compensation of rf coupler kicks
1st attempt, further continued

about I1 & L1 calculations

I1 & L1 calculations: the 1.3 GHz part

I1&L1: standard configuration

I1: module with “yrot”, L1: standard configuration

I1: no coupler kicks, L1: standard configuration

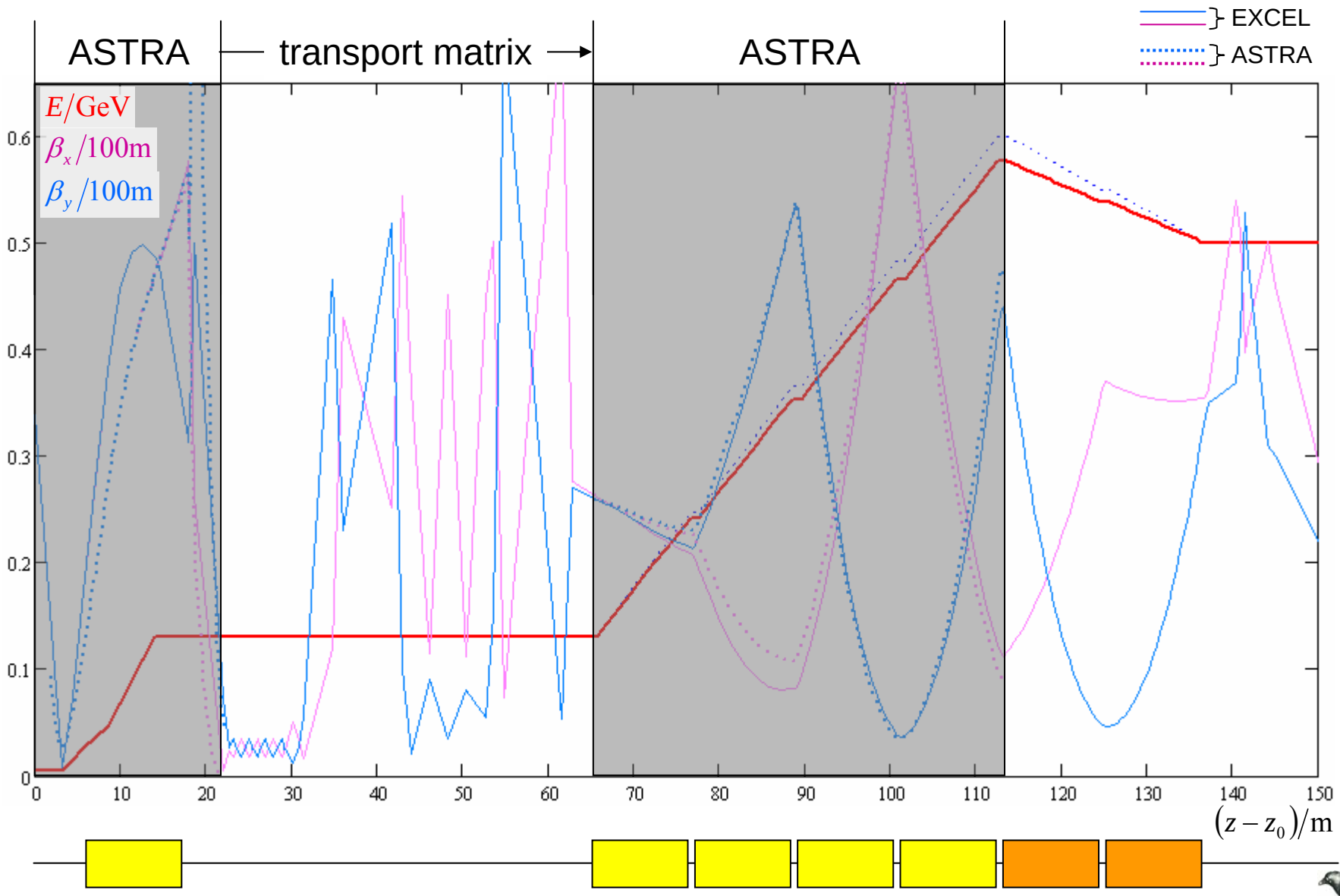
I1 standard config. → 180 deg phase advance → L1 standard config.

I1 standard config. → 0 .. 360 deg phase advance → L1 standard config.

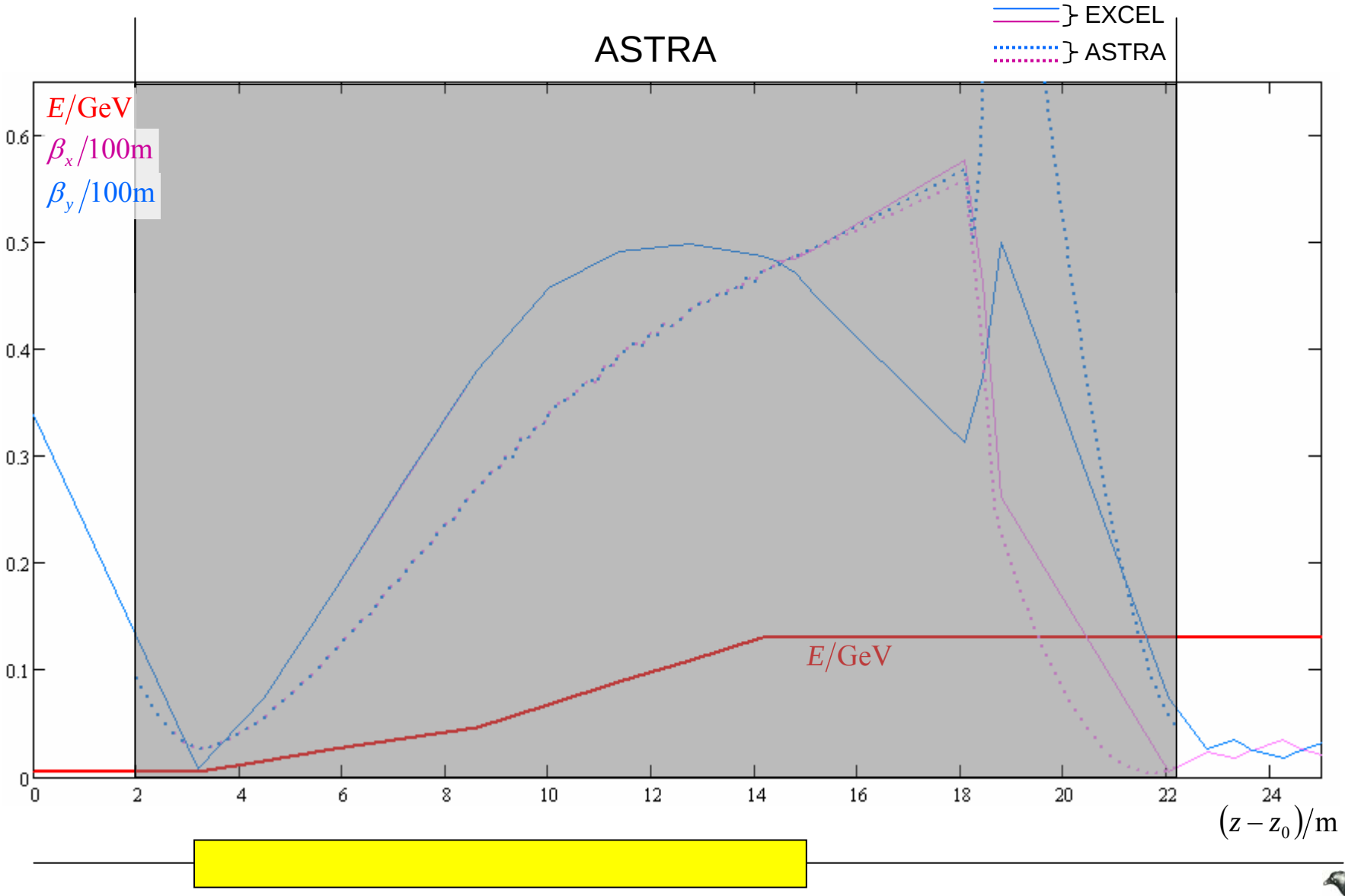
comparison ASTRA ↔ calc. with optics (from EXCEL) + kicks

summary

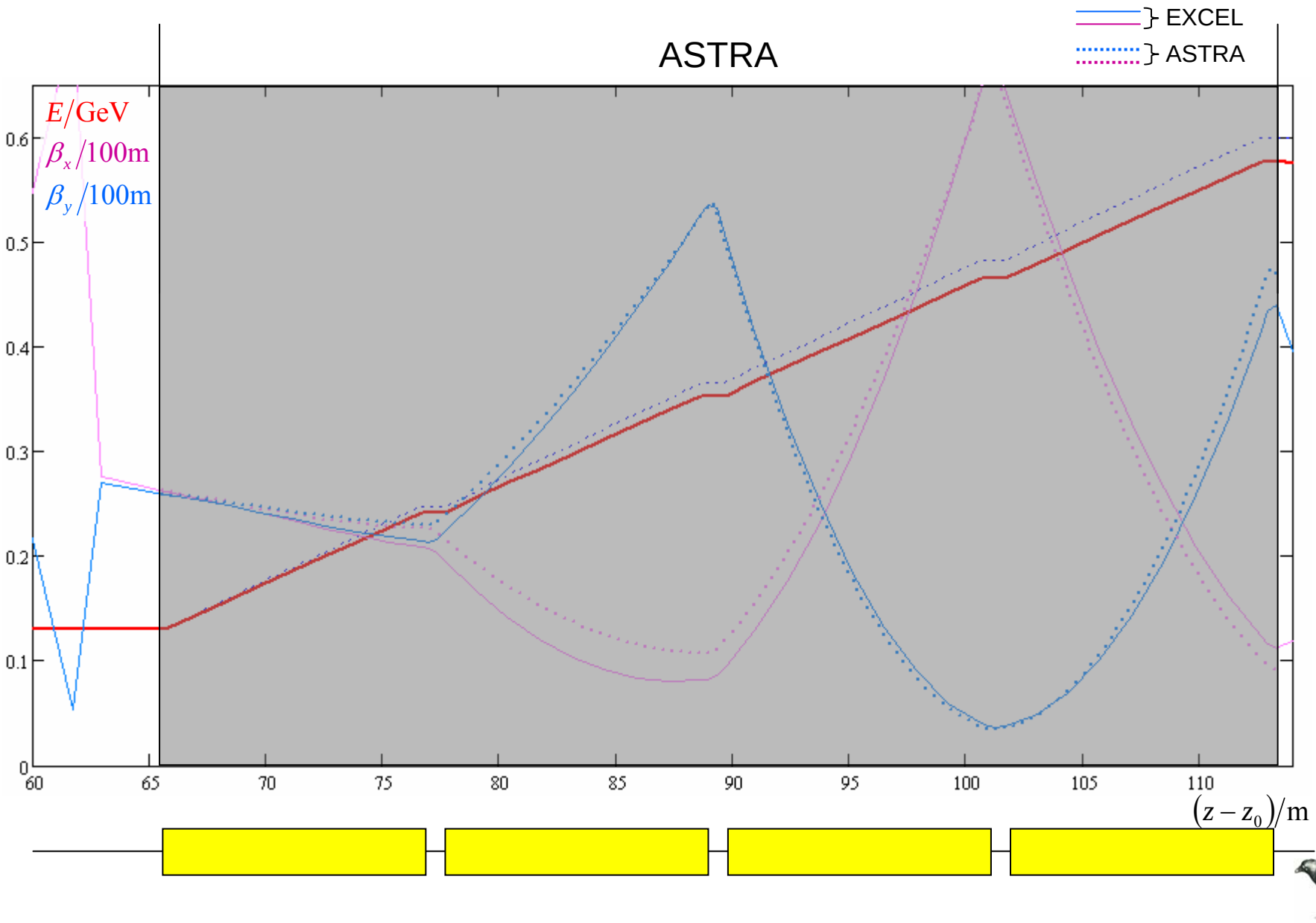
about I1 & L1 calculations



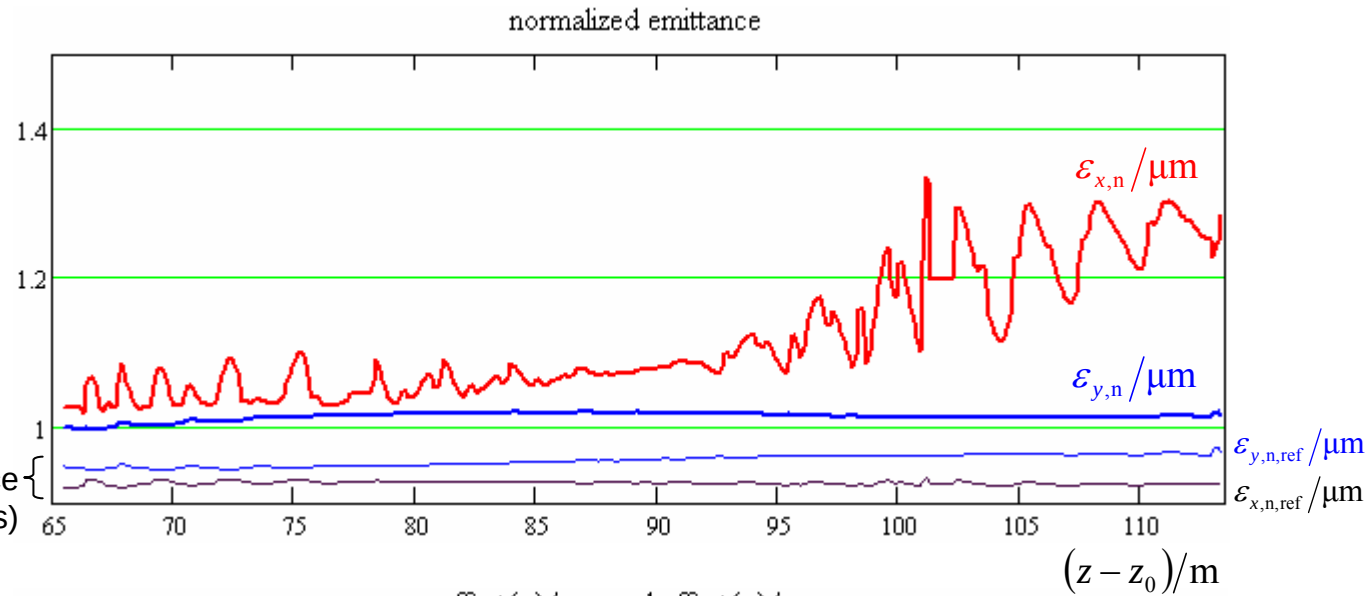
I1 calculations

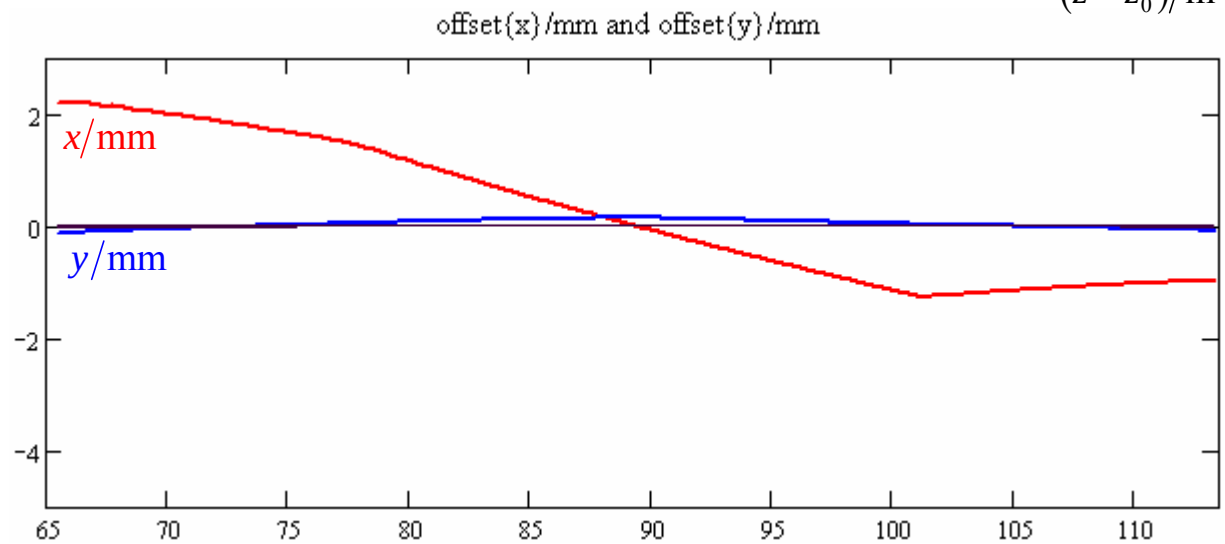


L1 calculations



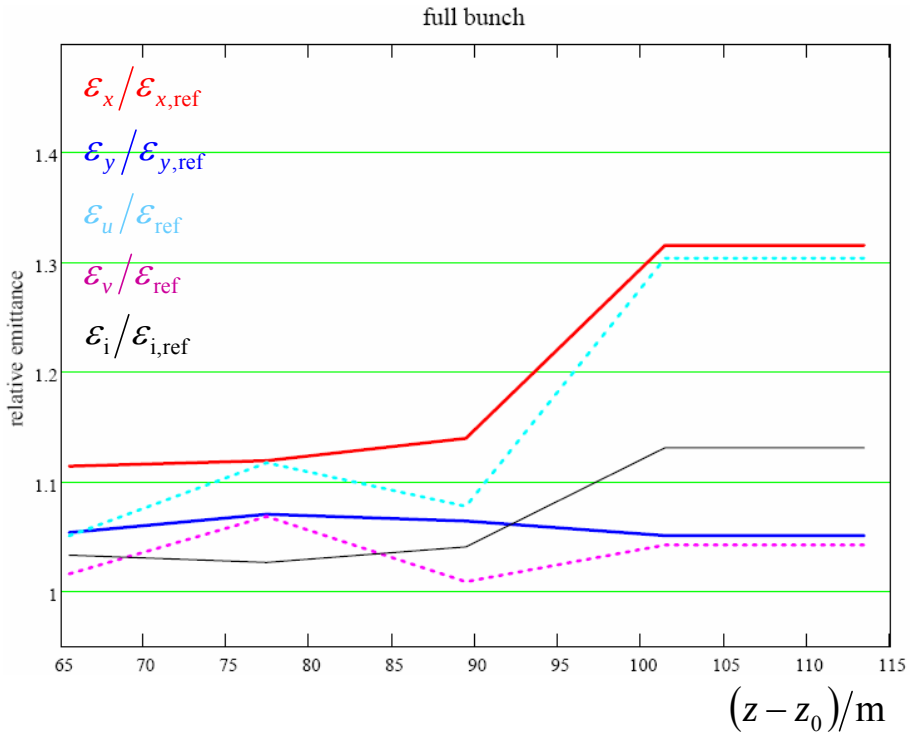
I1 & L1 calculations: the 1.3 GHz part
standard setup

