FETS Meeting
MEBT Status

RAL

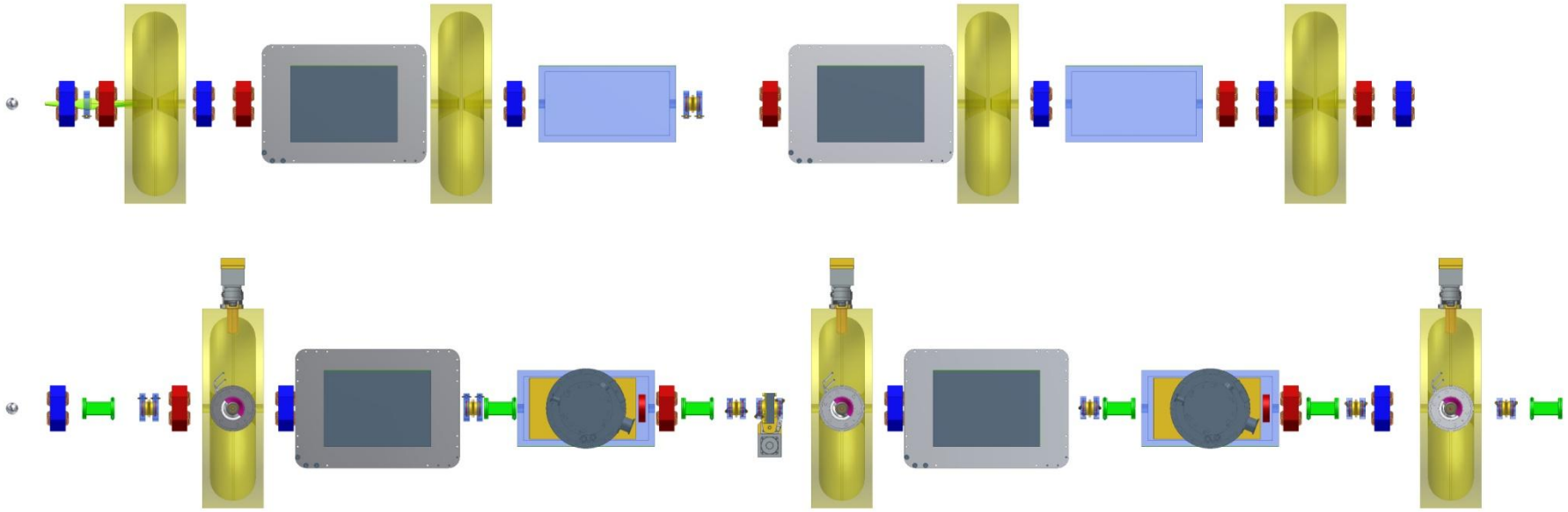
22 October 2012

Main issues

Status of the MEBT at 22 August 2012, University of Warwick

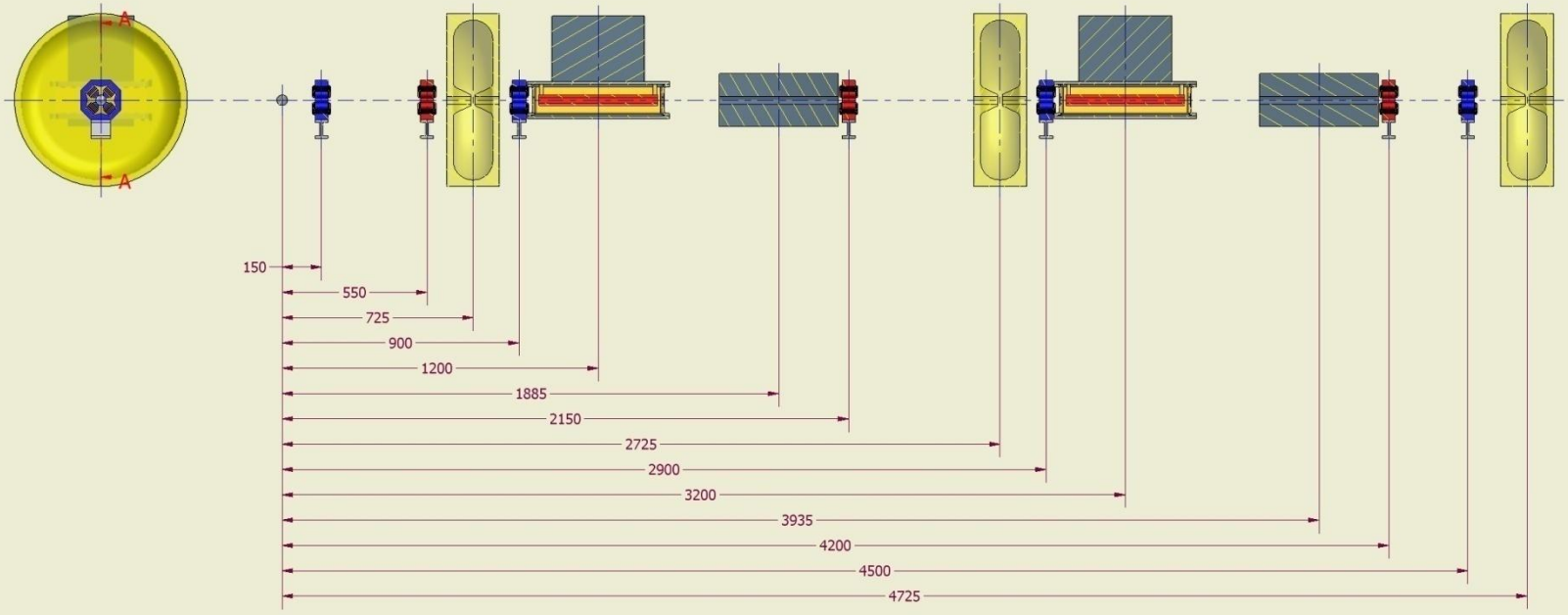
- **A second lattice For MEBT was presented.**
- **A comparison of the first and second lattice features is made.**

