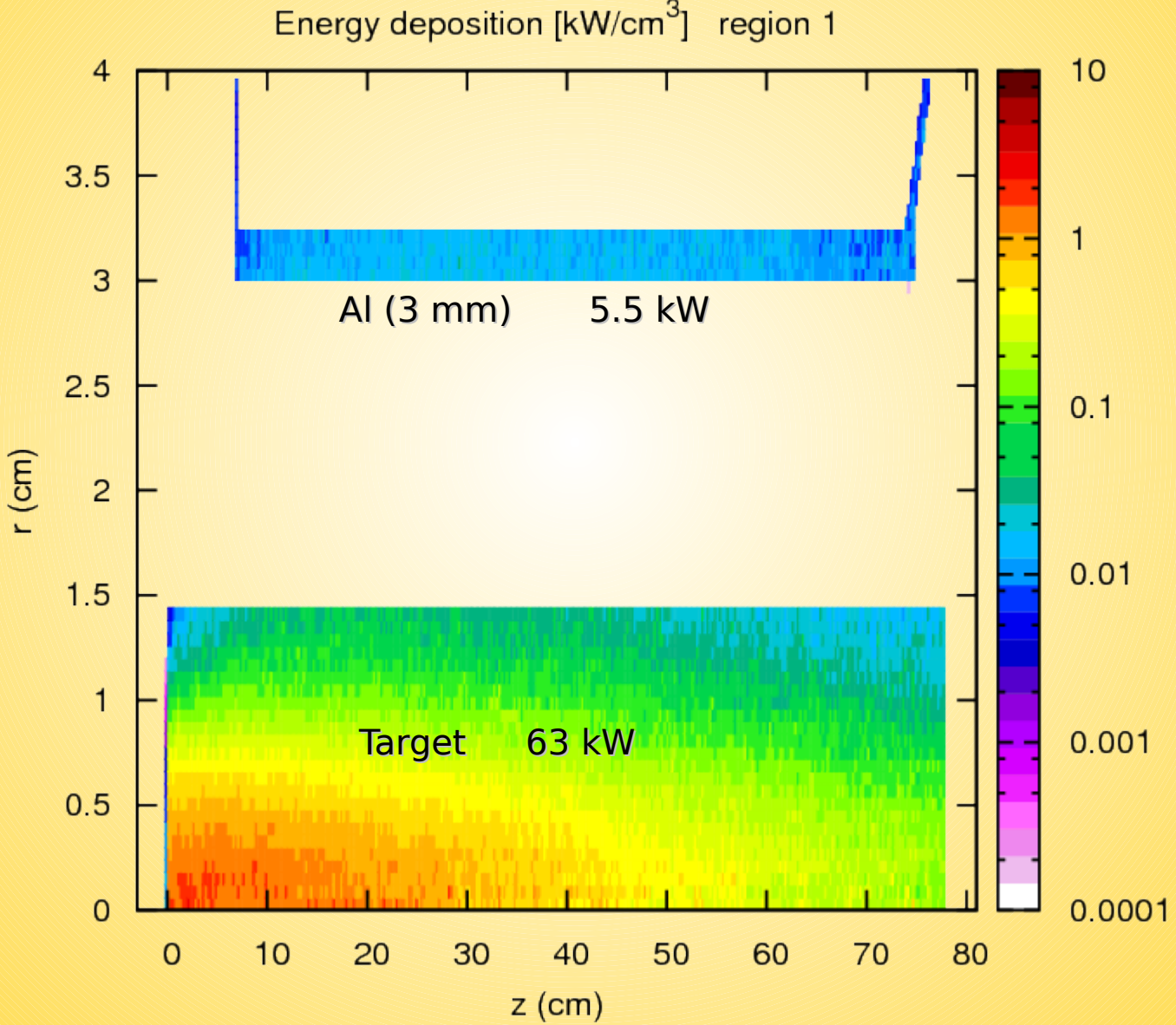
t_1 = 3 mm Al skin



◄ NB. log scale

Separated target: zoom

Inner radius 3 cm
(magnetic field starts at 3.3 cm)

