

Homework Problems
Physics 854
Due September 24, 2015

1. Wiedemann Problem 17.1. Can we rotate a horizontal flat 10 GeV beam by 90° with a solenoid? If yes, what is the strength of the solenoid and where along the z-axis do we have a flat vertical beam?
2. Wiedemann Problem 17.4. Consider a point source of particles (e.g., a positron conversion target) on the axis of a solenoid field. Determine the solenoid parameters for which the particles would exit the solenoid as a parallel beam. Such a solenoid is also called a $\lambda/4$ -lens, why? Let the positron momentum be 10 MeV/c. What is the maximum solid angle accepted from the target that can be focused to a beam of radius $r = 1$ cm? What is the exit angle of a particle which emerges from the target at a radius of 1 mm? Express the transformation of this $\lambda/4$ -lens in a matrix formulation.
3. Wiedemann Problem 17.6. Use the measurements in Fig. 17.2 and determine the coupling coefficient k . (Hint: Fit data to 17.120).