First and second lattice comparison

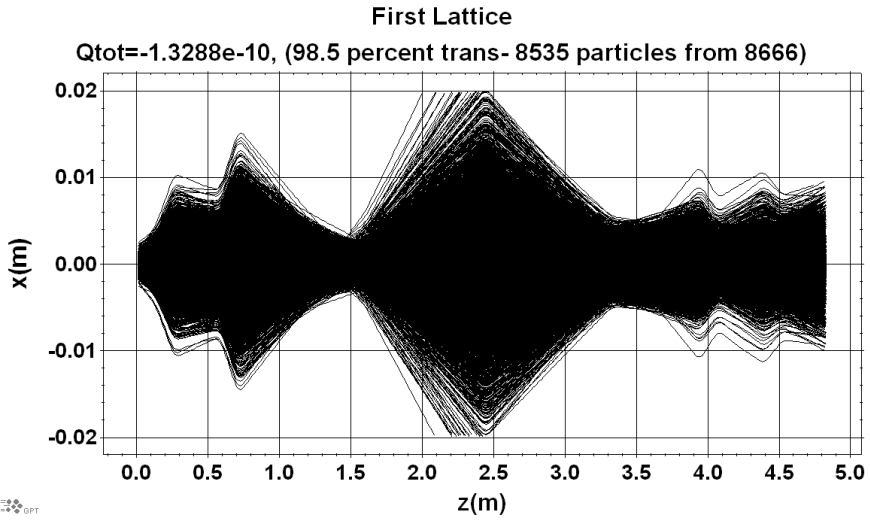


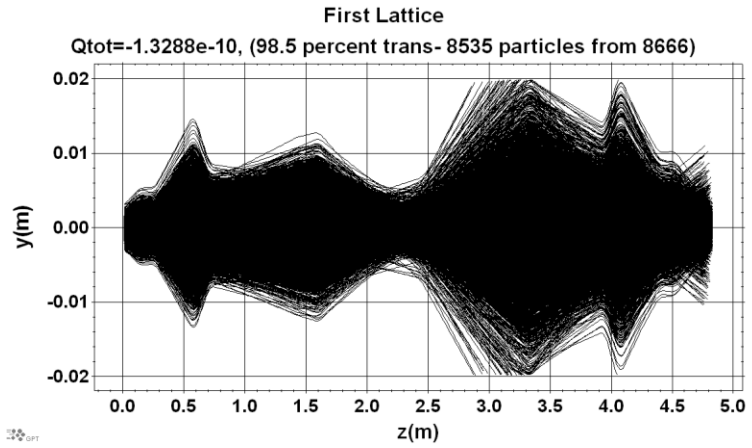
MEBT Scheme Z

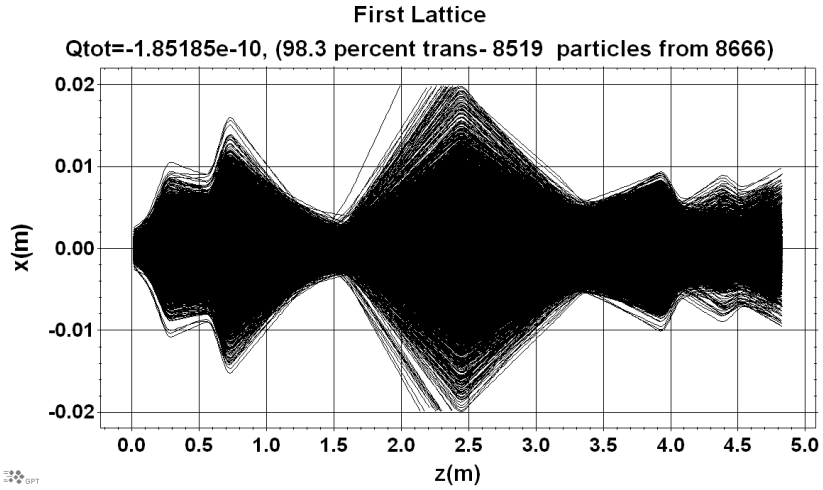
A-A (1 : 16)

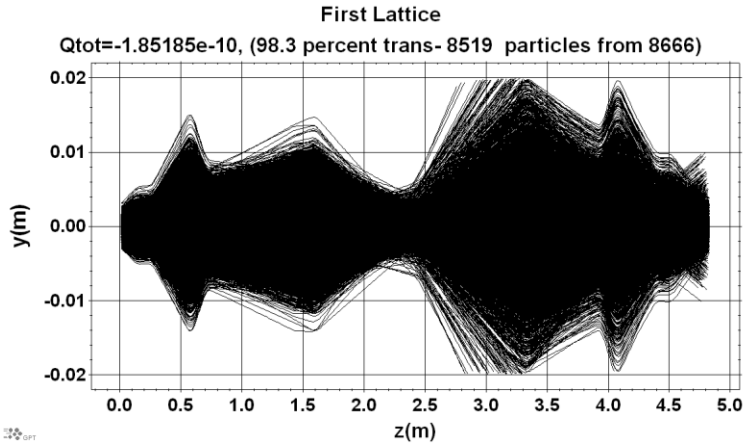


First Lattice-Trajectory of Particles

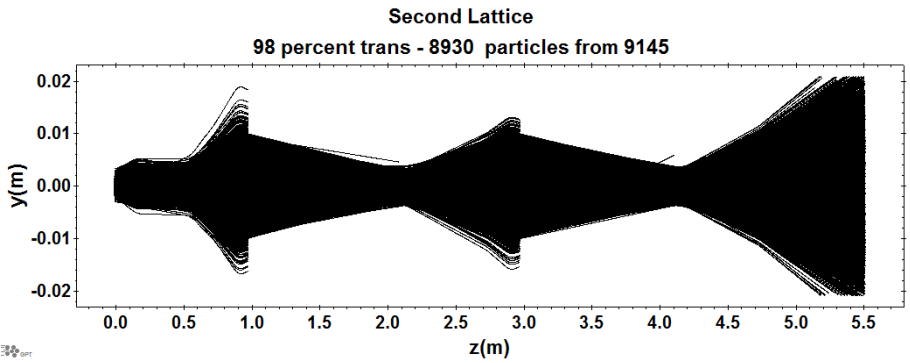


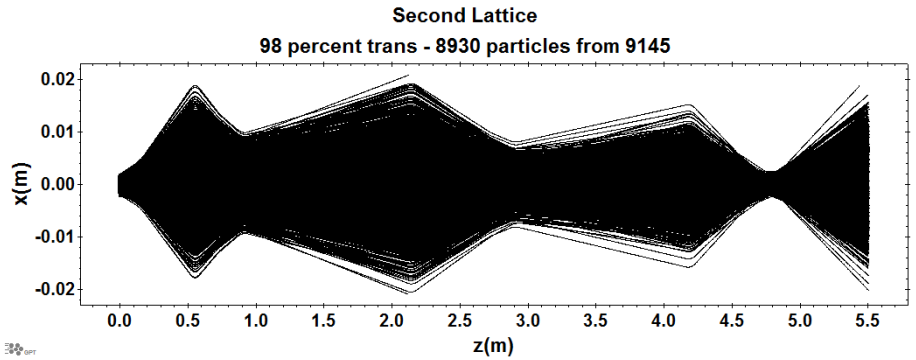


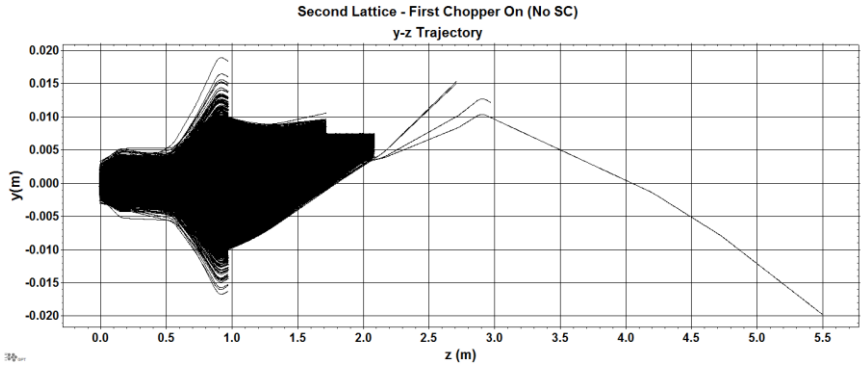


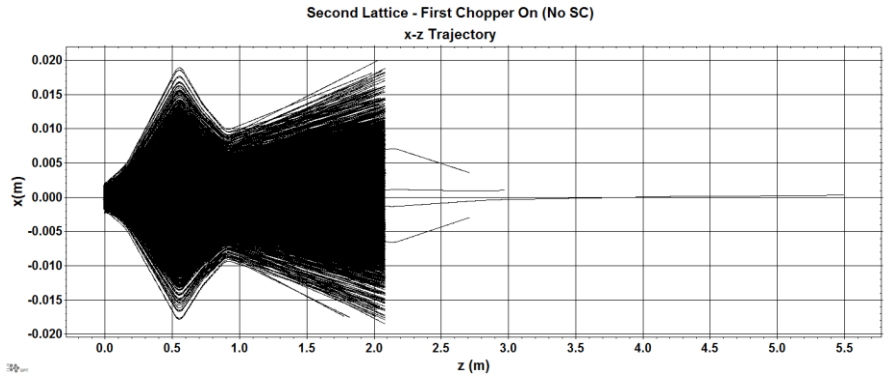


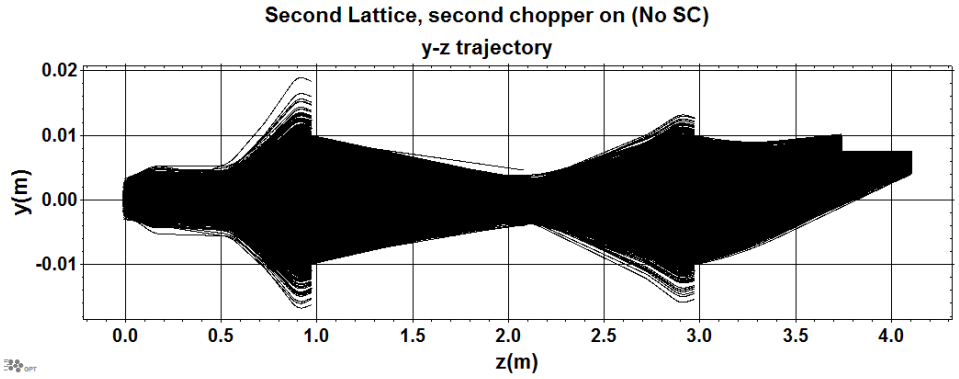
Particle trajectories in the second lattice- No space charge