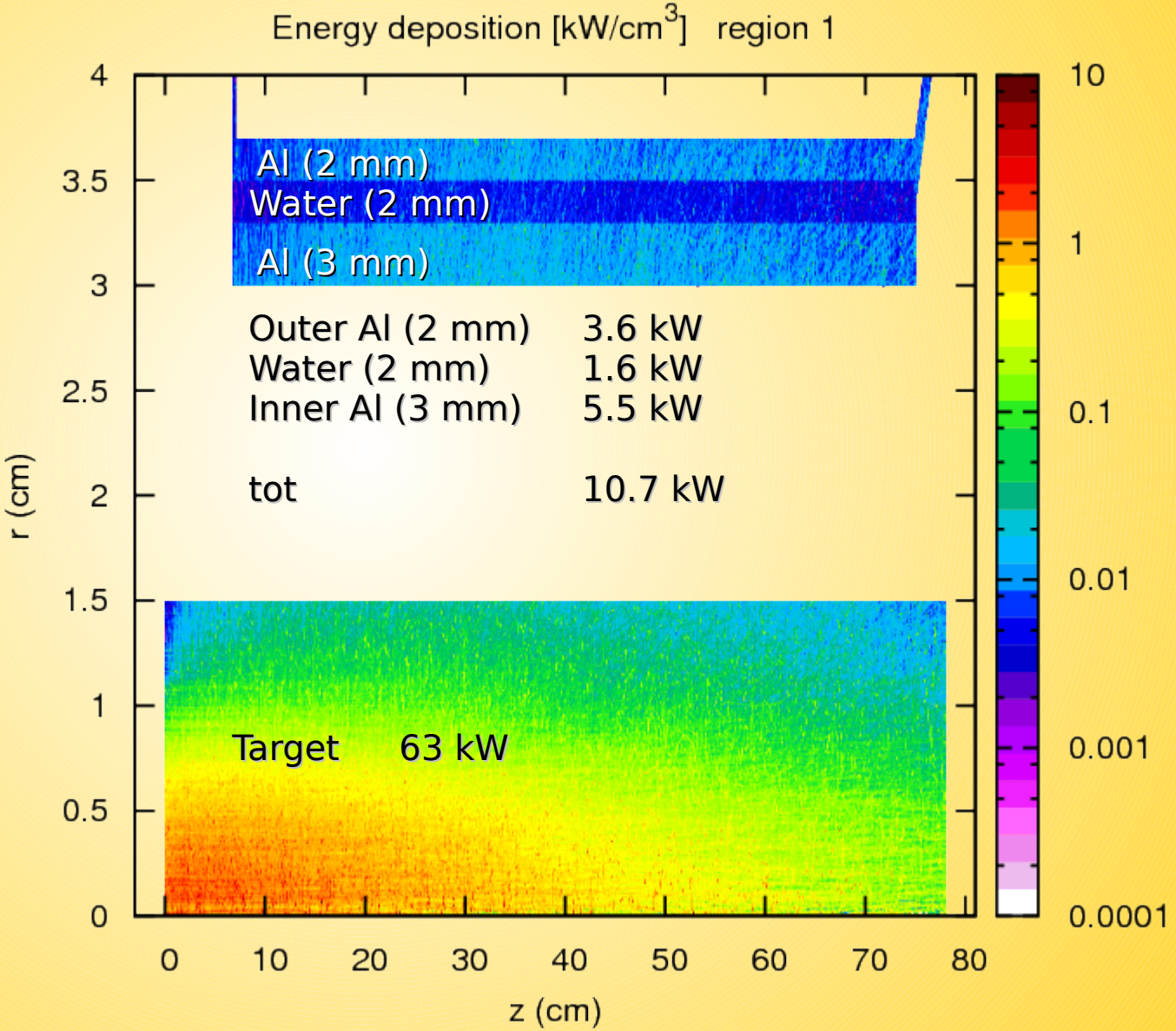


Separated target with water skin inner conductor

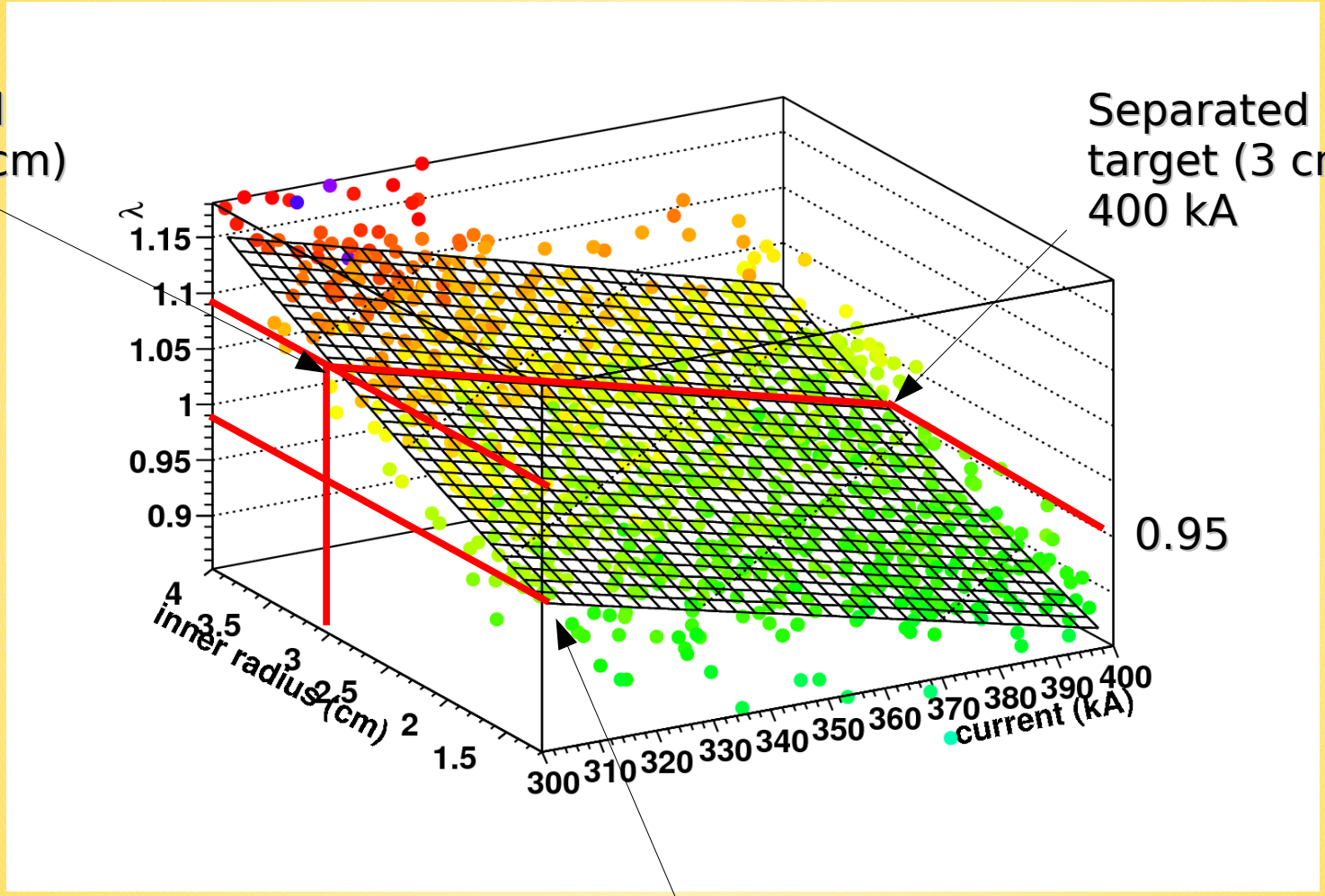
Request and dimensions by Piotr/Adam

Cross check: results are in agreement with the previous study by Christoph after rescaling for the differences in the considered volumes and the different radiuses

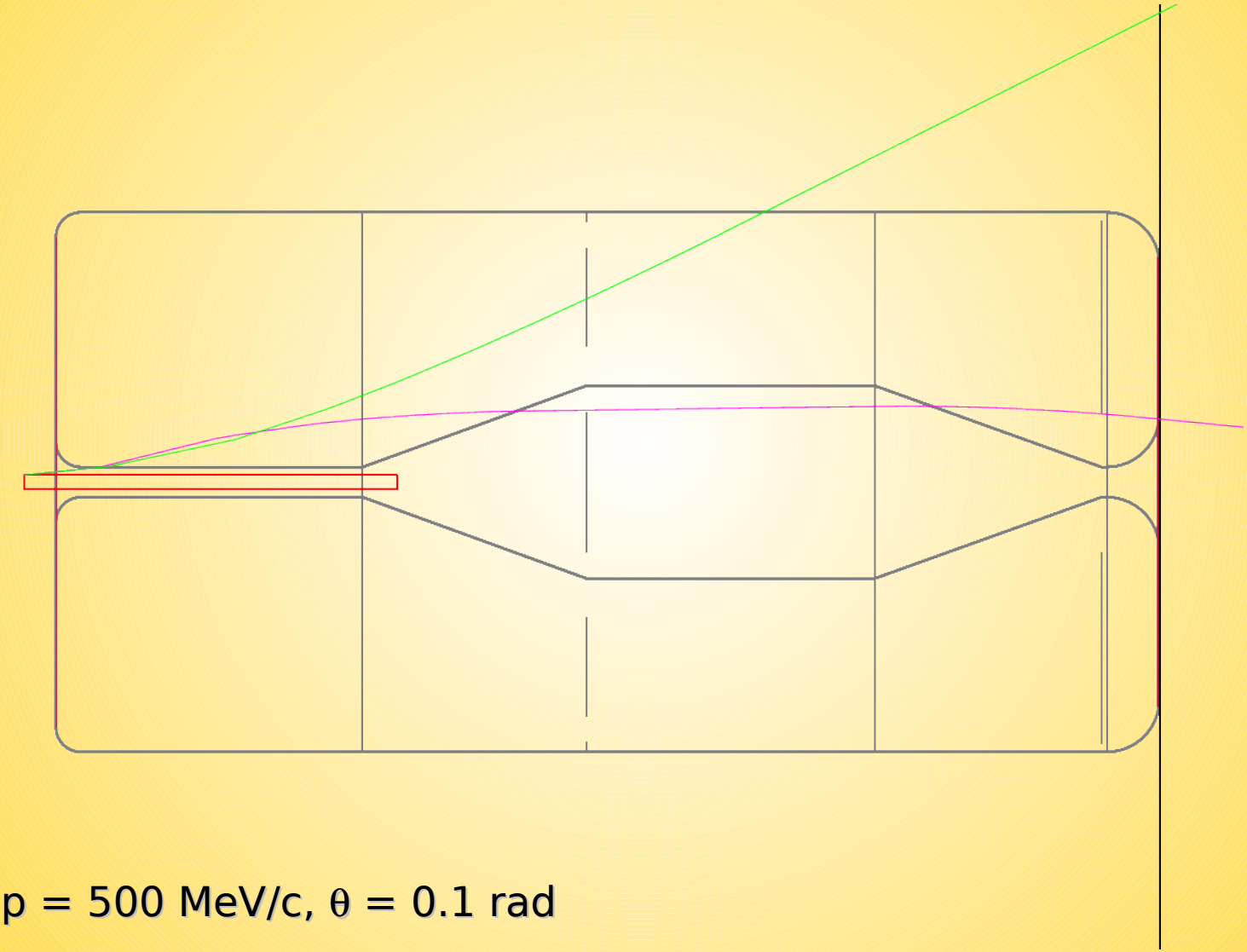
Full FLUKA simulation with water skin not done for the other horn conductors. Nevertheless numbers can be easily derived “by hand” scaling available data with single Al skin



