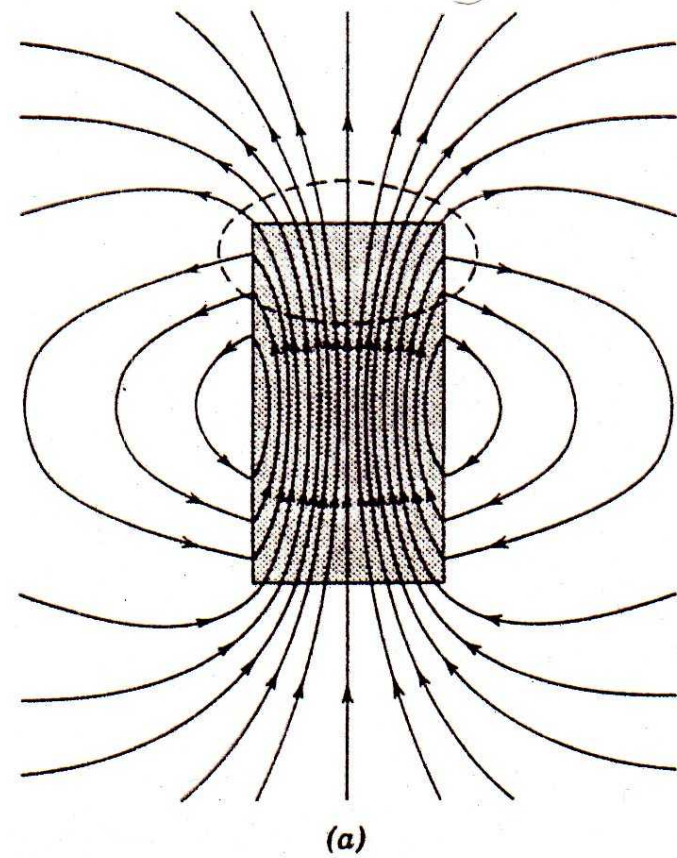
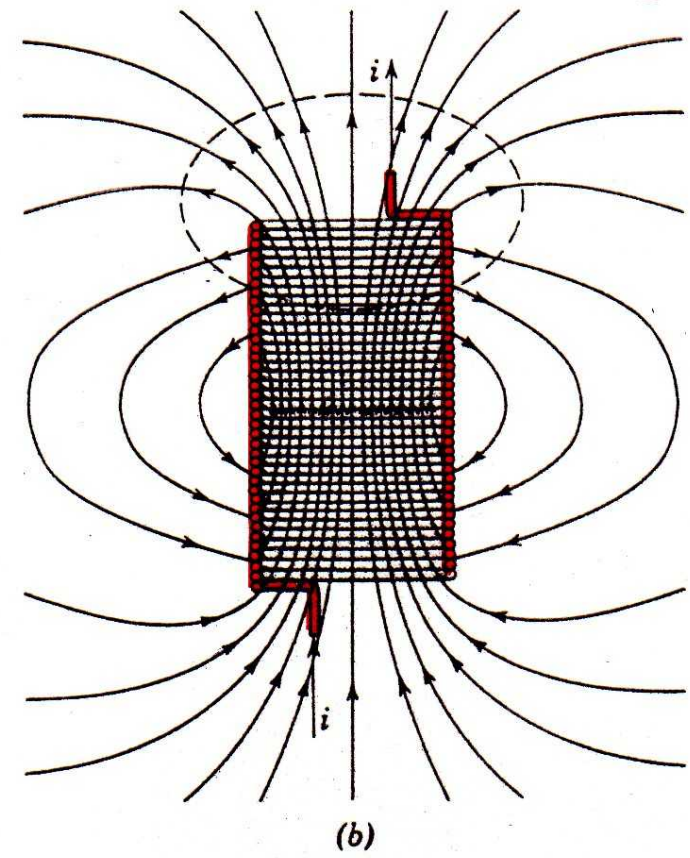


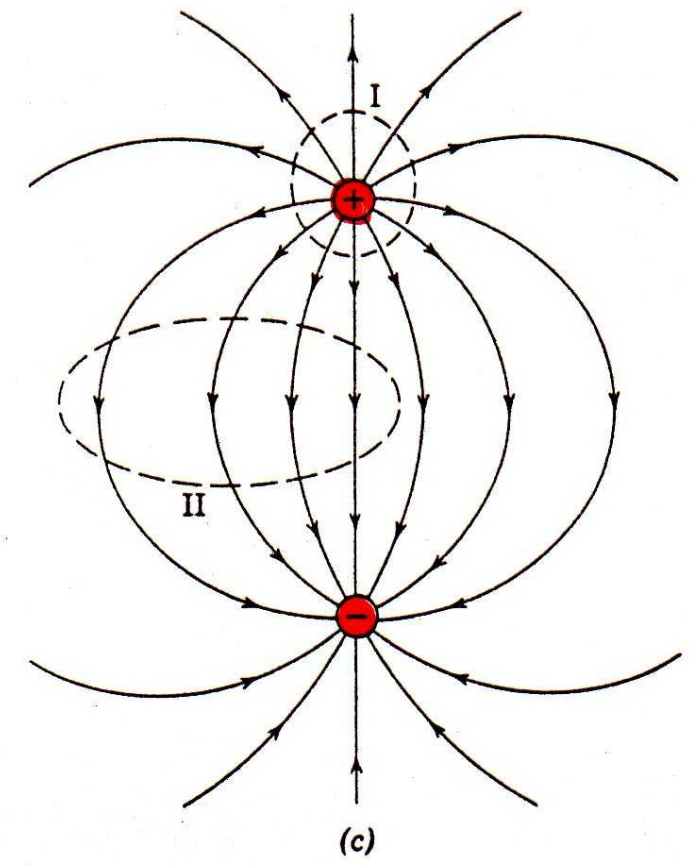
Dipolfelder



STABMAGNET



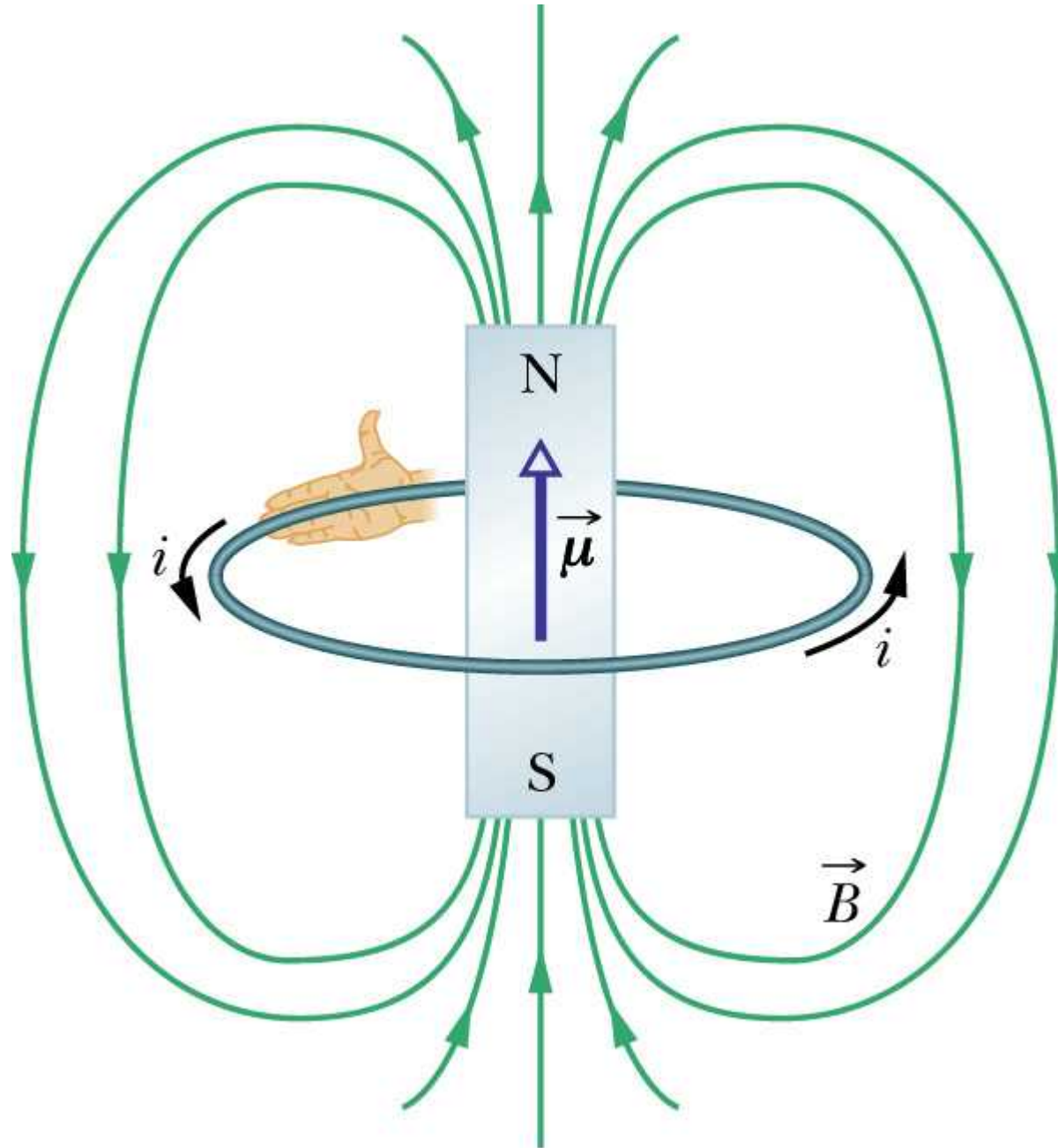
SPULE



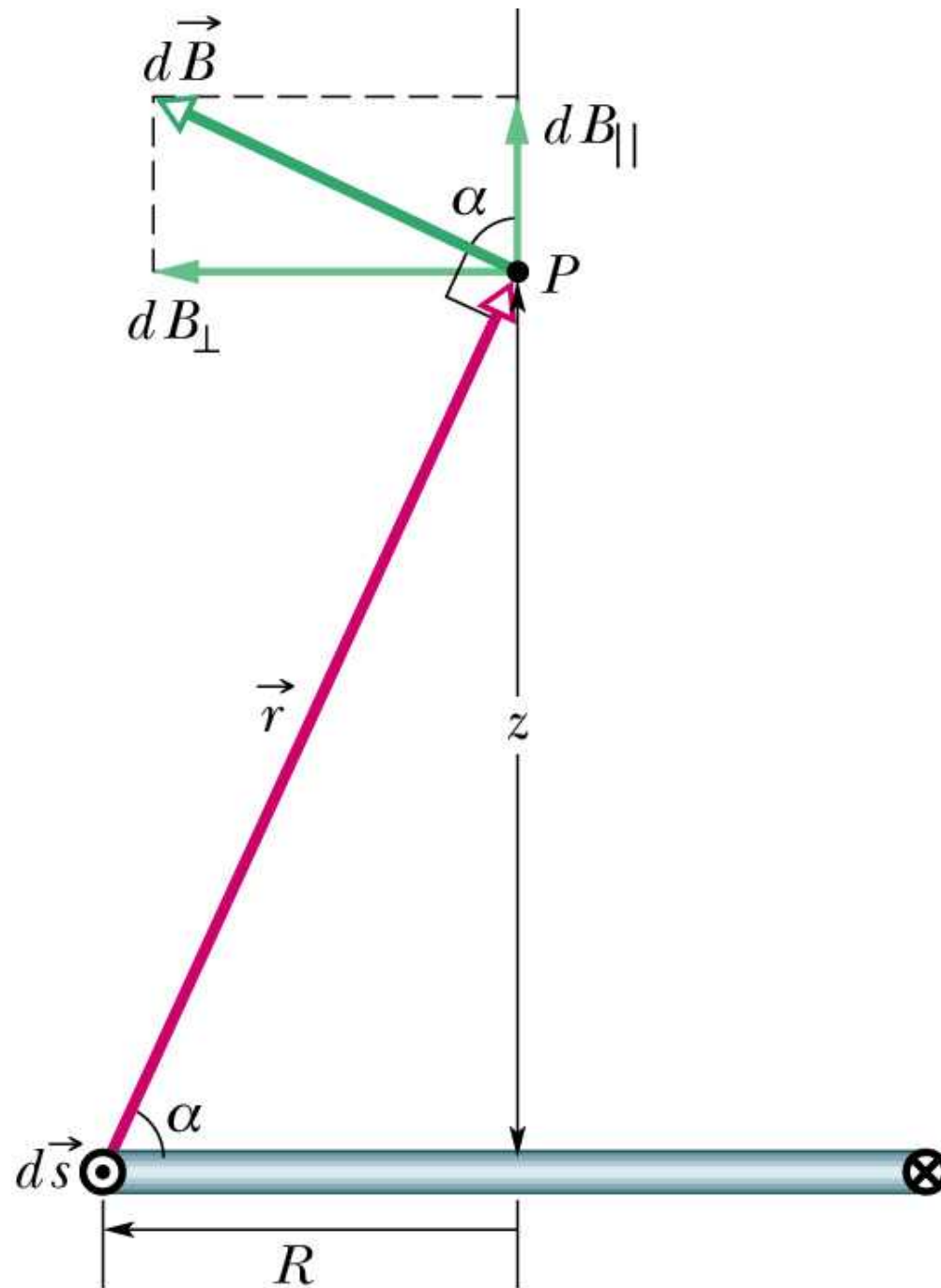
E-FELD

Quellenfrei vs. Punktladungen

Magnetisches Dipolfeld



