

Tutorial 5

29 January 2016, Archamps

`guido.sterbini@cern.ch, dario.pellegrini@cern.ch`

TUTORIAL 5: FIRST PART

Transfer lines: periodic and initial conditions

- ▶ Build a transfer line of 10 m with 4 quads of $L=0.4$ m (centered at 2, 4, 6, and 8 m). With $K1$ respectively of 0.1, 0.1, 0.1, 0.1 m^{-2} . Can you find a periodic solution?
- ▶ Can you find a IC solution starting from $(\beta_x, \alpha_x, \beta_y, \alpha_y) = (1 \text{ m}, 0, 2 \text{ m}, 0)$?
- ▶ What is the final optical condition $(\beta_x^{end}, \alpha_x^{end}, \beta_y^{end}, \alpha_y^{end})$?

TUTORIAL 5: SECOND PART

Transfer lines: the matching

- ▶ Starting from $(\beta_x, \alpha_x, \beta_y, \alpha_y) = (1 \text{ m}, 0, 2 \text{ m}, 0)$ match the line to $(\beta_x, \alpha_x, \beta_y, \alpha_y) = (2, 0, 1, 0)$ at the end.
- ▶ Starting from $(\beta_x, \alpha_x, \beta_y, \alpha_y) = (1 \text{ m}, 0, 2 \text{ m}, 0)$ and the gradient obtained with the previous matching, match to $(\beta_x^{end}, \alpha_x^{end}, \beta_y^{end}, \alpha_y^{end})$. Can you find back K1 respectively of $0.1, 0.1, 0.1, 0.1 \text{ m}^{-2}$?
- ▶ consider that the quadrupoles have an excitation current factor of 100 A/m^2 and an excitation magnetic factor of 100 T/m/A and aperture of 40 mm diameter. Compute the magnetic field at the poles of the four quads after matching (**HINT**: assume linear regime and use a dimensional approach).