Recovering performance by increasing the current



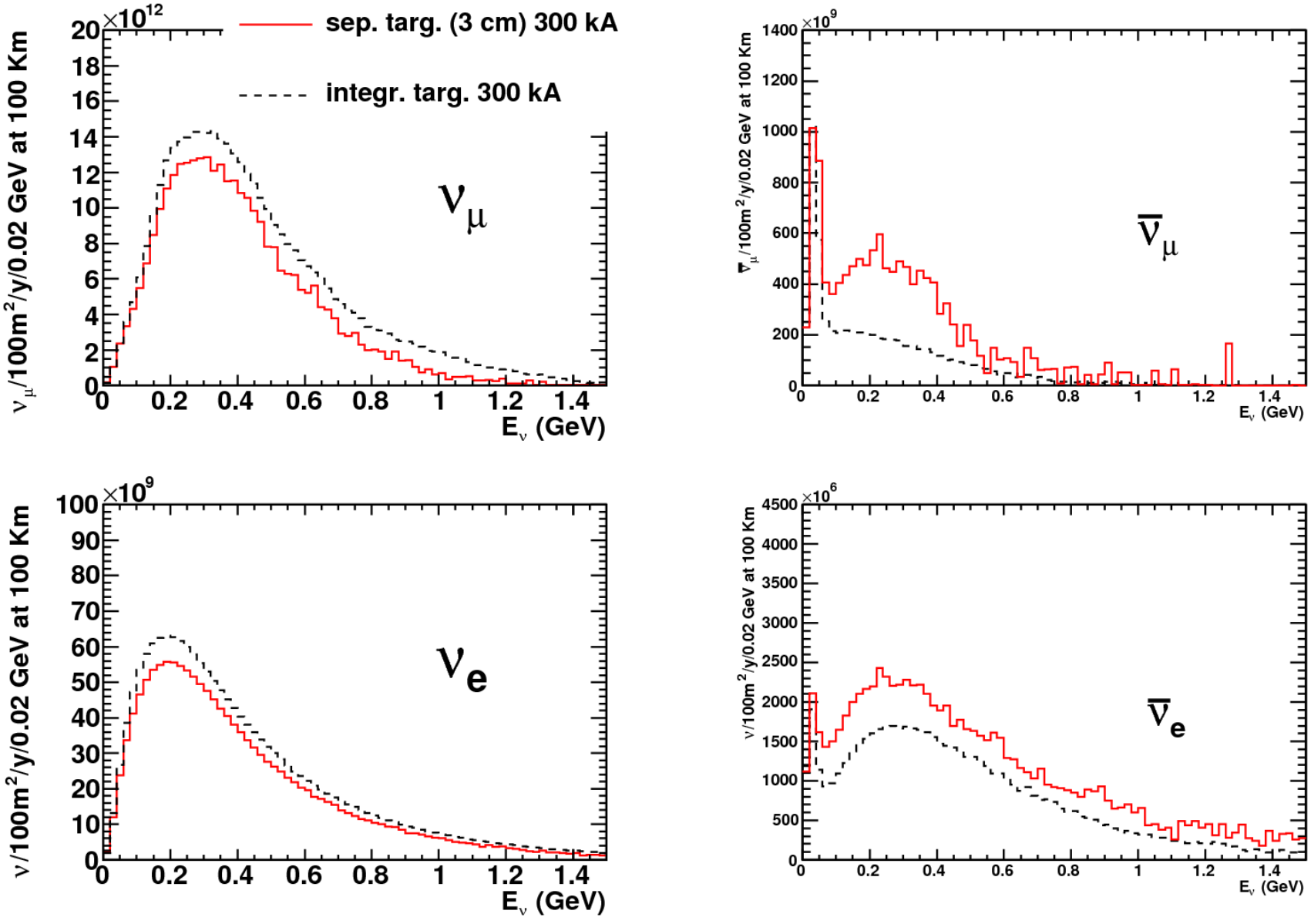
Separated target focusing



p = 500 MeV/c, θ = 0.1 rad

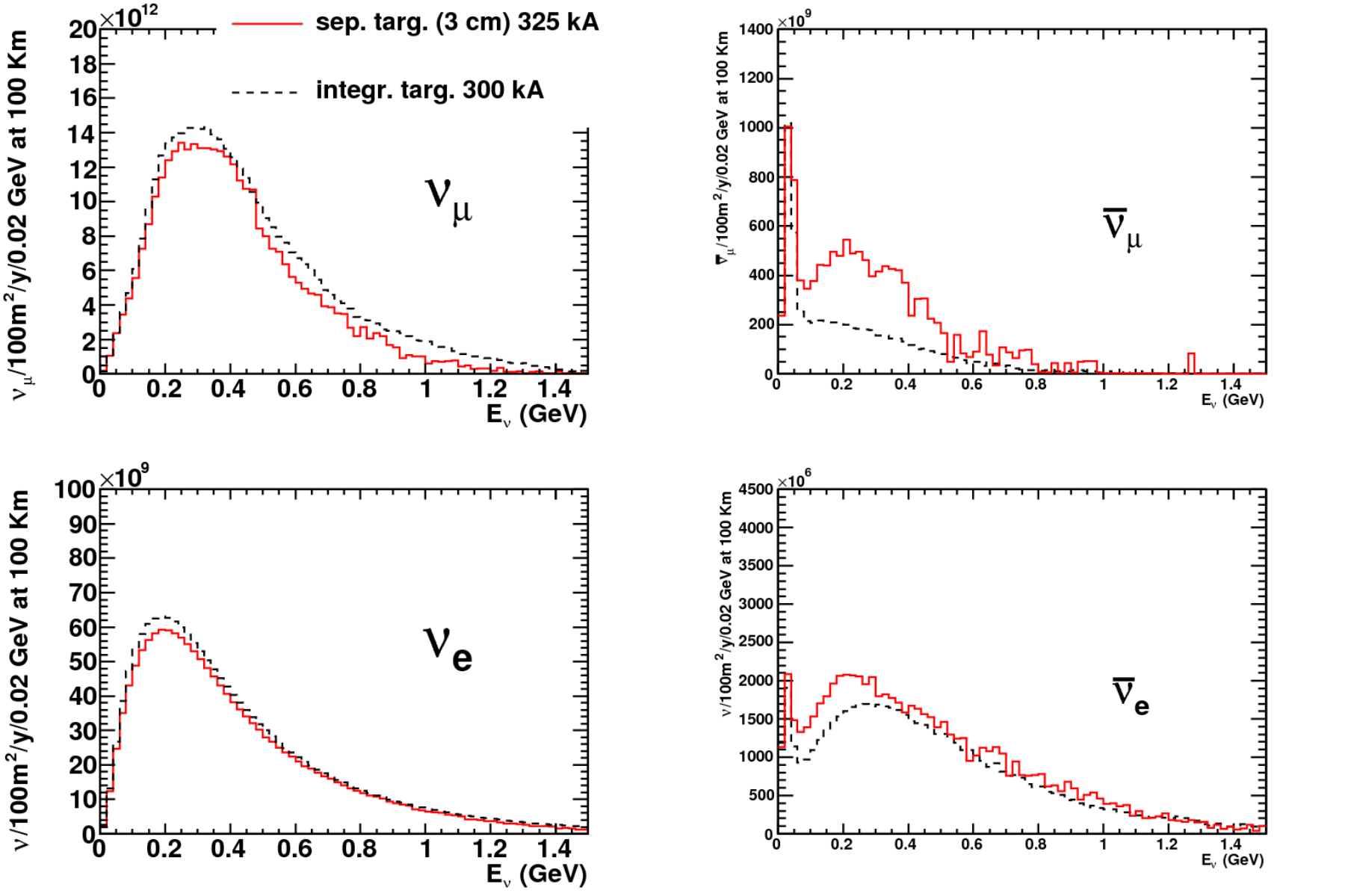