Magnetisches Dipolfeld - Berechnung

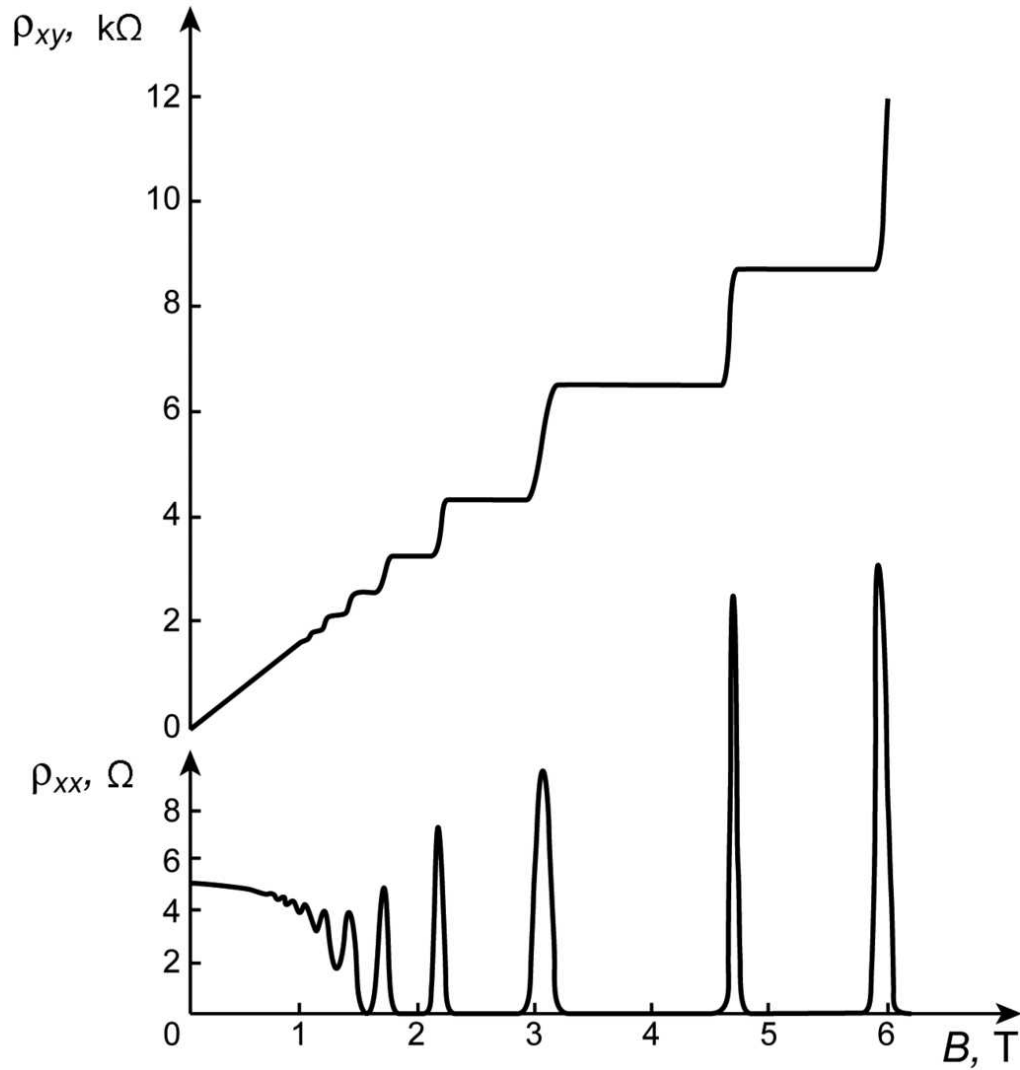


Halleffekt

Metall	Valenz	$-1/R_H n_e$
Li	1	0,8
Na	1	1,2
K	1	1,1
Rb	1	1,0
Cs	1	0,9
Cu	1	1,5
Ag	1	1,3
Au	1	1,5
Be	2	-0,2
Mg	2	-0,4
Al	3	-0,3

