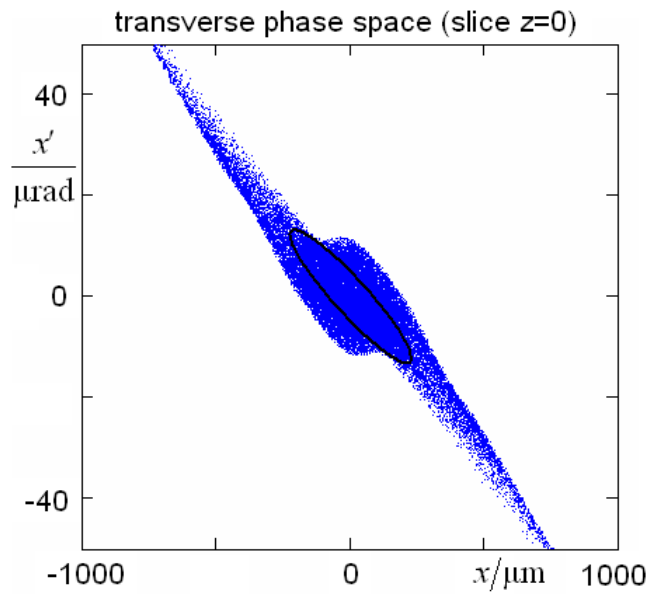# double BC

- **proposed setup**
  tracking with ASTRA, ELEGANT and CSRtrack
- **BC1 entrance**
- **conversion (200000 $\rightarrow$ 8120)**
- **BC1 exit**
- **BC2 entrance**
- **conversion (200000 $\rightarrow$ 10100)**
- **BC2 exit**
- **conversion (10100 $\rightarrow$ 200000)**

proposed setup
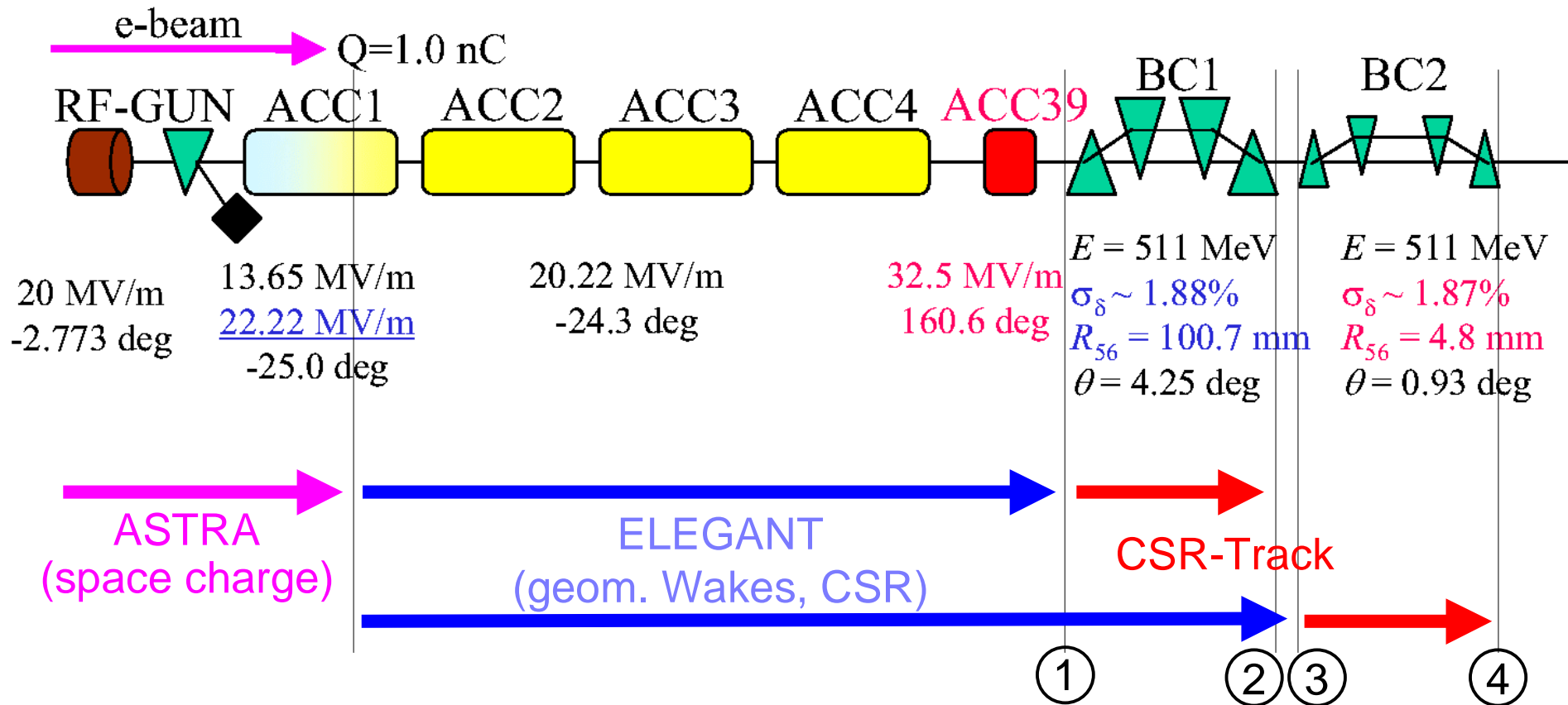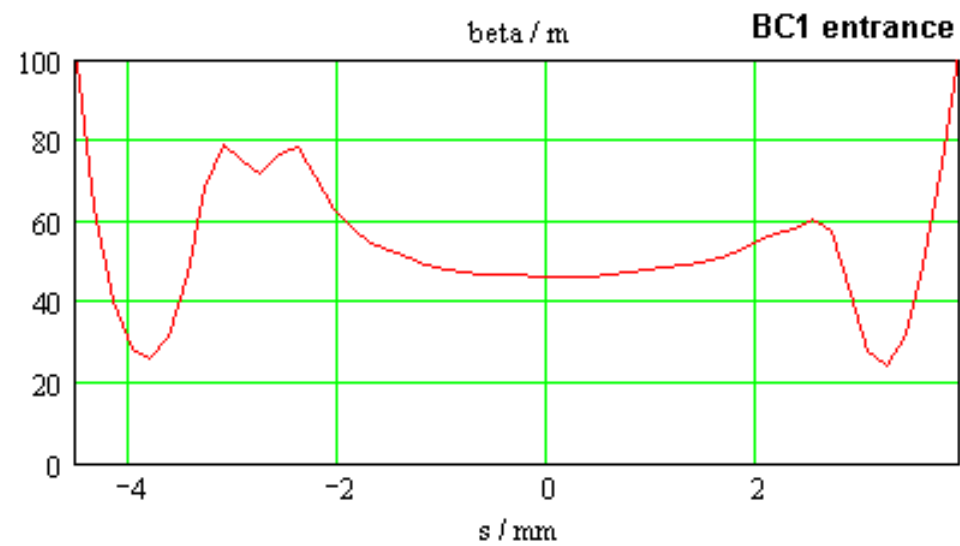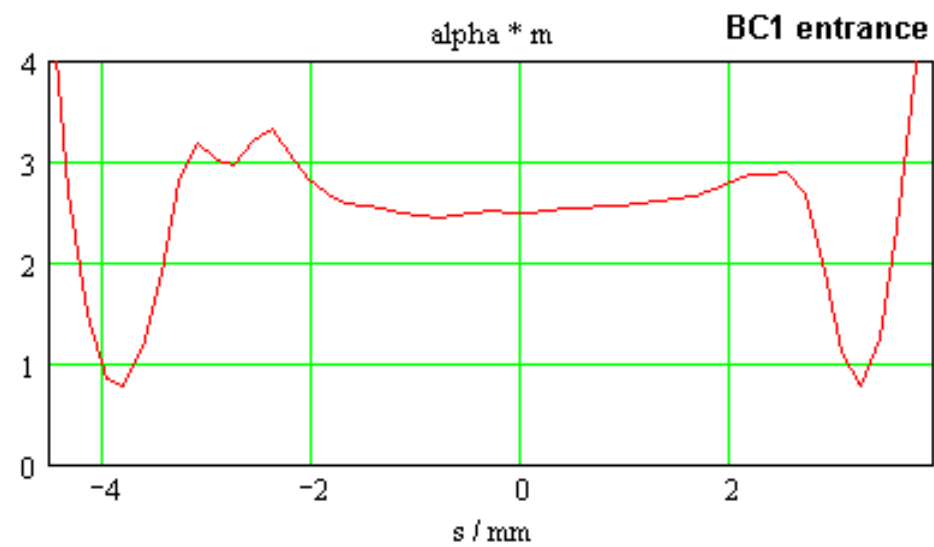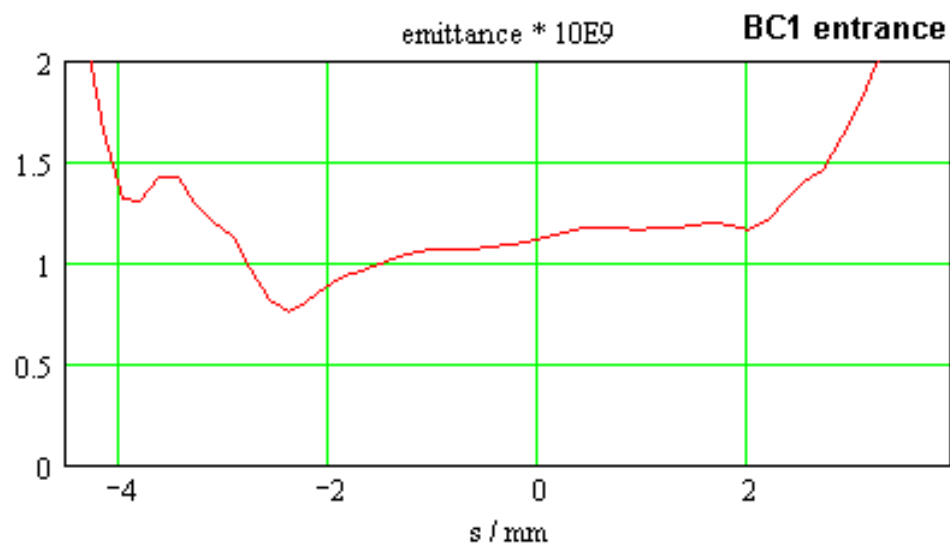

