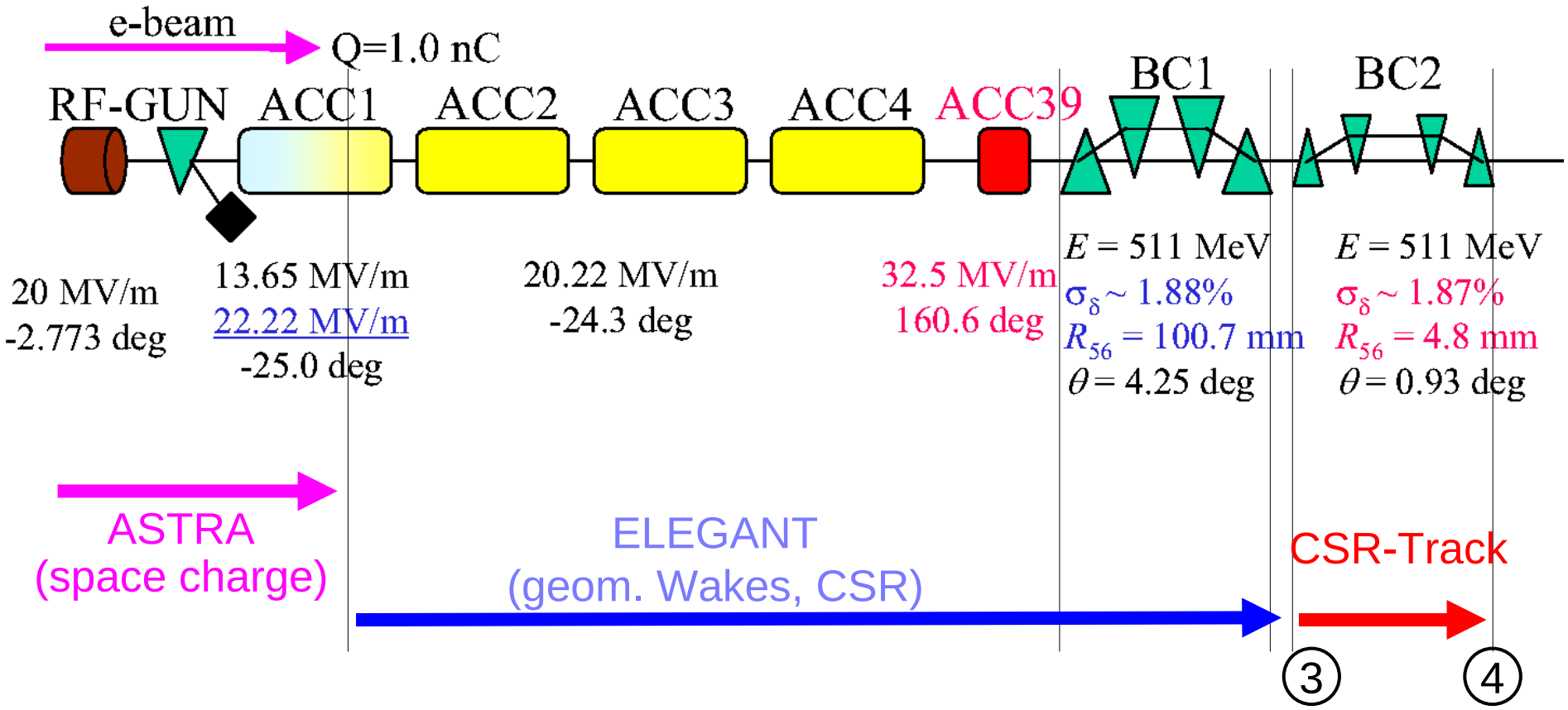
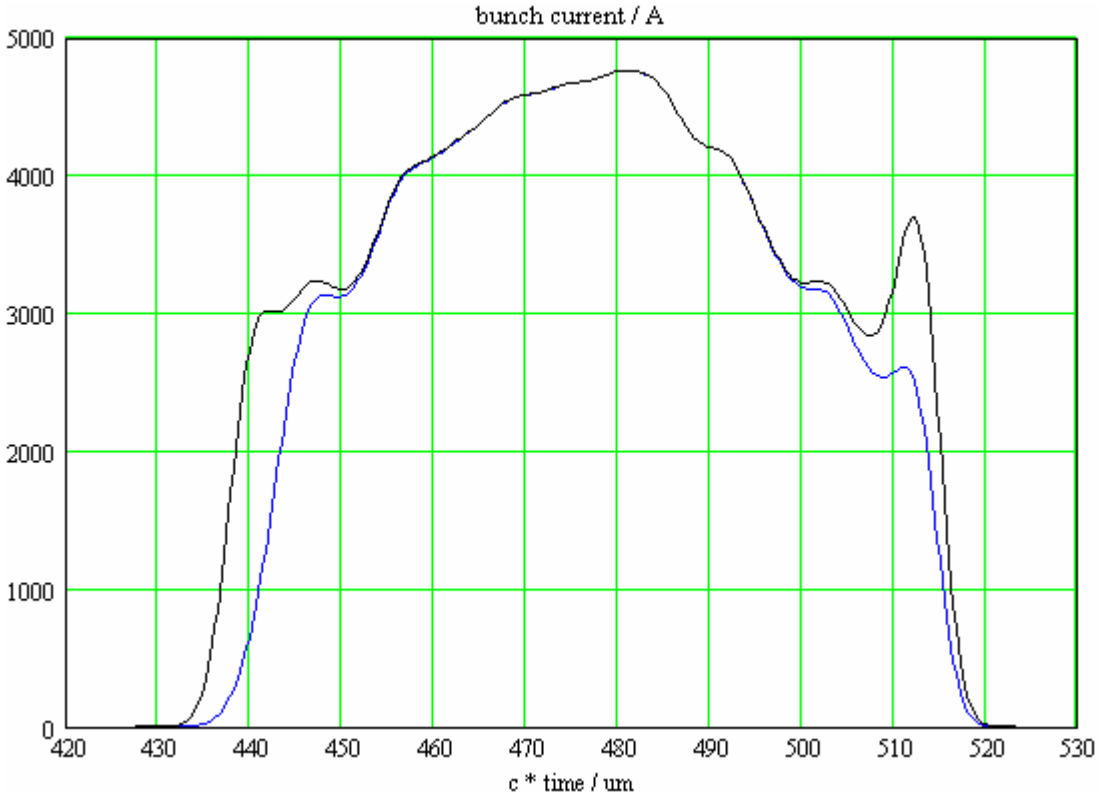
proposed setup – Zeuthen 2004

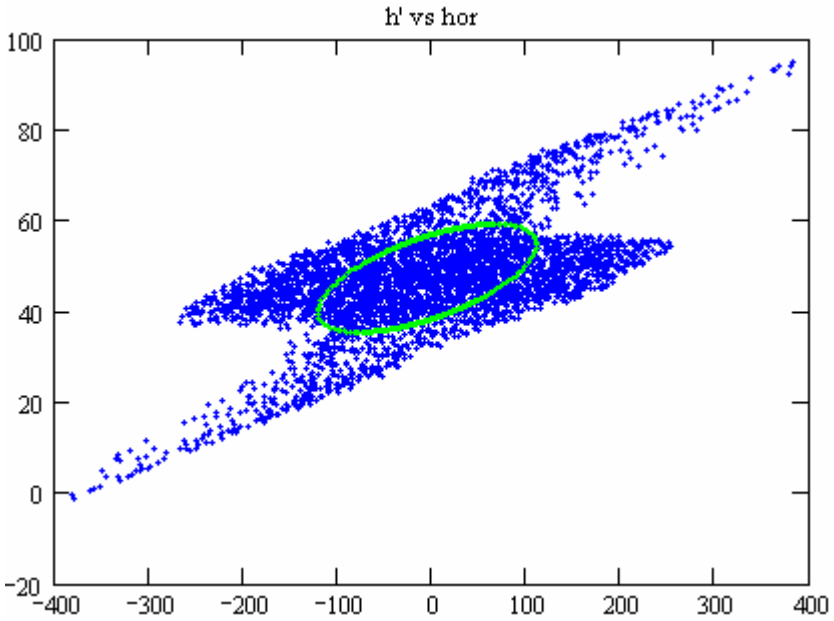


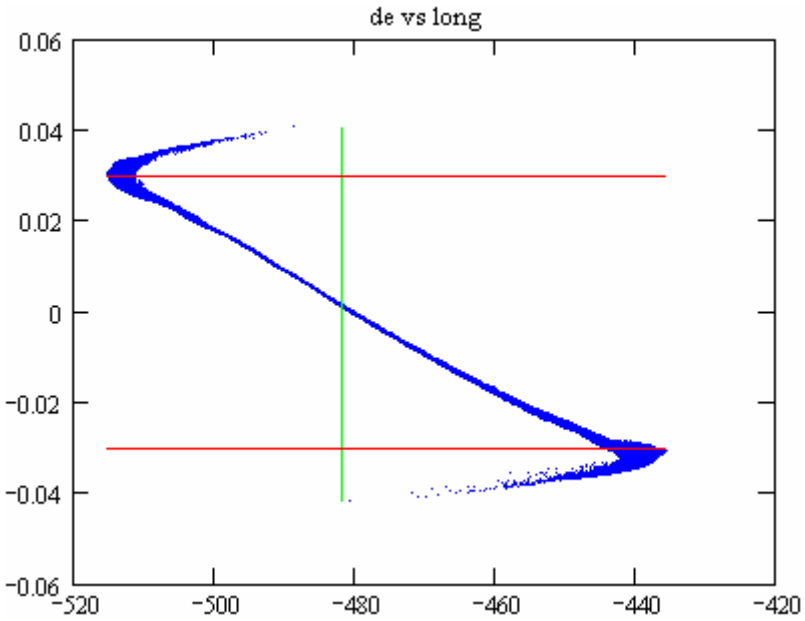
3 entrance of BC2 ASTRA/ELEGANT calculation with 200000 particles by Y.Kim
4 exit of BC2



full, in energy range:

$$\text{slice_proper}(X1,0,1) = \begin{pmatrix} -1.21 \times 10^{-6} & -0.52 \\ 3.915 \times 10^{-5} & 9.732 \\ 0 & 0.131 \\ 0 & 1.769 \times 10^{-9} \end{pmatrix}$$



