PHY466

H O M E W O R K 2

Homework should be handed in to F10 ***by 4:00 p.m. on Wednesday, 1st November 2017***.

1. Physicists have set up an experiment to observe the deflection of particles in a magnetic field and the ionisation per unit track length (ionisation density dE/dx), similar to the experiment by Street and Stevenson when they observed muons. Particles were entering the setup in a direction perpendicular to the magnetic field. In a calibration experiment with a magnetic field of 1.0×10^3 Gauss the scientists have sent the beam of mono-energetic electrons into their setup and measured the initial radius of curvature of their tracks to be 2.0 cm. Then they increased the strength of the field to 1.5×10^4 Gauss and observed a negative particle with an initial radius of track curvature of 20 cm. At the beginning of the track this particle had an ionisation density twice that of electrons in the calibration experiment. Calculate the mass of this particle. What can this particle be, assuming that its charge is the same as the electron charge? Assume that the overall uncertainty in the mass calculation is about 2 MeV/c^2. You can use the approximate dependence of the ionisation density on the particle velocity as $dE/dx \propto v^{-2}$. [10].

2. Describe the detectors and their role in the experiment to discover the antiproton (Phys. Rev. 100, 947 (1955)). How was the selection of antiproton events achieved? [10]