1 entrance of BC1   ASTRA/ELEGANT calculation with 200000 particles by Y.Kim
2 exit of BC 1
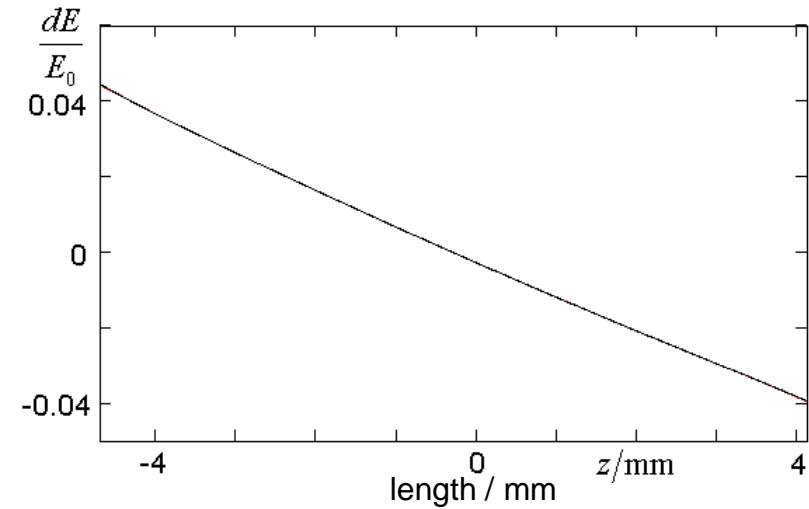3 entrance of BC2   ASTRA/ELEGANT calculation with 200000 particles by Y.Kim
4 exit of BC2

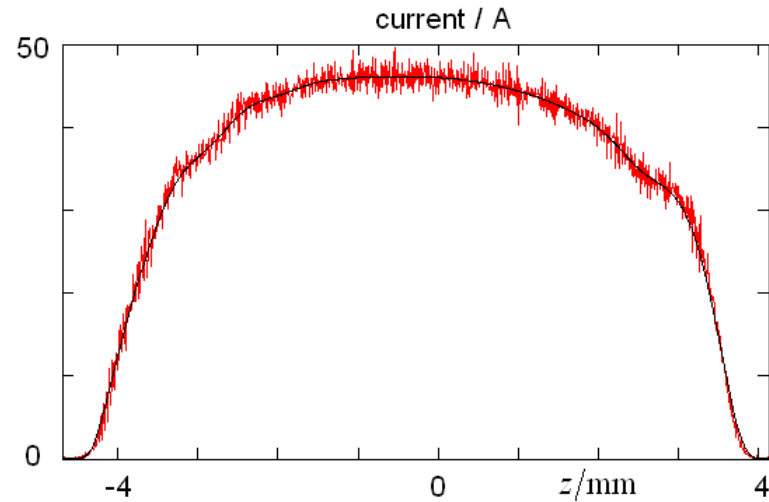Martin Dohlus   double bc jan 2004
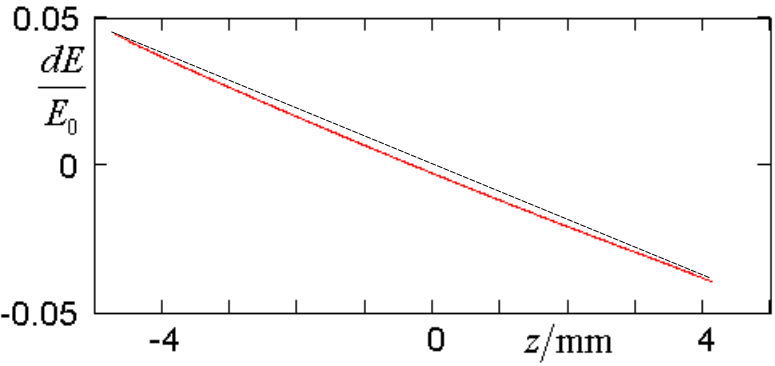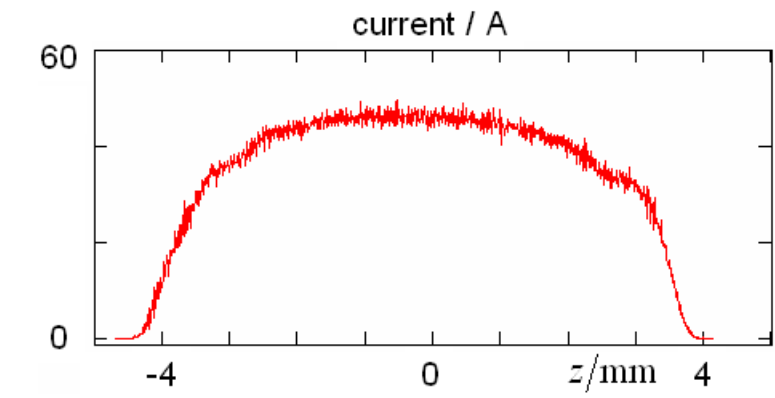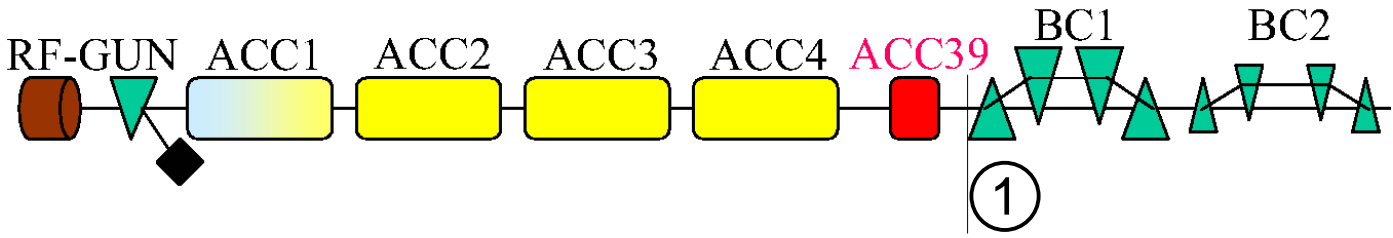
BC1 entrance