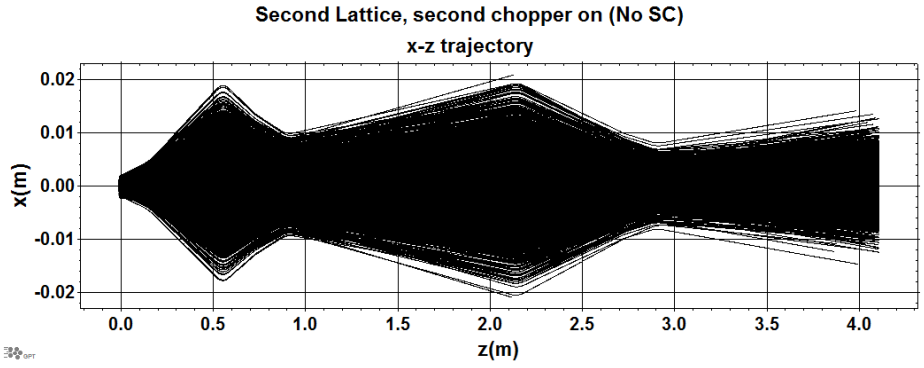




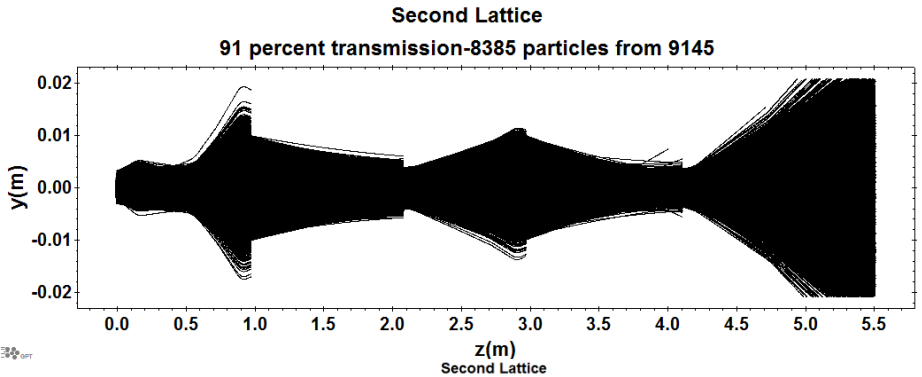


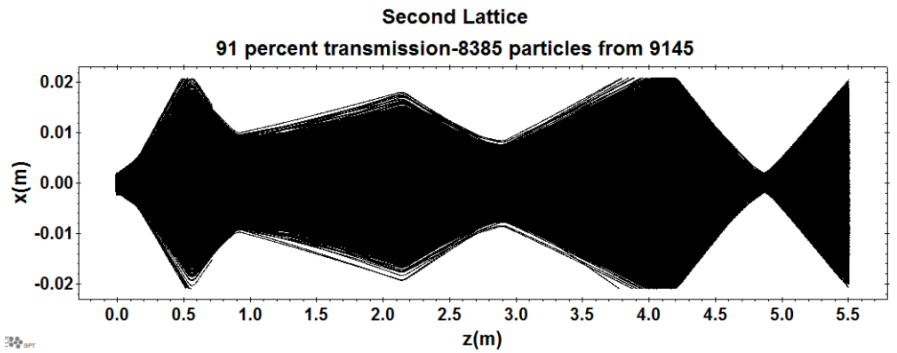


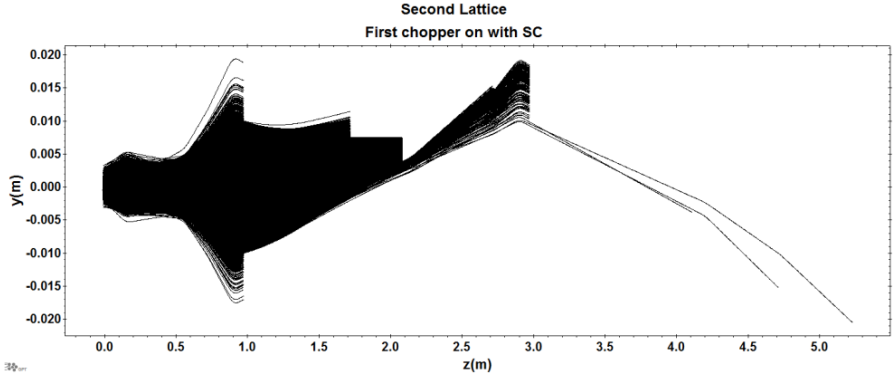


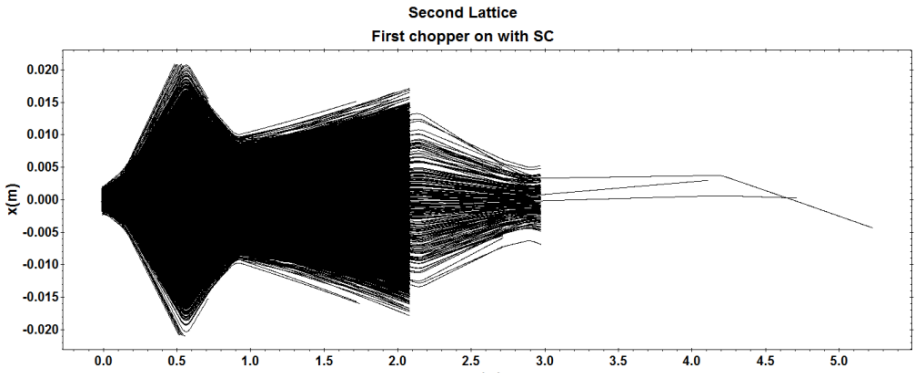


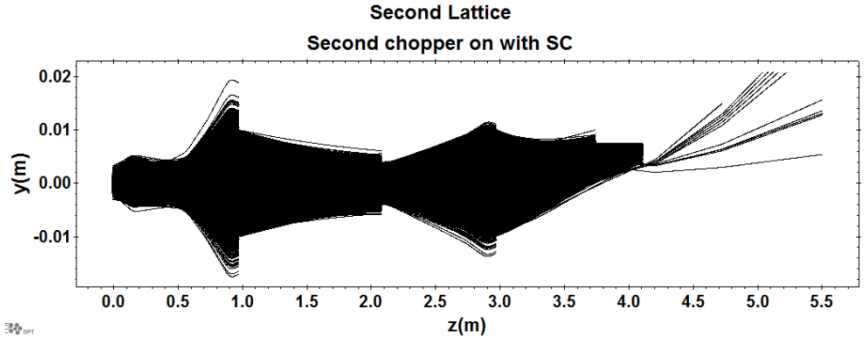
Particle trajectories in the second lattice- with space charge
Particle losses are observed
Temporary quad strengths:
Q1=18.5,Q2=-14.4, Q3= 11 and Q4=8 T/m

