NF-FE:
44-88 MHz scenario

44-88 MHz Front-end (1/2)

Pion production: 2 GeV proton beam on a 26 cm long Hg target in 20 T field (SPL+accumulator & compressor ring).

Decay: 30 m long in 1.8 T.

Rotation: particles with 100-300 MeV in kinetic energy rotated using 44 MHz (2 MV/m) RF cavities (energy spread divided by 2) in 1.8 T solenoid.

Cooling I: 44 MHz RF + H_2 absorbers ($\varepsilon_\perp$ reduced by 40%).

Acceleration I: particles accelerated to an average energy of 300 MeV with 44 MHz cavities.

Cooling II: 88 MHz RF + H2 absorbers ($\varepsilon_\perp$ reduced by 30%).

Acceleration II: 88 MHz cavities.

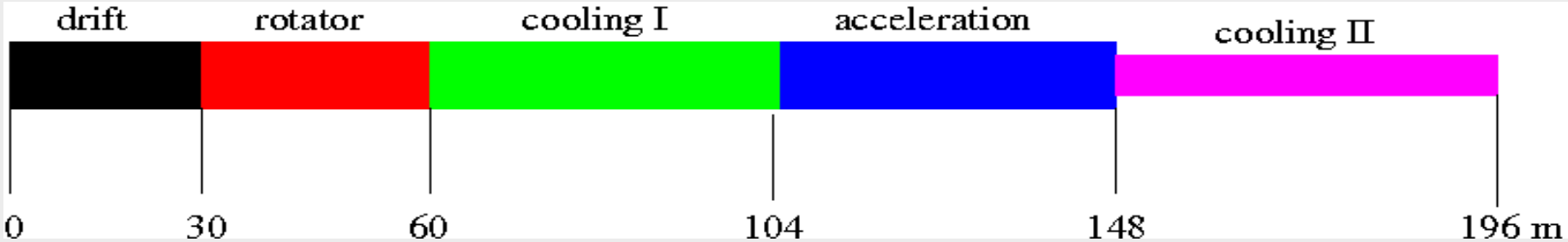
44-88 MHz Front-end (2/2)

Cavities phasing from 121 to -4 degrees.

Lattice translated in ICOOL:

- using 0.5 m solenoids coils and 1 m long cavities.

- cell length of 3 m – 1 m and 7 m.



Lattice transverse optics (1/3)

Scott's method: initial beam of 8 particles with (x,px,y,py) coordinates (±δx,0,0,0) - (0,±δpx,0,0) - (0,0,±δy,0,0) and (0,0,0,±δpy).

±δx,y = 1 mm - ±δpx,y = 1 MeV/c.

Transfer map:

$$M_{ij} = \frac{\partial f_i}{\partial x_j} = \frac{f_i(\vec{x}_0 + e_j \cdot \vec{u}_j) - f_i(\vec{x}_0 - e_j \cdot \vec{u}_j)}{2 \cdot e_j}$$

Where f_i is the ith coordinate of the transform of a particle with small deviation e_j in direction u_j.

Lattice transverse optics (2/3)

Case of a drift of length L (no RF no magnetic field):

$$M = \begin{pmatrix} 1 & L/pz & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & L/pz \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

and Tr(M) =4.

Particles momenta constant.

Defocusing in the transverse plane.

ALGORITHM OK.

