

Homework for Physics 456/656

Introduction to Accelerator Physics and Technology (Hoffstaetter)

Due Date: Thursday, 11/13/03 - 11:40 in 110 Rockefeller Hall

Exercise 1:

The first quadrupole after an interaction region typically has a very large vertical beta function.

(a) Use thin lens approximation to find β_y in this quadrupole for $\beta_y^* = 1\text{cm}$ and a distance of 1.5m from quadrupole to interaction point.

(b) If this quadrupole has a focal strength of 0.5m^{-1} and its current changes accidentally by 1%. How many percent of beta-beat ($\Delta\beta/\beta$) would you expect for a tune of $\nu = 0.52$?

(c) What tune shift would you expect?

Exercise 2: Compute the horizontal tune distribution $\rho(\nu_x)$ for a Gaussian beam with an emittance of $\epsilon = 180\text{nm}$ when the ring has the tune of $\nu = 0.52$ and there is an octupole of strength 2m^4 with length 1m at a place with β_x of 40m.