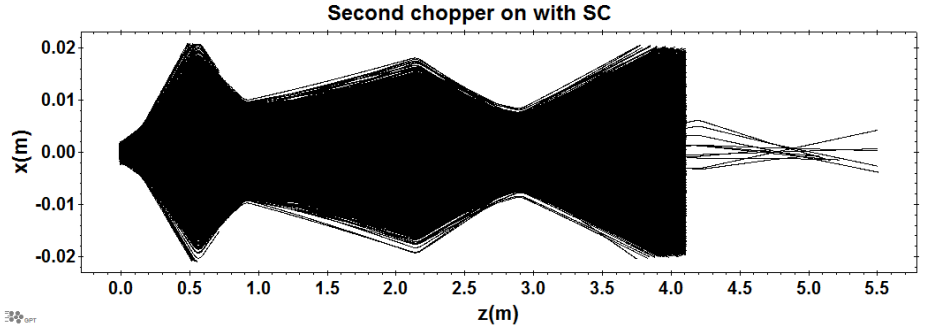












Status at 10 October 2012

Shift the first quadrupole to

Z=0.310

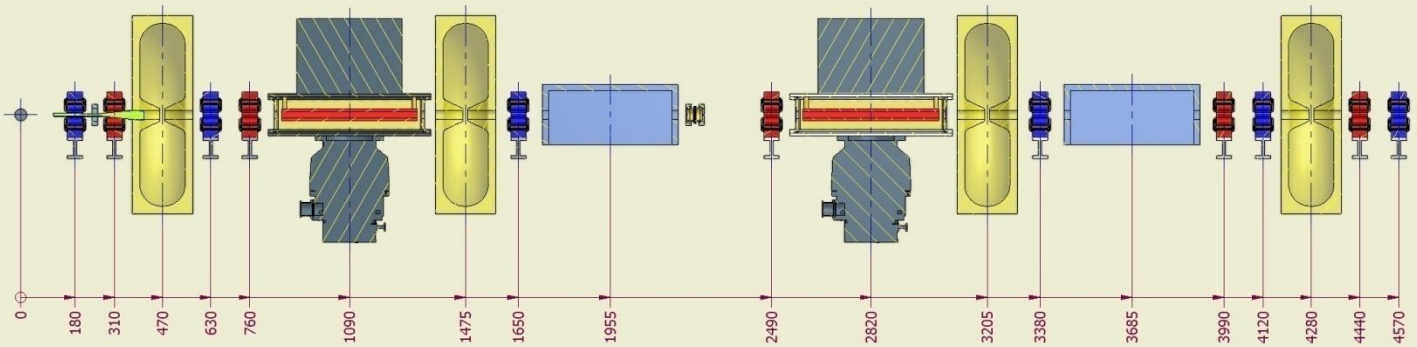
The second quadrupole to

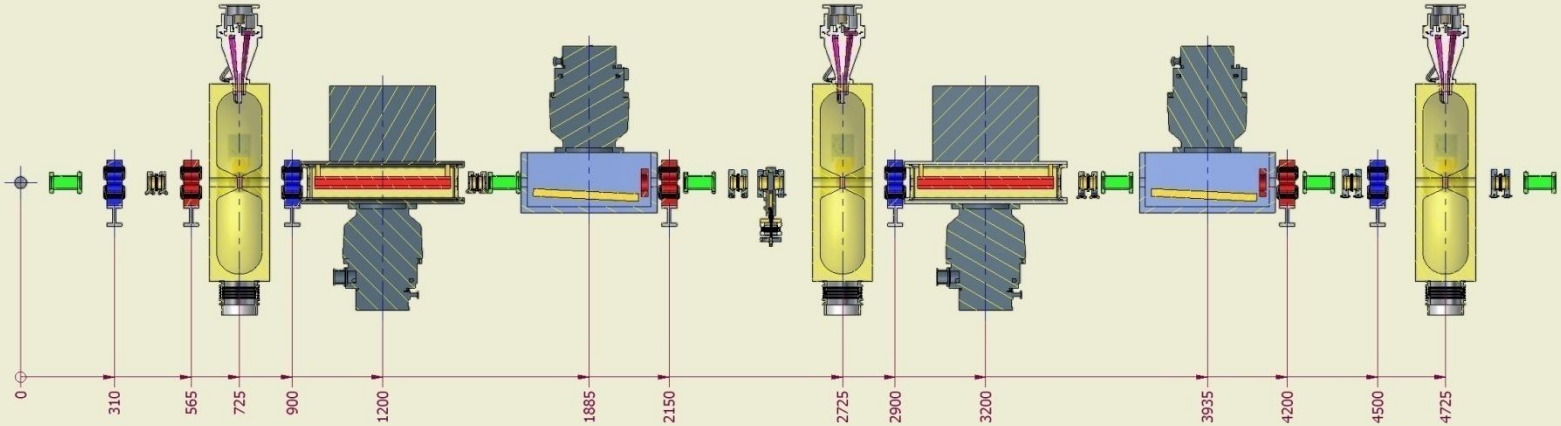
Z=0.560

Play around with the quads strength to get the best transmission

MEBT Scheme Comparison

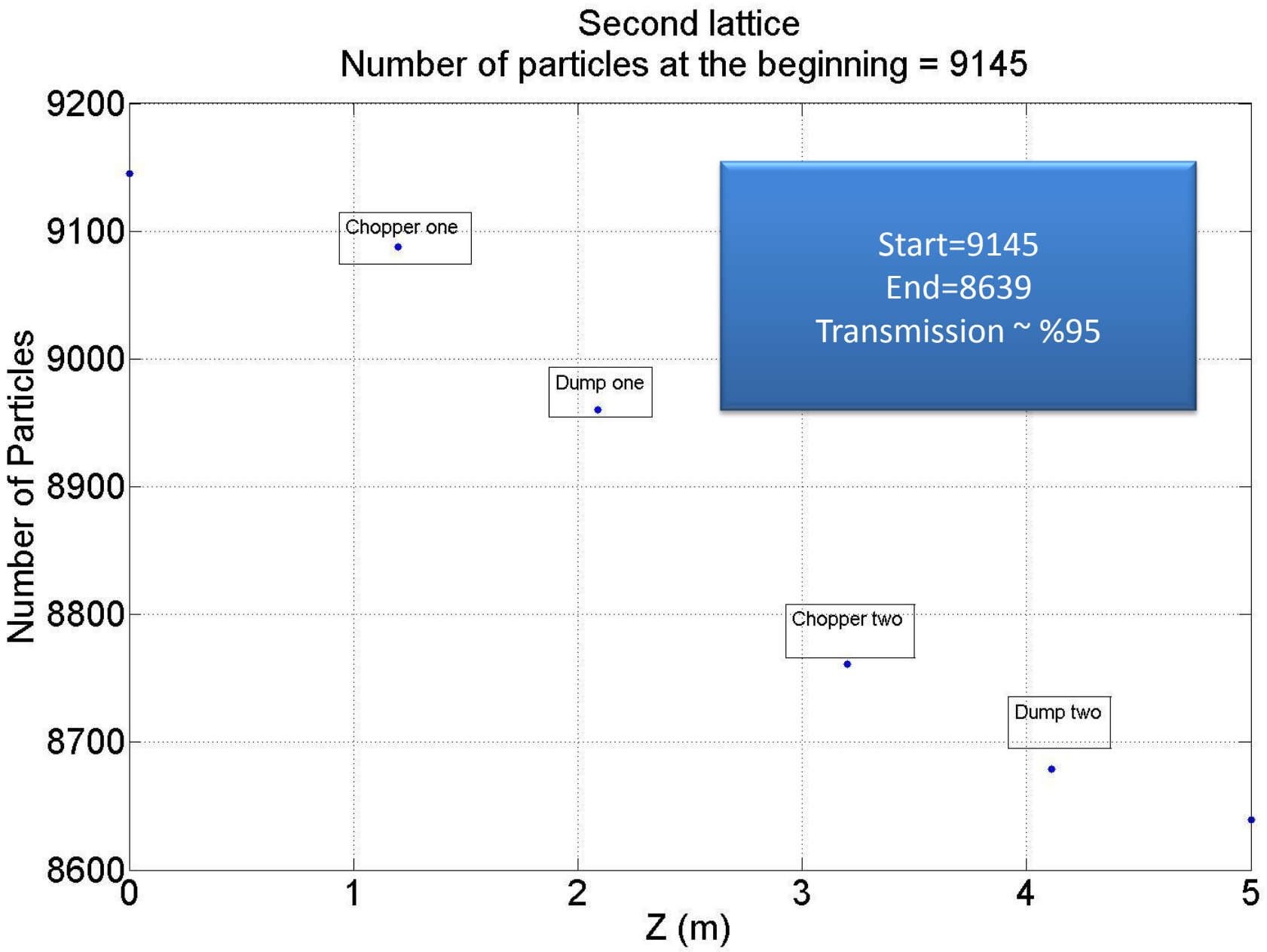
ORIGINAL SCHEME

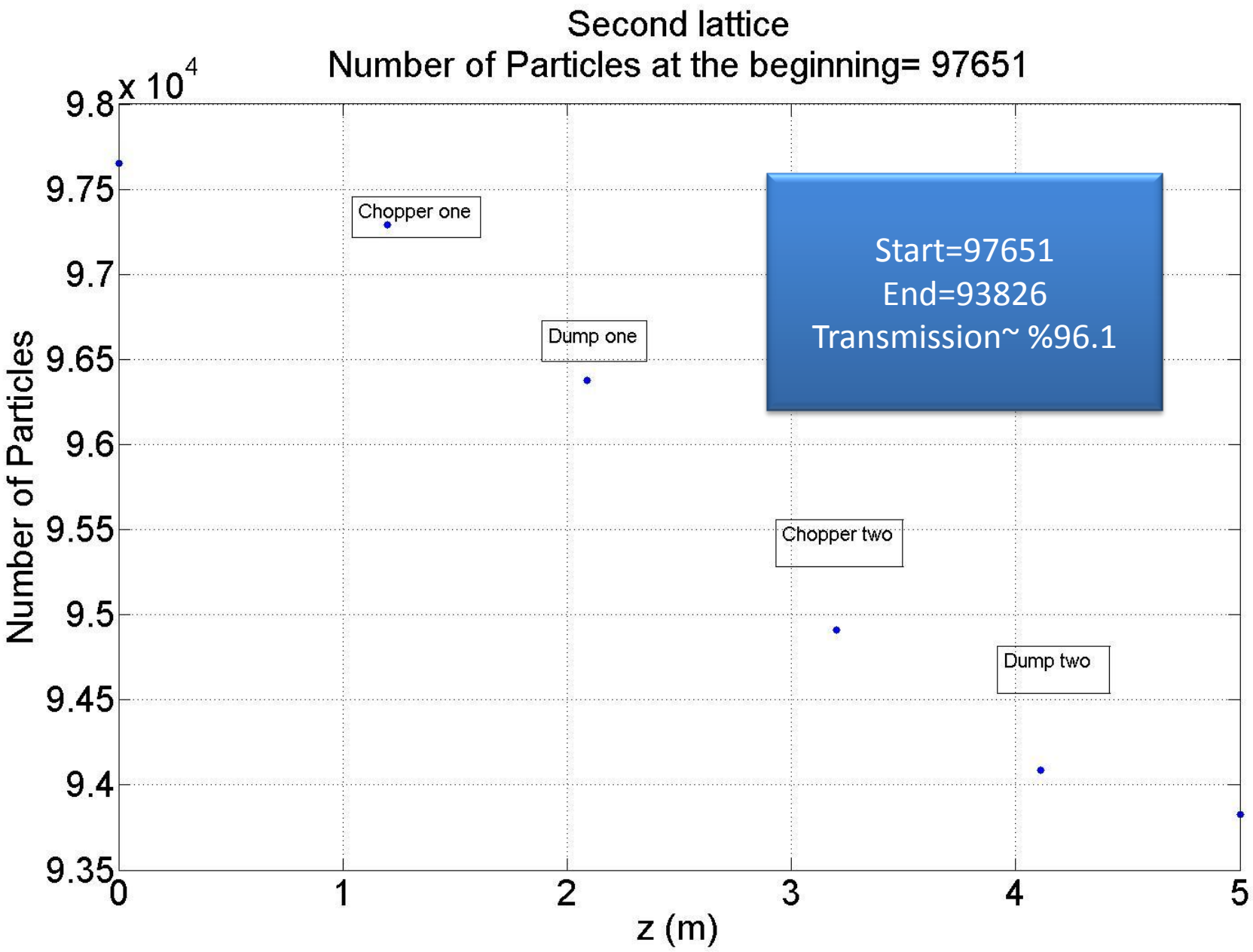


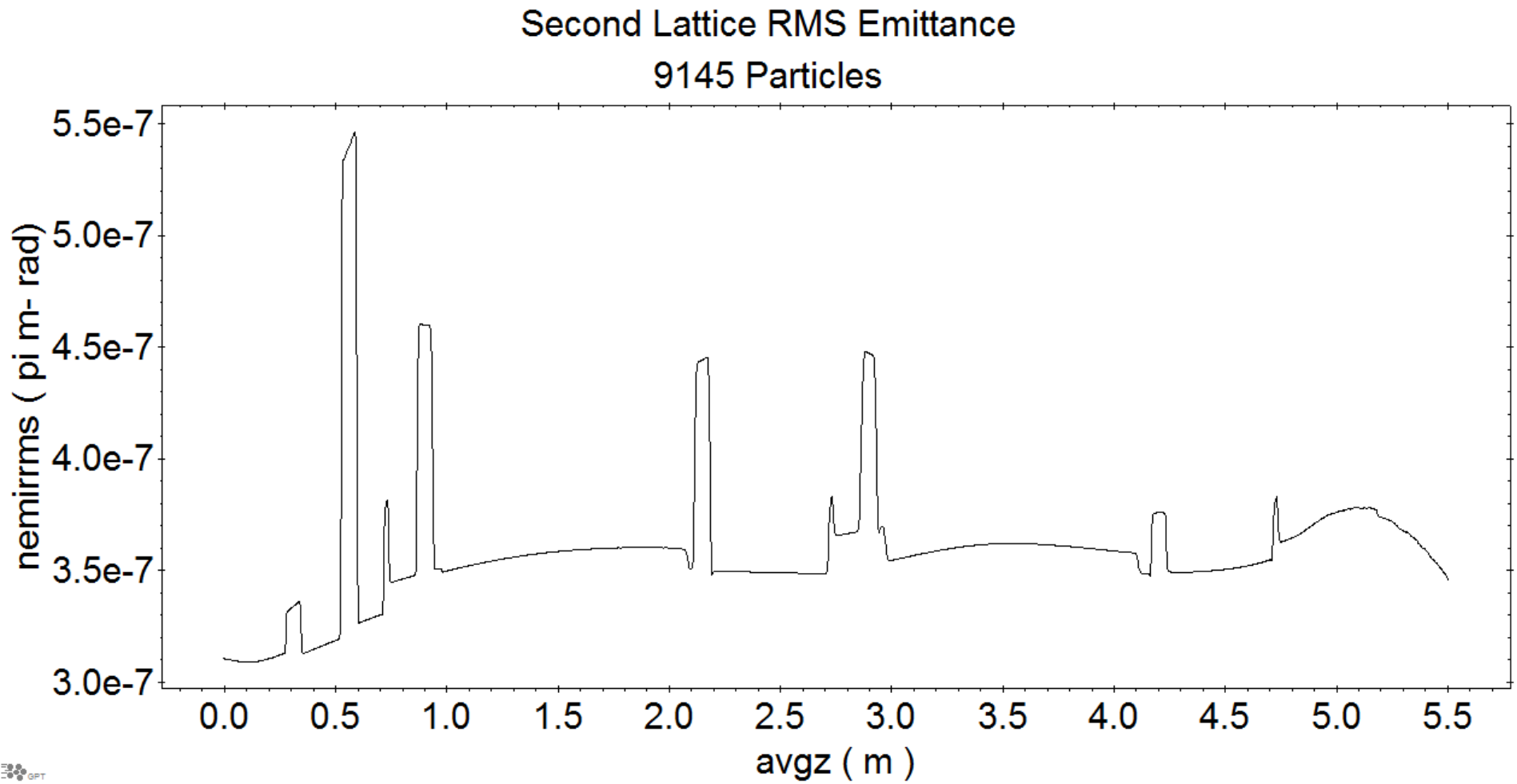


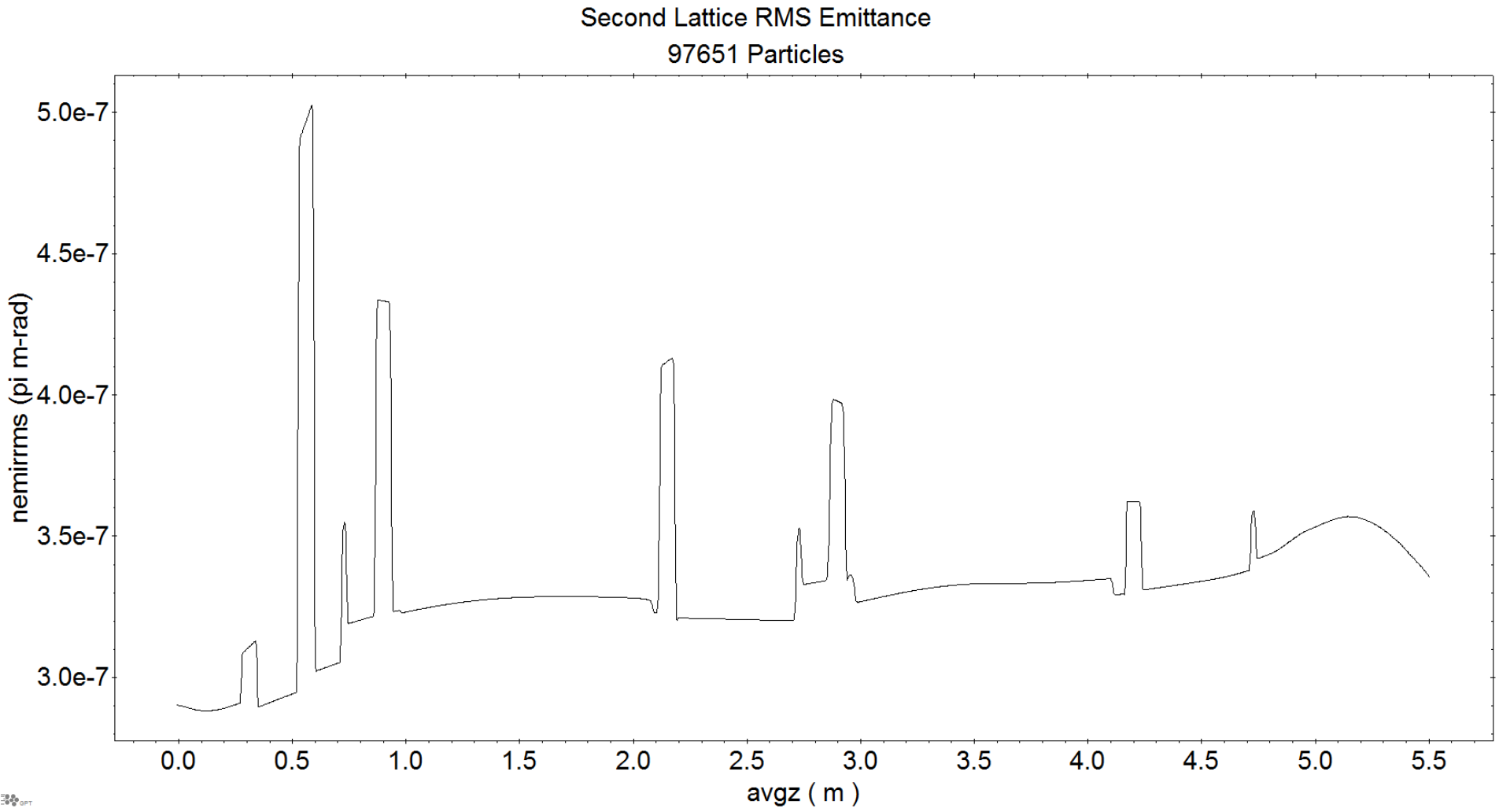
LATEST SCHEME

First Lattice	Second lattice
Quadrupole("wcs", "z", 0.180, 0.070,**15.6**)	Quadrupole("wcs", "z", 0.310, 0.070, **15.5**);
Quadrupole("wCs", "z",0.310, 0.070, **-19.0**)	Quadrupole("wcs", "z", 0.560, 0.070, **-16.5**);
Trwcell ("wcs", "z", 0.470, **-4.40e6**, 3.960, 2.03575e9, .0215); V=94.6 kV	**Trwcell** ("wcs", "z", 0.725, **-4.4e6**, 0.75, 2.03575e9, 0.0215);
Quadrupole ("wcs", "z", 0.630, 0.070, **20.5**)	Quadrupole("wcs", "z", 0.900, 0.070, **10.6**);
Quadrupole ("wcs", "z", 0.760, 0.070, **-17.9**)	beam chopper at 95-140 cm