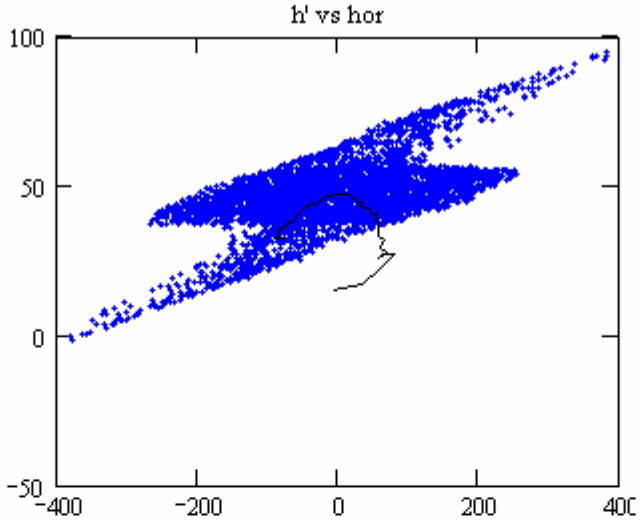


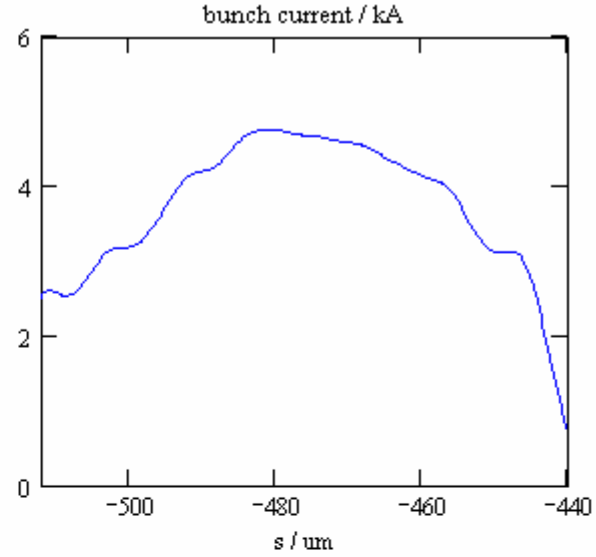
wake, 511MeV
slice with Ipeak:
projected