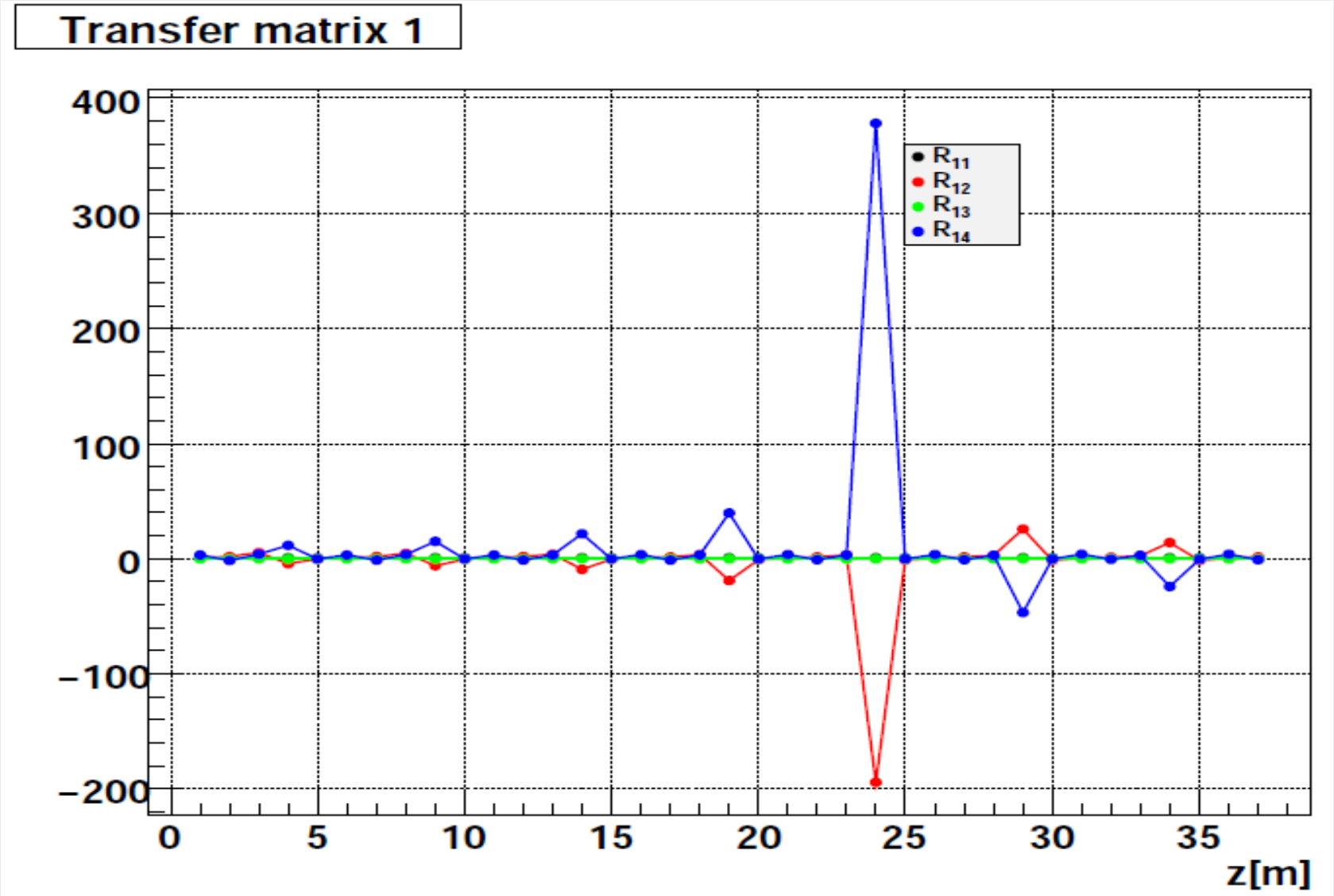
Lattice transverse optics (3/3)

Case of a solenoid only (no RF): M can be decomposed into a product of a rotation matrix and a focusing matrix function:

