PHY 554. Homework 5.

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1 (10 point): localized orbit correction

The closed orbit can be locally corrected by using steering dipoles. A commonly used algorithm is based on the "three-bumps'' method, where three steering dipoles are used to adjust local-orbit distortion.

Let θ_1 , θ_2 and θ_3 be the three bump angles. For the orbit distortion to be localized between first and third dipoles, show that these angles must be related by

$$\theta_2 = -\theta_1 \sqrt{\frac{\beta_1}{\beta_2} \frac{\sin \psi_{31}}{\sin \psi_{32}}}, \qquad \theta_3 = \theta_1 \sqrt{\frac{\beta_1}{\beta_3} \frac{\sin \psi_{21}}{\sin \psi_{32}}},$$

where β_1, β_2 and β_3 are the beta functions at local bumps and ψ_{ij} is the phase advance between ith and jth steering dipoles.

Show under what condition, the "three-bumps" method can become "two-bumps" method, i.e., only two steering dipoles are used for local orbit distortion.