$\gamma_E \varepsilon = 1.12 \cdot 10^{-6} \, \text{m} \cdot \text{rad}$

$\alpha = 2.5 \, \text{m}^{-1}$

$\beta = 46.6 \, \text{m}$

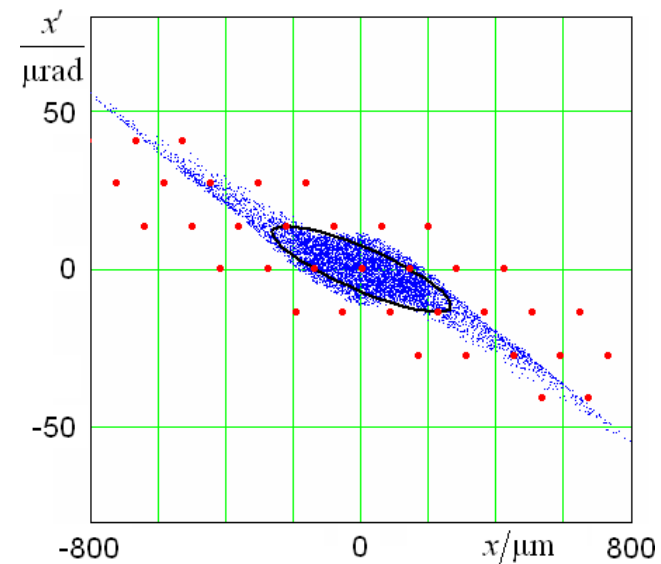$\gamma = 0.156$

Martin Dohlus   double bc jan 2004

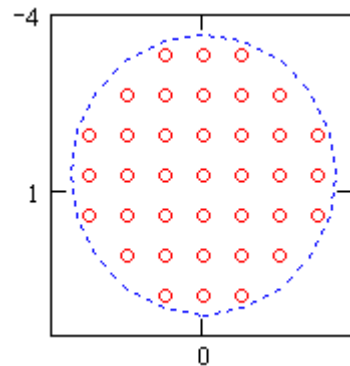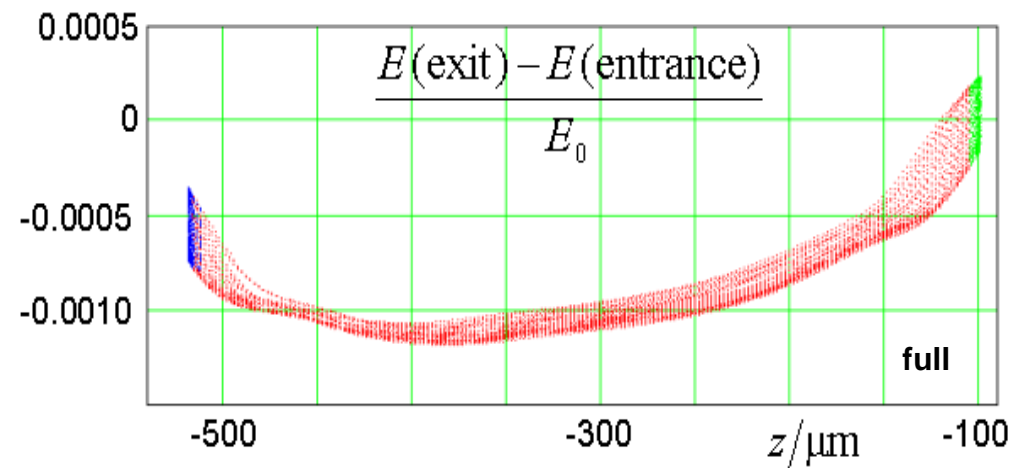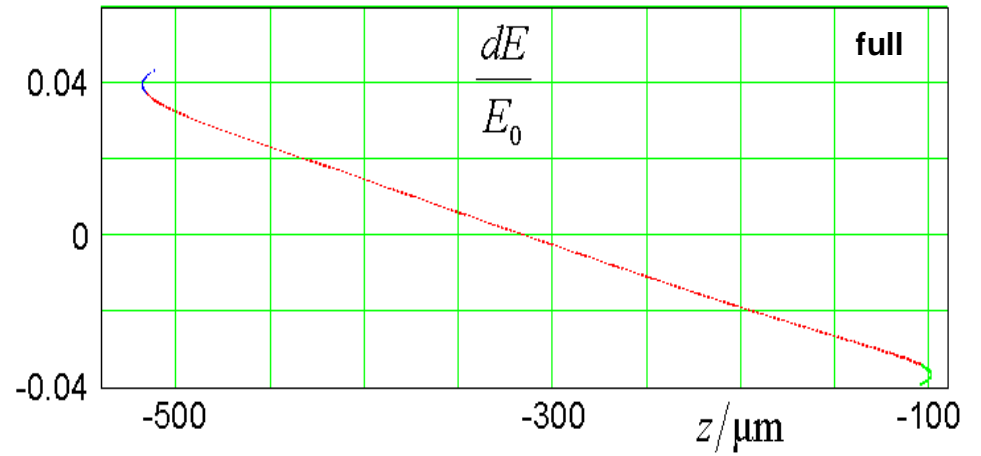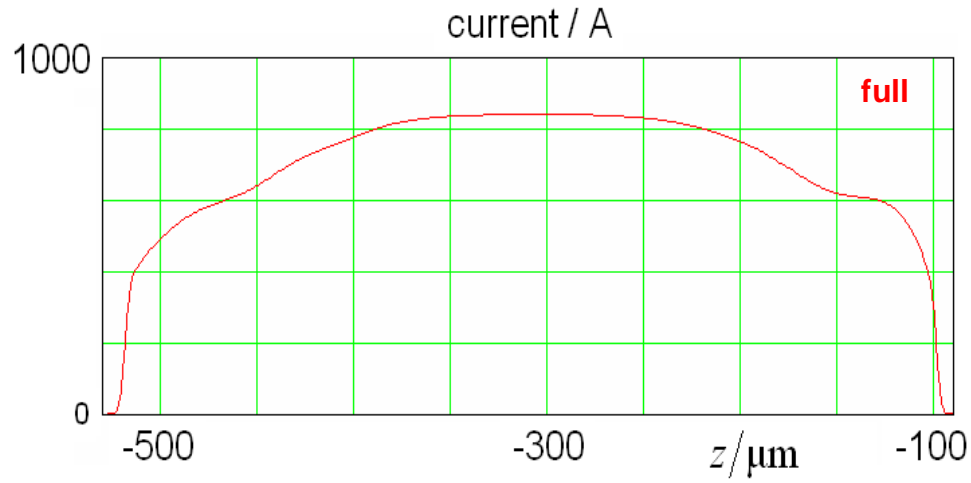**Martin Dohlus   double bc** jan 2004

