

# Tutorial 2

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## TUTORIAL 2: FIRST PART

Matching the FODO cell using a parametric plot.

- ▶ Consider the FODO cell of tutorial 1 ( $L_{cell} = 100$  m,  $L_{quad} = 5$  m and  $f = 200$  m).
- ▶ Define the beam (proton at  $E_{tot} = 7$  TeV), activate the sequence and try to twiss it powering the quads to obtain  $\Delta\mu \approx 90$  deg phase advance in the cell using the thin lens approximation (use Fig. 1). What is the actual phase advance computed by MADX?

# TUTORIAL 2: FIRST PART

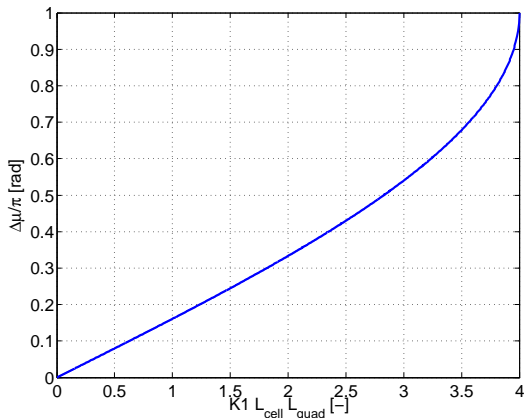


Figure 1: Phase advance versus quad strength, cell length and quad length. Thin lens approximation of a FODO.

## TUTORIAL 2: SECOND PART

### Tune and $\beta$ -function dependence with K1.

- ▶ What is the  $\beta_{max}$ ? Compare with the thin lens approximation (Fig. 2). Compute the maximum beam  $\sigma$  assuming  $\epsilon_n=3$  mrad mm,  $E_{tot} = 7$  TeV?
- ▶ Halve the focusing strength of the quadrupoles, what is the effect of it on the  $\beta_{max}$ ,  $\beta_{min}$  and on the  $\Delta\mu$ ? Compare with the parametric plots in Fig. 1 and Fig. 2.

# TUTORIAL 2: SECOND PART

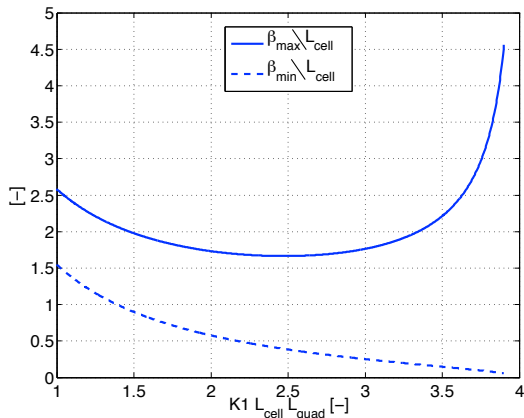


Figure 2:  $\beta$ -functions versus quad strength, cell length and quad length. Thin lens approximation of a FODO.