

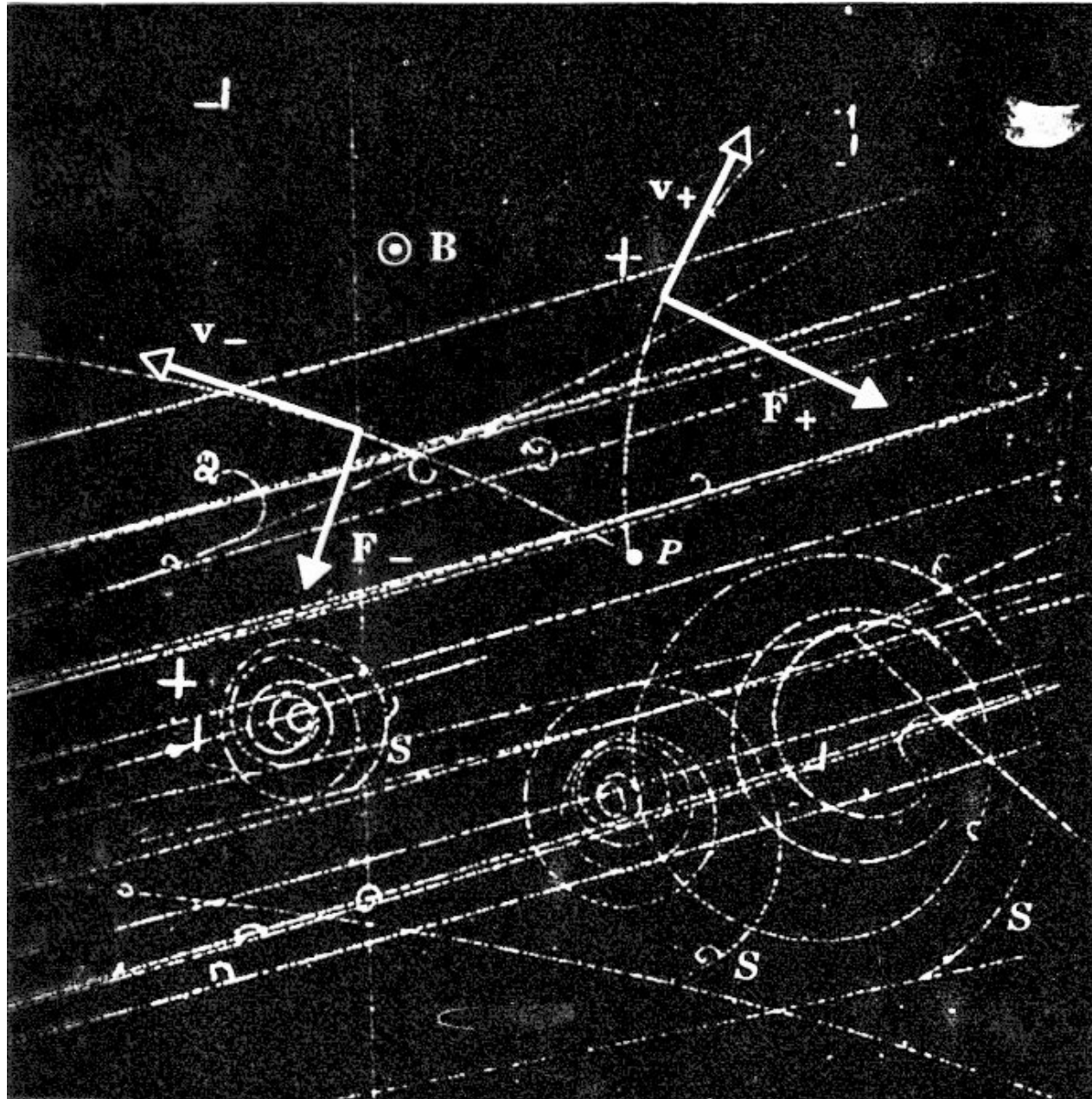
Lorentzkraft: Spiralbahnen

Table 33-2
The Brookhaven Proton Synchrotron

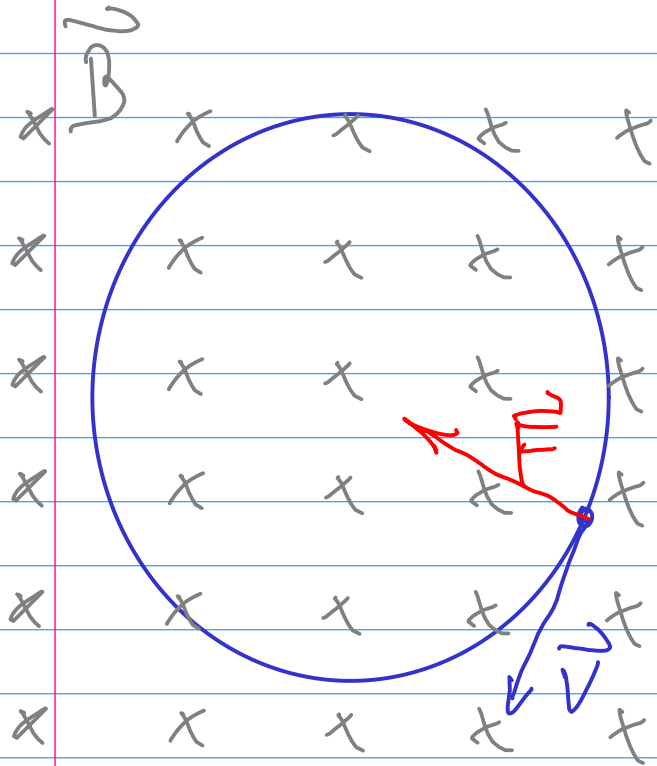
Maximum proton energy	33 GeV
Mean orbit radius	128 m
Maximum orbit field	1.3 T
Injection energy	50 MeV
Pulse repetition rate	2.4 Hz
Beam aperture	18 cm $\times$ 8 cm
Total weight of magnets	4000 tons

figure 33-4

A *bubble chamber* is a device for rendering visible, by means of small bubbles, the tracks of charged particles that pass through the chamber. The figure is a photograph taken with such a chamber immersed in a magnetic field B and exposed to radiations from a large cyclotron-like accelerator. The curved V at point P is formed by a positive and a negative electron, which deflect in opposite directions in the magnetic field. The spirals S are the tracks of three low-energy electrons. (Courtesy E. O. Lawrence Radiation Laboratory, University of California.)



Bewegte Ladung im homog. B-Feld



$$\vec{v} \perp \vec{B}$$

$$\vec{F} = q \vec{v} \times \vec{B}$$

$$\Rightarrow \vec{F} \perp \vec{v}$$

$$\Rightarrow \text{Kreisbahn} \quad qvB = \frac{mv^2}{r}$$

$$\Rightarrow r = \frac{m}{q} \frac{v}{B}$$

Umlauffrequenz:

$$\gamma = \frac{v}{2\pi r} = \frac{1}{2\pi} \frac{q}{m} B$$

$$2\pi\gamma = \boxed{\frac{q}{m} B = \omega}$$

Zyklotronfrequenz

(unabh. von v, r)

