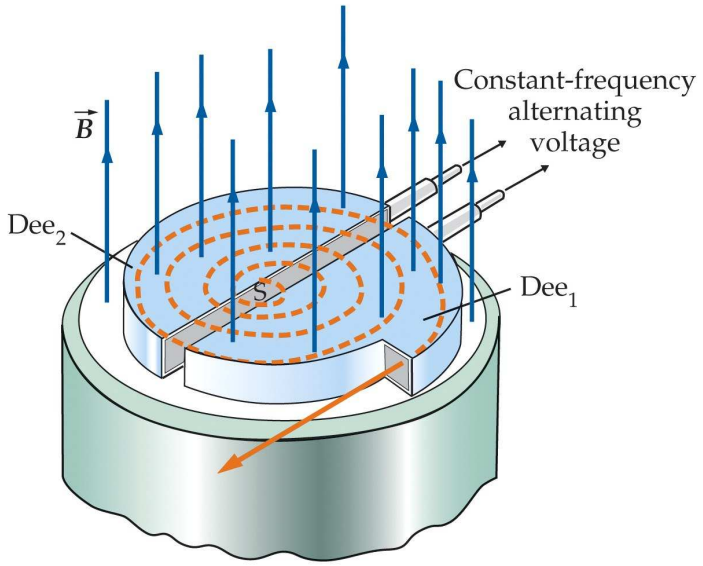
Cyclotron

Purpose: accelerate charged particles to high energy.



- Low-energy protons are injected at S.
- Path is bent by magnetic field $\vec{B}$.
- Proton is energized by alternating voltage ΔV between Dee_1 and Dee_2.
- Proton picks up energy $\Delta K = e\Delta V$ during each half cycle.
- Path spirals out as velocity of particle increases:
  Radial distance is proportional to velocity: $r = \dfrac{mv}{eB}$.
- Duration of cycle stays is independent of r or v:
  cyclotron period: $T = \dfrac{2\pi m}{eB}$.
- Cyclotron period is synchronized with alternation of accelerating voltage.
- High-energy protons exit at perimeter of $\vec{B}$-field region.