

## Problems Lecture 2: Lattice Design

1) A transport lattice with no acceleration consists of FODO cells with quadrupole spacing  $L = 10$  m and focal distance  $f = 10$  m. How large is the phase advance?

2) Estimate the RMS beam jitter at a position with  $\beta(s_2) = 1$  m if one quadrupole jitters  $450^\circ$  upstream with a focal length  $f = 7$  m and  $\beta(s_1) = 10$  m. The quadrupole jitter amplitude has an RMS of  $1 \mu\text{m}$ .

3) Calculate the average beta-function in a thin lens FODO lattice as a function of  $\hat{\beta}$ ,  $\check{\beta}$  and  $L/f$

How much does a cavity with tilt  $\theta \ll 1$  deflect the beam?