Quantenhalleffekt

$$R_H = h/ne^2 \quad n = 1, 2, \dots$$



Quanten-Hall-Widerstands-Normal zur Bewahrung und Weitergabe der Widerstandseinheit.

www.ptb.de

Josephson-Effekt

Tunneln von Cooperpaaren zwischen zwei Supraleitern über Isolator oder Normalleiter

Mikrowelle mit f einstrahlen: Sprünge in $I(U)$ -Kennlinie bei

$$U_n = n \Phi_0 f \quad n = 1, 2, \dots \quad \Phi_0 = h/2e$$

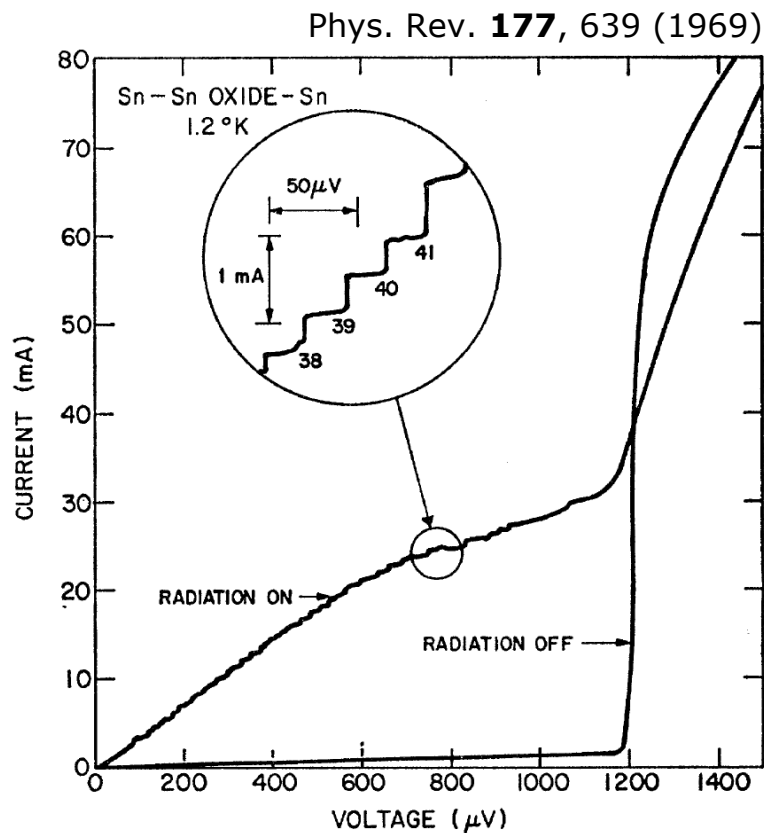
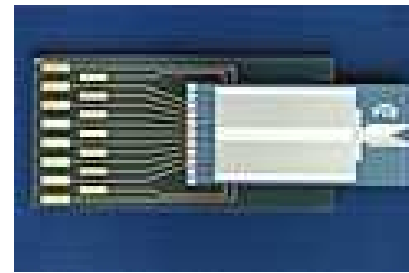


FIG. 3. I - V curves of a Sn-Sn oxide-Sn tunnel junction displaying radiation-induced current steps.



Josephson-Spannungs-Normal
 ~ 14000 Josephson-Elemente in Reihe
ergeben Spannung von maximal $14\ \text{V}$

