

USPAS Graduate Accelerator Physics Homework 17

Due date: Thursday February 18, 2021

1 Chicane Bunch Compressor

The figure sketches the layout of a simple symmetric four-dipole chicane. The bend angle θ is small, the four identical dipoles are assumed to be short, and the two distances labeled a are equal.

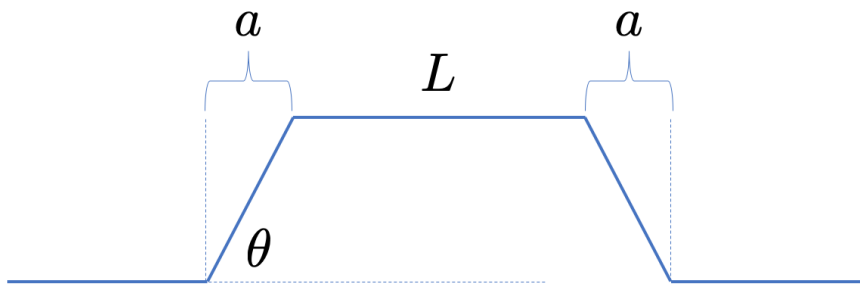


Figure 1: A simple four-dipole chicane, with no quadrupoles.

a) (5 points) Following Equation 14.18, show that

$$M_{56} \equiv \frac{dz_2}{d\delta_1} = -2a\theta^2$$

b) (5 points) Explain why M_{56} is independent of L .

c) (5 points) Following the Taylor expansion of the path length in Equation 14.20,

$$z_2 - z_1 = M_{56}\delta_1 + T_{566}\delta_1^2 + U_{5666}\delta_1^3 + \dots, \quad (1.1)$$

show that

$$T_{566} = -\frac{3}{2}M_{56} \quad (1.2)$$

and

$$U_{5666} = 2M_{56} \quad (1.3)$$