Separated target: fluxes comparison

I = 300 kA



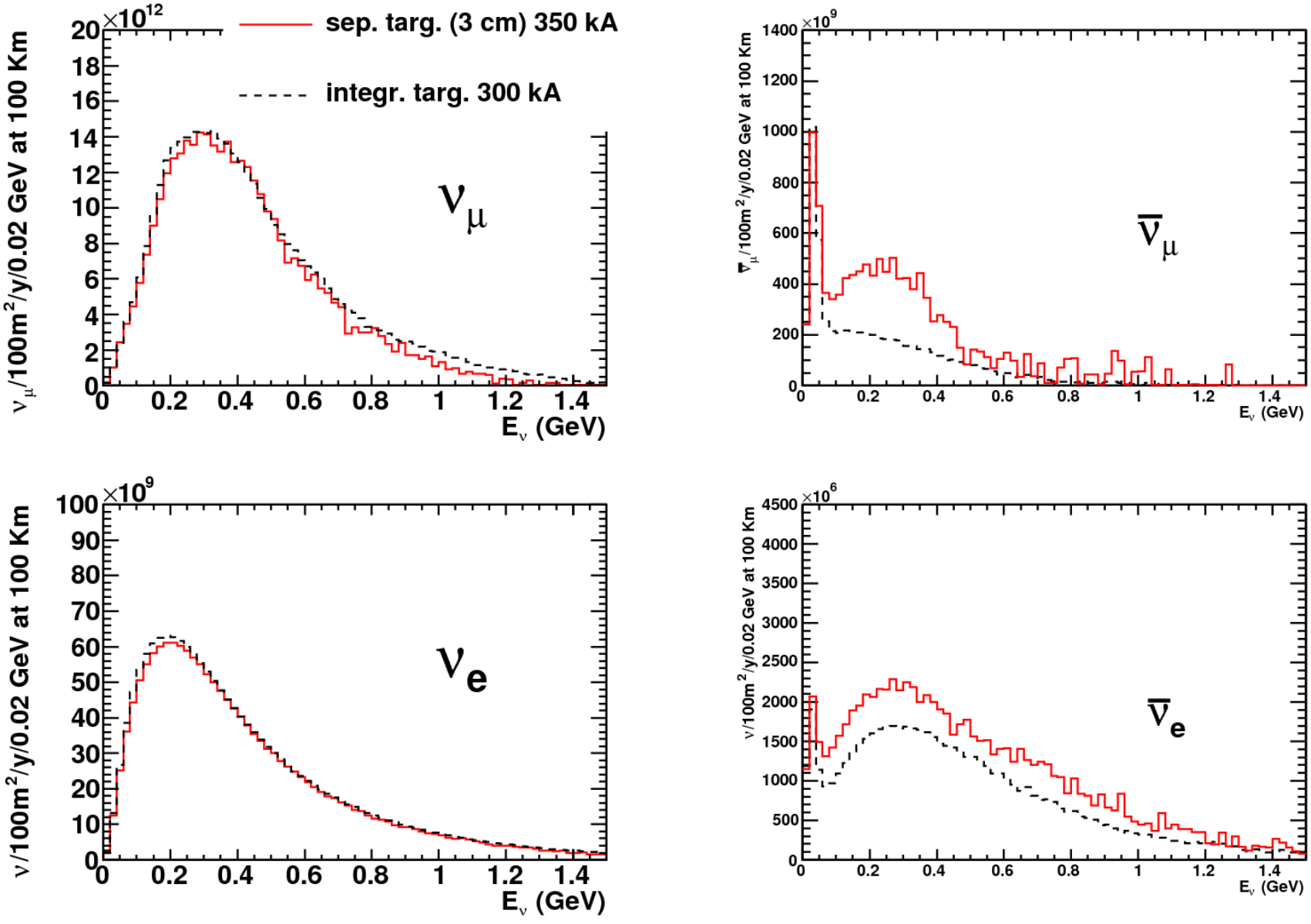
Separated target: fluxes comparison

I = 325 kA



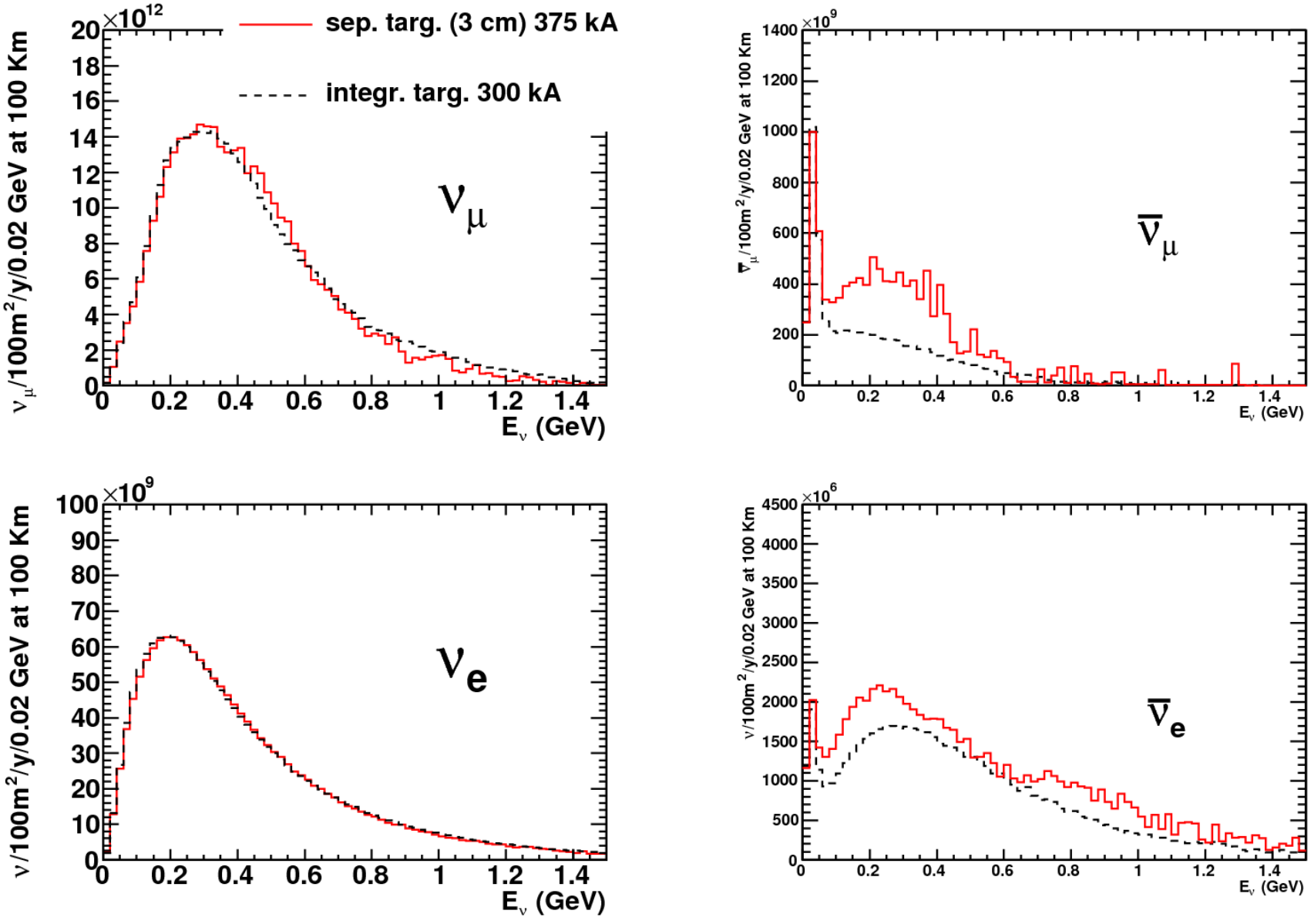
