Lecture A3
Damping Ring Basics

Homework

S. Guiducci, INFN-LNF
Seventh International Accelerator School for Linear Colliders

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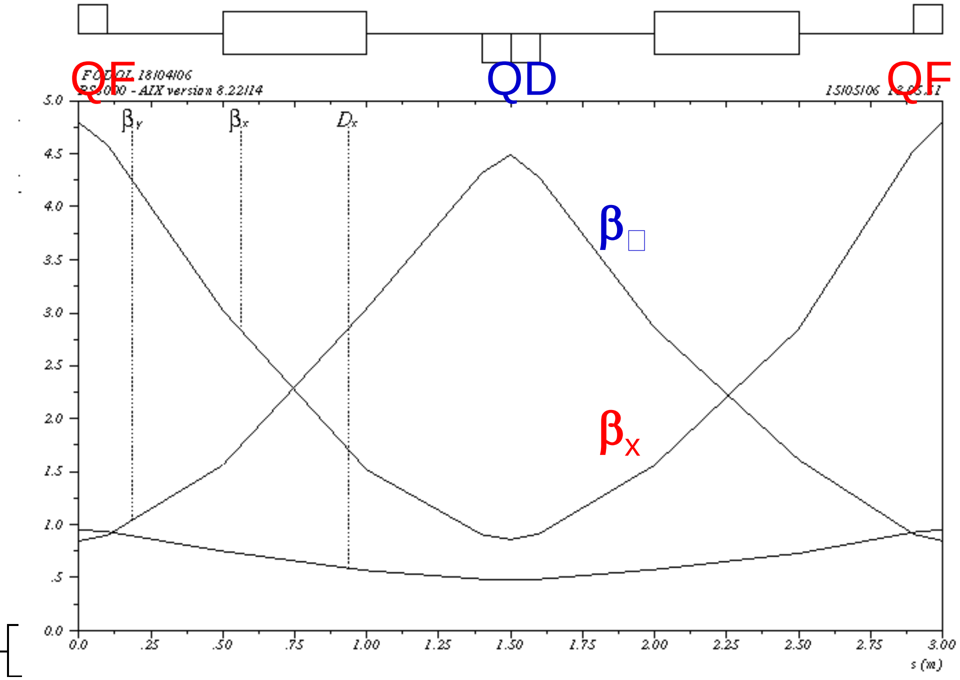
FODO Lattice
an example

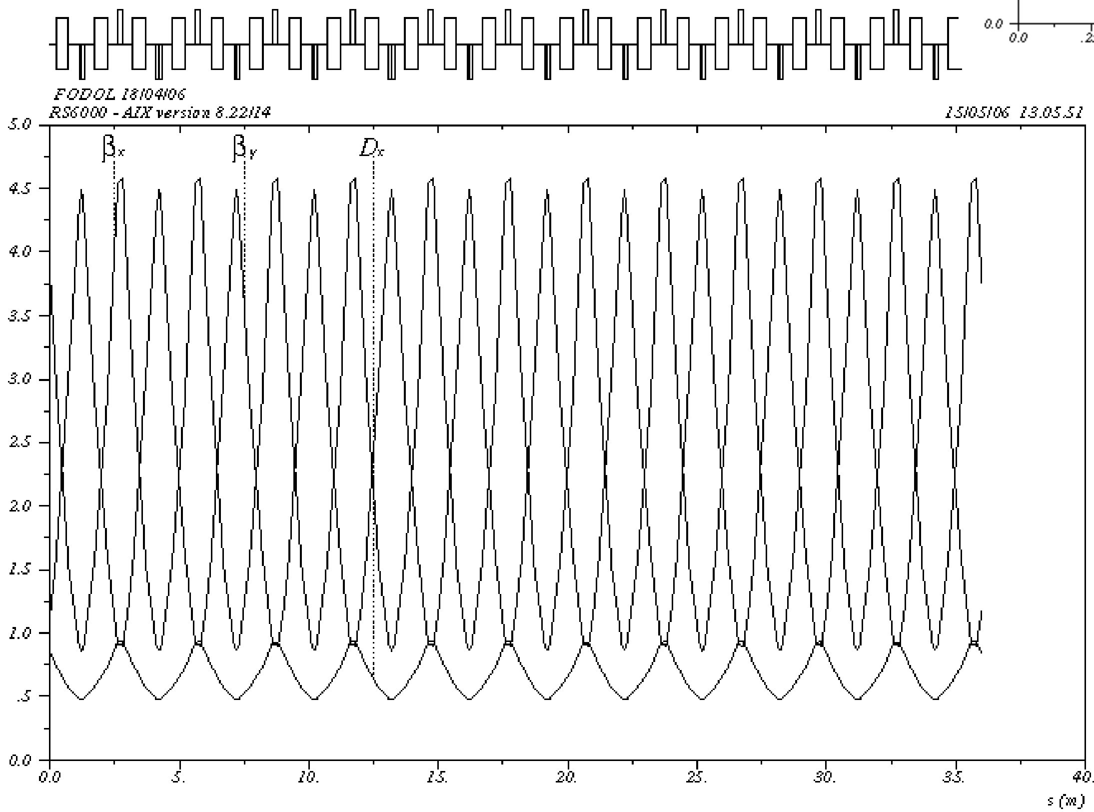
12 FODO cells

$Q_x = 3.15$, $Q_z = 3.15$



FODO cell

$\phi_x = \phi_y = 94.5^o$



Thin Lens FODO Cell

In thin lens approximation and representing dipoles as drift spaces the matrix of a FODO cell can be written as

$$M = \begin{pmatrix} 1 & 0 \\ -\frac{1}{2f} & 1 \end{pmatrix} \begin{pmatrix} 1 & L \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ \frac{1}{f} & 1 \end{pmatrix} \begin{pmatrix} 1 & L \\ 0 & 1 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ -\frac{1}{2f} & 1 \end{pmatrix} = \begin{pmatrix} 1 - \dfrac{L^2}{2f^2} & 2L(1 + \dfrac{L}{2f}) \\ -\dfrac{L}{2f^2}(1 - \dfrac{L}{2f}) & 1 - \dfrac{L^2}{2f^2} \end{pmatrix}$$

Comparing this with the matrix of a periodic structure evaluate the betatron phase advance ϕ and the Twiss functions $\beta_{\square}$ and $\alpha_{\square}$ at the center of QF (optionally QD)

Optional: Observe the behavior of $\beta_{\square}$ and β_D as a function of ϕ; what happens at 180º?

Injection Kicker orbit

The optimum phase advance between the injection kicker and septum is $\pi/2$.

Using the general transport matrix between the kicker and septum evaluate the displacement at the septum given by a kicker angle θ and show that it is maximum at $\pi/2$ phase advance.