Chopper1(Fast chopper)	beam dump at 170-210 cm
Trwcell ("wcs", "z", 1.475, **-3.8e6**, 0.044, 2.03575e9,0.0215)	Quadrupole("wcs", "z", 2.150, 0.070, **-5.6**);
Quadrupole("wcs", "z", 1.650, 0.07, **6.56**)	**Trwcell** ("wcs", "z", 2.725, **-4.0e6**, 0.6 , .03575e9, 0.0215);
Dump1	Quadrupole("wcs", "z", 2.900, 0.070, **8.5**);
Quadrupole("wcs", "z", 2.490, 0.07, **-7.2**)	# beam chopper at 295-340 cm #erect("wcs",0, 0, 3.2, 1,0,0, 0,0,1, 0.450, 0.450, 0.450, 1.0*0.82*0.14e6);
Chopper2(slow chopper)	beam dump at 370-410 cm
Trwcell ("wcs", "z", 3.205, **-3.2e6**, 3.51, 2.03575e9, 0.0215)	Quadrupole("wcs", "z", 4.200, 0.070, **-8.5**);
Quadrupole ("wcs", "z", 3.38, 0.07, **6.4**)	Quadrupole("wcs", "z", 4.500, 0.070, **7.0**);
Dump2	**Trwcell** ("wcs", "z", 4.725, **-3.8e6**, 0.4, 2.03575e9, 0.0215);
Quadrupole("wcs","z",3.990,0.07,**-16**)	
Quadrupole("wcs", "z", 4.120, 0.07, **16.8**)	
Trwcell ("wcs", "z", 4.28, **-2.50e6**, 6.20, 2.03575e9,0.0215); V=92.02 kV	
Quadrupole ("wcs", "z", 4.440, 0.07, **-10.4**)	