Separated target: fluxes comparison

I = 350 kA



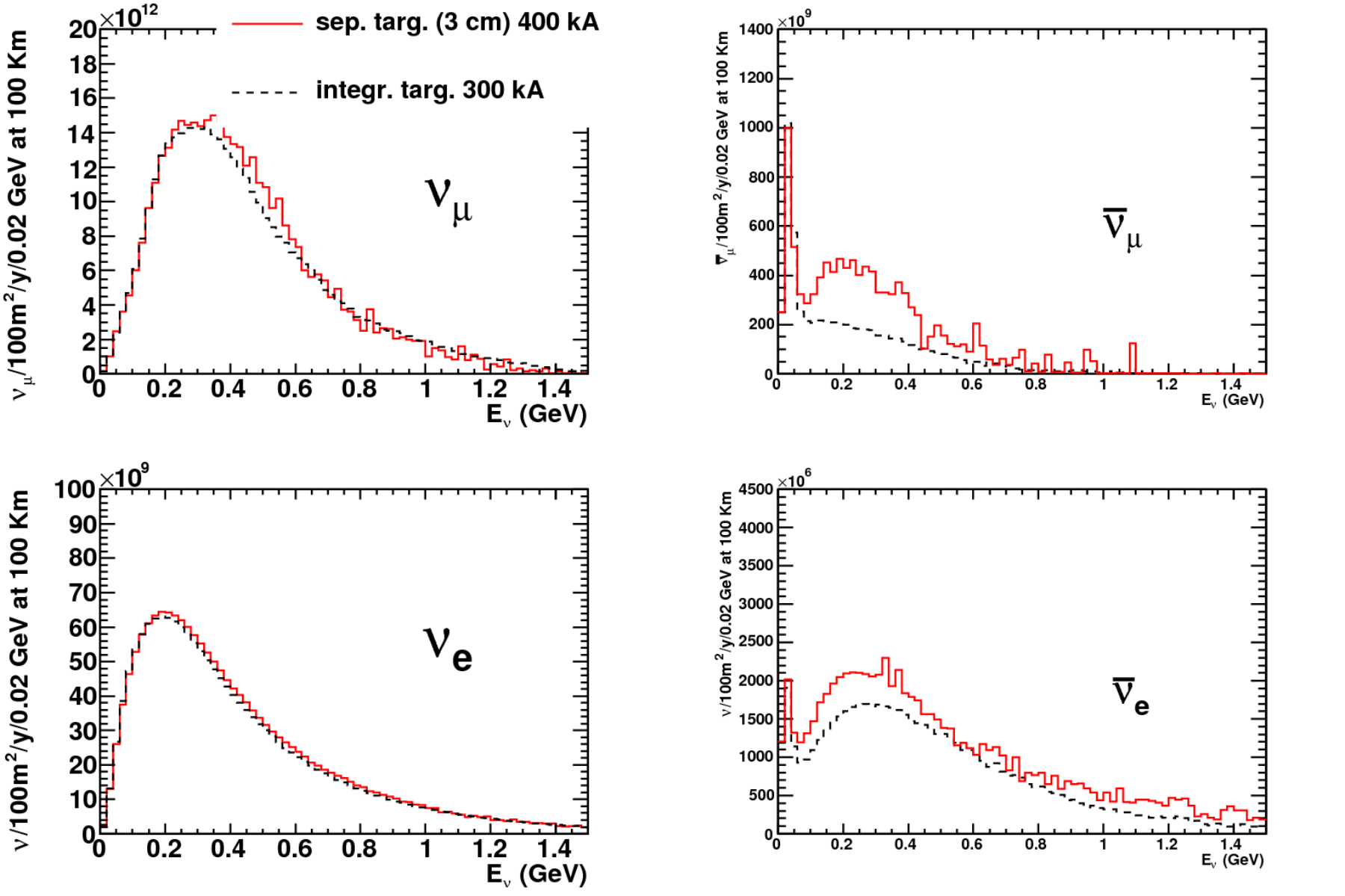
Separated target: fluxes comparison

I = 375 kA



Separated target: fluxes comparison