Zyklotron

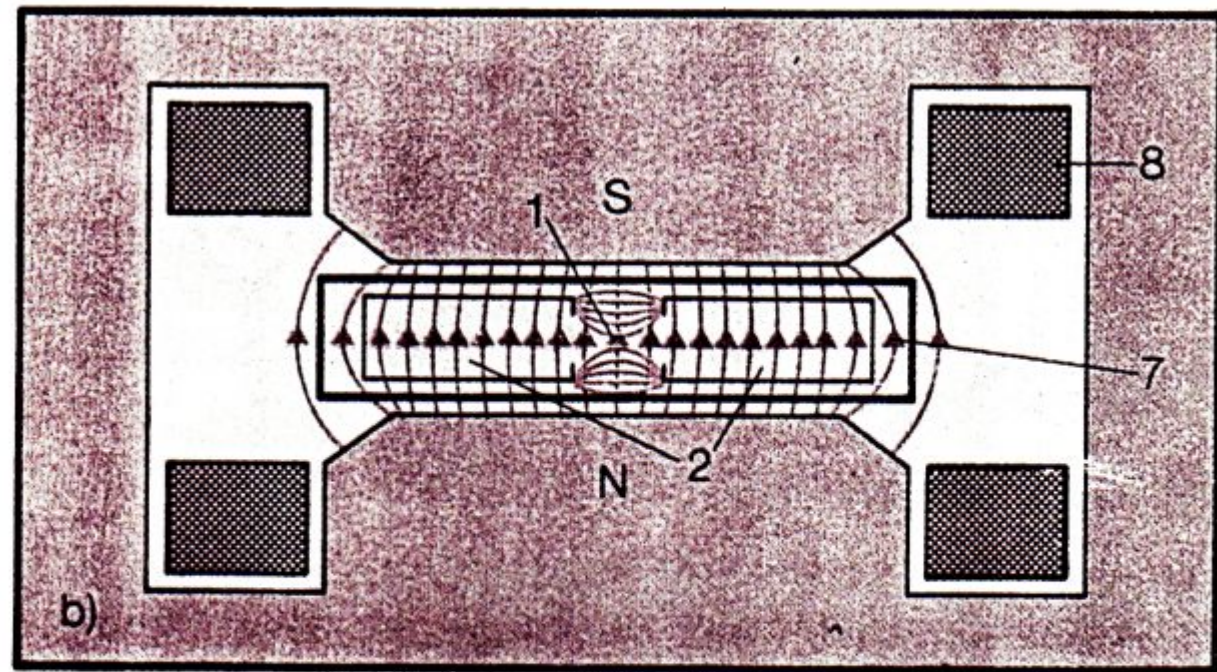
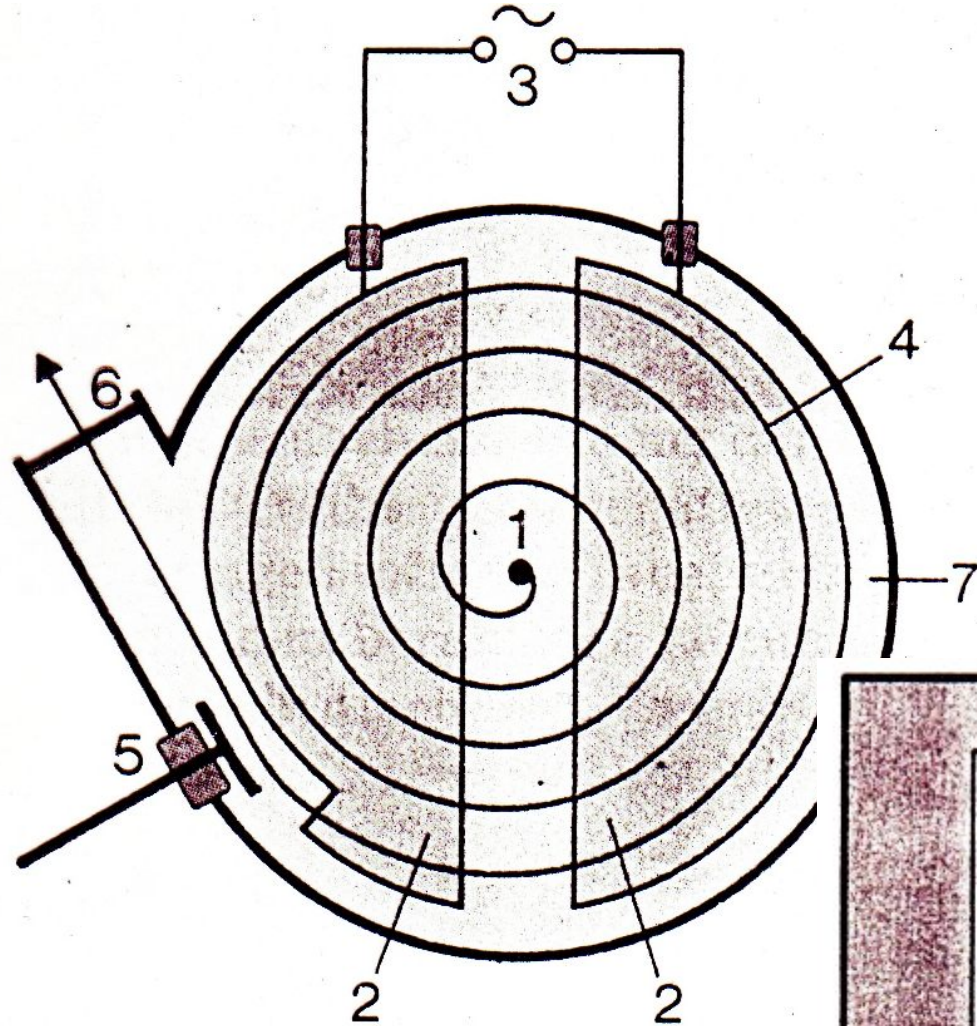


Abb. 6-19: Schema eines Zyklotrons; a) Grundriß, b) Aufriß. 1 Ionenquelle, 2 D-förmige Elektroden, 3 hochfrequente Wechselspannung, 4 Teilchenbahn, 5 Ablenkplatte, 6 Austrittsfenster, 7 Vakuumkammer, 8 Magnetspulen.

Wechselsgg. mit $\omega = \frac{q}{m} B$

$\Rightarrow$ Beschleunigung bei Spaltquerung

nach n Umläufen:

$$E_{\text{kin}} = \frac{1}{2} m v^2 = 2 n q U$$