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Zukunft des A? SET

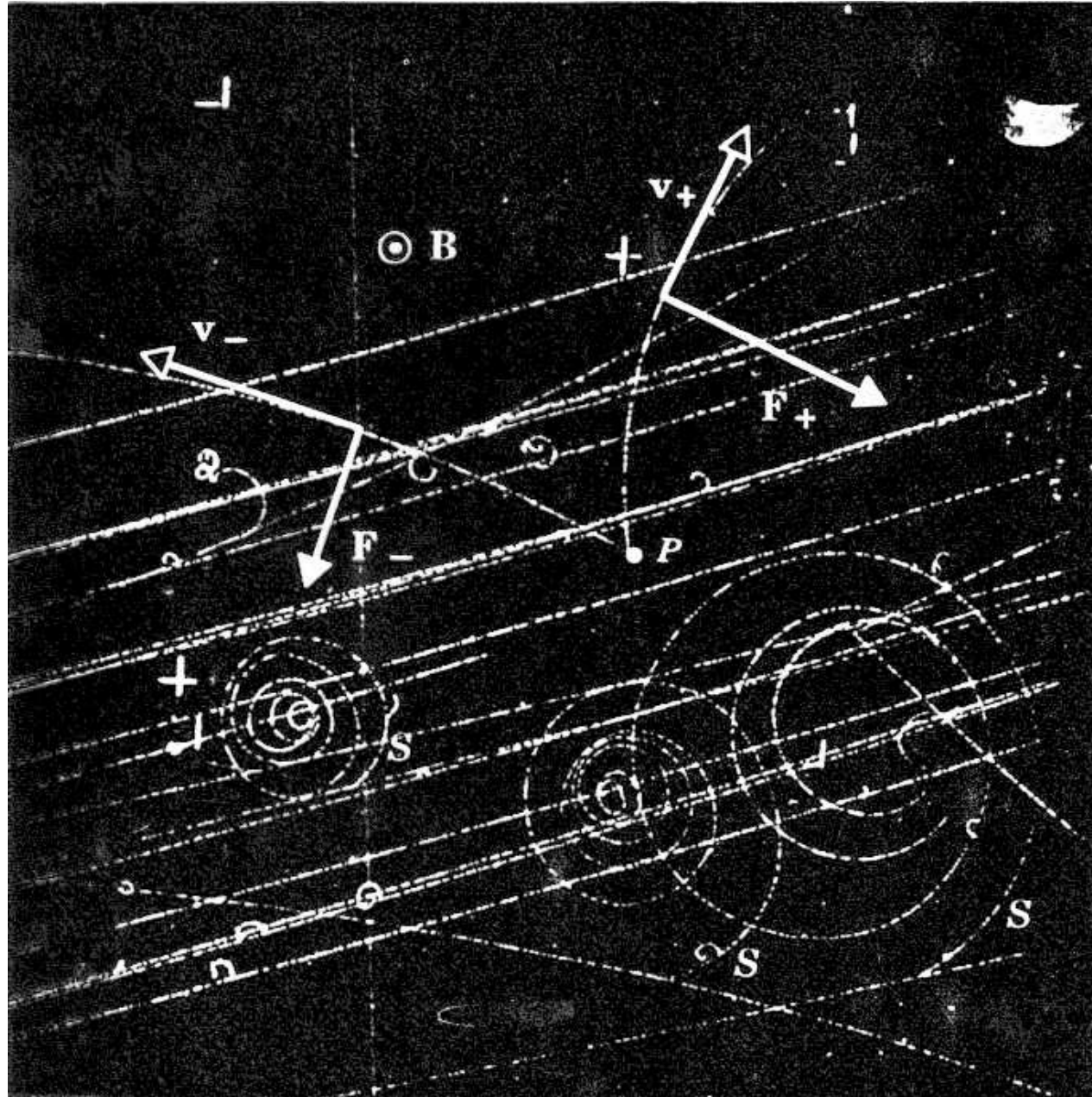
Lorentzkraft: Spiralbahnen

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 × 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.)