conversion (200000 → 8120)

a) longitudinal, equidistant z-mesh, **no uncorrelated energy spread !**
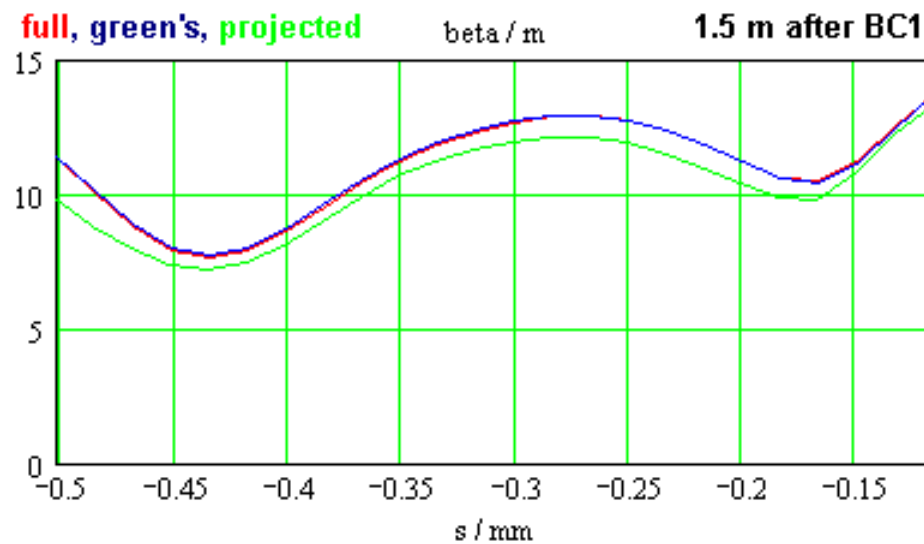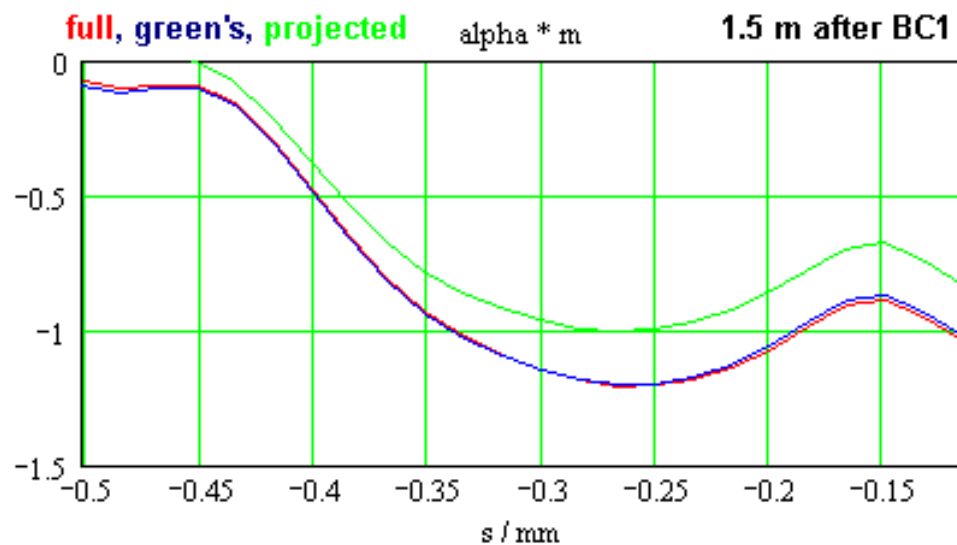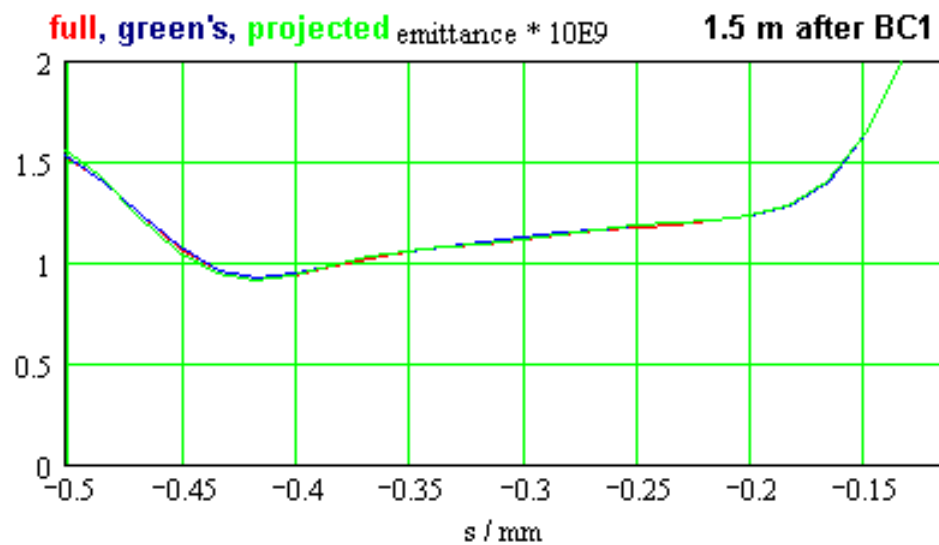

