44-88 MHz transverse optics for the rotation section

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Finding Twiss parameters

- ICOOL provides particles position and momentum for a given z.
- Choose 8 particles with 0.1 cm or 1 MeV/c deviation.
- Compute the transfer map for each plane (cf. Scott's algorithm).
- Transfer map R of a lattice made with solenoids only is a function of the phase advance ϕ and solenoid strength S(e,B,p).
- At the end of the solenoid coil:

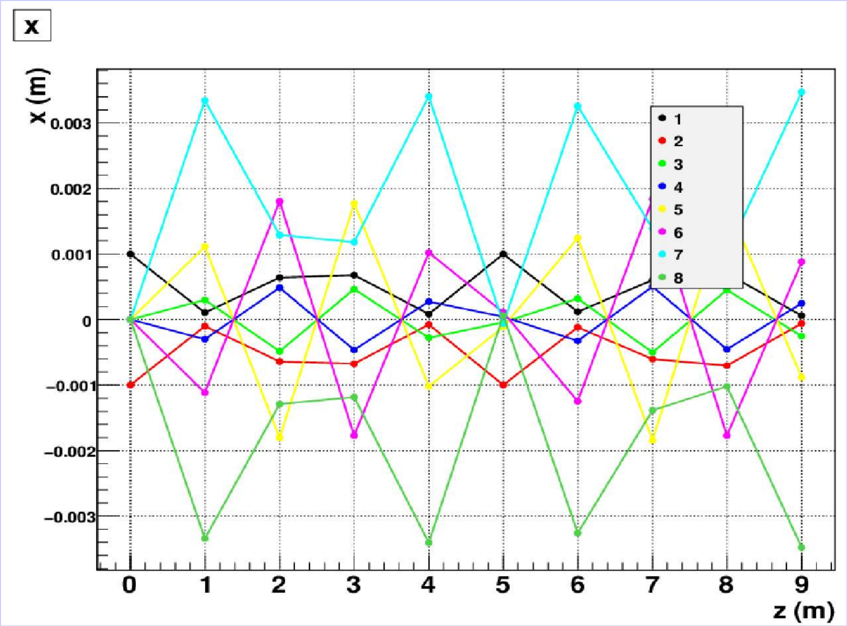
$$R = \begin{matrix} \cos^2(\phi) & \sin(2\cdot\phi)/S & \sin(2\cdot\phi)/2 & 2\cdot\sin^2(\phi)/S \\ -S\cdot\sin(2\cdot\phi)/4 & \cos^2(\phi) & -S\cdot\sin^2(\phi)/2 & \sin(2\cdot\phi)/2 \\ -\sin(2\cdot\phi)/2 & -2\cdot\sin^2(\phi)/S & \cos^2(\phi) & \sin(2\cdot\phi)/S \\ S\cdot\sin^2(\phi)/2 & -\sin(2\cdot\phi)/2 & -S\cdot\sin(2\cdot\phi)/4 & \cos^2(\phi) \end{matrix}$$

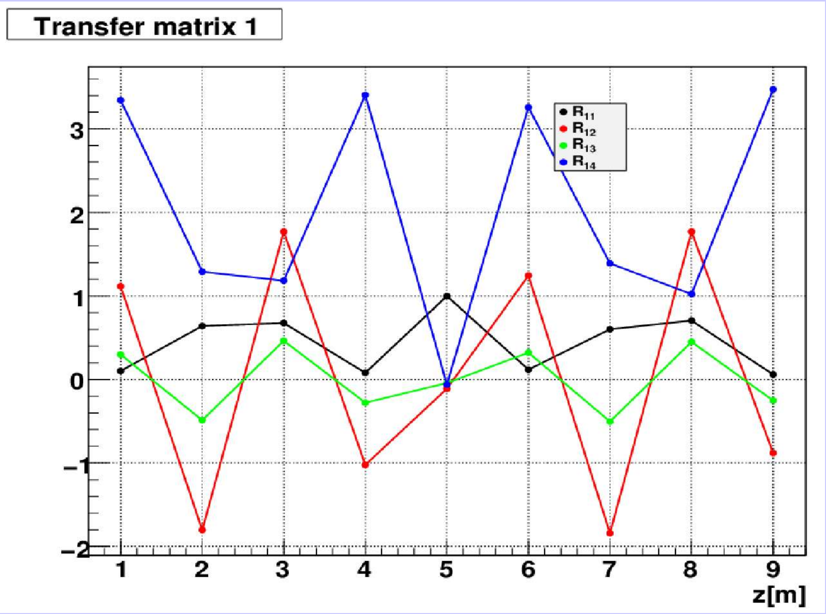
S= 0.299*B[T]/p[GeV/c]