Zyklotron

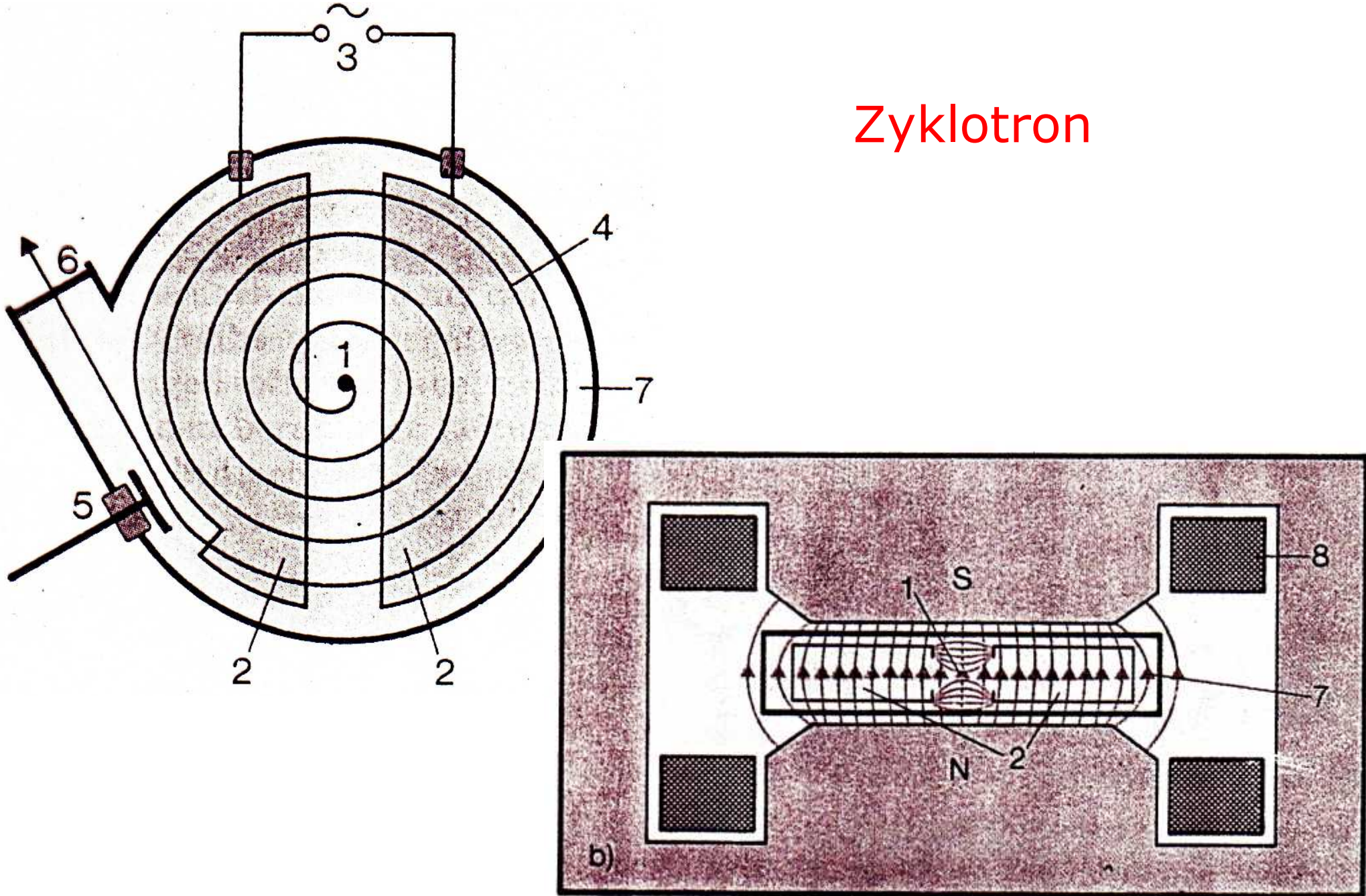
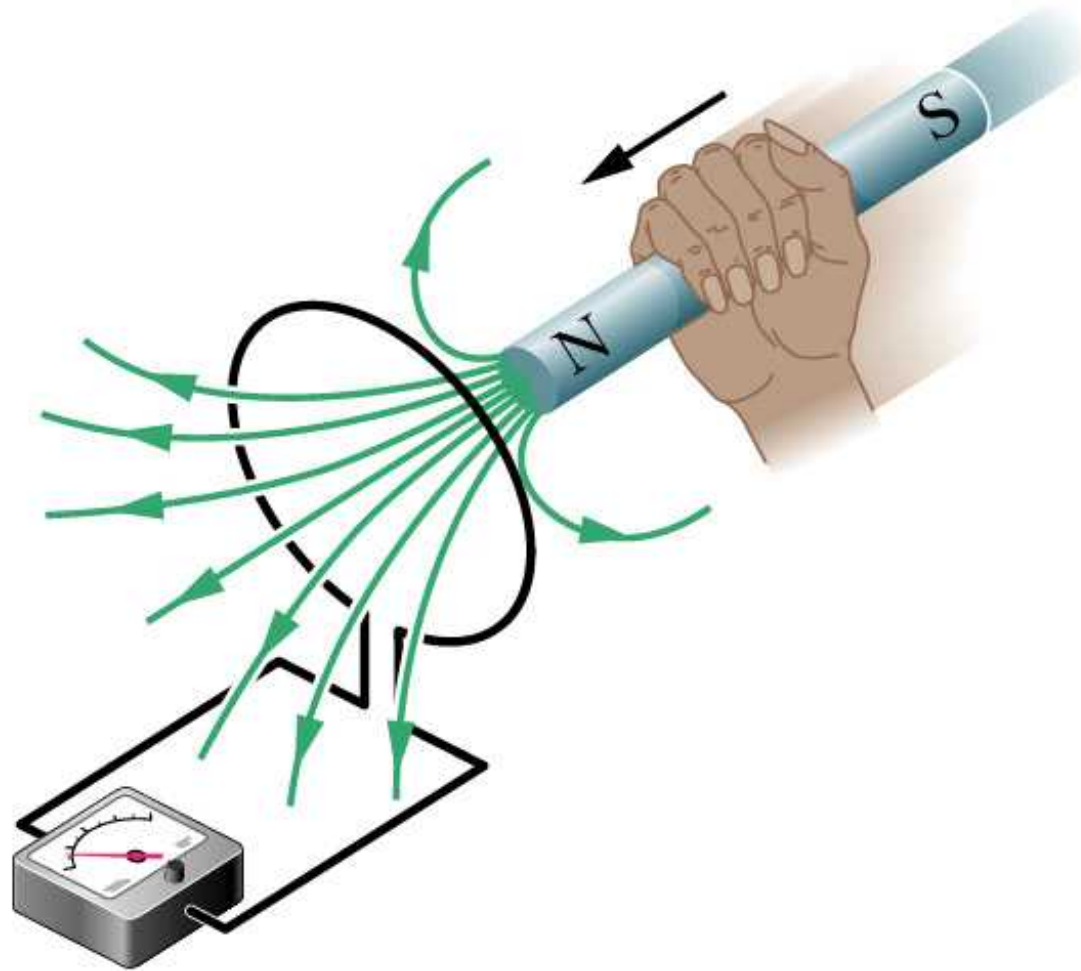
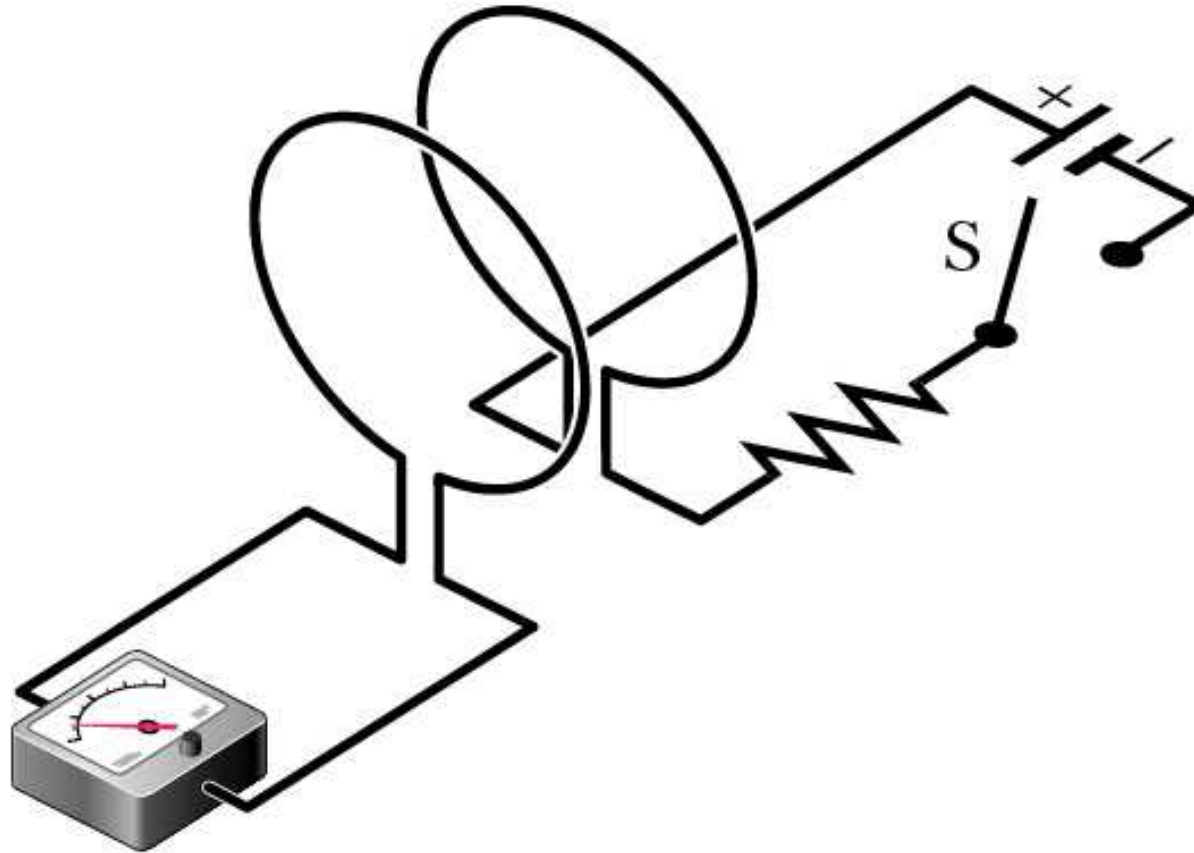