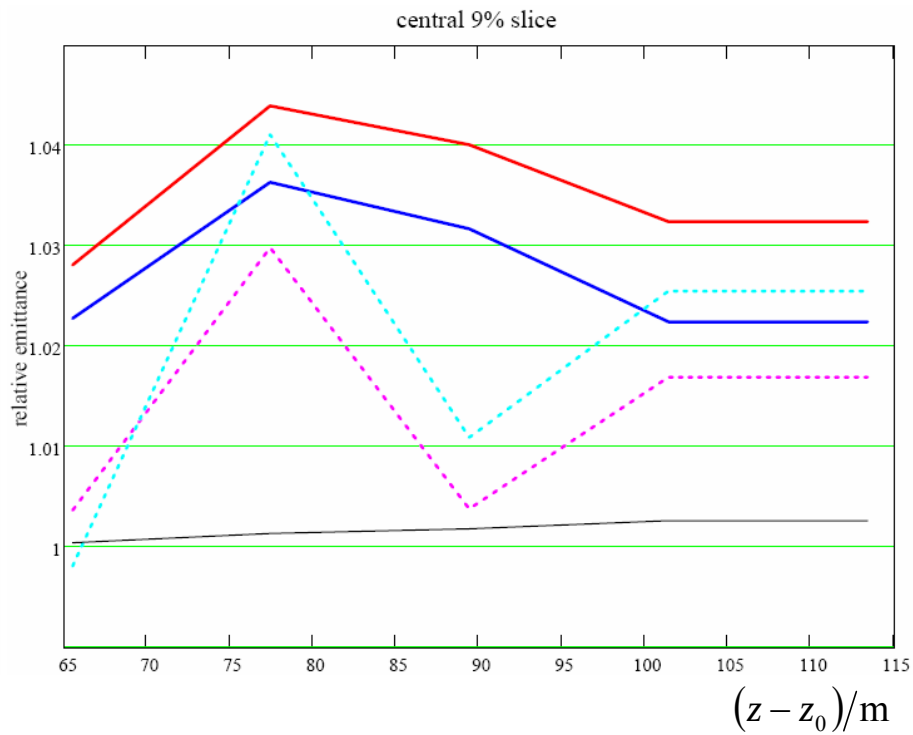




I1&L1: standard configuration

relative emittance growth





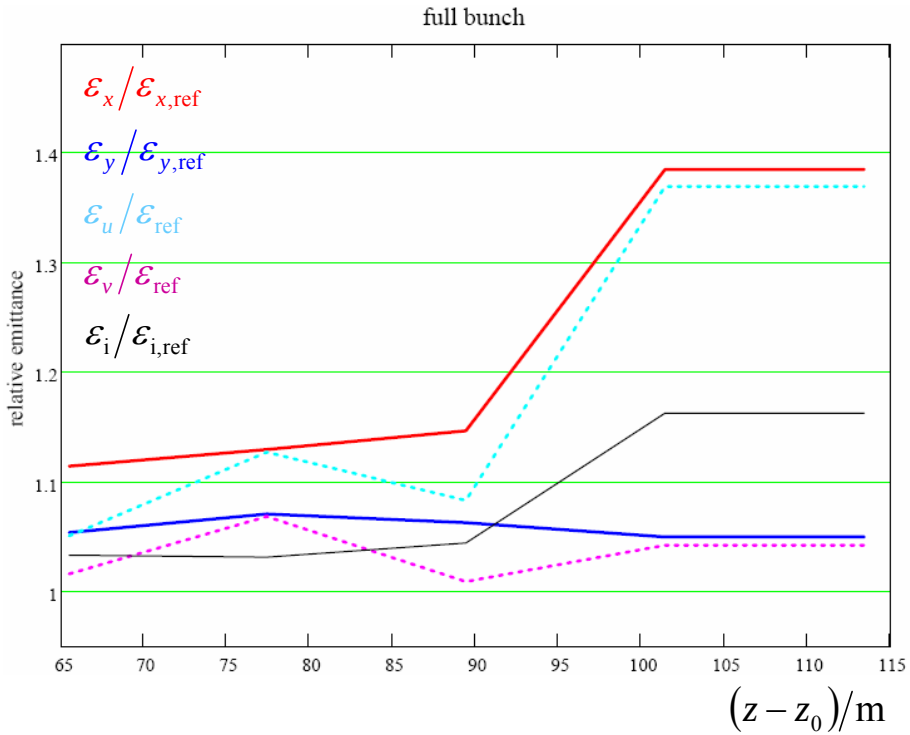
with $\varepsilon_{\mathrm{ref}} = \sqrt{\varepsilon_{x,\mathrm{ref}}\varepsilon_{y,\mathrm{ref}}}$

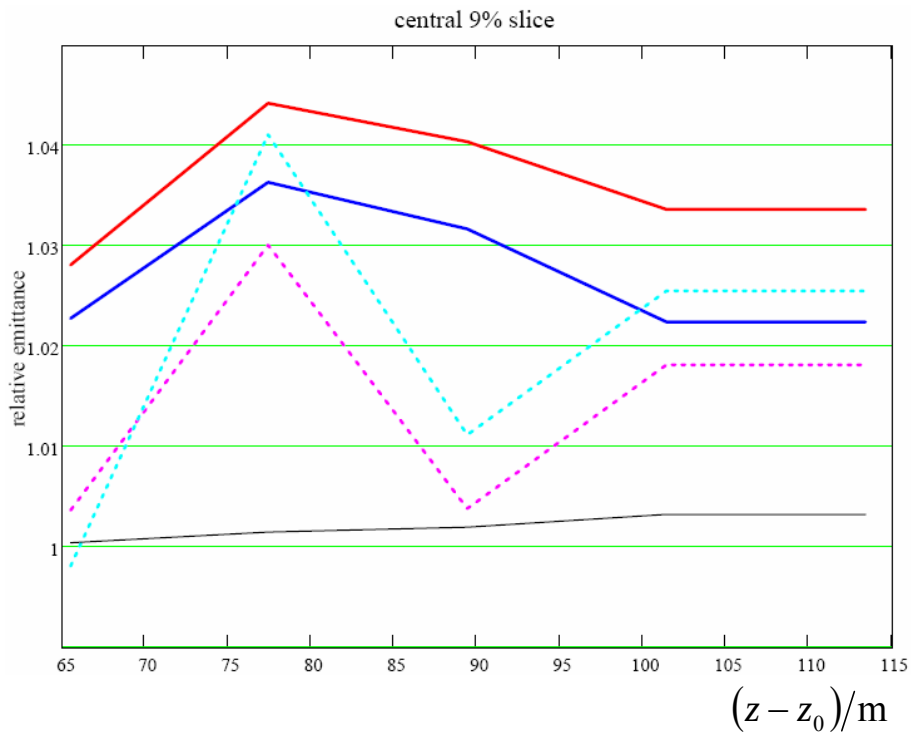
$$\varepsilon_\mathrm{i} = \gamma \left\{ \det \begin{bmatrix} \langle xx \rangle & \langle xx' \rangle & \langle xy \rangle & \langle xy' \rangle \\ \cdots & & & \end{bmatrix} \right\}^{1/4}$$

I1&L1: standard configuration

no offset at 65.5m (x,x',y,y')

relative emittance growth



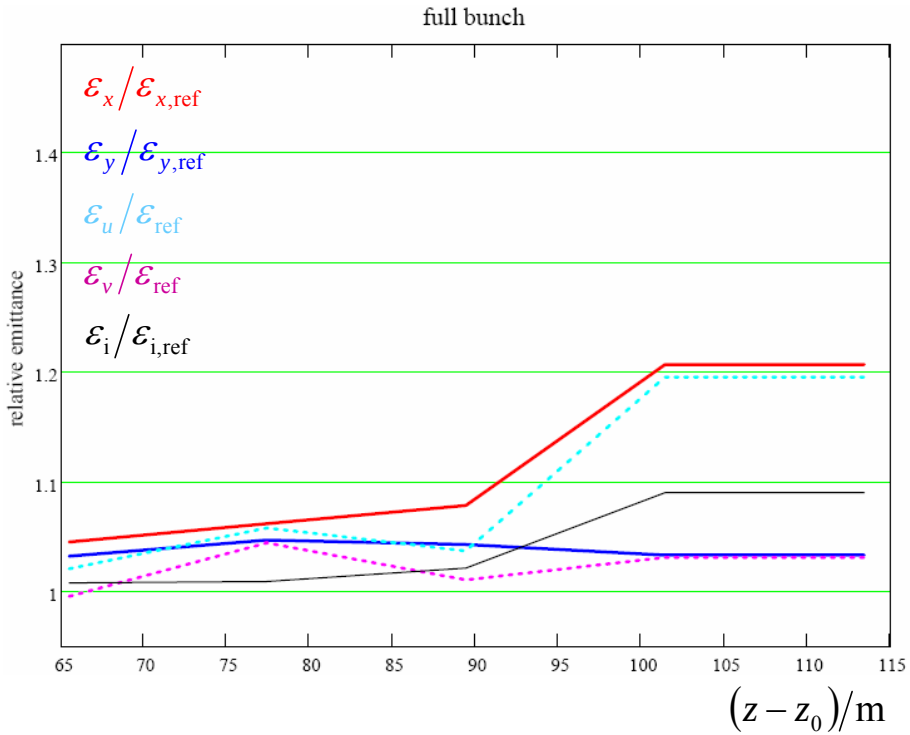


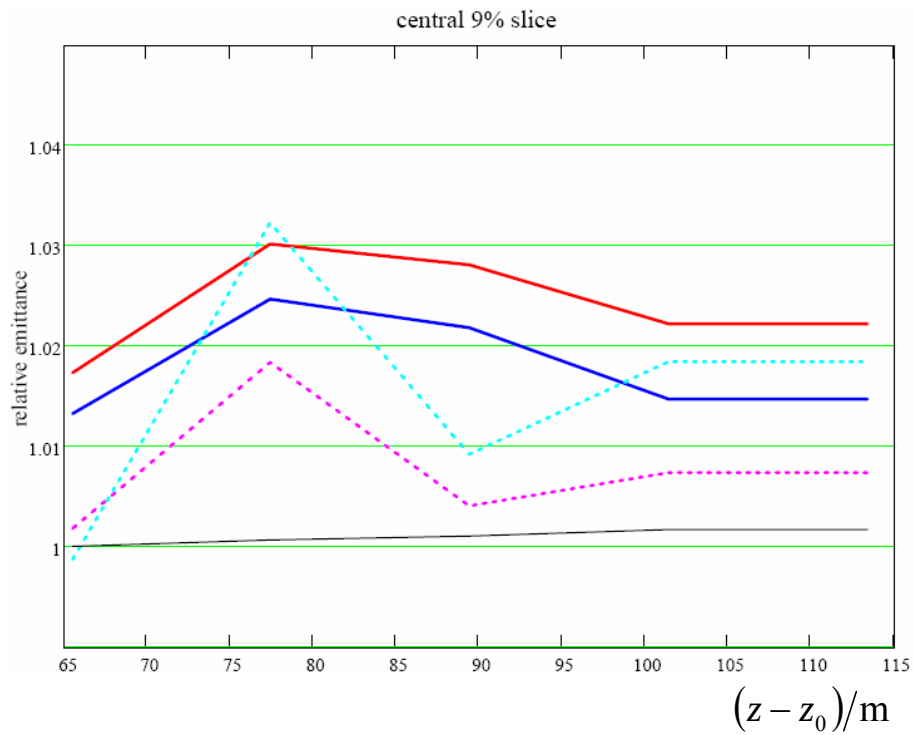
with $\varepsilon_{\mathrm{ref}} = \sqrt{\varepsilon_{x,\mathrm{ref}}\varepsilon_{y,\mathrm{ref}}}$

$$\varepsilon_\mathrm{i} = \gamma\left\{\det\begin{bmatrix}\langle xx\rangle & \langle xx'\rangle & \langle xy\rangle & \langle xy'\rangle \\ \cdots & & & \end{bmatrix}\right\}^{1/4}$$

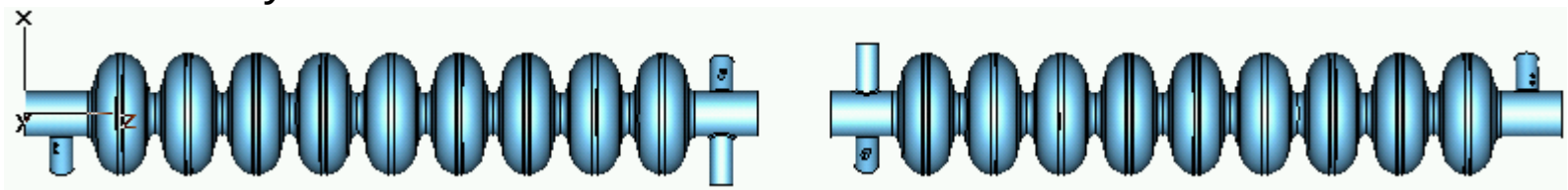
I1: module with “yrot”, L1: standard configuration

relative emittance growth



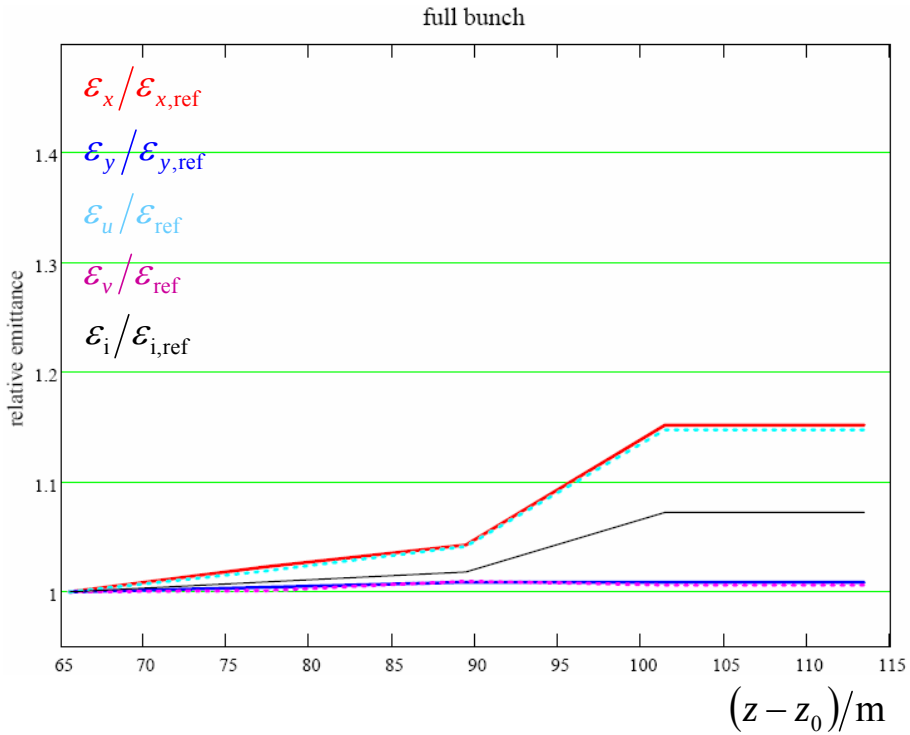


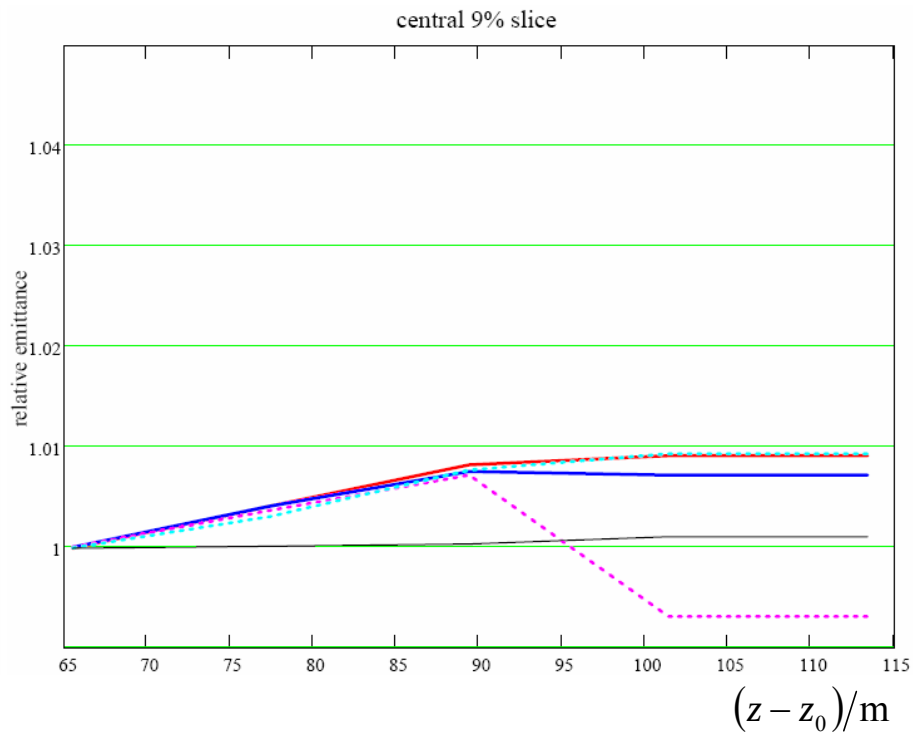
I1 module with “yrot”:



I1: no coupler kicks, L1: standard configuration

relative emittance growth



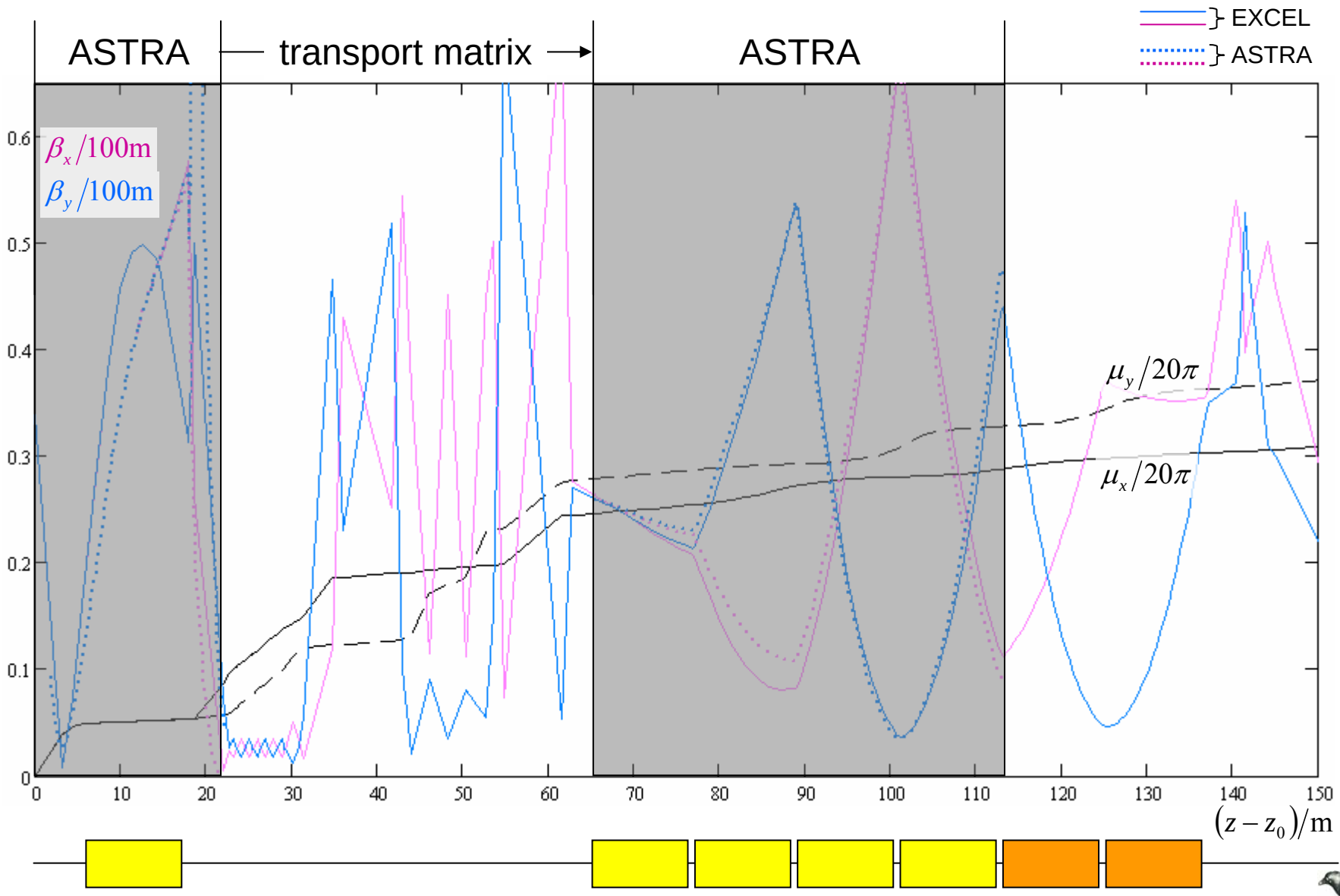


with $\varepsilon_{\mathrm{ref}} = \sqrt{\varepsilon_{x,\mathrm{ref}}\varepsilon_{y,\mathrm{ref}}}$

$$\varepsilon_\mathrm{i} = \gamma \left\{ \det \begin{bmatrix} \langle xx \rangle & \langle xx' \rangle & \langle xy \rangle & \langle xy' \rangle \\ \cdots & & & \end{bmatrix} \right\}^{1/4}$$

influence of phase advance

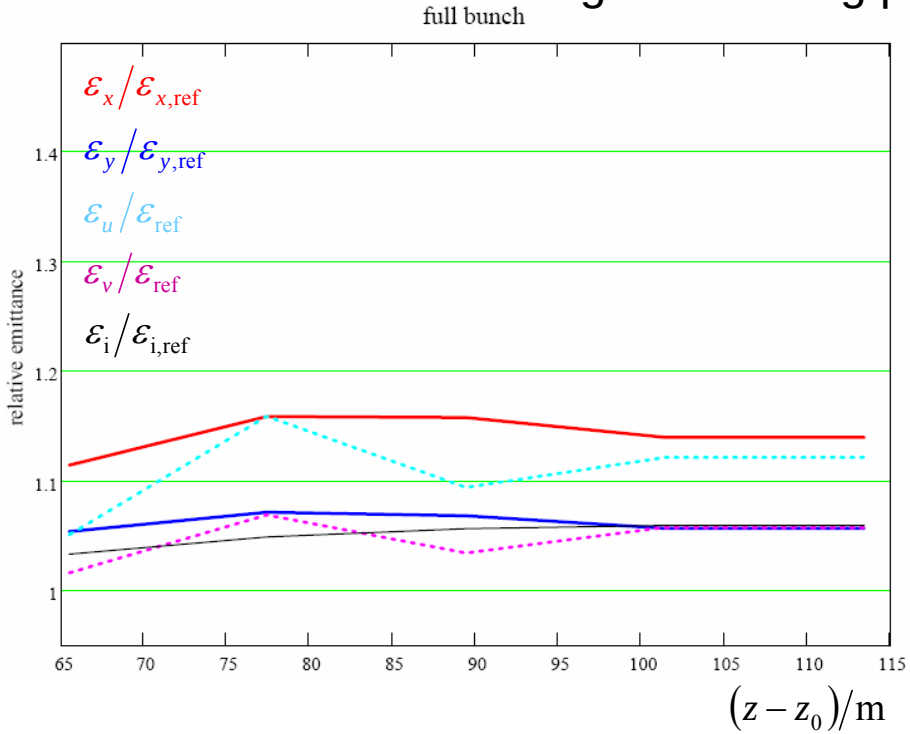
"standard setup"

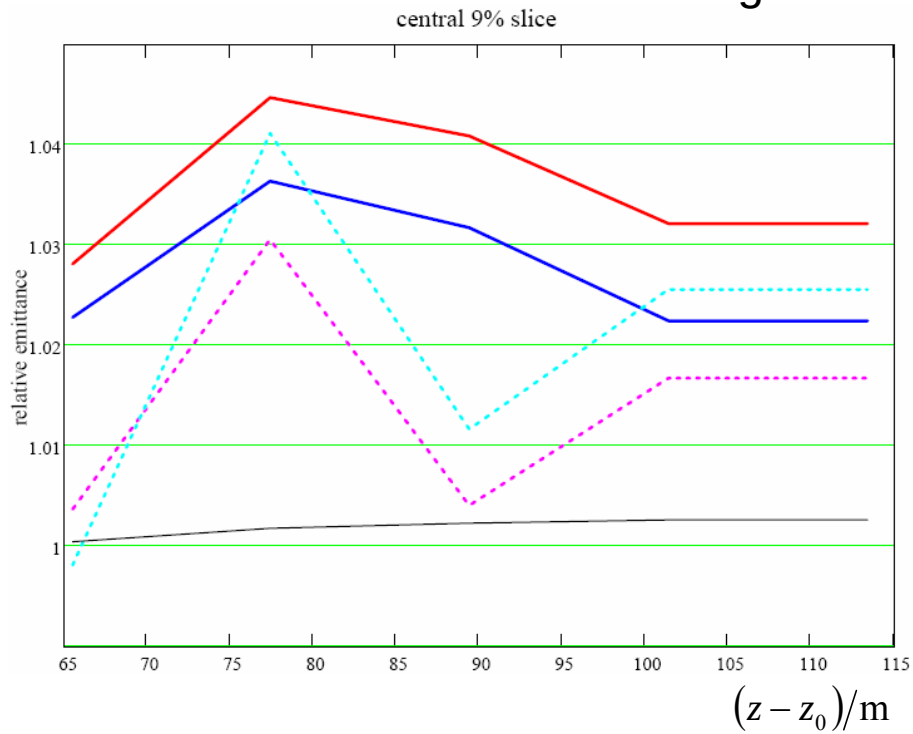


I1 standard config. → 180 deg phase advance → L1 standard config.
no offset at 65.5m (x,x',y,y')

relative emittance growth

I1 standard config. → 180 deg phase advance → L1 standard config.



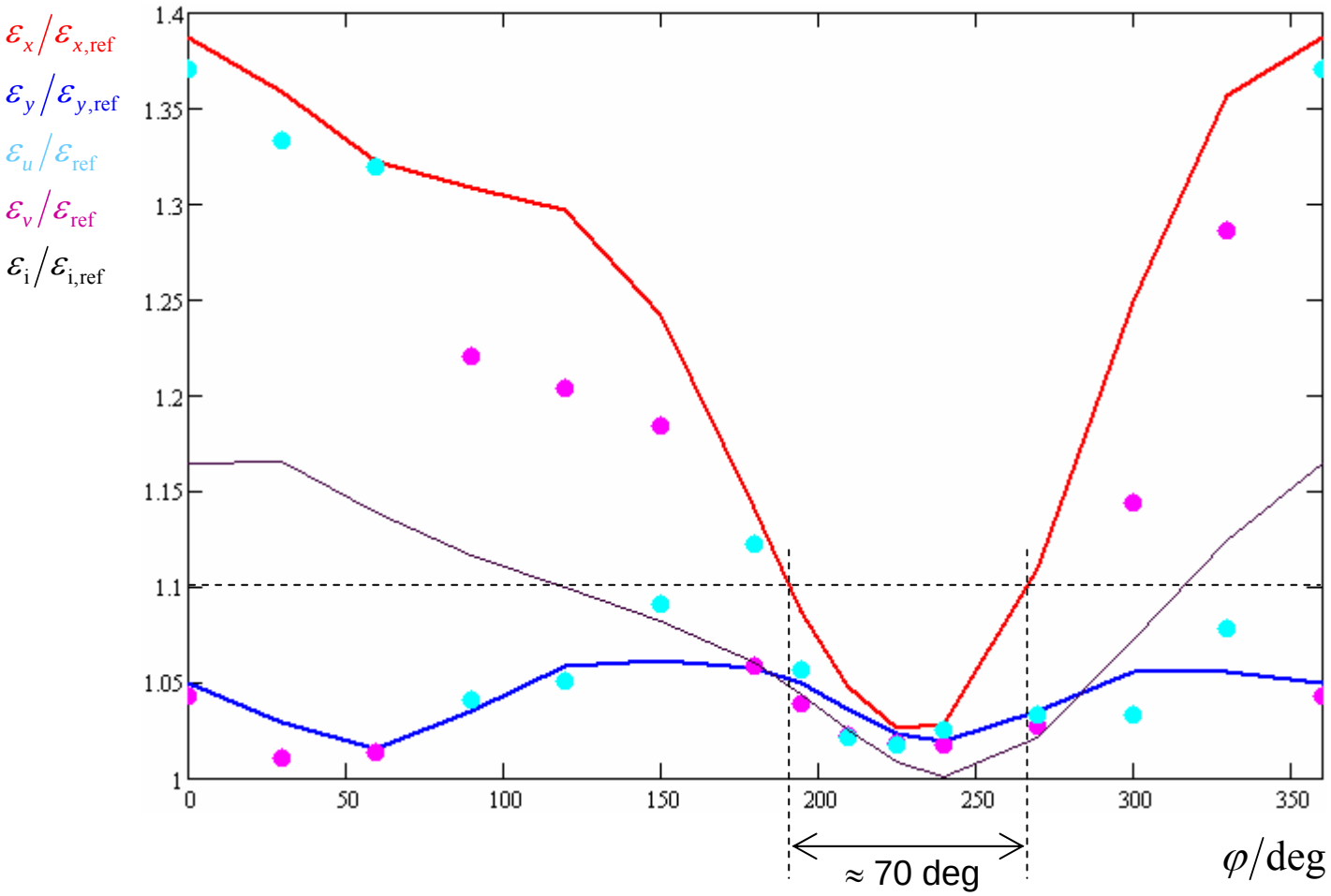


with $\varepsilon_{\mathrm{ref}} = \sqrt{\varepsilon_{x,\mathrm{ref}}\varepsilon_{y,\mathrm{ref}}}$ $\qquad \varepsilon_\mathrm{i} = \gamma\left\{\det\begin{bmatrix}\langle xx\rangle & \langle xx'\rangle & \langle xy\rangle & \langle xy'\rangle \\ \cdots & & & \end{bmatrix}\right\}^{1/4}$

I1 standard config. → phase scan → L1 standard config.

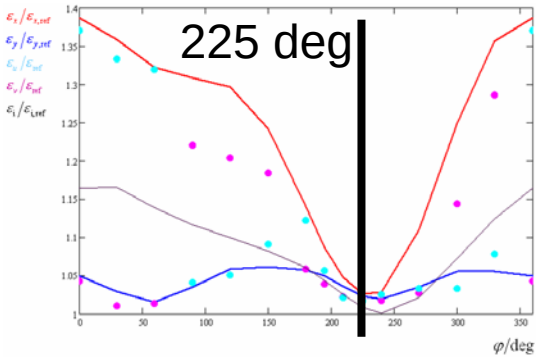
no offset at 65.5m (x,x',y,y')

$$\mu_{x/y}(65.5\,\mathrm{m}) \leftarrow \varphi + \mu_{x/y}(65.5\,\mathrm{m})$$

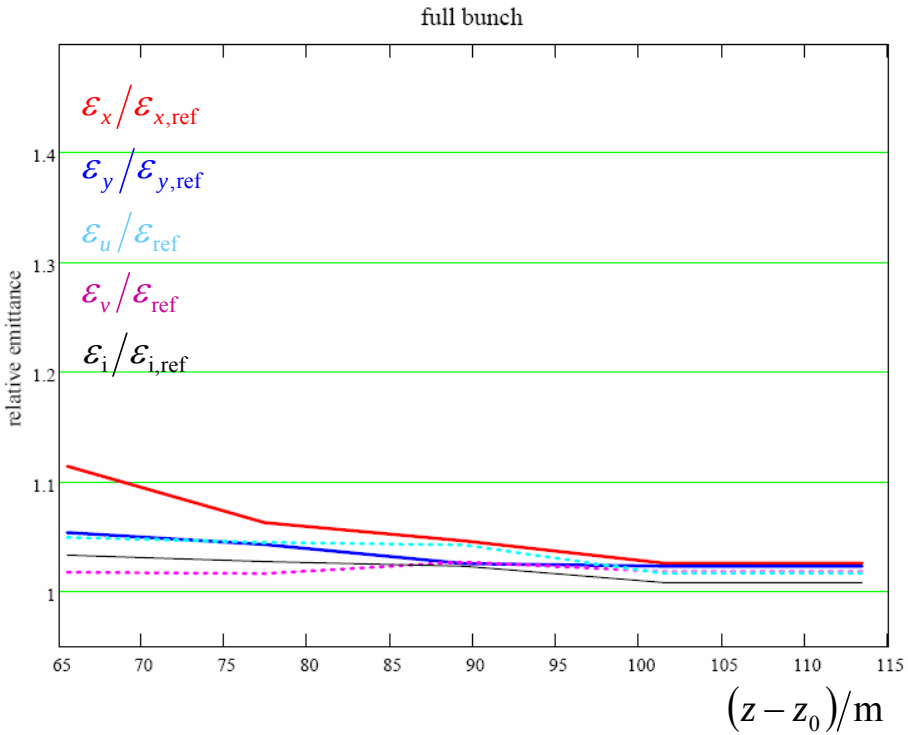


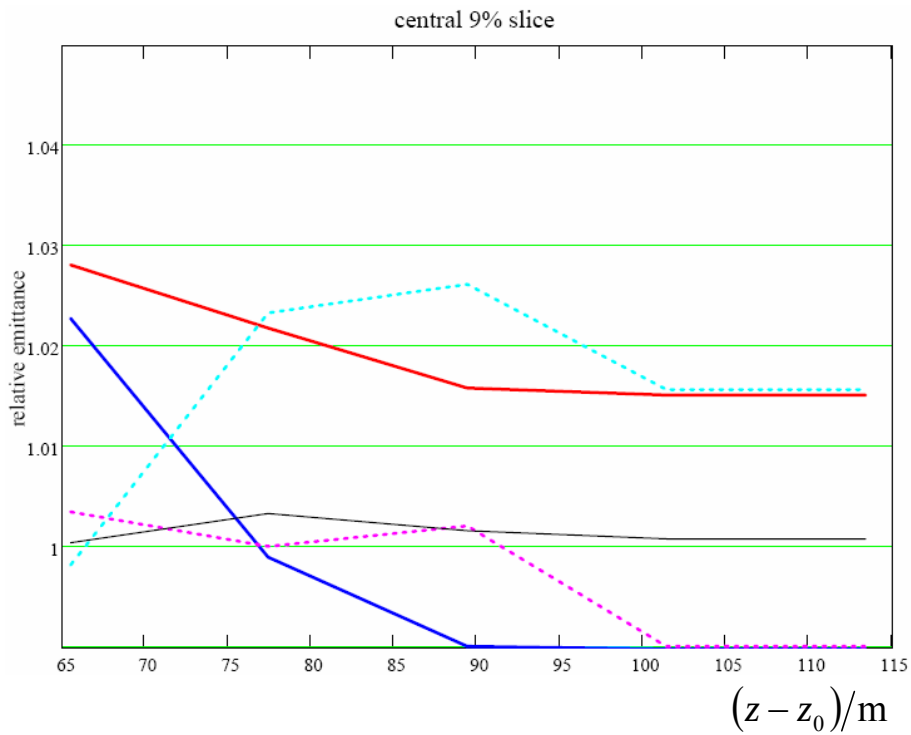
I1 standard config. → 225 deg phase advance → L1 standard config.

no offset at 65.5m (x,x',y,y')



