Tutorial 5

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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 $(\beta_x, \alpha_x, \beta_y, \alpha_y) = (1\,\mathrm{m}, 0, 2\,\mathrm{m}, 0)$?
- 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 $(\beta_x, \alpha_x, \beta_y, \alpha_y) = (1\ \mathrm{m}, 0, 2\ \mathrm{m}, 0)$ match the line to $(\beta_x, \alpha_x, \beta_y, \alpha_y) = (2, 0, 1, 0)$ at the end.
- Starting from $(\beta_x, \alpha_x, \beta_y, \alpha_y) = (1\ \mathrm{m}, 0, 2\ \mathrm{m}, 0)$ 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 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).