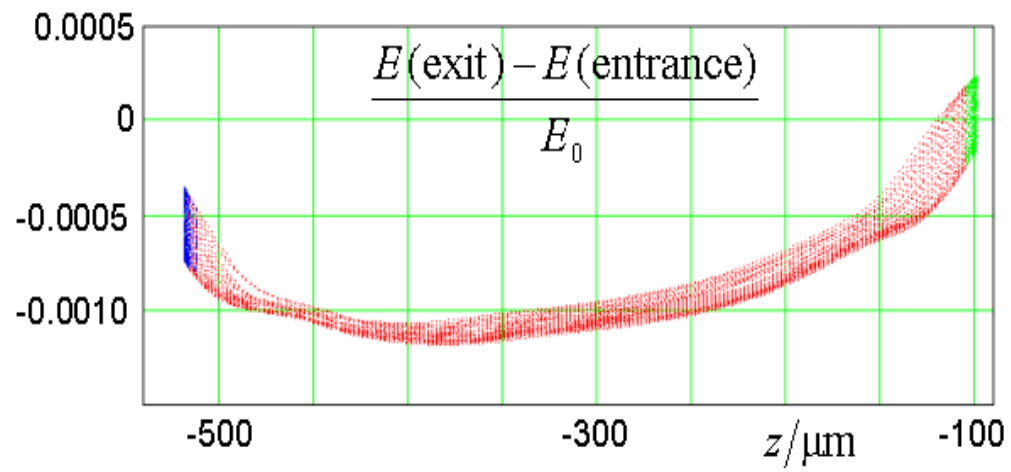b) transverse, gaussian, equidistant mesh
   37 particles/slice, 219 slices

BC1 exit
(1.5 m after BC1)

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full

$$\frac{E(\text{exit}) - E(\text{entrance})}{E_0}$$

projected

$$\frac{E(\text{exit}) - E(\text{entrance})}{E_0}$$

Martin Dohlus   double bc jan 2004

BC2 entrance

current / A

transverse phase space (slice z=-0.47mm)
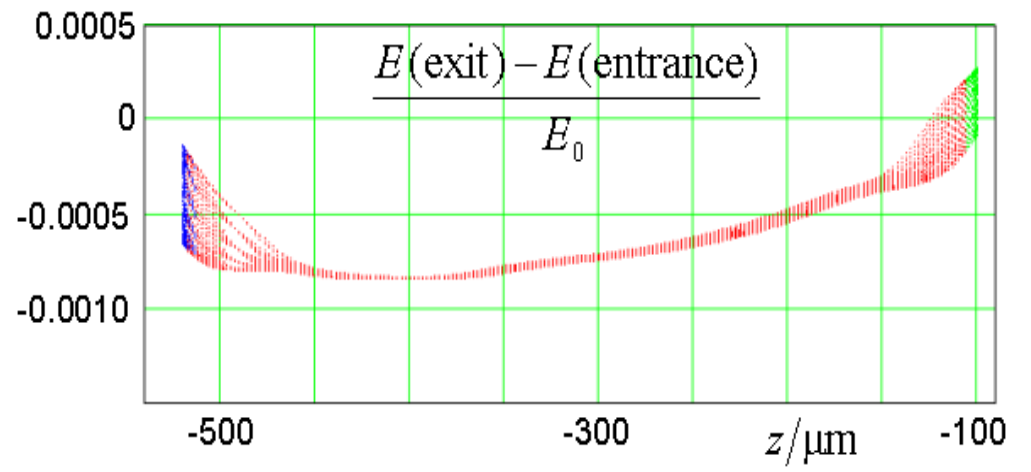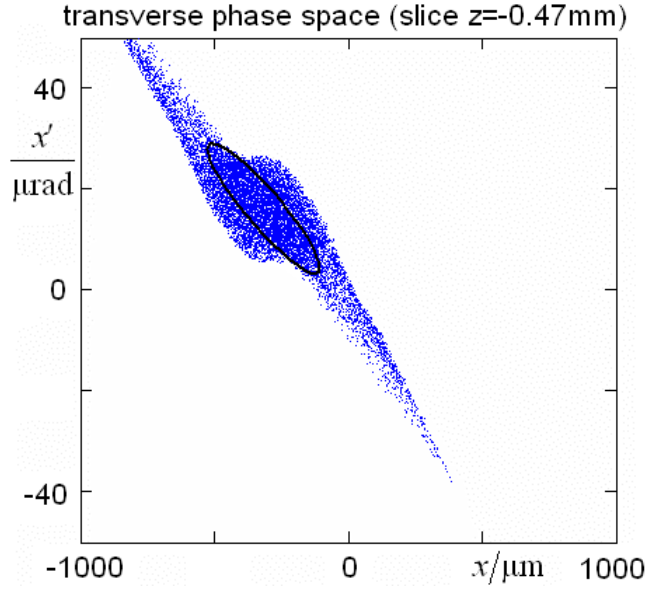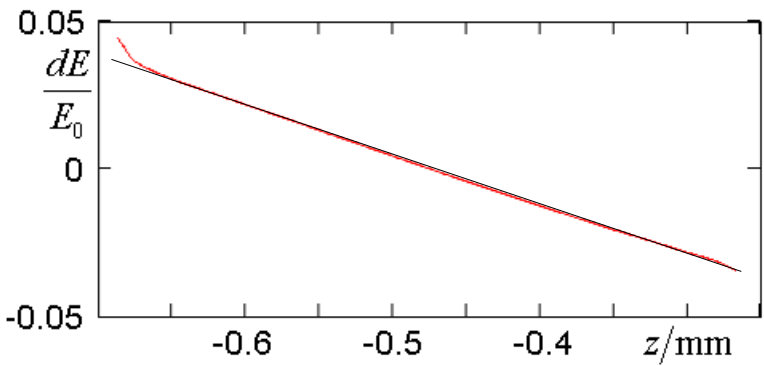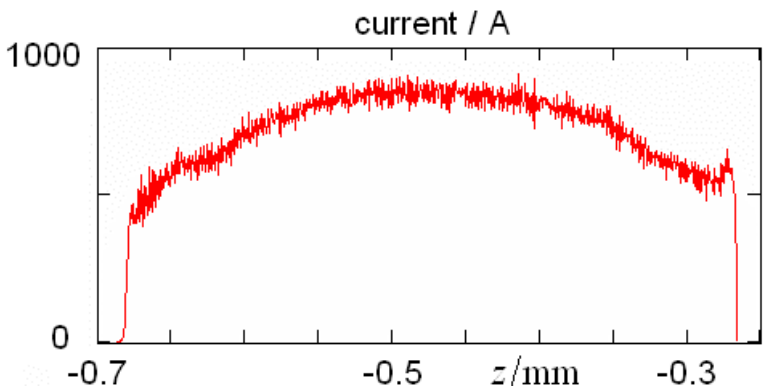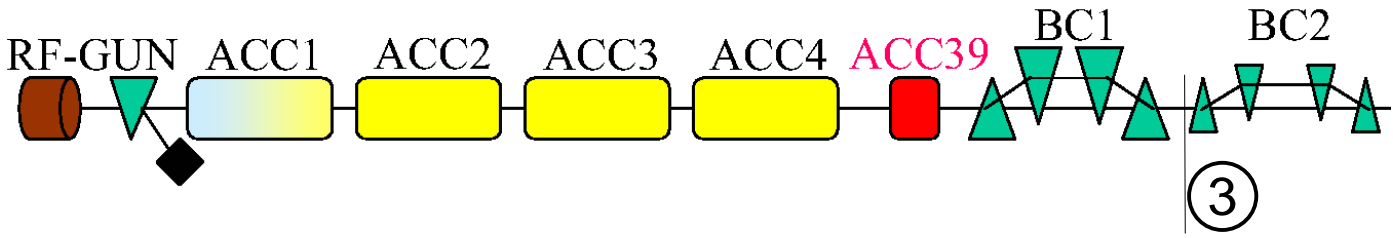
$\gamma_E \varepsilon = 1.10 \cdot 10^{-6} \ \mathrm{m} \cdot \mathrm{rad}$

$\alpha = 2.25 \ \mathrm{m}^{-1}$

$\beta = 40.19 \ \mathrm{m}$

$\gamma = 0.151$

Martin Dohlus   double bc jan 2004

Martin Dohlus   double bc jan 2004
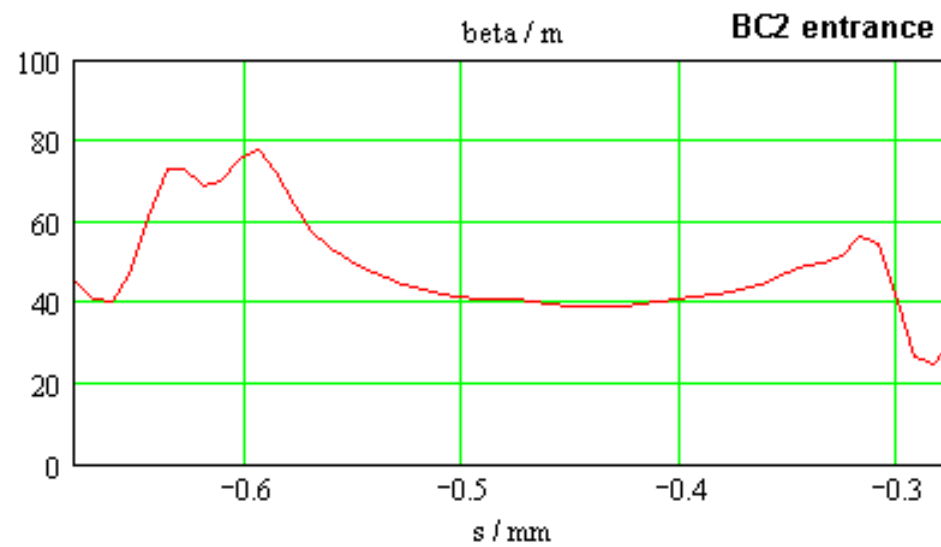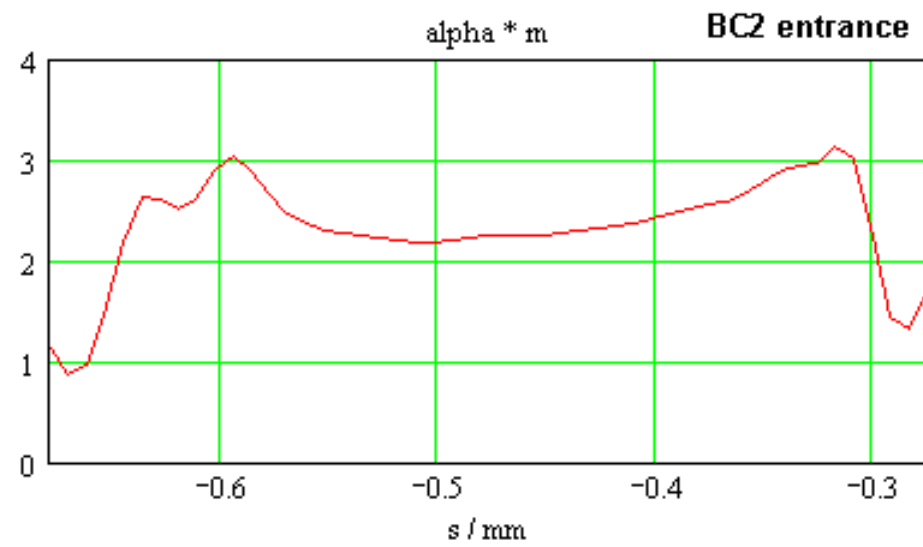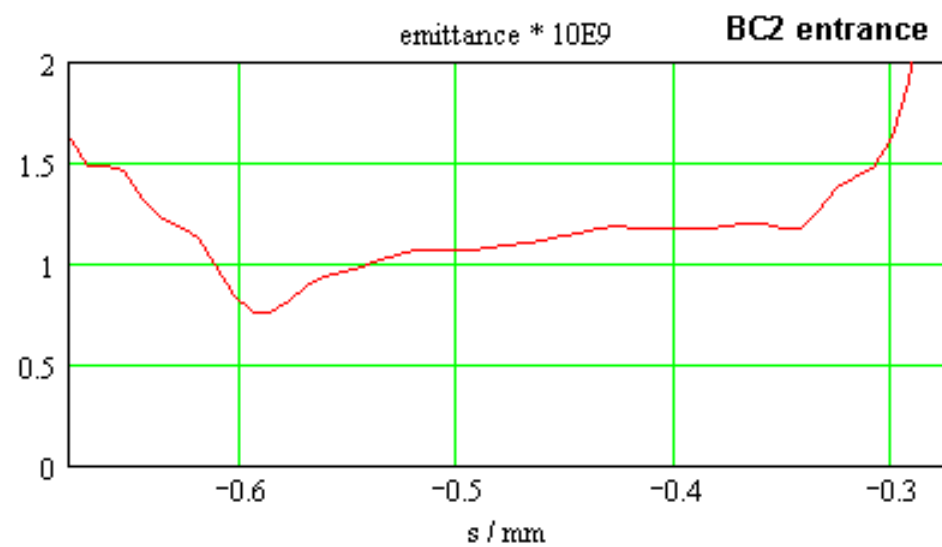
conversion (200000 → 10100)

a) longitudinal, dE-mesh (**not** equidistant), **no uncorrelated energy spread !**
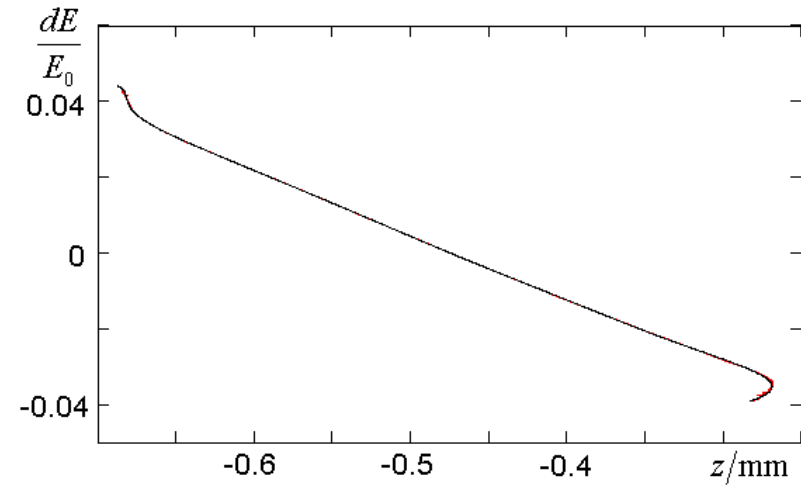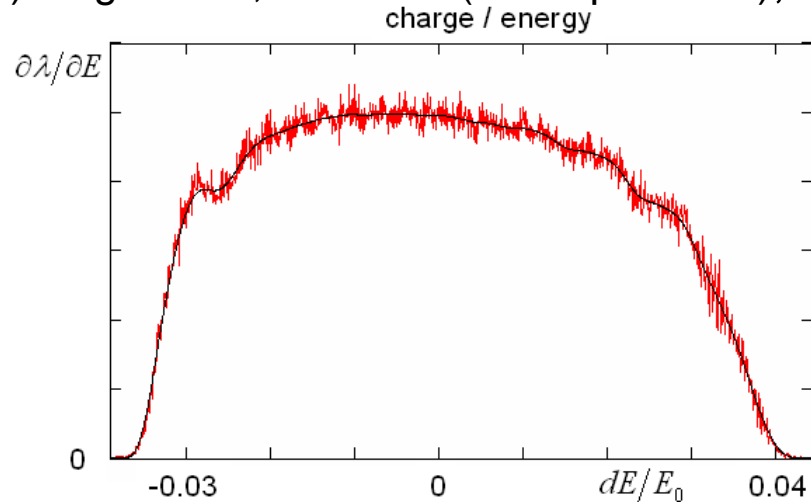
b) transverse, gaussian, equidistant mesh
101 particles/slice, 100 slices