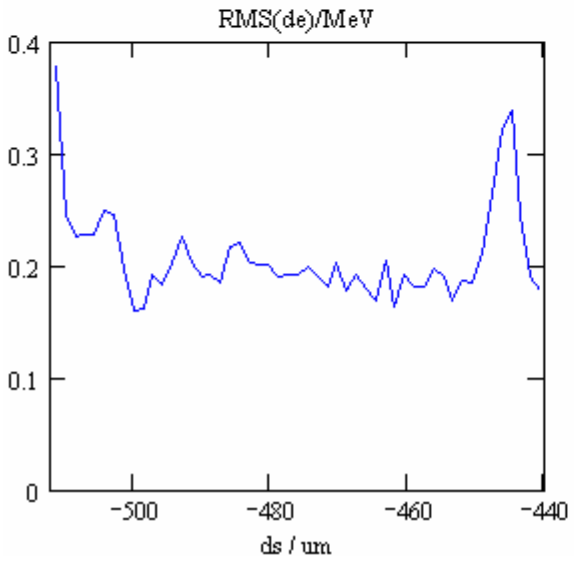
emittance(x1) = 1.078×10^{-6}

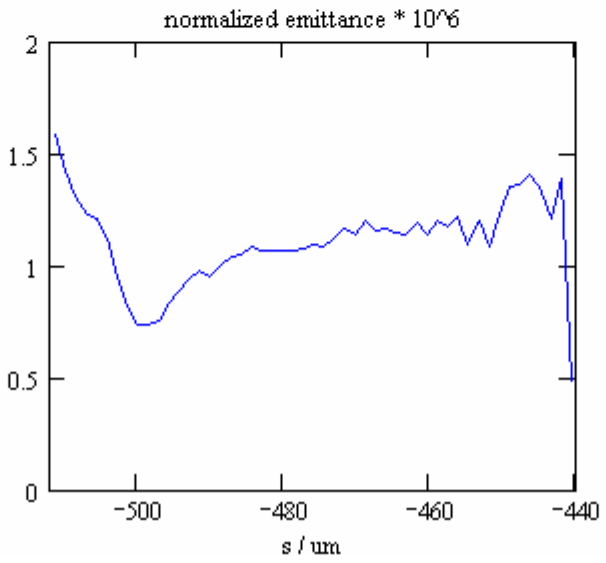
E0 = 5.11×10^{8}

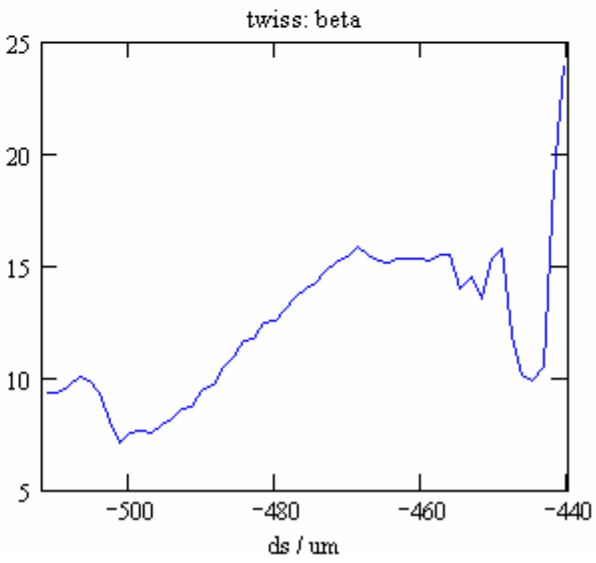
emittance(X1) = 1.785×10^{-6}

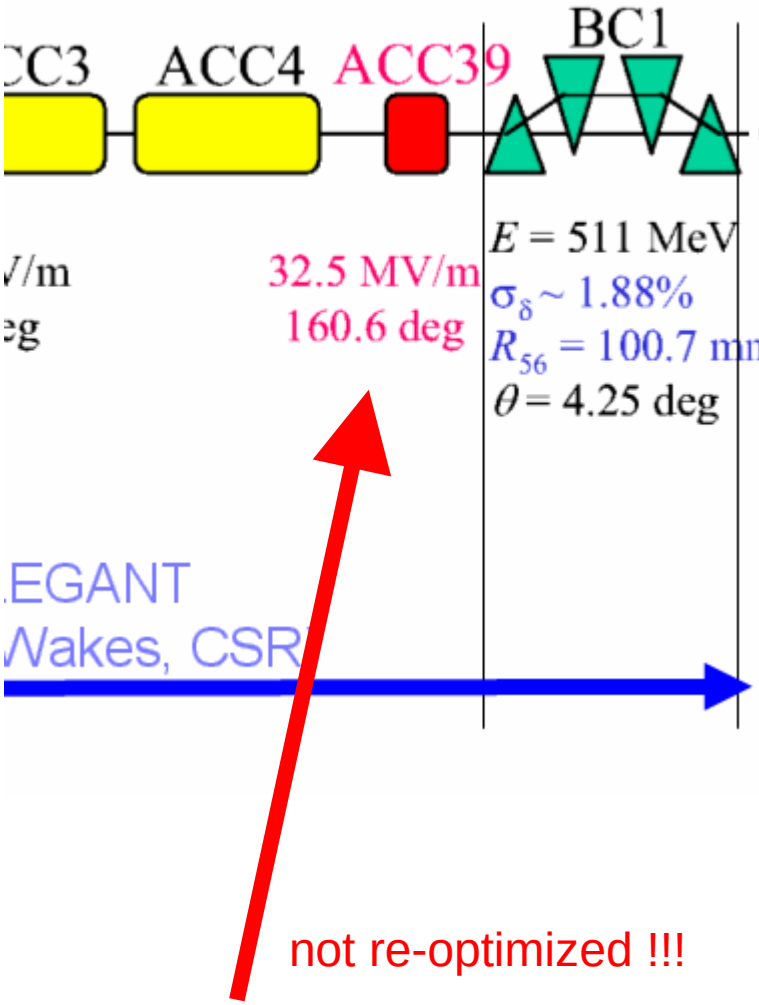












particles scaled to 2.5GeV

$$\bar{p}_{new} \leftarrow \bar{p}_{old} \cdot X$$

$$x_v \leftarrow x_v / \sqrt{X}$$

$$x_v \leftarrow x_v / \sqrt{X}$$

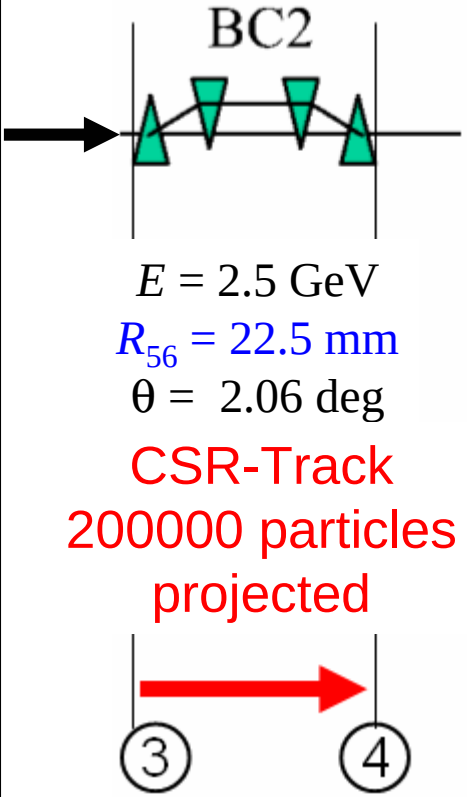
$$x_v \leftarrow z_v$$

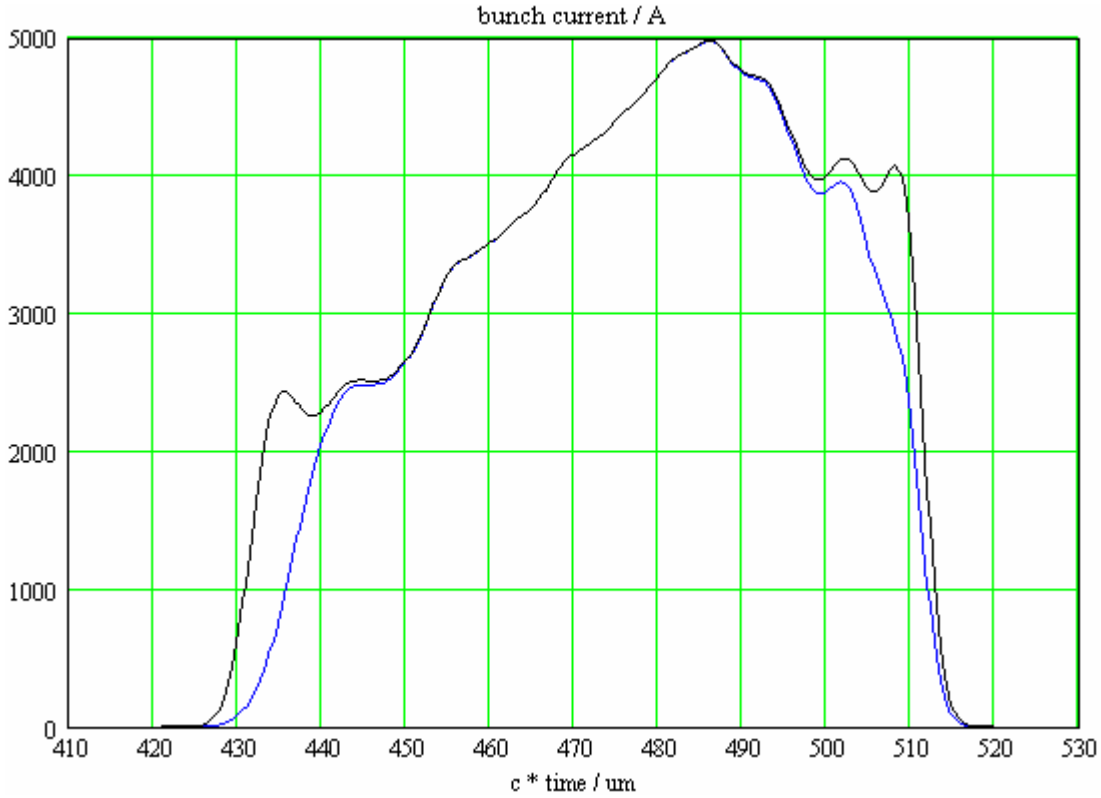
$$p_{x,v} \leftarrow p_{x,v} \cdot \sqrt{X}$$

$$p_{y,v} \leftarrow p_{y,v} \cdot \sqrt{X}$$

$$p_{z,v} \leftarrow p_{z,v} + (\bar{p}_{new} - \bar{p}_{old})$$

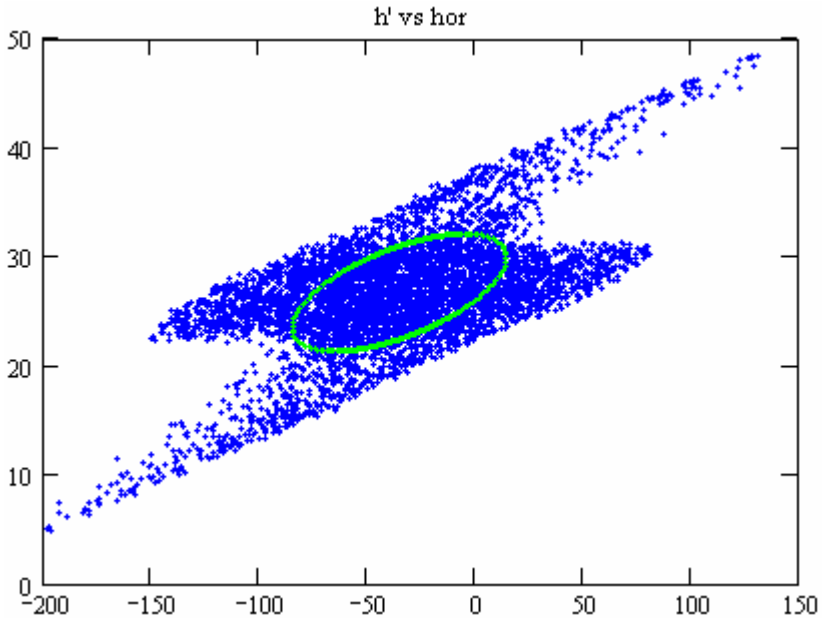
no wake

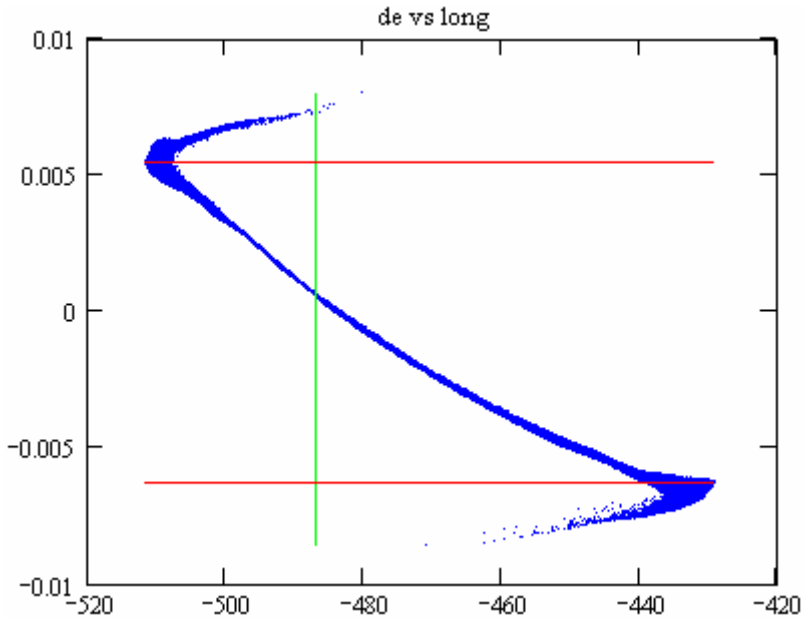




full, in energy range:

$$\text{slice_proper}(X1,0,1) = \begin{pmatrix} -2.73 \times 10^{-5} & -0.263 \\ 2.112 \times 10^{-5} & 7.102 \\ 0 & 0.151 \\ 0 & 4.599 \times 10^{-10} \end{pmatrix}$$



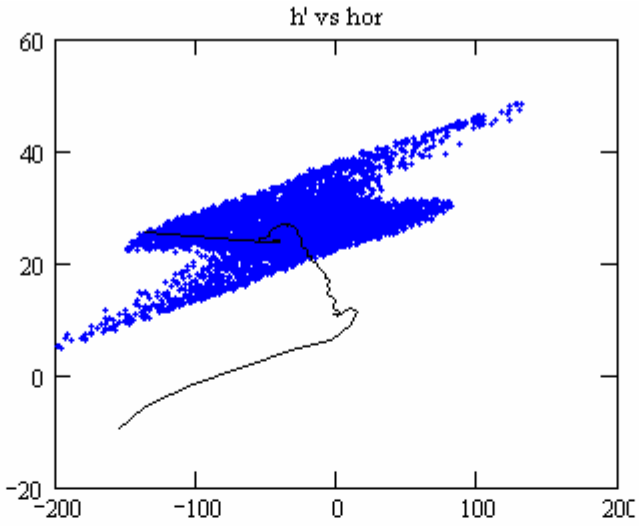


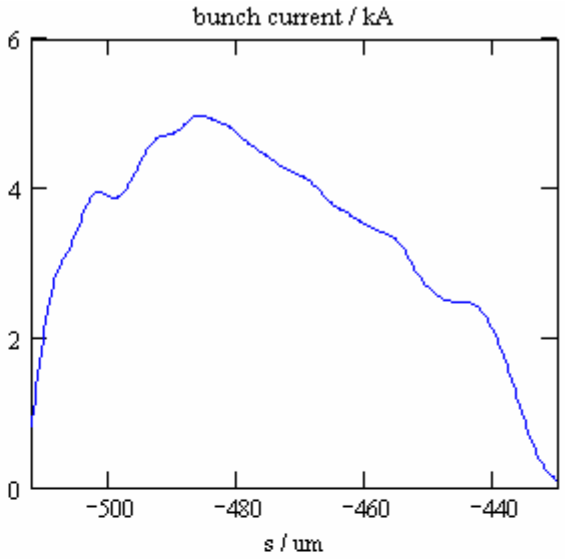
no wake, 2.5GeV
slice with I_peak:
projected