I = 400 kA



Next steps

1) compare sensitivity curves

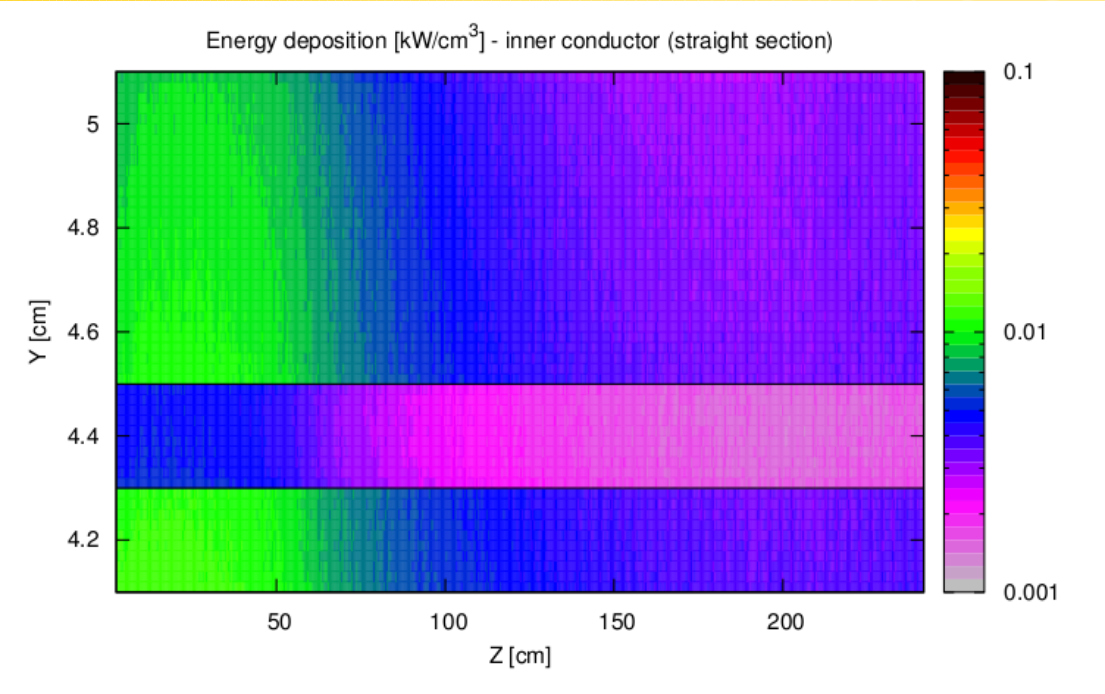
2) test the idea of Chris concerning a target with cavities to “spread” the power deposition.