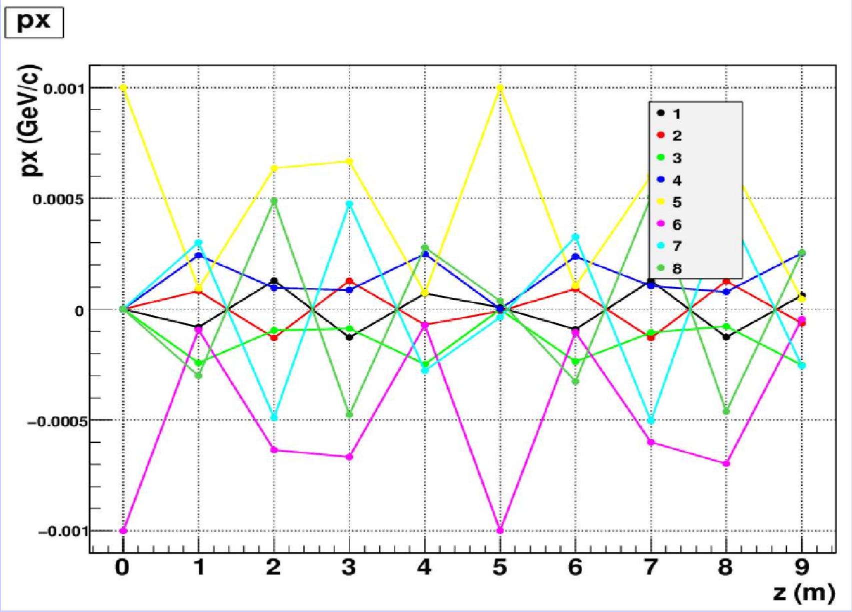
ϕ = S*z/2

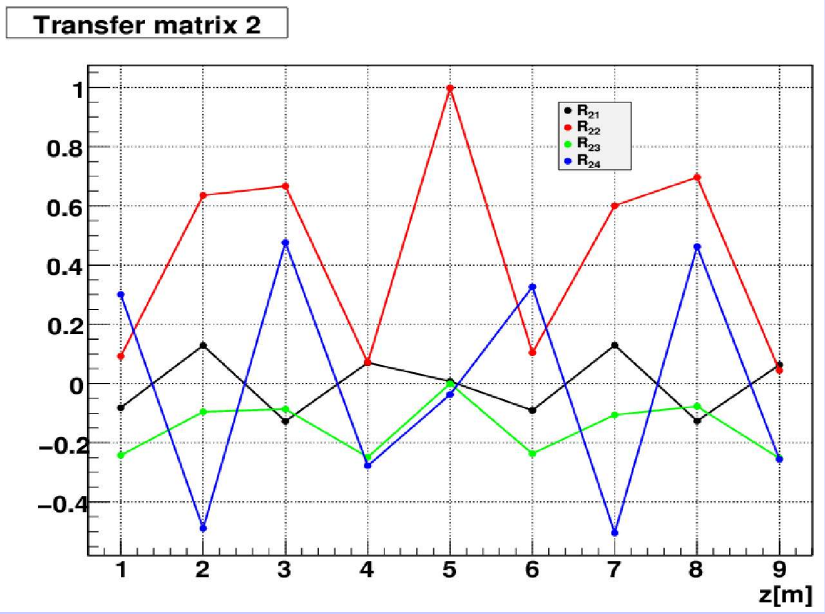
SOL model 1 (1/2)

- Constant 1.8 T field in central region + linear ends.
- At the coil ends Bz = 0 and dBz/dz non-zero.