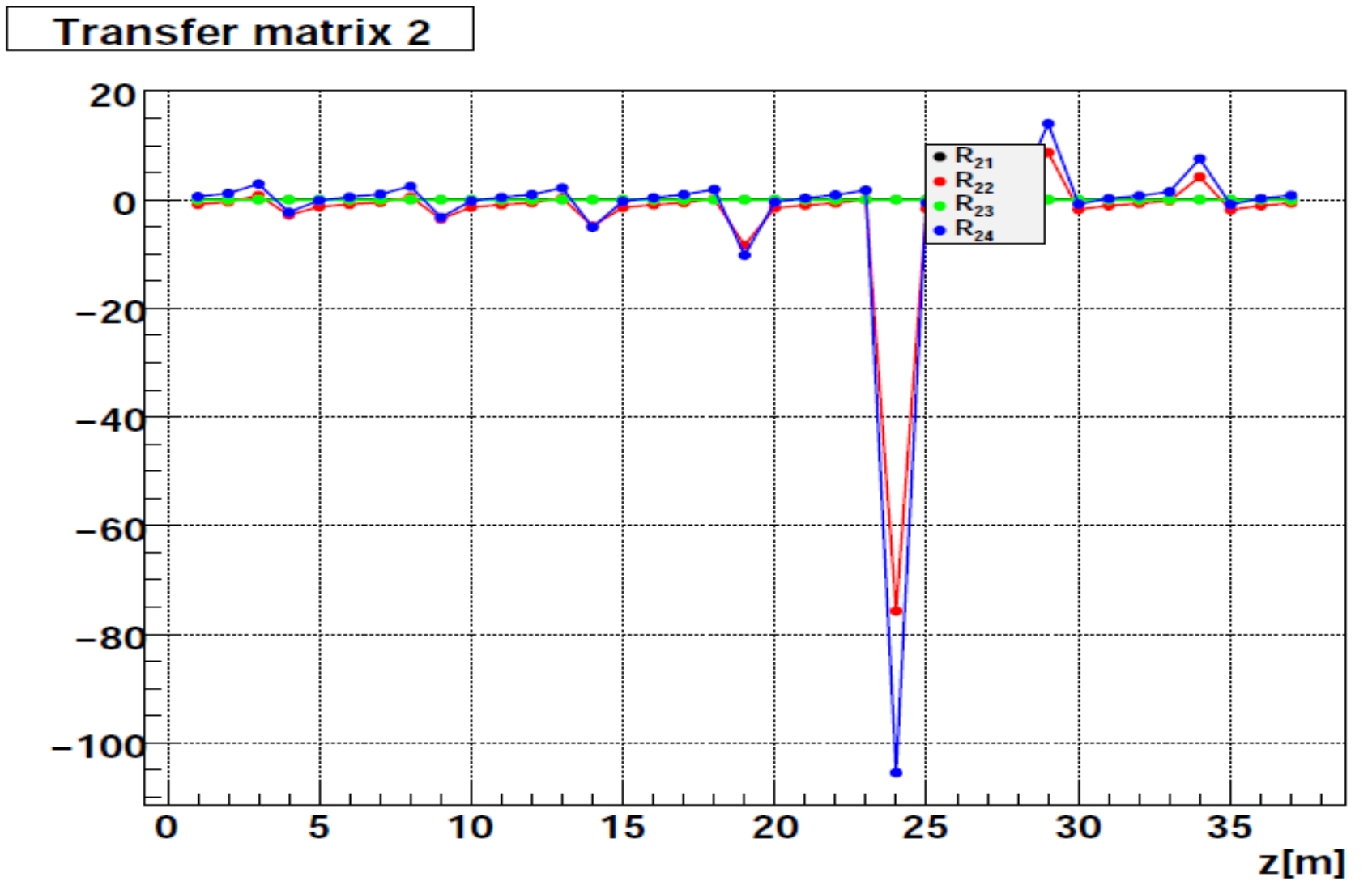
- still struggling to get the equations right (field strength and period angle calculations).

- there is some periodicity in the lattice still not understood.