3) produce a set of fluxes with increased aluminum thickness (3->4,5,6 mm)

4) write down documentation on the simulation code (ongoing)

Back-up

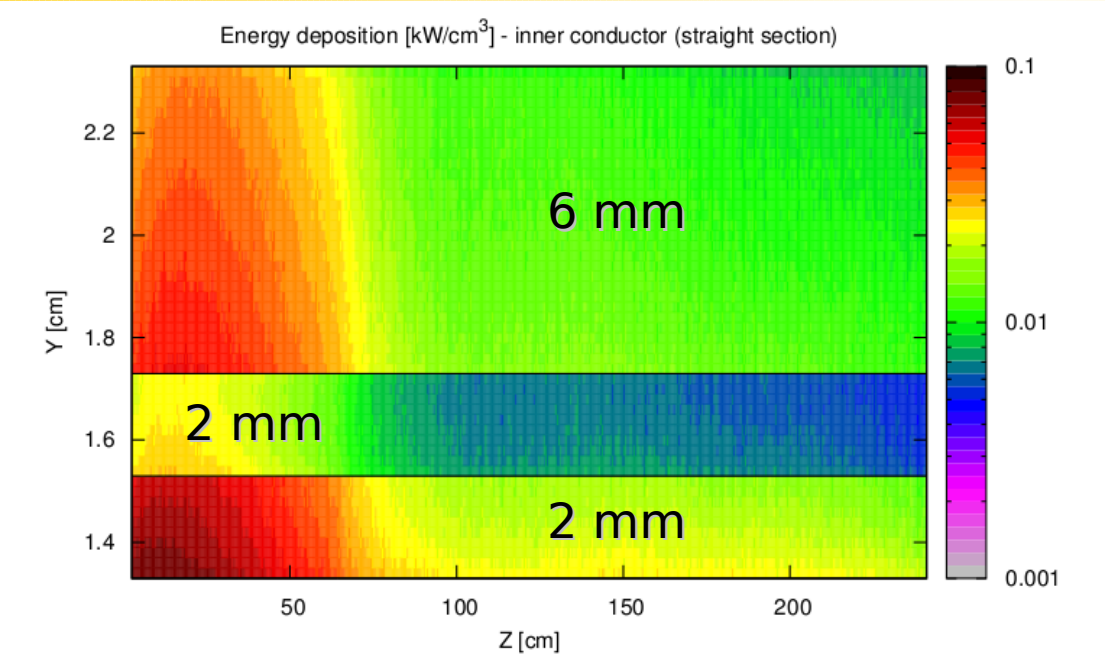
Christoph's computation



35.4 kW X 60/250 x 2/6 = 2.8
6.1 kW X 60/250 x 2/2 = 1.4
15.1 kW X 60/250 x 3/2 = 5.4

9.6

Note the different radius

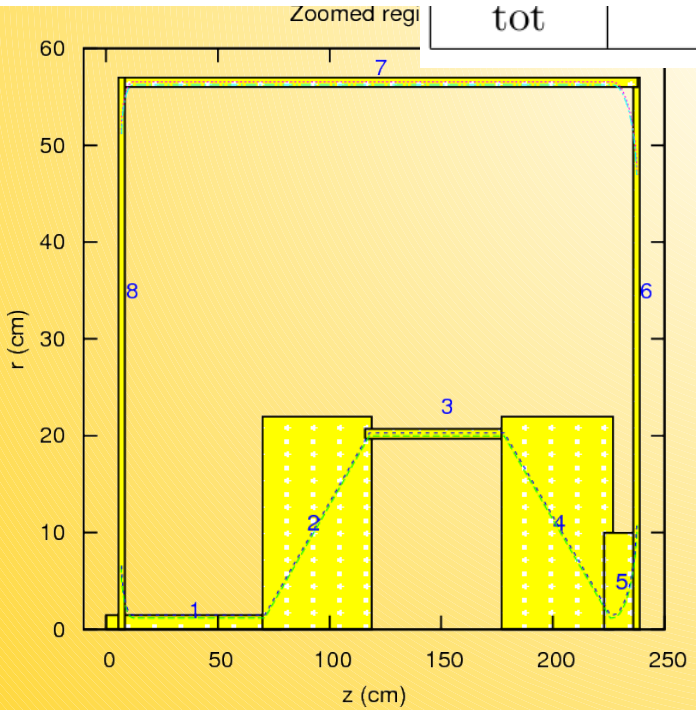


AlBeMet

46.1 kW
7.8 kW
19.2 kW

Integrated power deposition by region

Region	z range	r range	Deposited power (kW)	(%)	Deposited power (kW)	(%)
1	[0, 78]	[0, 1.5]	63.343	88.5	62.98	82.2
2	[70, 119]	[1.5, 22]	1.756	2.4	1.93	2.5
3	[116, 179]	[19.7, 20.7]	1.117	1.6	1.13	1.5
4	[177, 227]	[0, 22]	0.584	0.8	0.62	0.8
5	[225, 239]	[0, 10]	0.357	0.5	0.45	0.6
6	[236, 239]	[10, 57]	0.480	0.7	0.48	0.6
7	[6.8, 238.1]	[56, 57]	3.344	4.7	3.32	4.3
8	[5.5, 8.5]	[1.5, 57]	0.757	1.1	0.69	0.9
tot			71.580	100	5.5	7.1
					76.6	100



Comparison with the previous fluxes