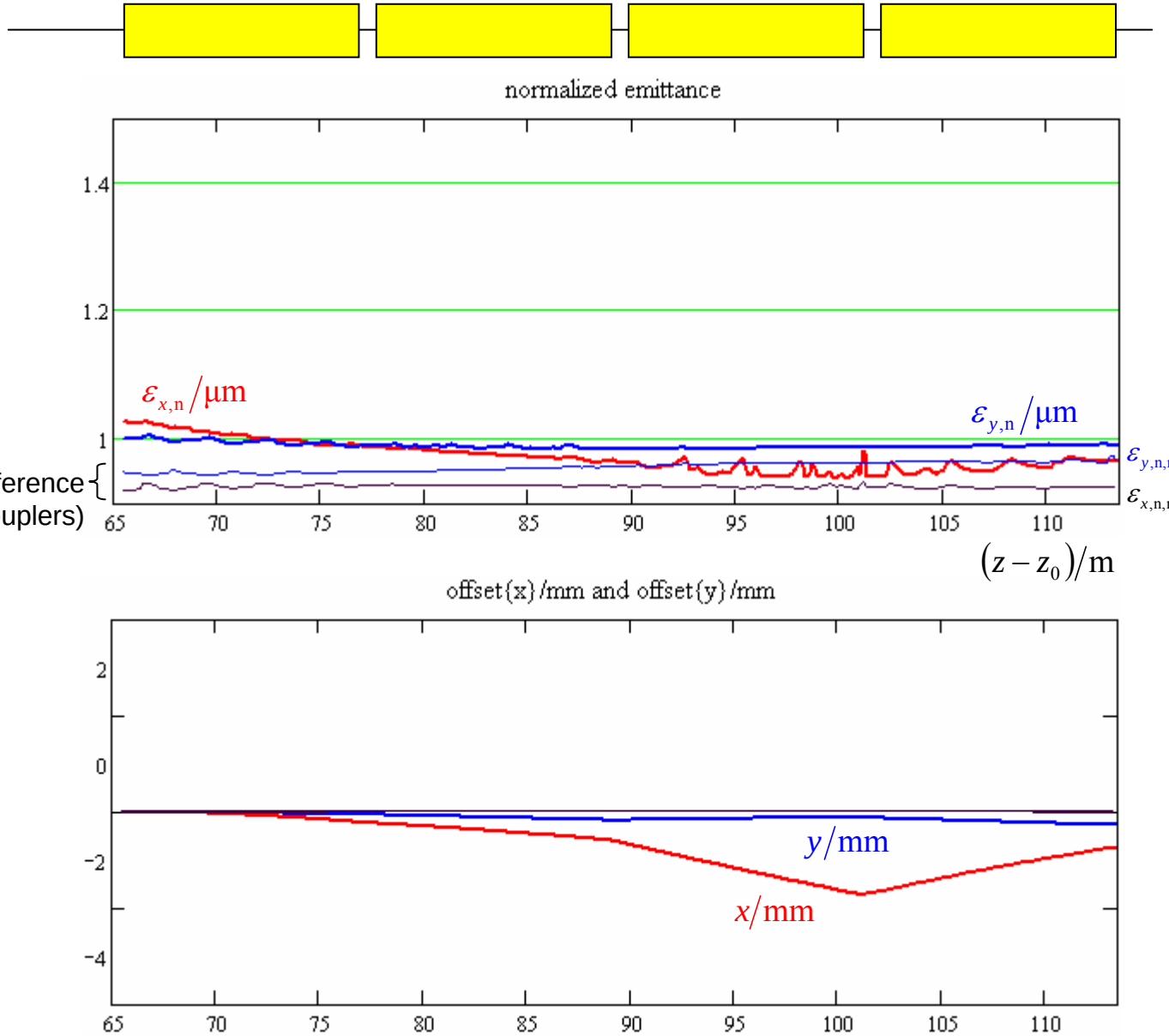
relative emittance growth





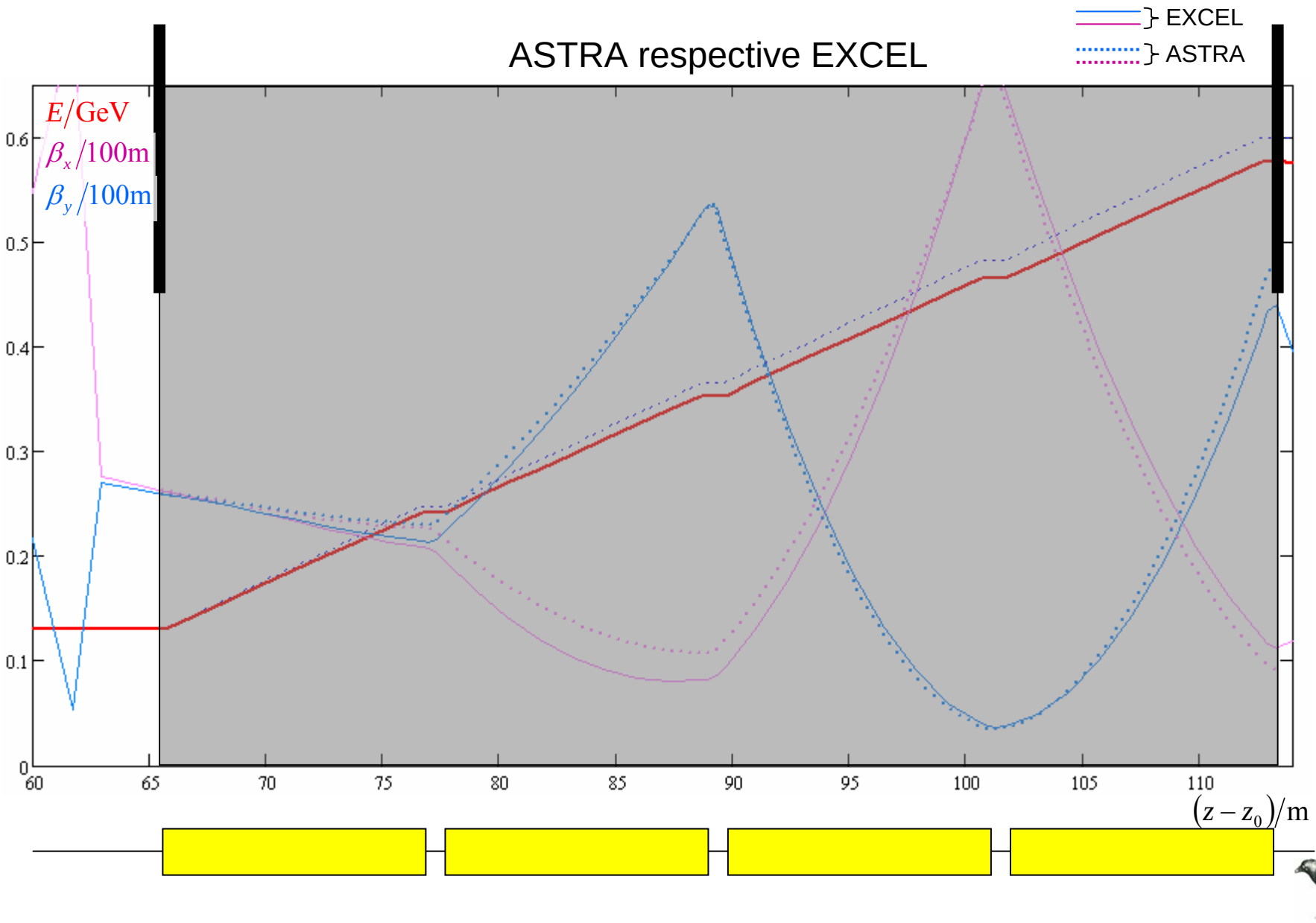
I1 standard config. → 225 deg phase advance → L1 standard config.

no offset at 65.5m (x,x',y,y')