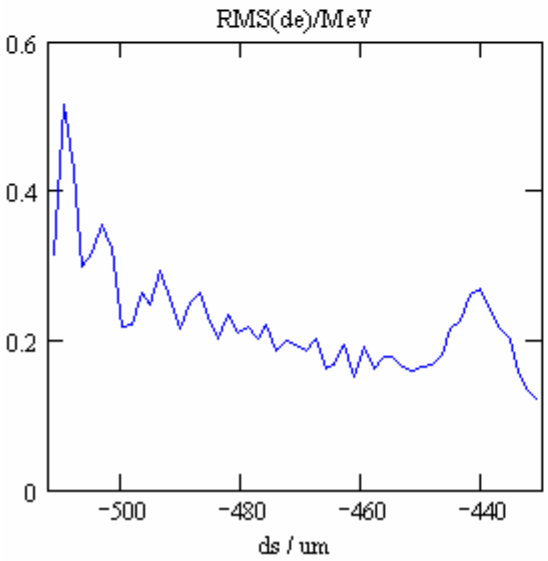
emittance(x1) = 1.039×10^{-6}

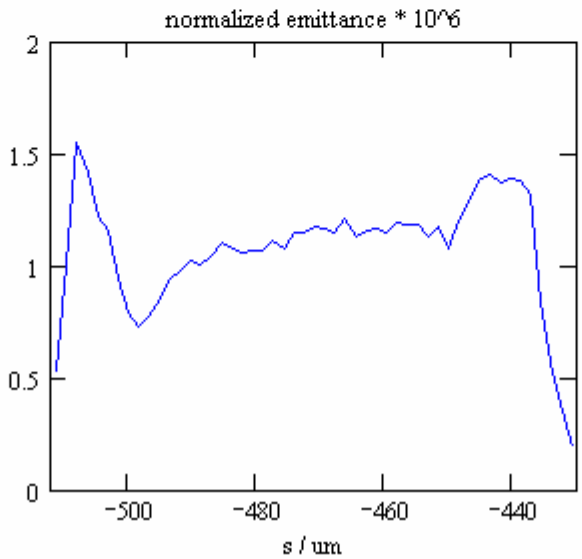
E0 = 2.5×10^{9}

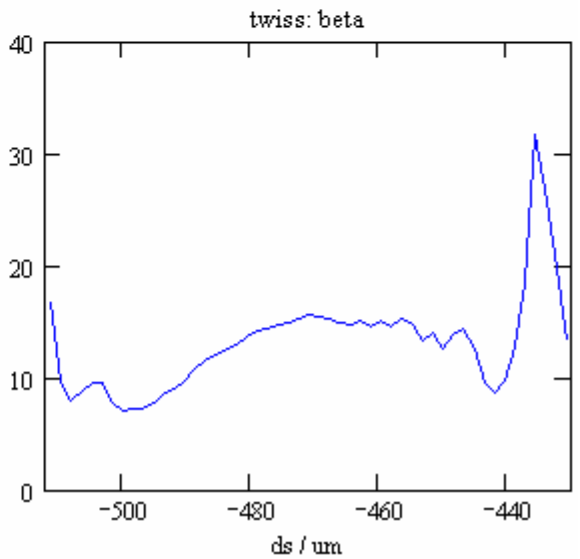
emittance(X1) = 2.257×10^{-6}

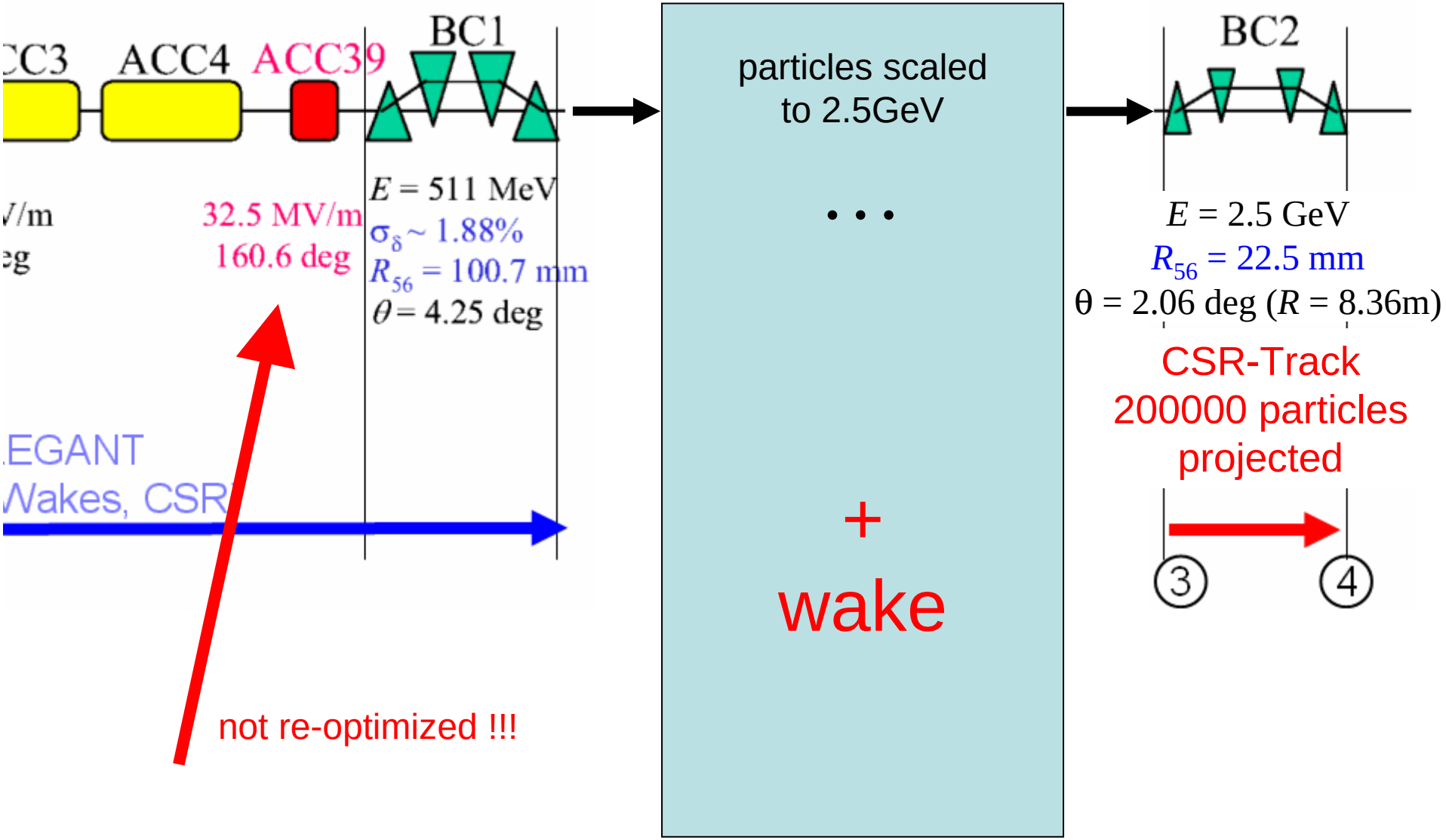


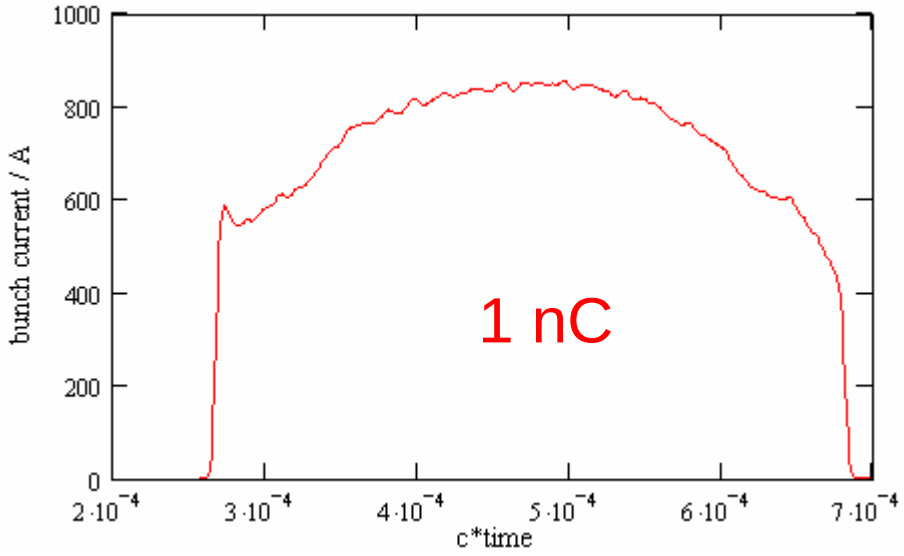


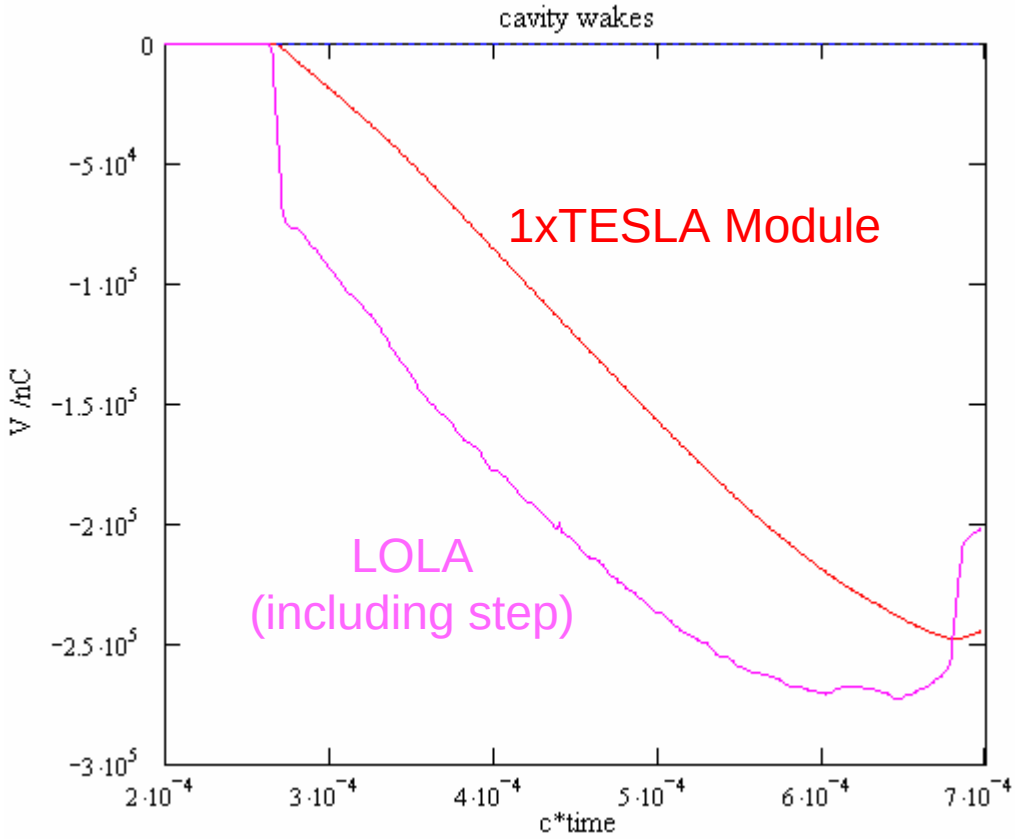


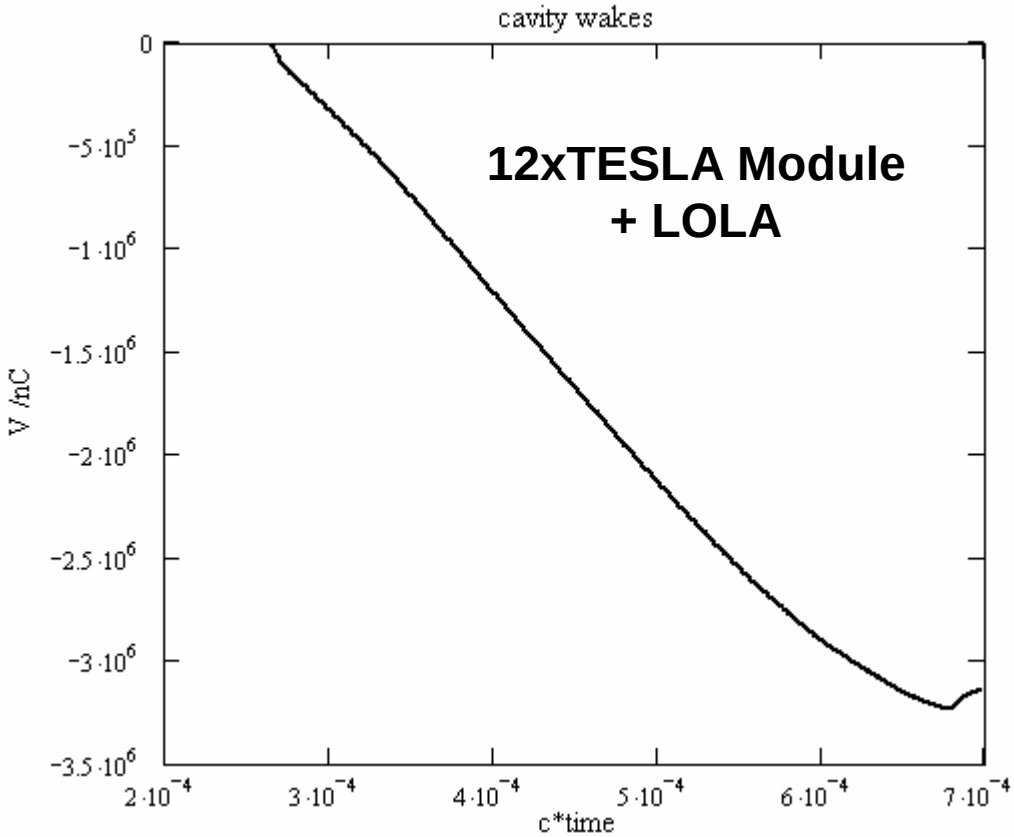


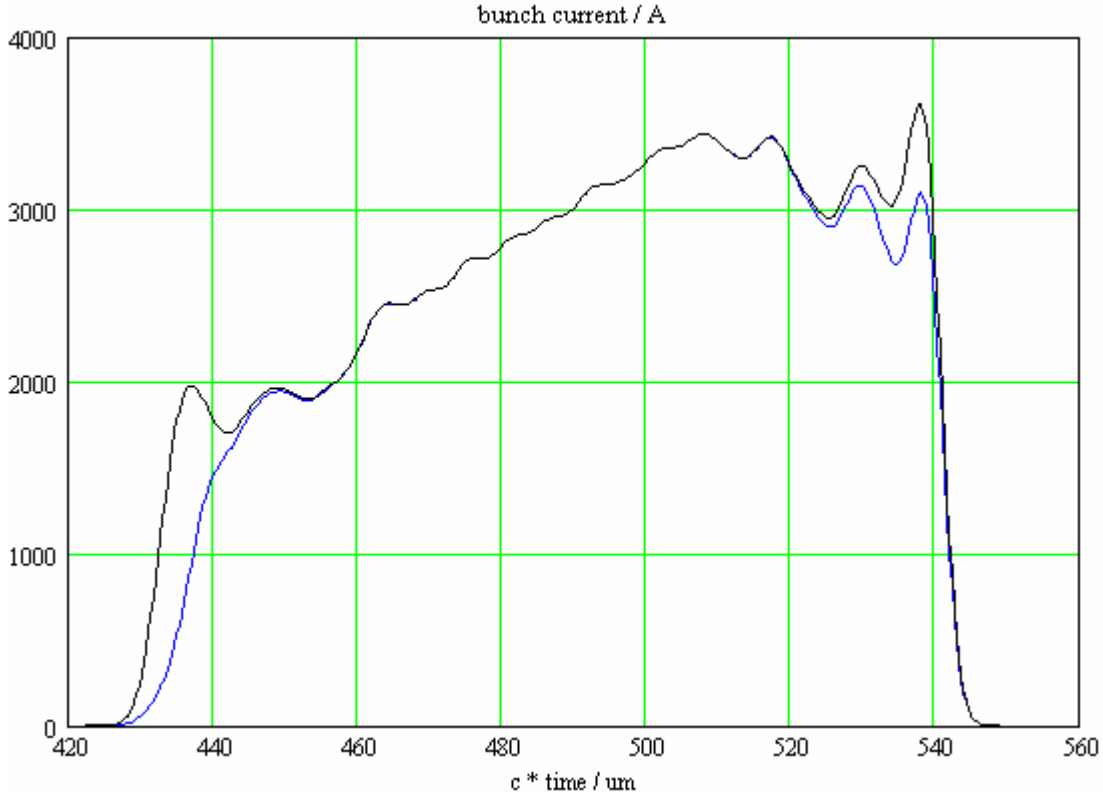



CC3
ACC4
ACC39
BC1
/m
eg
32.5 MV/m
160.6 deg
E = 511 MeV
σδ ~ 1.88%
R56 = 100.7 mm
θ = 4.25 deg
EGANT
Wakes, CSR
not re-optimized !!!
particles scaled
to 2.5GeV
• • •
+
wake
BC2
E = 2.5 GeV
R56 = 22.5 mm
θ = 2.06 deg (R = 8.36m)
CSR-Track
200000 particles
projected
3
4


