**Measurement of particle momentum (from curvature of its path in a magnetic field)**

A particle of charge ***q*** travelling at right‐angles to a magnetic field ***B*** with a speed ***v*** experiences a force **Bqv** at right angles to its motion.

This makes the particle follow a circular path of radius r and the motion is described by

***Bqv = mv2/r → p = (Bq) r***

This tells us that for a fixed field B, and charge q, the momentum p is proportional to the radius of curvature r. Here, nature has been kind: all charged particles that live long enough to travel a measurable distance have a charge equal or opposite to the charge on the electron e=1.6x10‐19 C.



*p* = *mv* = (*Bq*) *r*

**Exercise 1**

The radius of curvature of the curved sections of the LHC is 2804 m. Show that, whit a magnetic field of 8.33 T, the momentum of the circling protons is ≅ 7000 Gev/c (or 7 Tev/c).

[Note: 1 eV= 1.6022 x 10-19J]

**Exercise 2**

Find the ratio of the proton velocity to the velocity of light in a vacuum.