comparison ASTRA ↔ calc. with optics (from EXCEL) + kicks

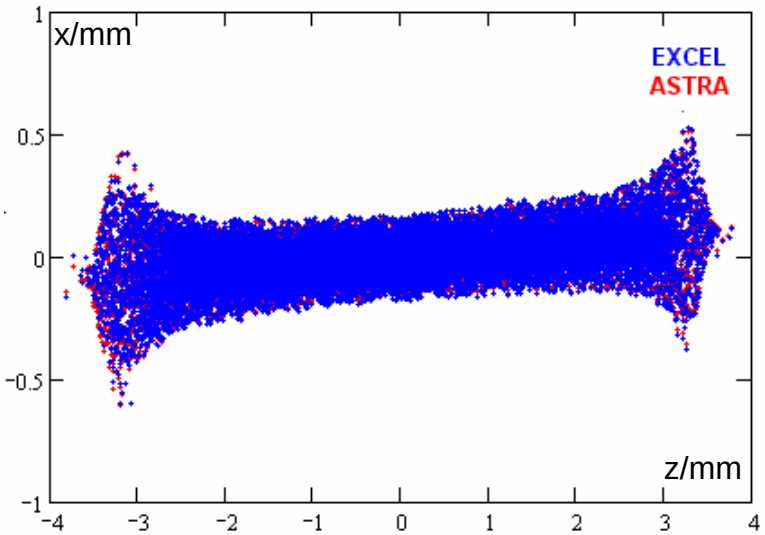
L1 part with 1.3GHz modules

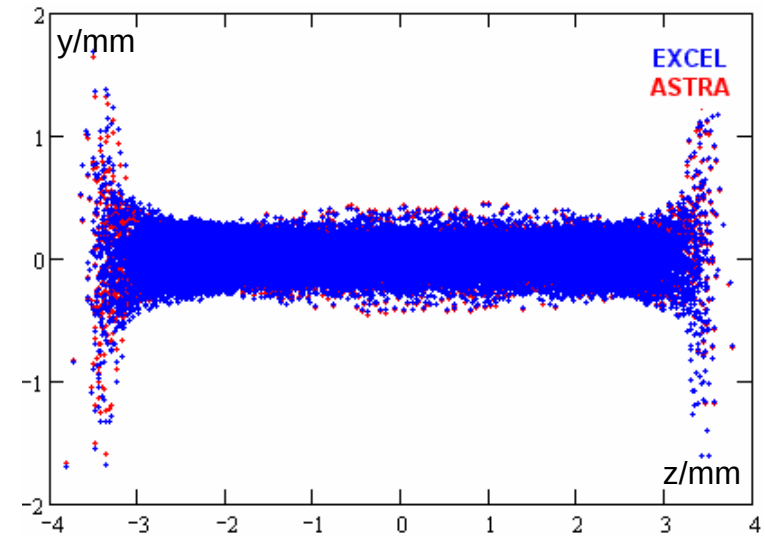


comparison ASTRA ↔ calc. with optics (from EXCEL) + kicks

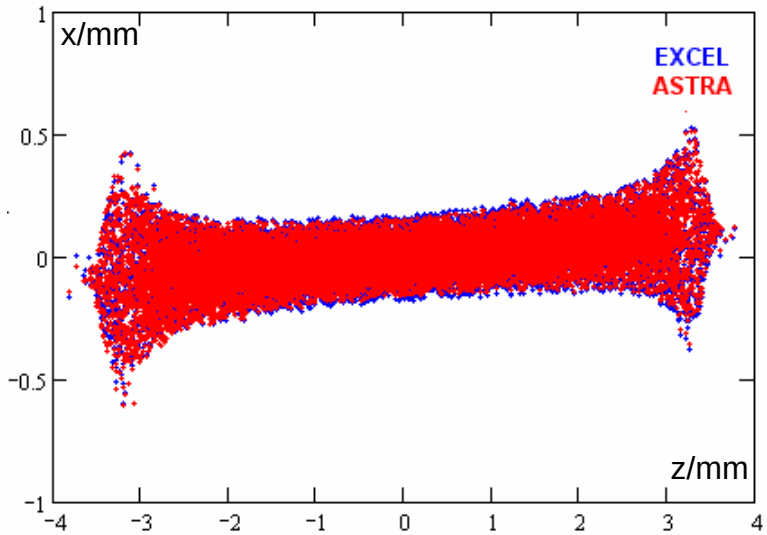
L1 part with 1.3GHz modules

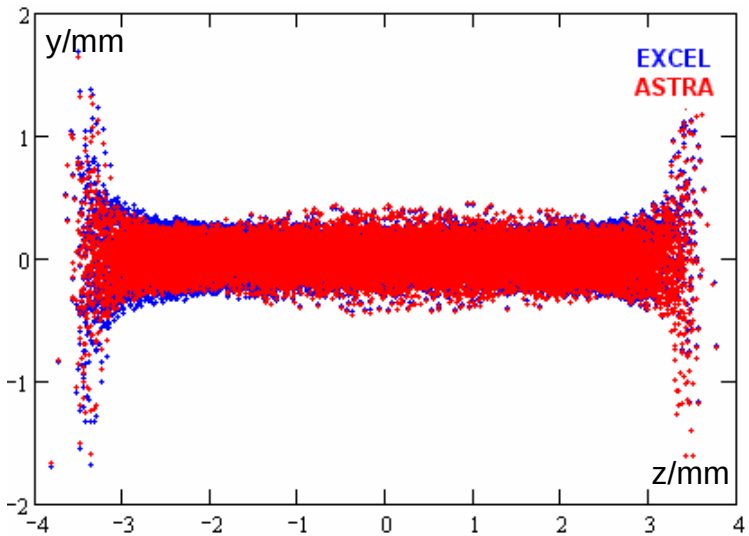
blue above red





red above blue



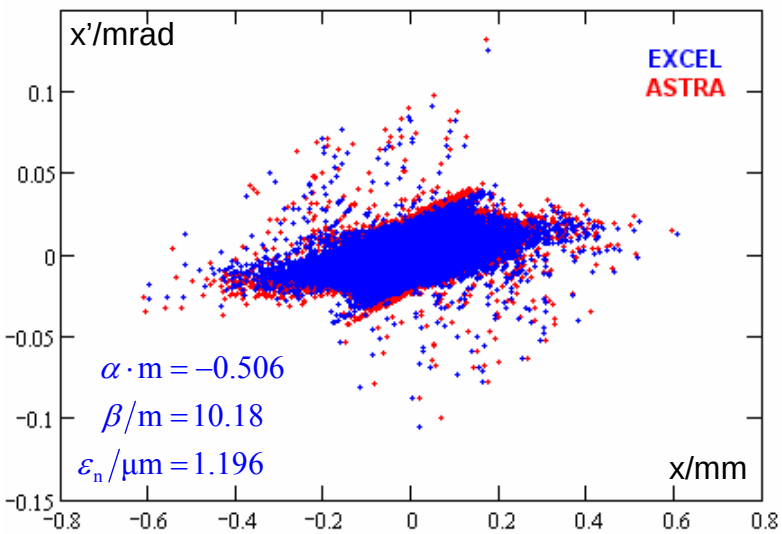


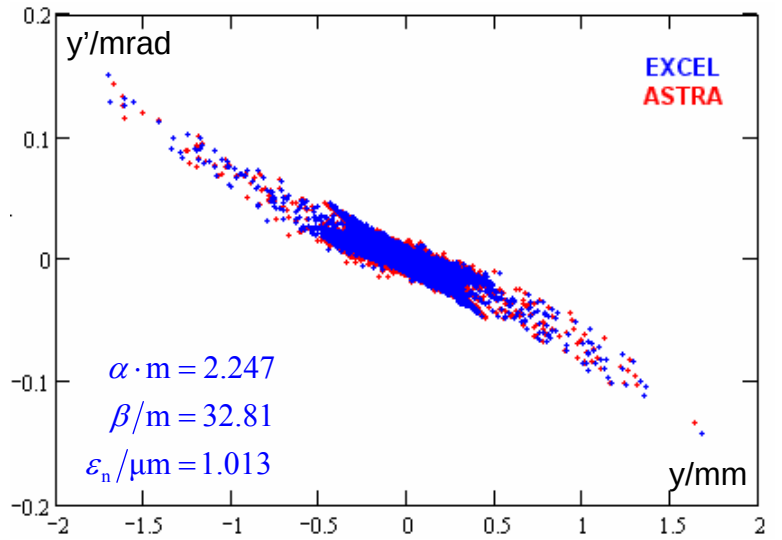
standard setup, averaged offset suppressed

comparison ASTRA ↔ calc. with optics (from EXCEL) + kicks

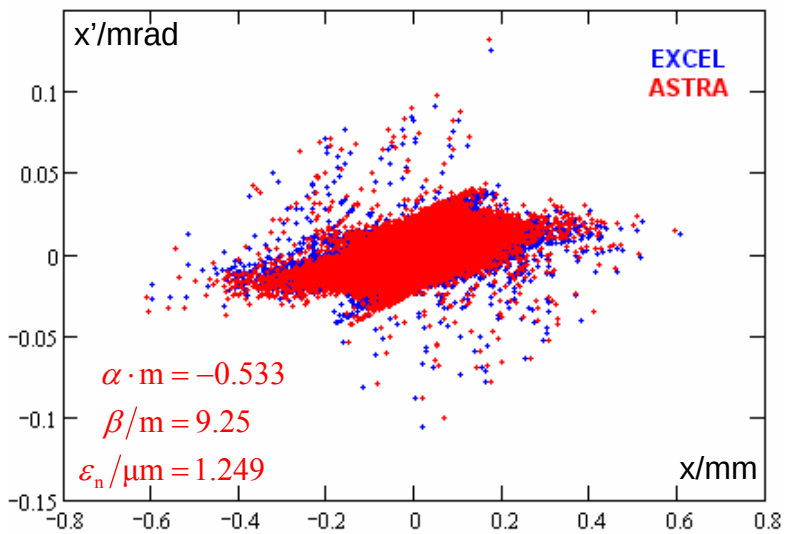
L1 part with 1.3GHz modules

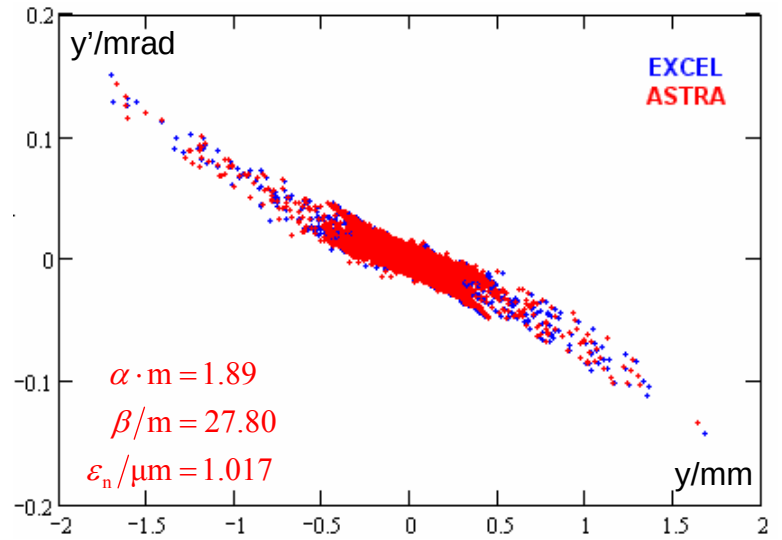
blue above red





red above blue





standard setup, averaged offset suppressed

summary

E. Kot: optic after ACC1 is under investigation (Laser heater)

standard modules (I1 & L1): emittance growth up to 40% possible

modified ACC1: “yrot” of each 2nd cavity: ~20% growth possible
perfect compensation of kicks: ~15% growth possible

standard modules (I1 & L1): scan of phase advance ACC1 →ACC2
emittance growth below 5% possible
70 deg window to keep growth below 10%

comparison ASTRA ↔ calc. with optics (from EXCEL) + kicks
reasonable agreement
→ simplified investigation of 3.9 GHz coupler kicks (to be done)