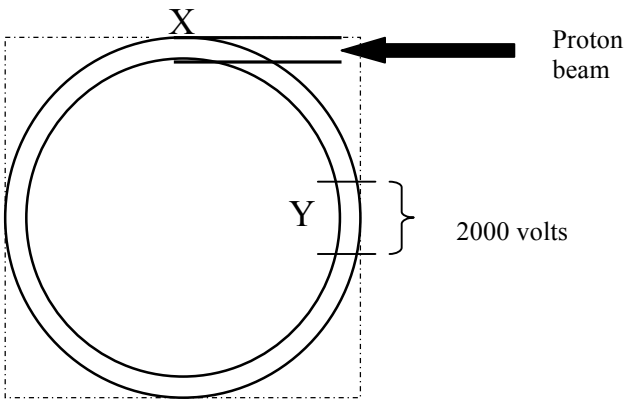
The Proton's Story...

Imagine that you are a **proton** at the Large Hadron Collider. Describe your trip from start to finish using at least 8 of the following terms. (1/2 point for each term used)

- Magnetic field
- Accelerating gap
- Synchotron
- Linear
- Fixed target
- Positive
- Negative
- Detector
- Cockcroft Walton
- Colliding beam
- Ring
- Steer
- Velocity
- Energy
- Bunches
- Superconducting

Design an Accelerator

You are to design a synchotron accelerator capable of accelerating protons to a speed of 90% the speed of light in a classroom approximately 20ft x 20 ft. (Answers are disregarding relativistic effects.)



1) Convert the classroom length and width to metric units (meters).

2) Use the maximum radius available and calculate the magnetic force necessary to steer a proton at maximum speed.

3) Calculate the magnetic field intensity, B.

4) Would B increase or decrease if the velocity increased?

5) Where does the north pole of the magnet need to be positioned if the proton travels in a counterclockwise direction beginning at point X?

6) How much energy would the proton gain going once around the ring if it were accelerated only by the magnetic field?

7) How much energy will the proton gain (in eV) each time it passes through the 2000 volt accelerating gap (at area Y)?

8) Convert this energy to Joules.

9) How much kinetic energy will the proton have at the maximum speed of 0.9c?

10) How many times must the proton travel through the accelerating gap (at area Y) to produce the necessary speed of 0.9c?

Possible addition…

11) – 20) Recalculate the answers to questions 1 through 10 if the size of the room is now 1000 ft x 1000 ft.