1000
800
600
400
200
0
bunch current / A
1 nC
2·10^-4
3·10^-4
4·10^-4
5·10^-4
6·10^-4
7·10^-4
c*time

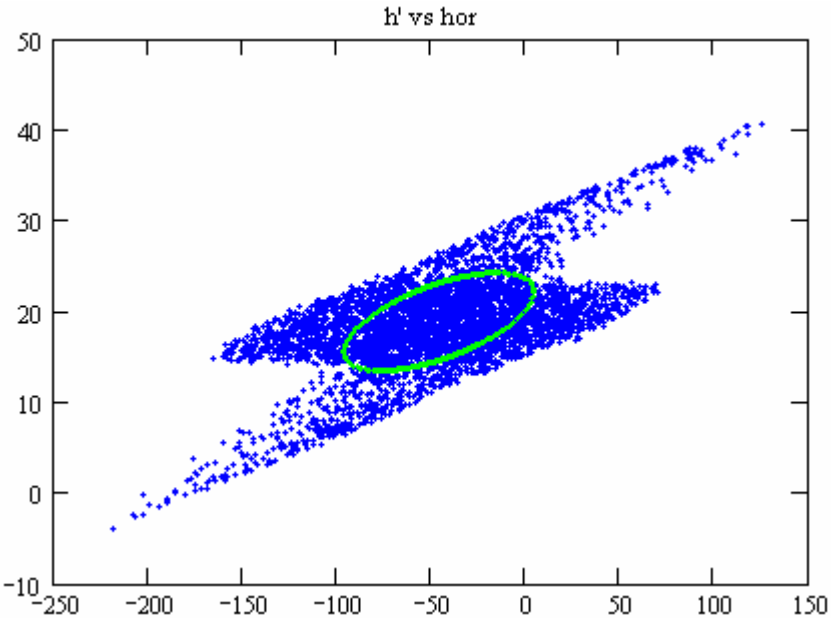

cavity wakes
0
-5·10^4
-1·10^5
-1.5·10^5
-2·10^5
-2.5·10^5
-3·10^5
V /nC
1xTESLA Module
LOLA
(including step)
2·10^-4
3·10^-4
4·10^-4
5·10^-4
6·10^-4
7·10^-4
c*time

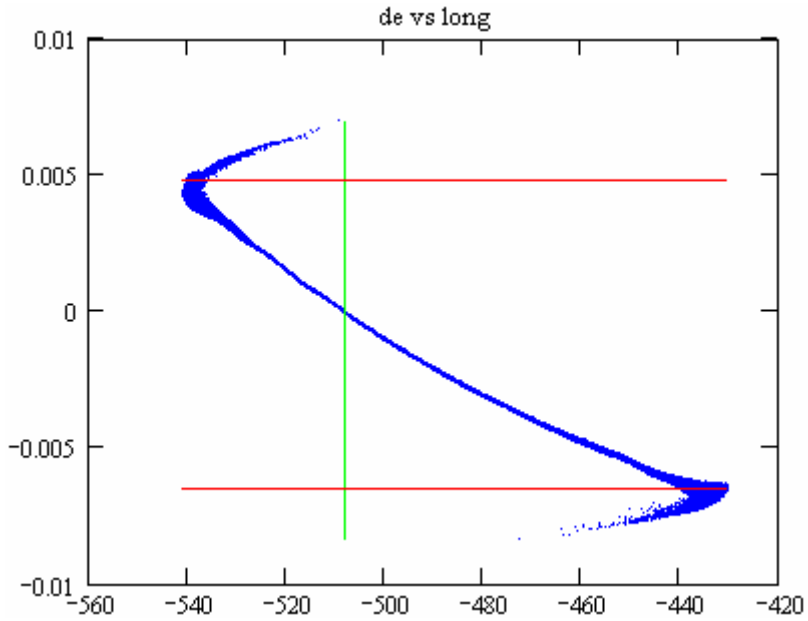

cavity wakes
0
-5·10^5
-1·10^6
-1.5·10^6
-2·10^6
-2.5·10^6
-3·10^6
-3.5·10^6
V /nC
12xTESLA Module
+ LOLA
2·10^-4
3·10^-4
4·10^-4
5·10^-4
6·10^-4
7·10^-4
c*time



full, in energy range:

$$\text{slice_proper}(X1,0,1) = \begin{pmatrix} -3.528 \times 10^{-5} & -0.277 \\ 1.583 \times 10^{-5} & 8.357 \\ 0 & 0.129 \\ 0 & 4.124 \times 10^{-10} \end{pmatrix}$$



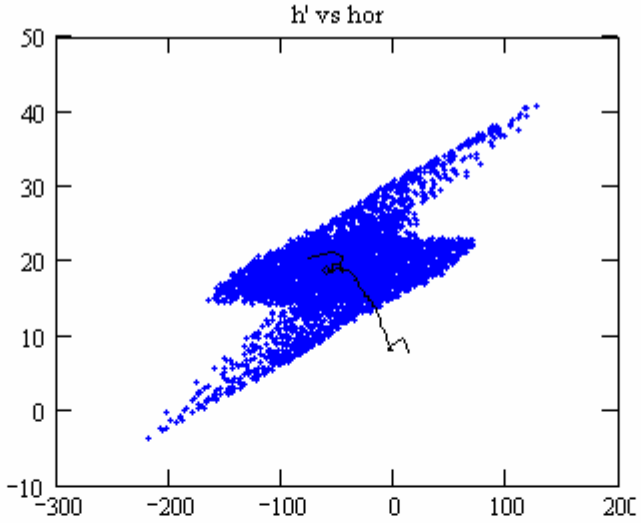


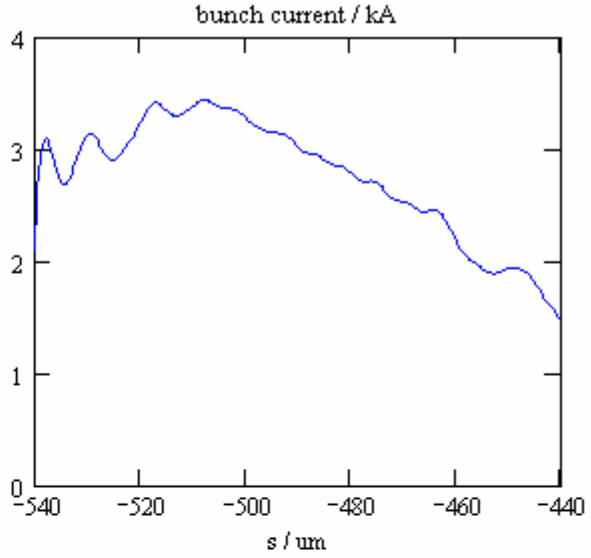
wake, 2.5GeV
slice with I_peak:
projected

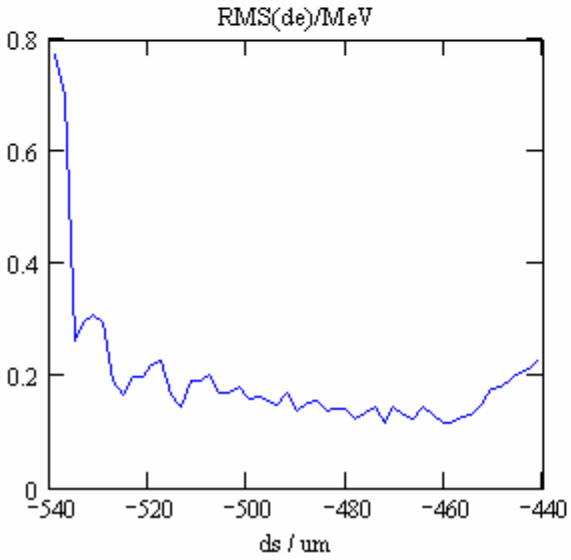
emittance(x1) = 1.048×10^{-6}

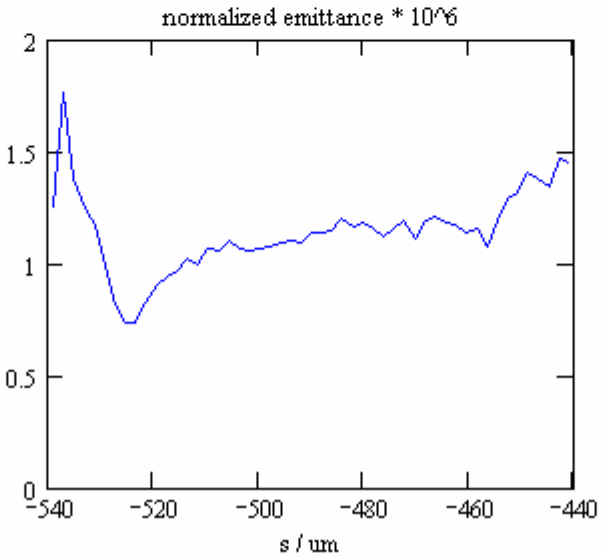
E0 = 2.5×10^{9}

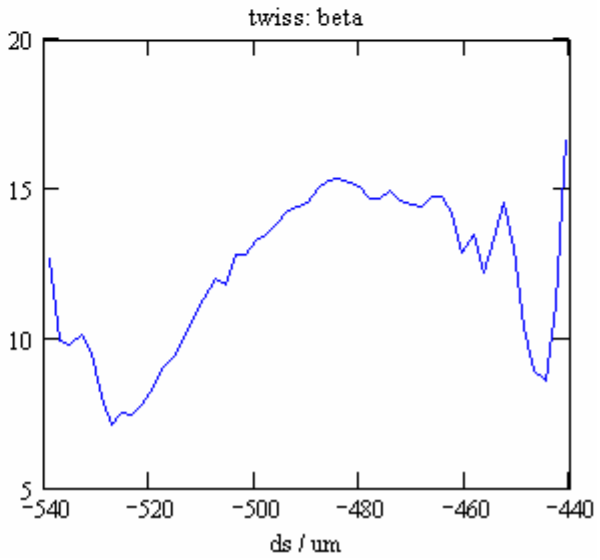
emittance(X1) = 2.022×10^{-6}

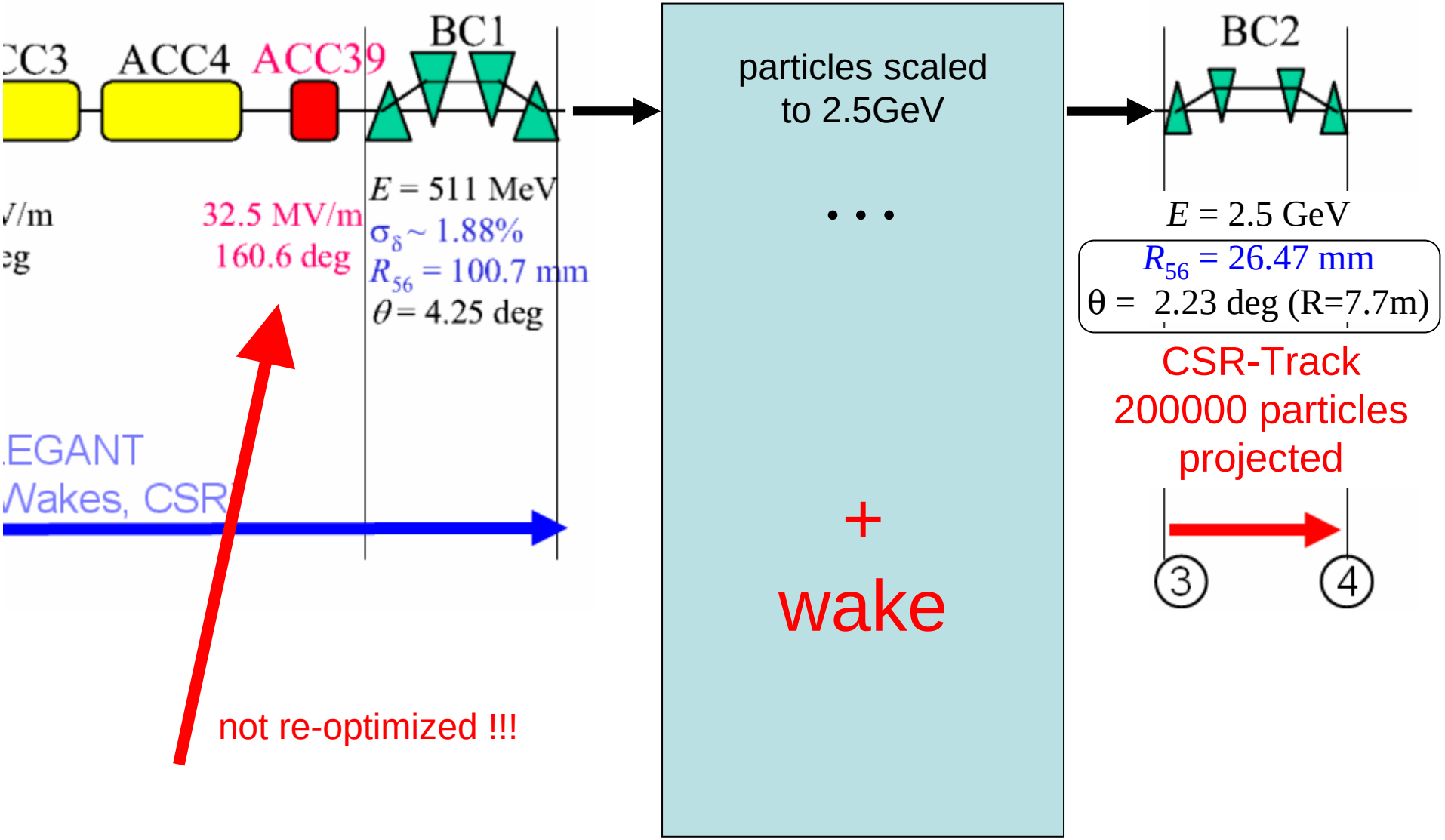


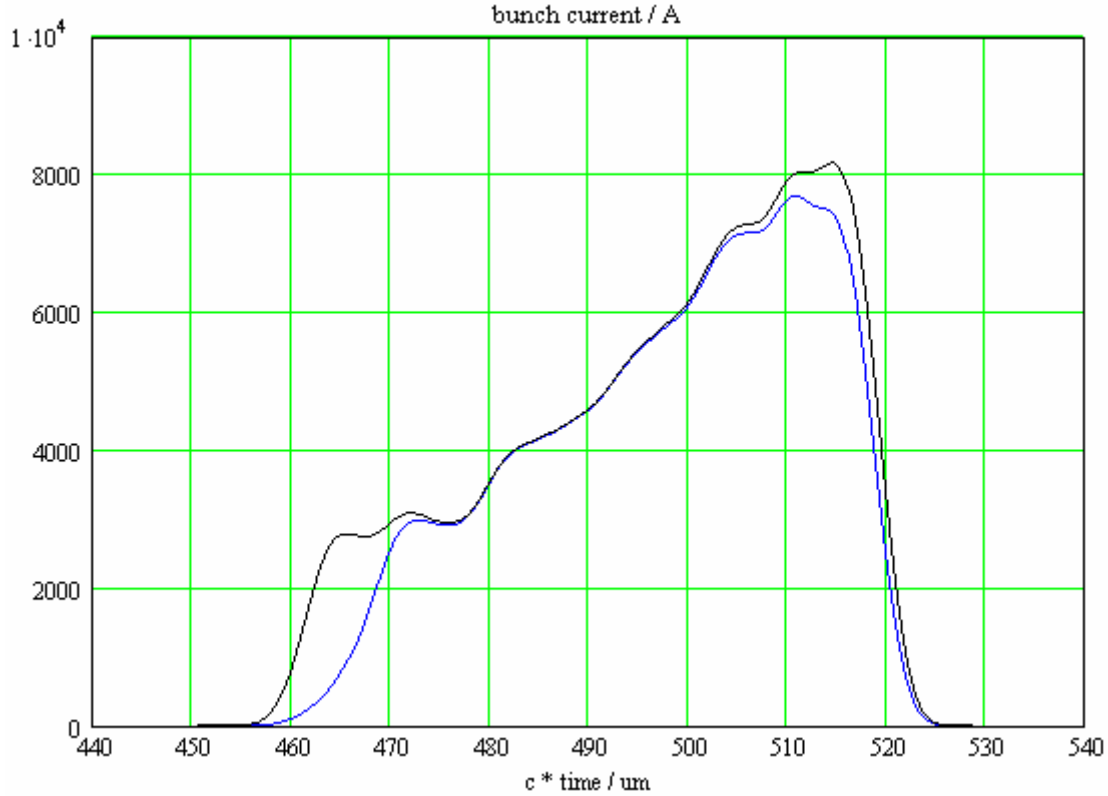






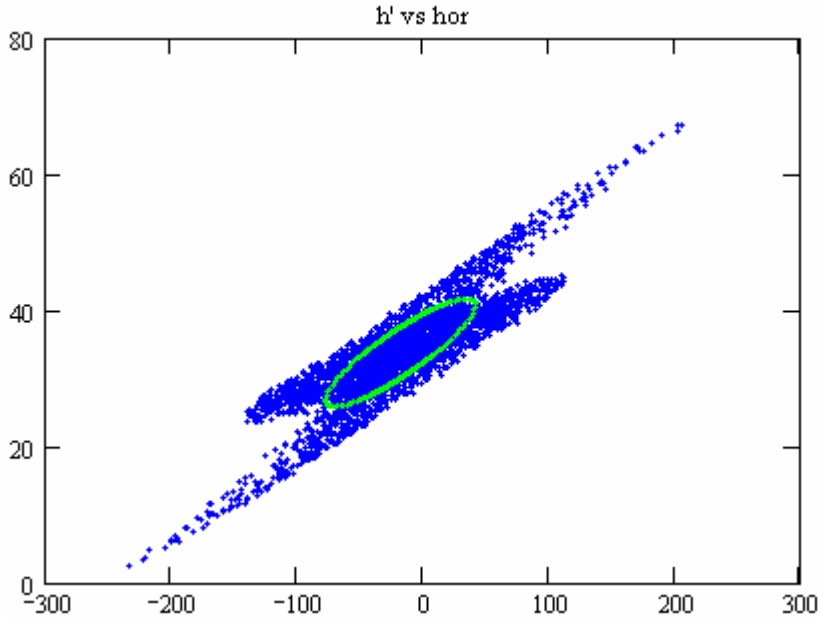


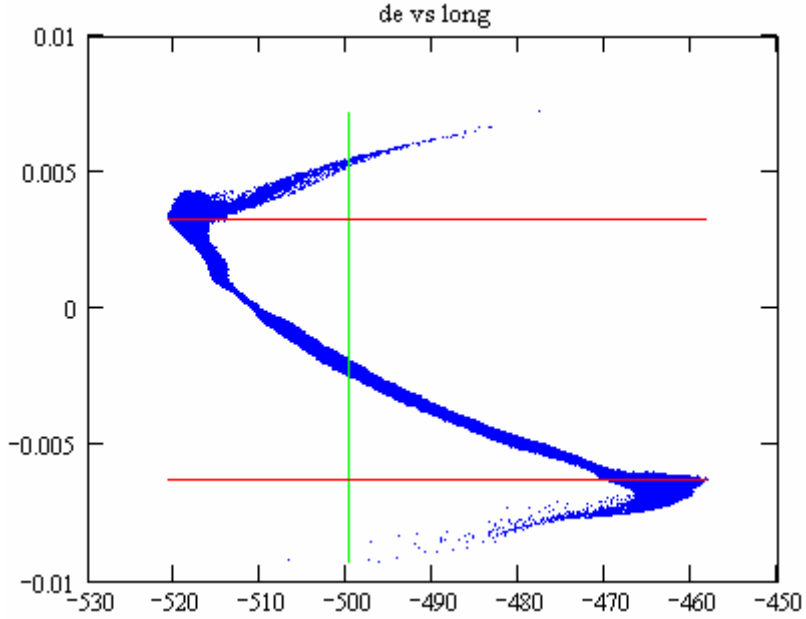

CC3
ACC4
ACC39
BC1
E = 511 MeV
σδ ~ 1.88%
R56 = 100.7 mm
θ = 4.25 deg
/m
eg
32.5 MV/m
160.6 deg
EGANT
Wakes, CSR
not re-optimized !!!
particles scaled
to 2.5GeV
• • •
+
wake
BC2
E = 2.5 GeV
R56 = 26.47 mm