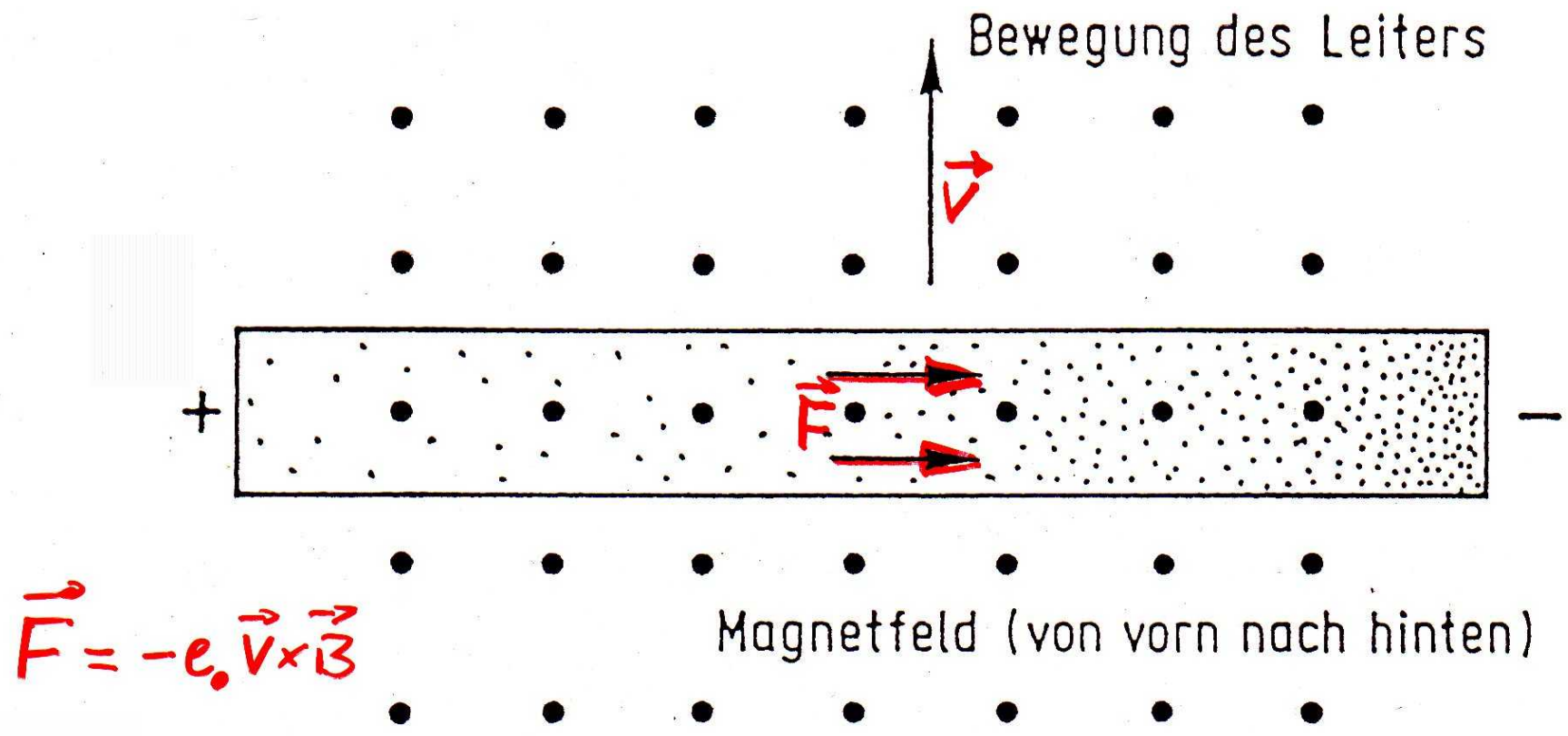
Abb. 6-19: Schema eines Zyklotrons; a) Grundriß, b) Aufriß. 1 Ionenquelle, 2 D-förmige Elektroden, 3 hochfrequente Wechselspannung, 4 Teilchenbahn, 5 Ablenkplatte, 6 Austrittsfenster, 7 Vakuumkammer, 8 Magnetspulen.