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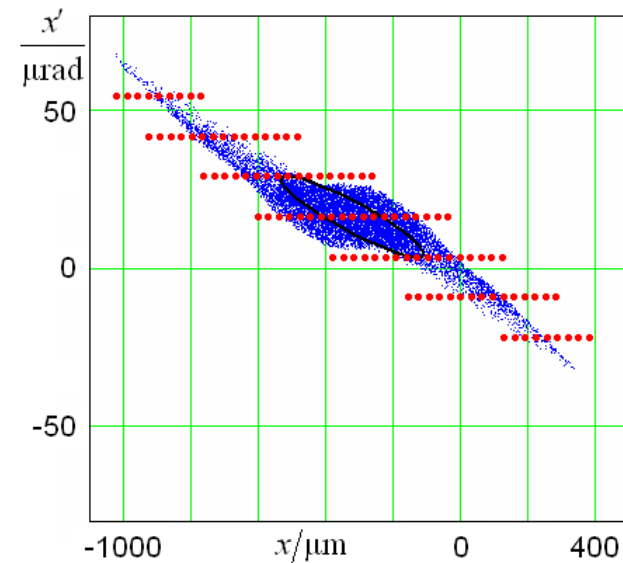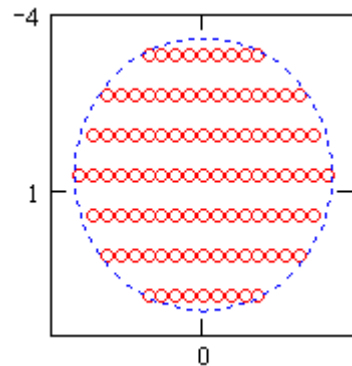
BC2 entrance
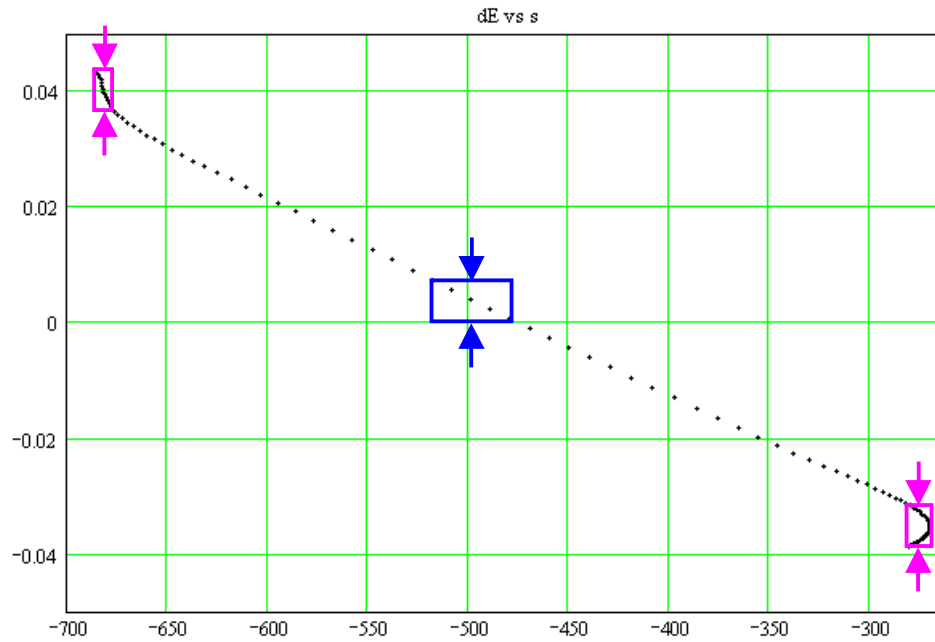
equidistant *E*-mesh

$$\Delta E = \Delta E$$

$\Downarrow$

distance between tail slices is increased

BC2 exit
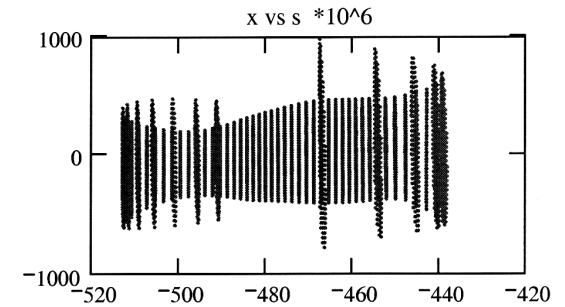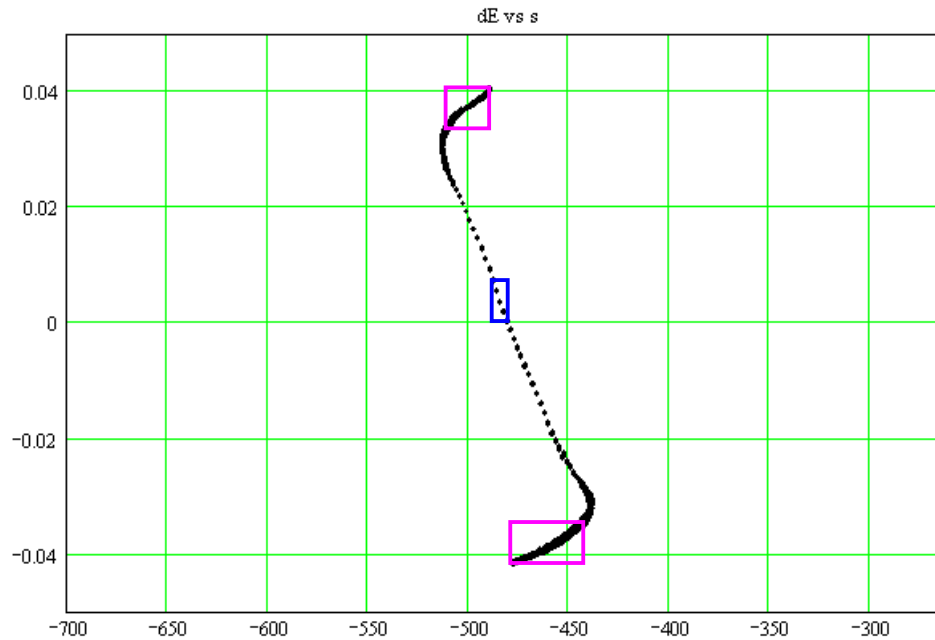
use fine mesh in the tails:

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BC2 exit
(1.5 m after BC2)

current / A

$\dfrac{dE}{E_0}$ full

full

$\dfrac{E(\text{exit}) - E(\text{entrance})}{E_0}$ full

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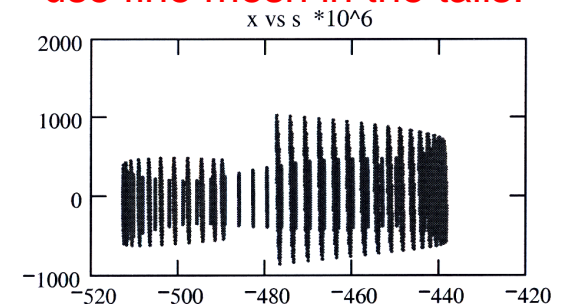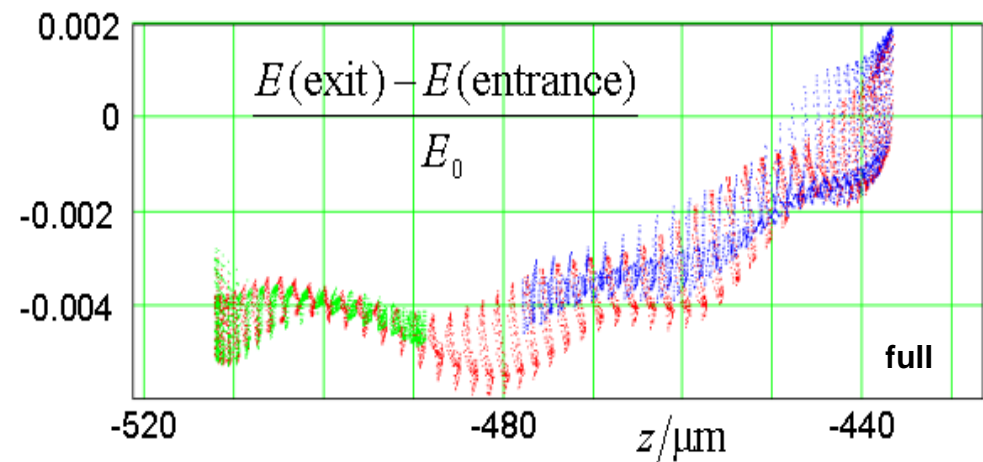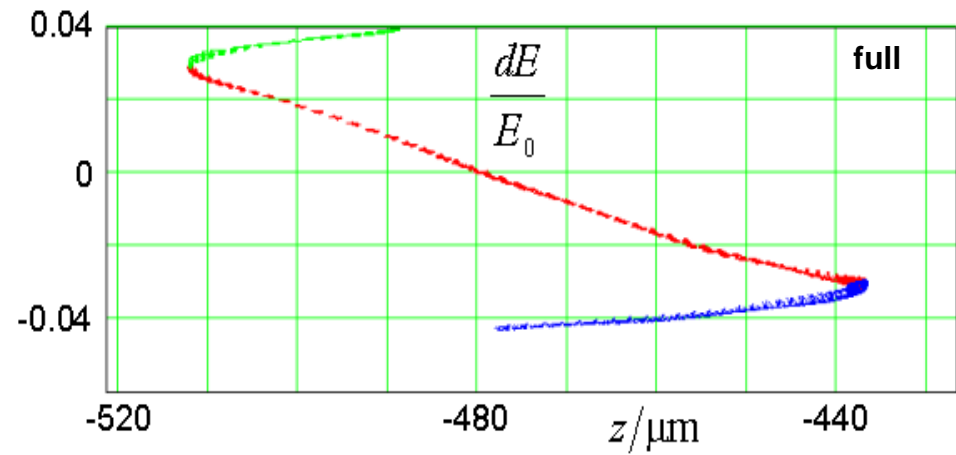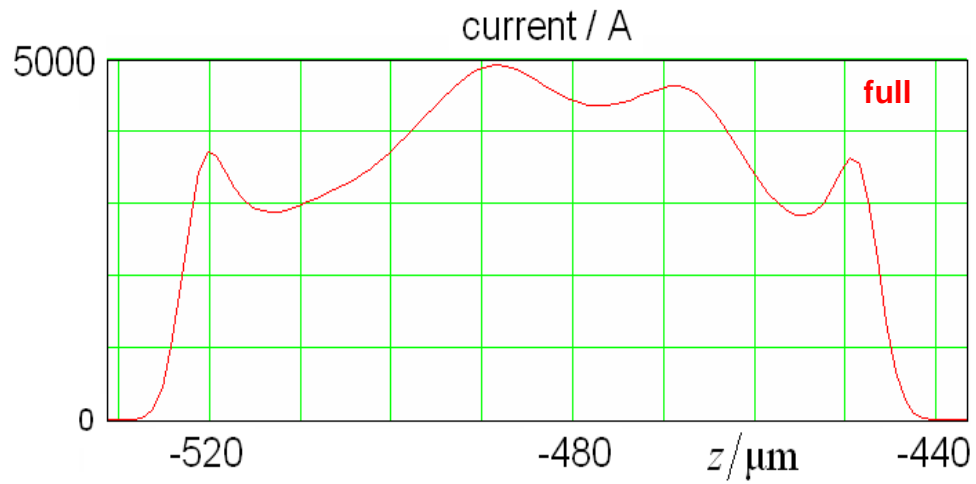
1.5 m after BC2, analysis of "initial" slices

full   ---- projected

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full

projected

$$\frac{E(\text{exit}) - E(\text{entrance})}{E_0}$$

$z/\mu m$

$$\frac{E(\text{exit}) - E(\text{entrance})}{E_0}$$

$z/\mu m$

(only red particles)

$$\frac{E(\text{exit}) - E_c(z)}{E_0}$$

$z/\mu m$

$$\frac{\text{rms}\{E(\text{exit}) - E_c(z)\}}{E_0}$$

$z/\mu m$

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conversion (10100 → 200000)

vertical
z-pz uncorrelated

transport matrix

horizontal
z-pz
correlated

CSRtrack

200000
particles

$$\begin{pmatrix} x \\ p_x \\ y \\ p_y \\ z \\ p_z \end{pmatrix}$$

200000
particles

$$\begin{pmatrix} 0 \\ 0 \\ y \\ p_y \\ z - z_c(p_z) \\ 0 \end{pmatrix}$$

200000
particles

$$\begin{pmatrix} 0 \\ 0 \\ y \\ p_y \\ z \\ 0 \end{pmatrix}$$

200000
particles

$$\begin{pmatrix} x \\ p_x \\ 0 \\ 0 \\ z_c(p_z) \\ p_z \end{pmatrix}$$

10100
particles

$$\begin{pmatrix} x \\ p_x \\ z_c(p_z) \\ p_z \end{pmatrix}$$

10100
particles

$$\begin{pmatrix} x \\ p_x \\ z \\ p_z \end{pmatrix}$$

200000
particles

$$\begin{pmatrix} x \\ p_x \\ 0 \\ 0 \\ z \\ p_z \end{pmatrix}$$

200000
particles

$$\begin{pmatrix} x \\ p_x \\ y \\ p_y \\ z \\ p_z \end{pmatrix}$$

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CSRtrack particles

200000 particles
without / with "uncorrelated" dE

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