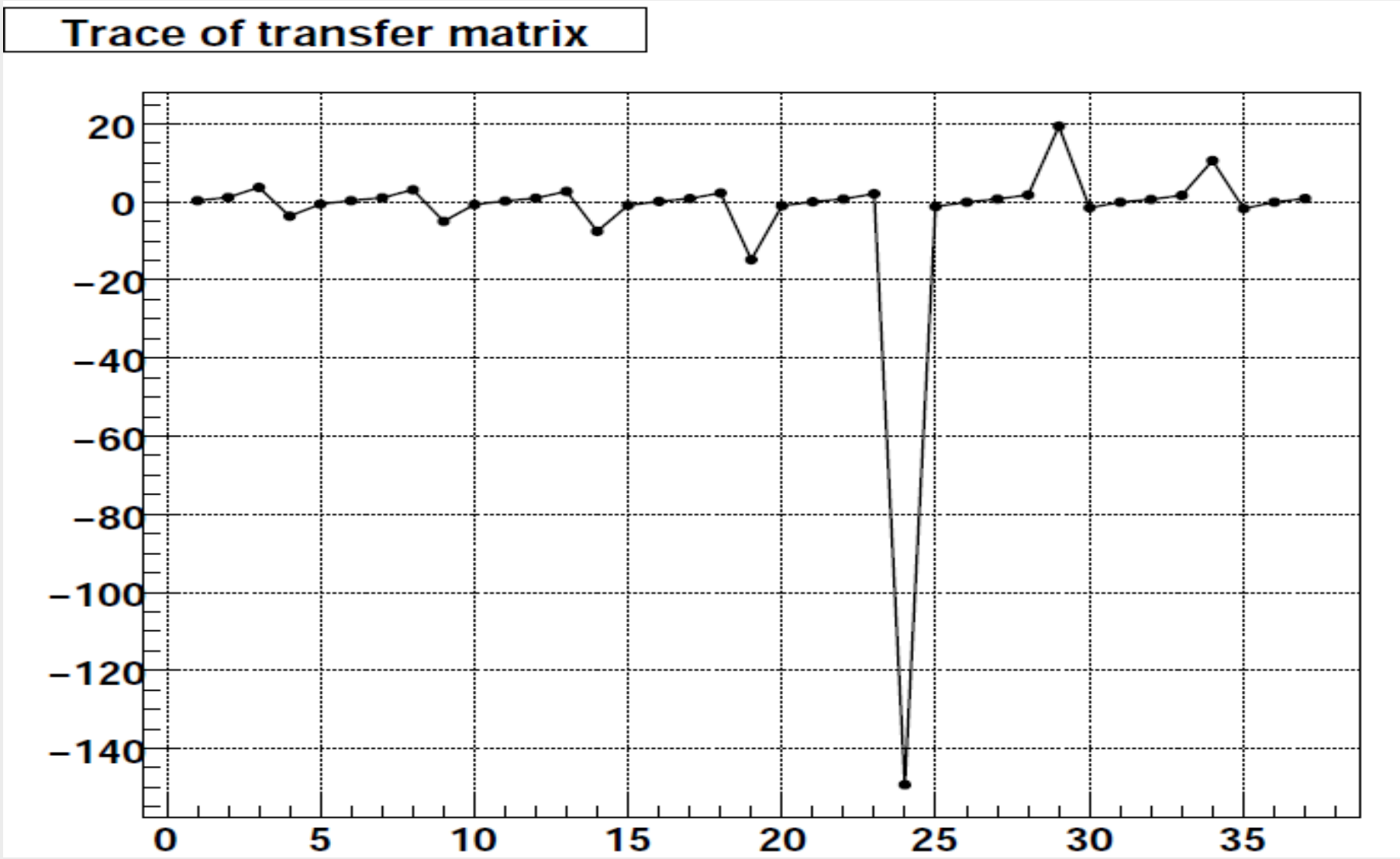
Lattice transverse optics (4/5)