θ = 2.23 deg (R=7.7m)
CSR-Track
200000 particles
projected
3
4



full, in energy range:

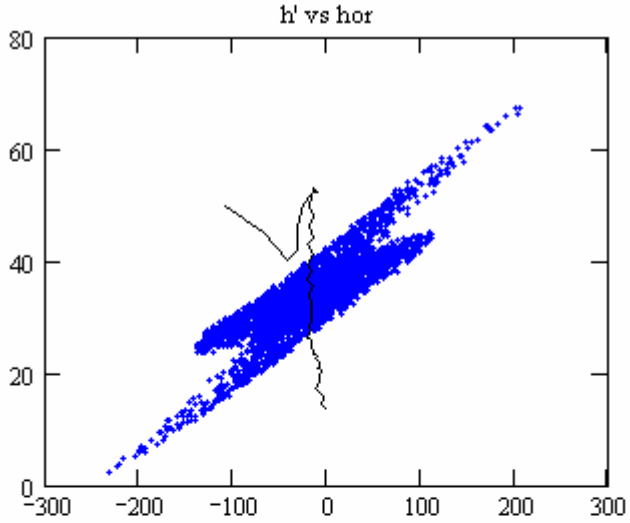
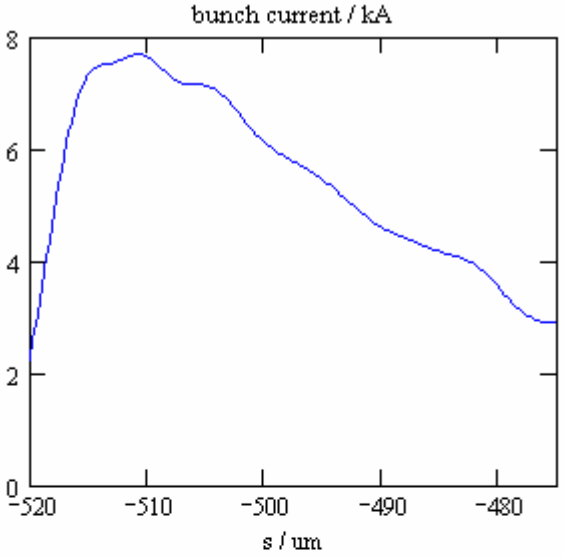
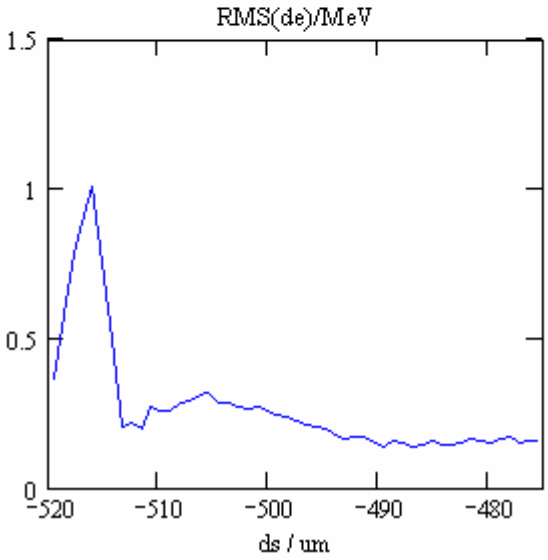
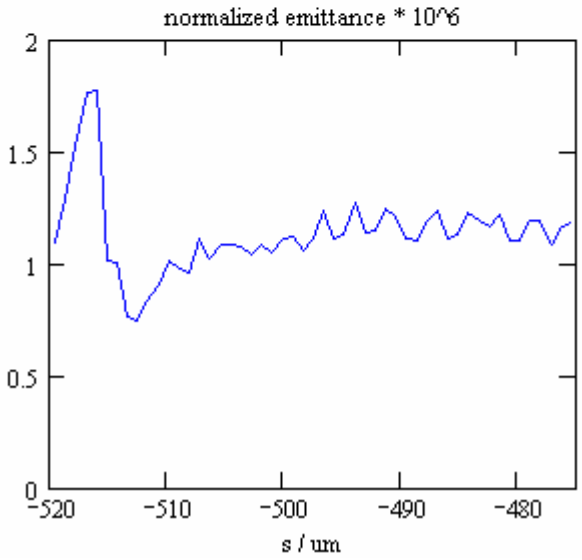
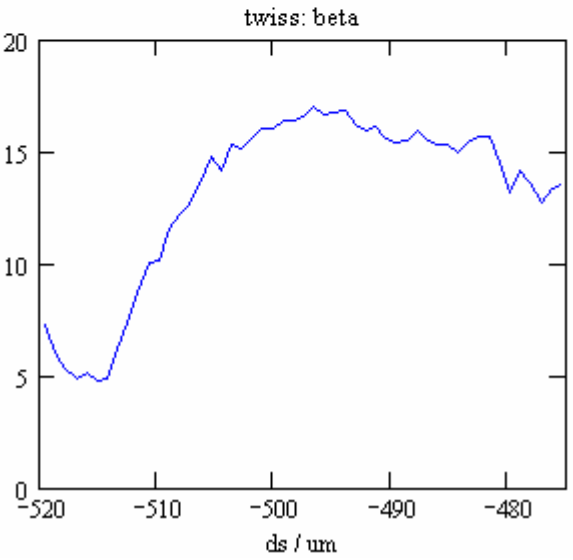
$$\text{slice_proper}(X1,0,1) = \begin{pmatrix} -1.774 \times 10^{-5} & -0.194 \\ 3.377 \times 10^{-5} & 3.669 \\ 0 & 0.283 \\ 0 & 8.648 \times 10^{-10} \end{pmatrix}$$





wake, 2.5GeV
slice @ 500um:
projected

emittance(x1) = 1.091×10^{-6}

E0 = 2.5×10^{9}

emittance(X1) = 4.241×10^{-6}