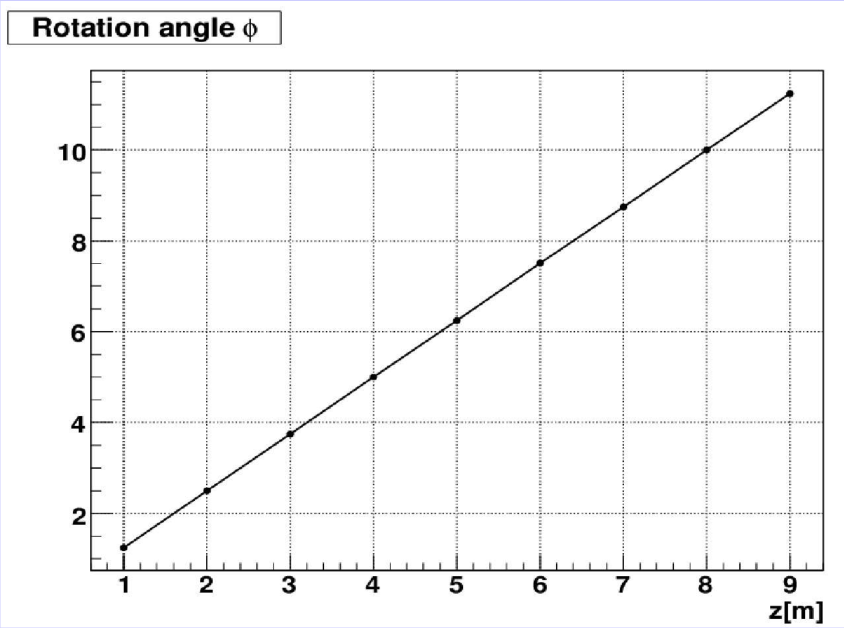


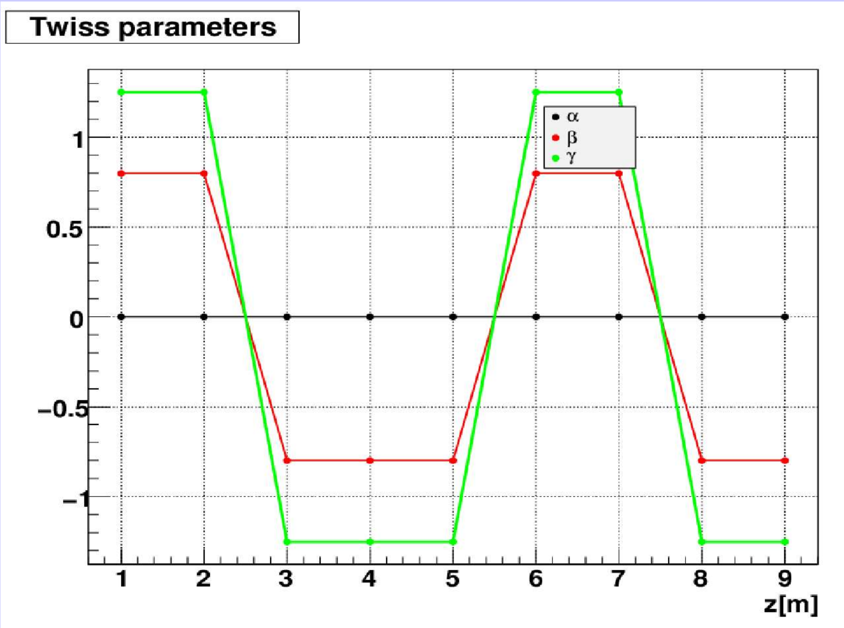


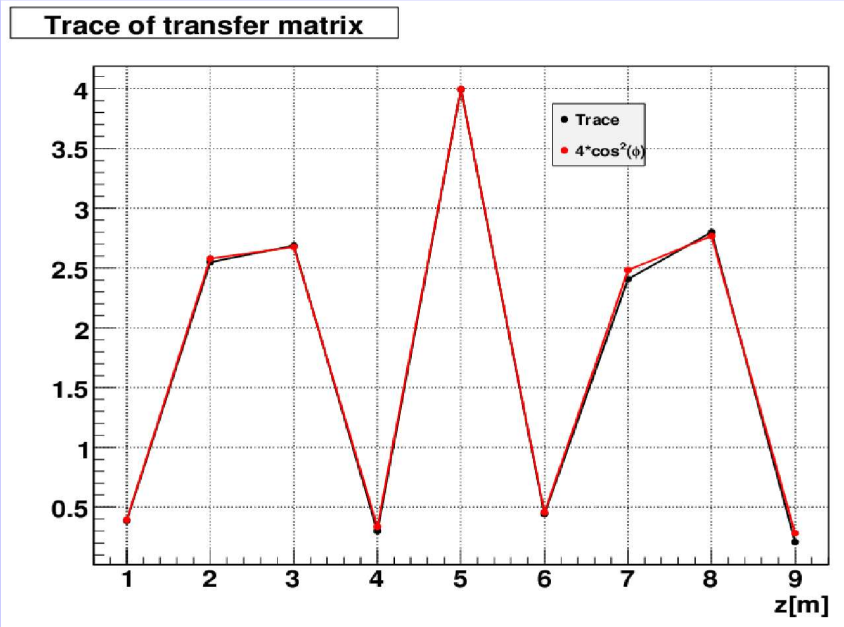




SOL model 1 (2/2)