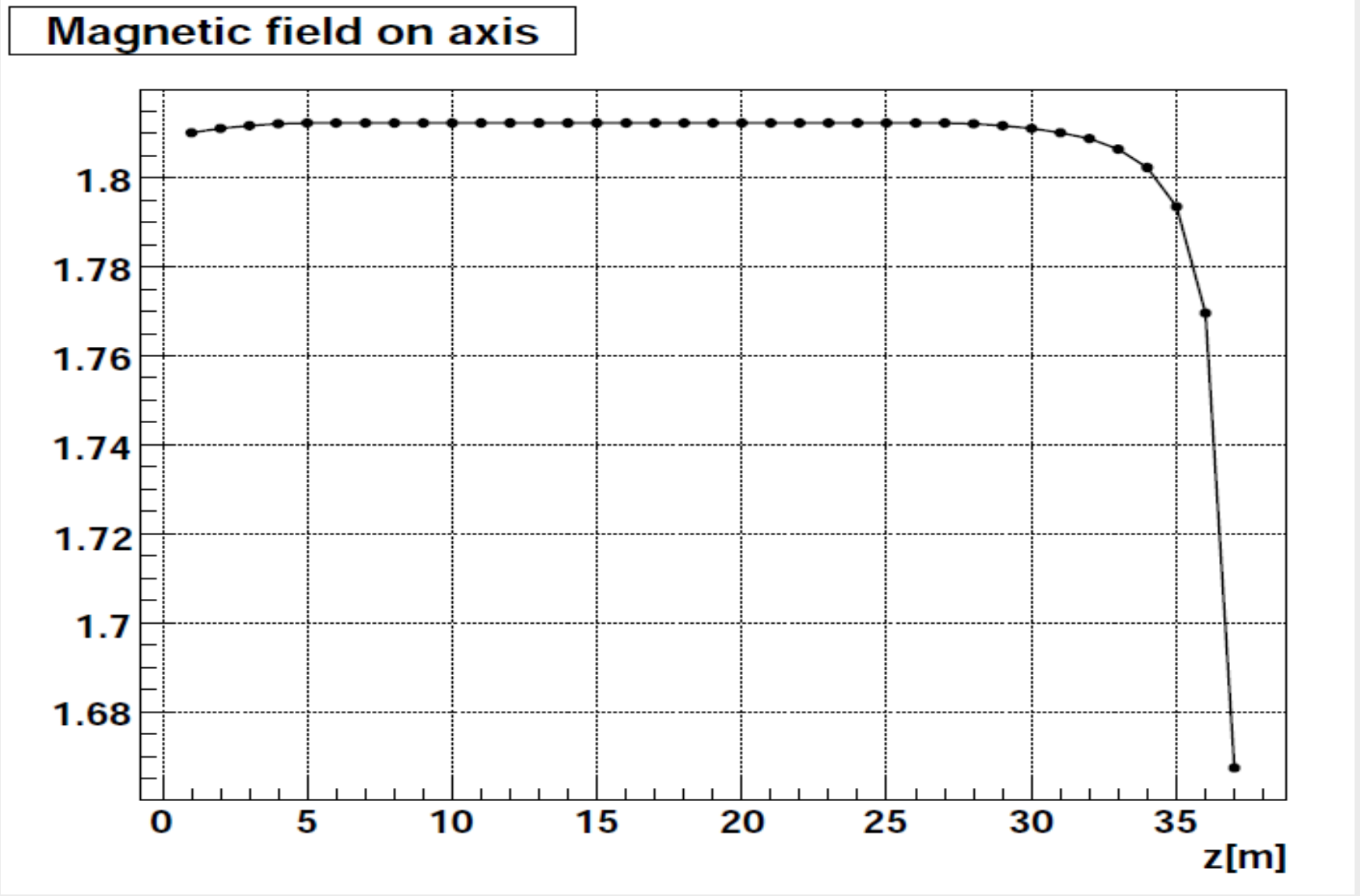
Lattice Transverse optics (/6)



Lattice transverse optics ()



Optimization of B field



To do

Need to verify if periodicity of transfer map values corresponds to the solenoid periodic functions.

Need to understand the jump at 24 m.

Finishing to optimize the field to a constant field on axis of 1.8 T.