Quadrupole ("wcs", "z", 4.57, 0.07, **8.8**)	


Second lattice
Number of particles at the beginning = 9145
Number of Particles
Z (m)
9200
9100
9000
8900
8800
8700
8600
0
1
2
3
4
5
Chopper one
Dump one
Chopper two
Dump two
Start=9145
End=8639
Transmission ~ %95


Second lattice
Number of Particles at the beginning= 97651
x 10^4
9.8
9.75
9.7
9.65
9.6
9.55
9.5
9.45
9.4
9.35
Number of Particles
0
1
2
3
4
5
z (m)
Chopper one
Dump one
Chopper two
Dump two
Start=97651
End=93826
Transmission~ %96.1


Second Lattice RMS Emittance
9145 Particles
nemirrms (pi m- rad)
5.5e-7
5.0e-7
4.5e-7
4.0e-7
3.5e-7
3.0e-7
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
avgz (m)


Second Lattice RMS Emittance
97651 Particles
nemirrms (pi m-rad)
5.0e-7
4.5e-7
4.0e-7
3.5e-7
3.0e-7
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
avgz (m)

New changes after 10th of October

1- shift the first cavity to the right (5 mm) and change the phase accordingly.

2-Change the position and the length of the chopper to kick the beam to higher vertical positions.

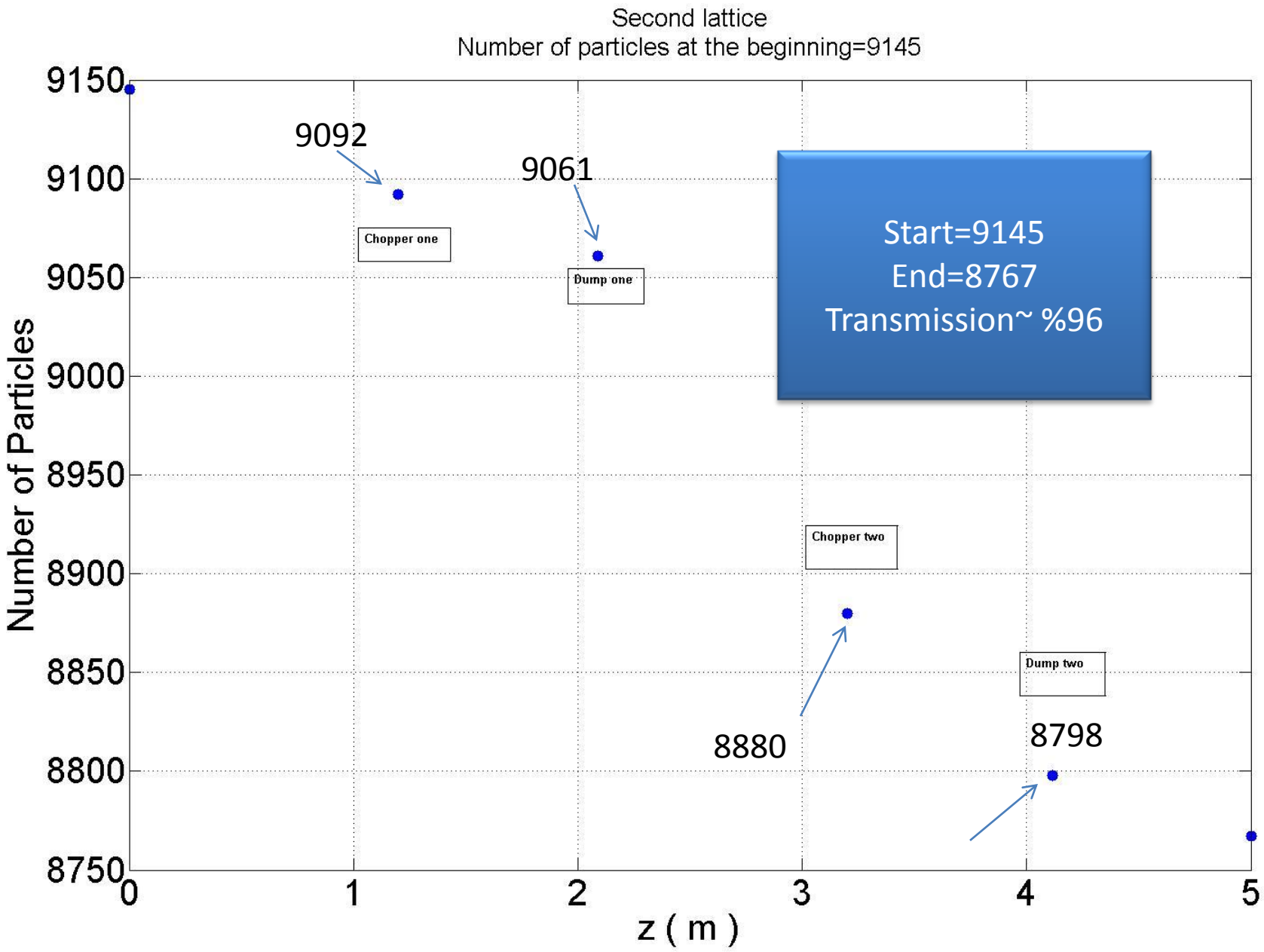
Z=1.220 and l=0.470 m

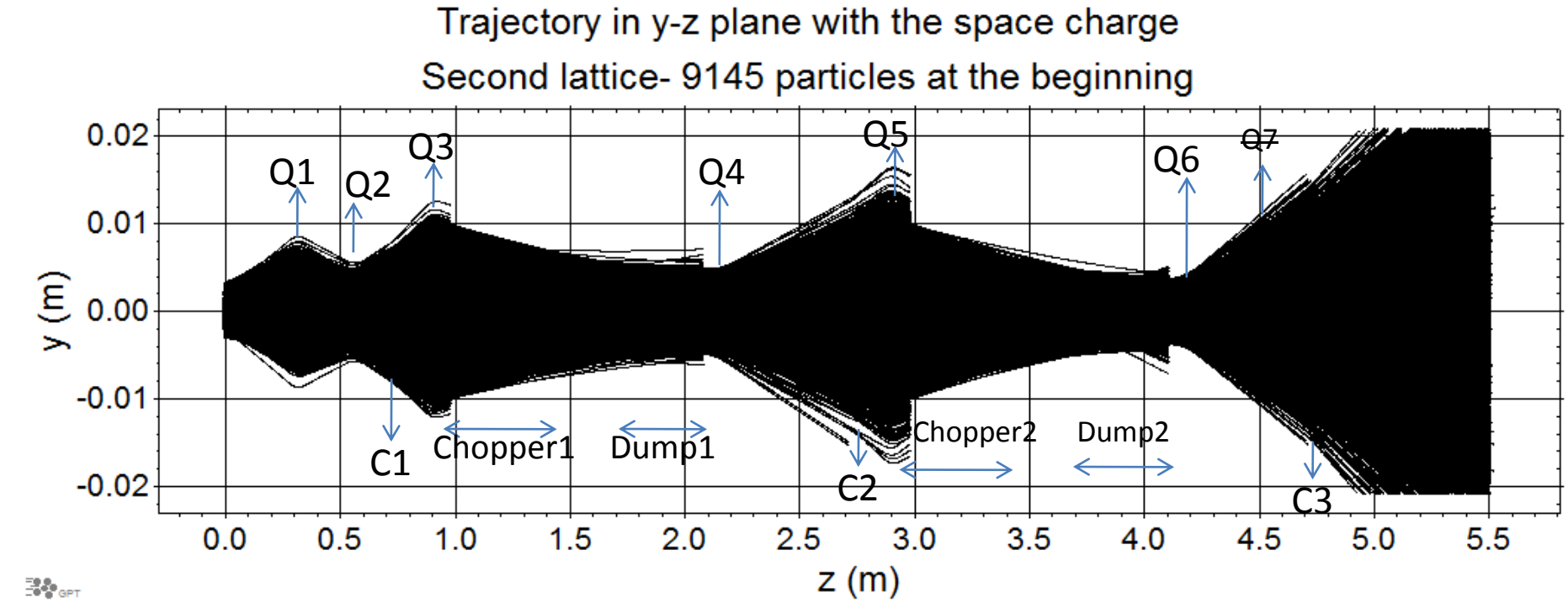
3-With enough separation between the chopped and un-chopped beam, now increase the size of the aperture(scraper) at 2.09.

