Cyclotron

Cyclotron is a device used to accelerate the charged particles to gain large kinetic energy. It is also called as high energy accelerator. It was invented by Lawrence and Livingston in 1934.

Principle:

When a charged particle moves normal to the magnetic field, it experiences magnetic Lorentz force.

Working:

Let us assume that the ion ejected from source S is positively charged. As soon as ion is ejected, it is accelerated towards a Dee (say, Dee – 1) which has negative potential at that time. Since the magnetic field is normal to the plane of the Dees, the ion undergoes circular path. After one semi-circular path in Dee-1, the ion reaches the gap between Dees. At this time, the polarities of the Dees are reversed so that the ion is now accelerated towards Dee-2 with a greater velocity. For this circular motion, the centripetal force of the charged particle q is provided by Lorentz force.

Limitations of cyclotron

(a) The speed of the ion is limited

(b) Electron cannot be accelerated

(c) Uncharged particles cannot be accelerated

Construction and working of cyclotron: