

Homework, due October 10, 2019

Storage ring design problem set #1

(1) Use Tao to design the lattice of a storage ring with the following parameters:

- 800m circumferences, created by 100 equal dipoles
- Between each dipole is a quadrupole to initially create equivalent fodo cells.
- Next to each horizontally focusing quadrupole is a small dipole magnet for horizontal orbit correction
- Next to each vertically focusing quadrupole is a small dipole magnet for vertical orbit correction
- Chose the quadrupole strengths so the beta functions stay below 50m.

(a) Plot the periodic beta functions around the ring.

(b) Plot the phase advances around the ring.

(c) Plot the dispersion around the ring.

(d) Plot the maximum of the horizontal and vertical betas as a function of the horizontally focusing quadrupole strength.

(e) Plot the maximum of the dispersion as a function of the horizontally focusing quadrupole strength.

(f) Plot the tune as a function of the horizontally focusing quadrupole strengths.

(2) Orbit correction

Excite two small steering errors by setting two main dipoles incorrectly by 1%.

(a) Find the two corrector coils that most effectively correct the closed orbit. What is the largest value for the remaining closed orbit. What is the RMS x-value for the remaining closed orbit?

(b) Use all corrector coils to correct the horizontal closed orbit. What is the largest value for the remaining closed orbit. What is the RMS x-value for the remaining closed orbit?