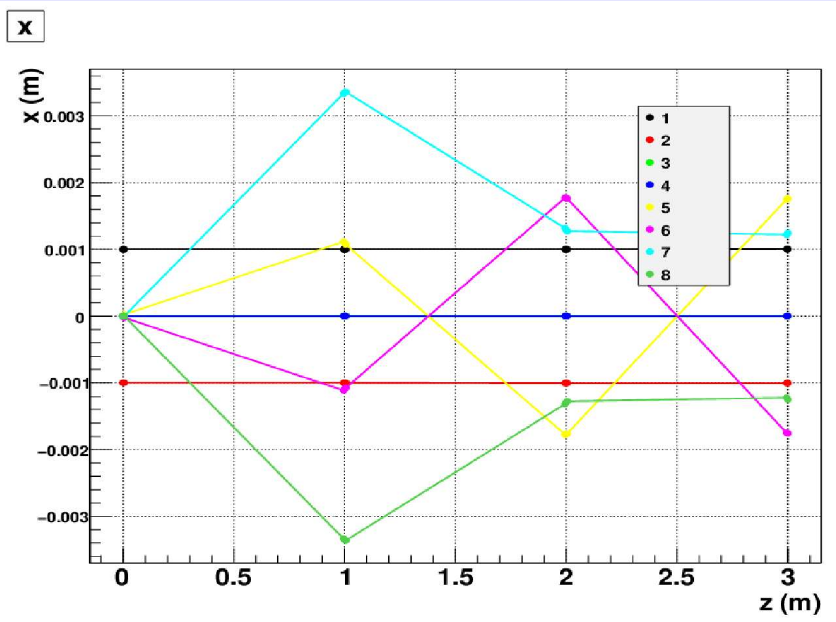


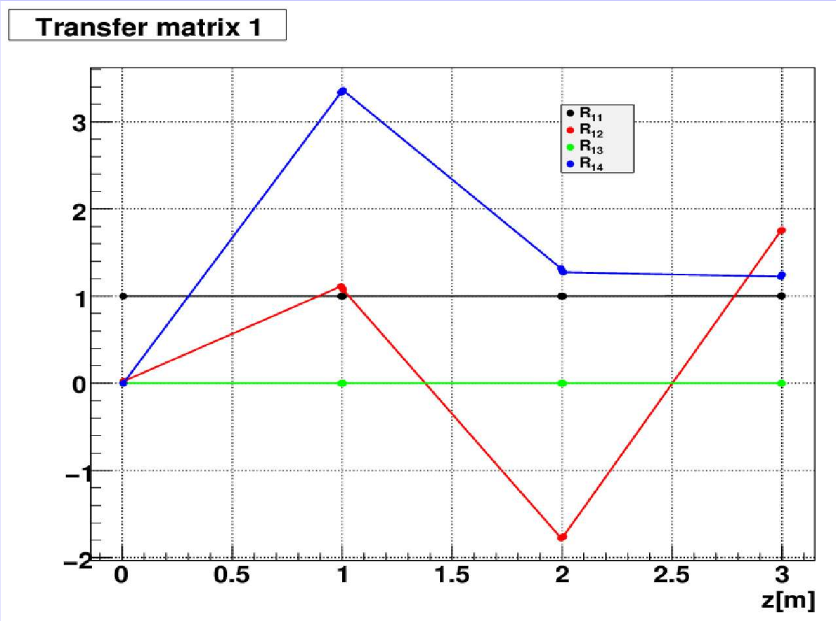
Identify the transfer map elements to the Twiss parameters for a periodic lattice.

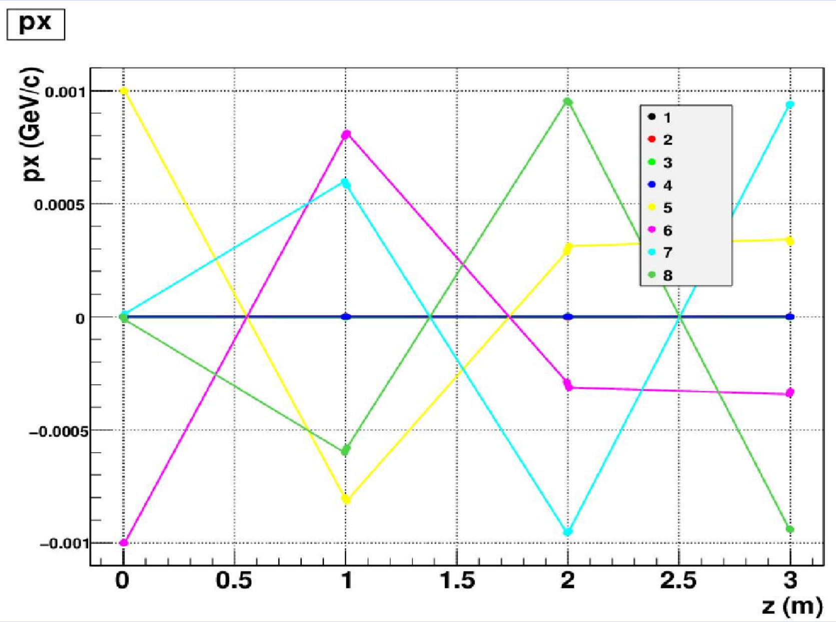
Algorithm working fine.

SHEET model 4

- Continuous 1.8 T field in the rotation section.
- At the coil ends Bz ≠ 0 and dBz/dz ~ 0.







Particles with no momentum deviation don't change transverse position.

Particle with no momentum deviation don't change momentum.

SHEET model 4: no x-y coupling ?
Algorithm does not work in this case.

Conclusion (to do)

- SHEET model 4: particles not rotating in 1.8 T continuous field (does it make sense?).

- Use another algorithm to compute the transverse map with SHEET model 4 ?

- Use another code (G4MICE, PATH) ?

- Look at other parameters of the rotation channel (energy spread, rotation performance).