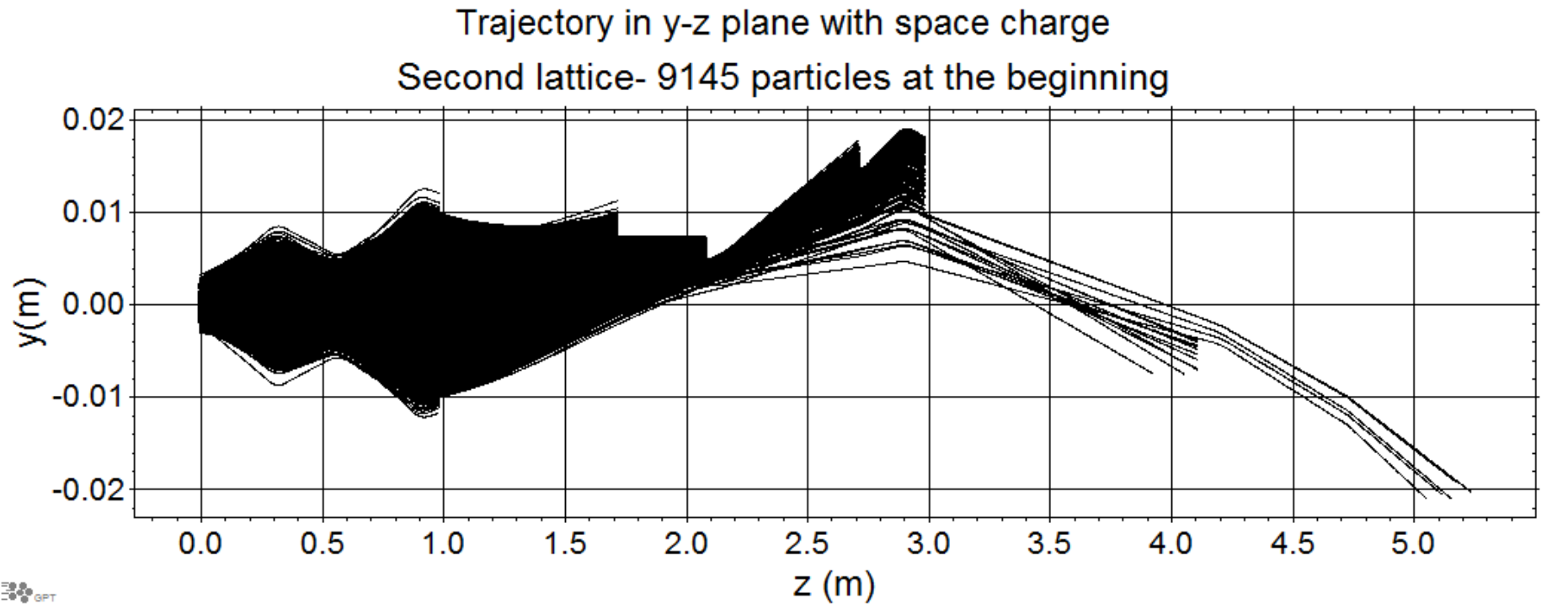
Δy= 9-10 mm

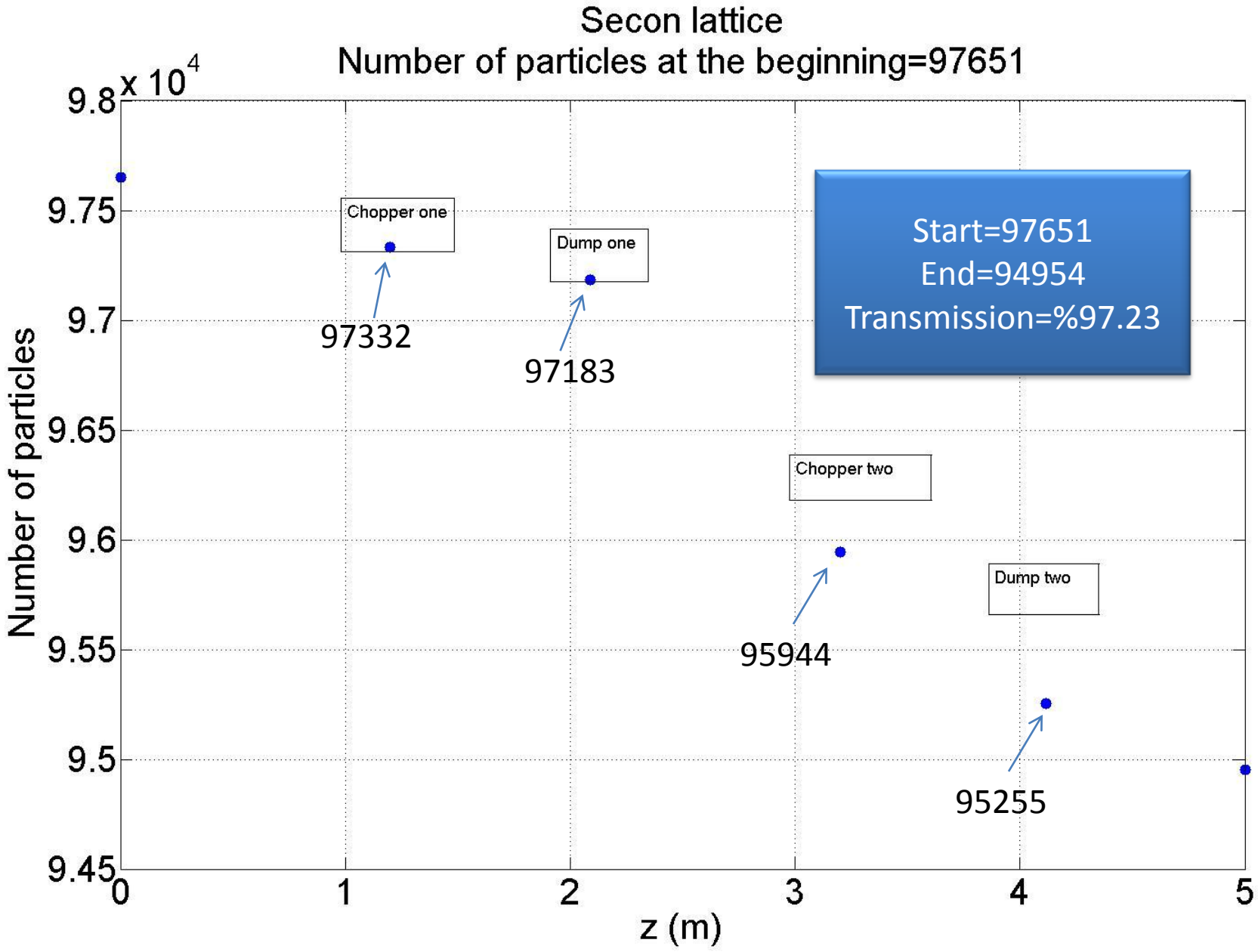
We may need to increase the chopper length a bit more!

Second lattice
Quadrupole("wcs", "z", 0.310, 0.070, **15.50**);
Quadrupole("wcs", "z", 0.560, 0.070, **-16.50**);
Trwcell ("wcs", "z", 0.730, **-4.4e6**, 0.75, 2.03575e9, 0.0215);
Quadrupole("wcs", "z", 0.900, 0.070, **10.45**);
beam chopper at 0.985-1.455 m
beam dump at 170-210 cm
Quadrupole("wcs", "z", 2.150, 0.070, **-5.20**);
Trwcell ("wcs", "z", 2.725, **-4.0e6**, 0.6 , .03575e9, 0.0215);
Quadrupole("wcs", "z", 2.900, 0.070, **8.10**);
beam chopper at 295-340 cm
beam dump at 370-410 cm
Quadrupole("wcs", "z", 4.200, 0.070, **-8.00**);
Quadrupole("wcs", "z", 4.500, 0.070, **7.00**);
Trwcell ("wcs", "z", 4.725, **-3.8e6**, 0.4, 2.03575e9, 0.0215);


Second lattice
Number of particles at the beginning=9145
9150
9100
9050
9000
8950
8900
8850
8800
8750
Number of Particles
0
1
2
3
4
5
z (m)
9092
9061
Chopper one
Dump one
Start=9145
End=8767
Transmission~ %96
Chopper two
Dump two
8880
8798


Trajectory in y-z plane with the space charge
Second lattice- 9145 particles at the beginning
Q1
Q2
Q3
Q4
Q5
Q6
Q7
C1
C2
C3
Chopper1
Dump1
Chopper2
Dump2
y (m)
z (m)
0.02
0.01
0.00
-0.01
-0.02
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5


Trajectory in y-z plane with space charge
Second lattice- 9145 particles at the beginning
y(m)
z (m)
0.02
0.01
0.00
-0.01
-0.02
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0


Secon lattice
Number of particles at the beginning=97651
x 10^4
9.8
9.75
9.7
9.65
9.6
9.55
9.5
9.45
Number of particles
0
1
2
3
4
5
z (m)
Chopper one
Dump one
Chopper two
Dump two
97332
97183
95944
95255
Start=97651
End=94954
Transmission=%97.23

To do list

Still need to get better transmission

- Field maps for components
- power transferred to the dumps
- Effect of temperature rise on the frequencies.

Thank you