Induktion bei bewegtem Magnet



Induktion bei veränderlichem Strom

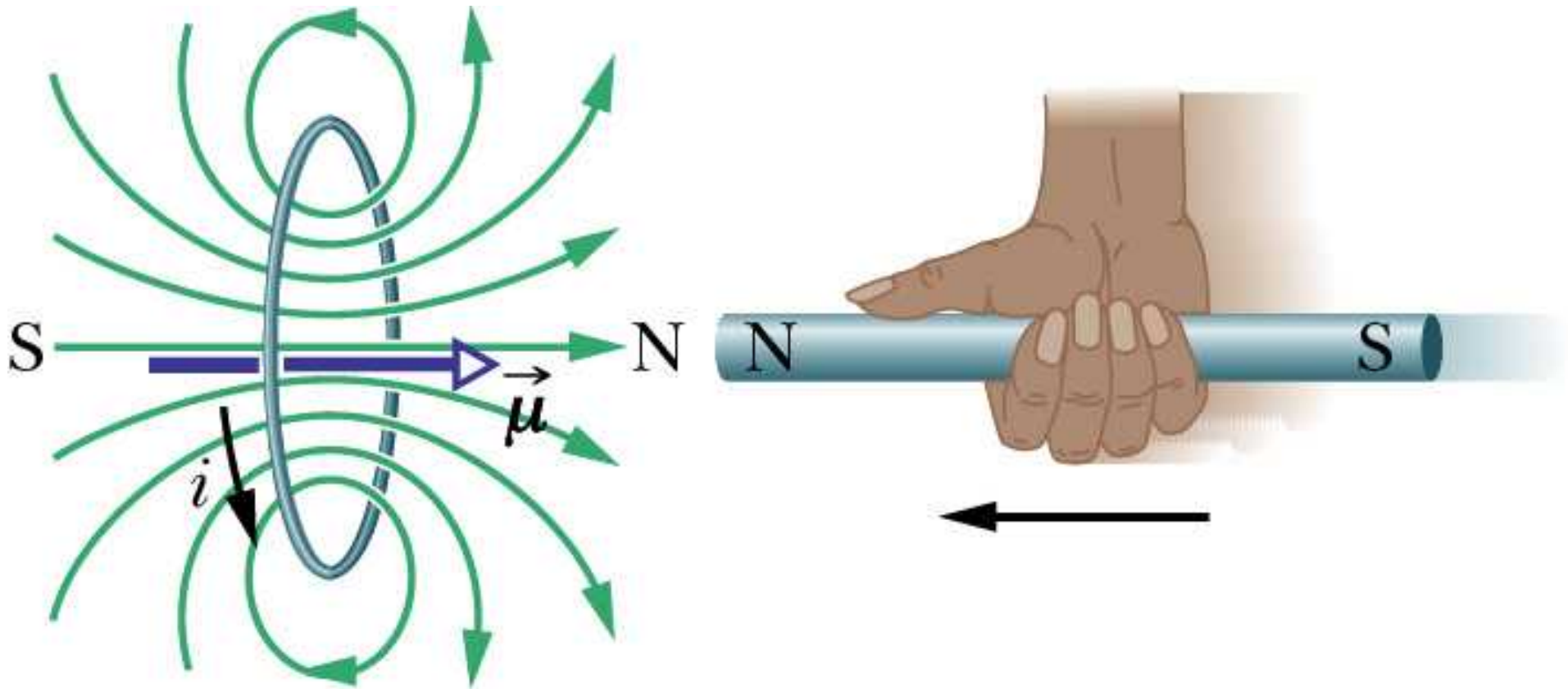




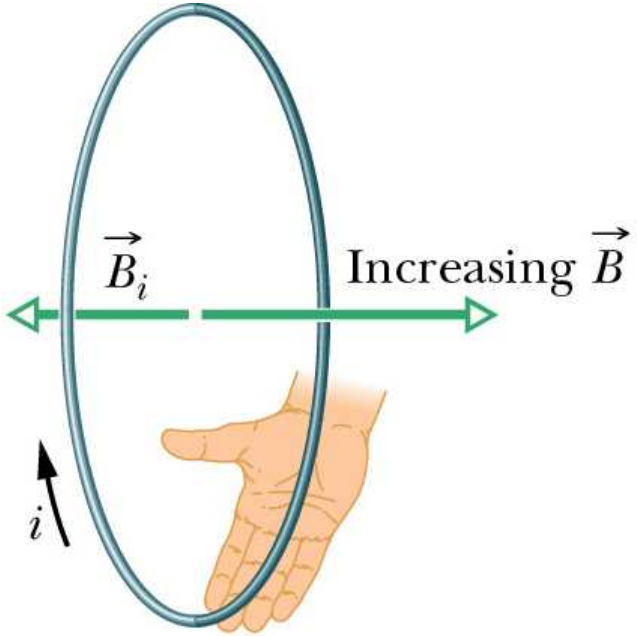
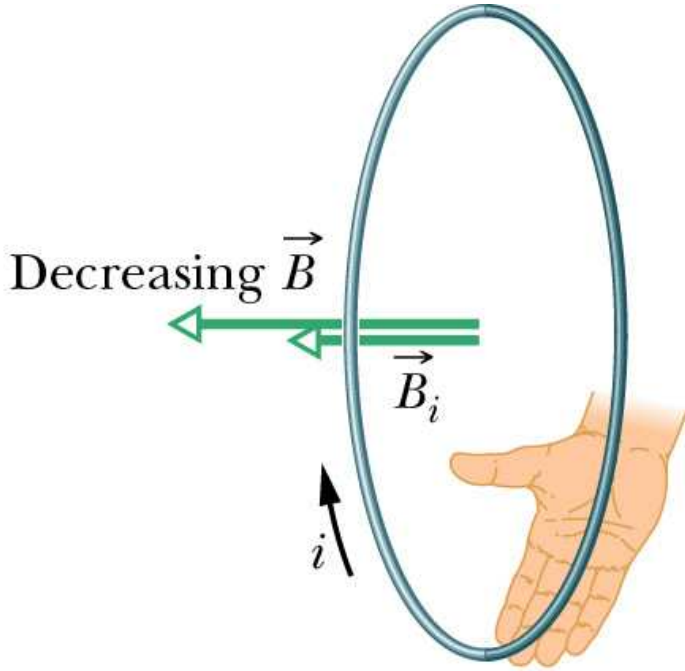
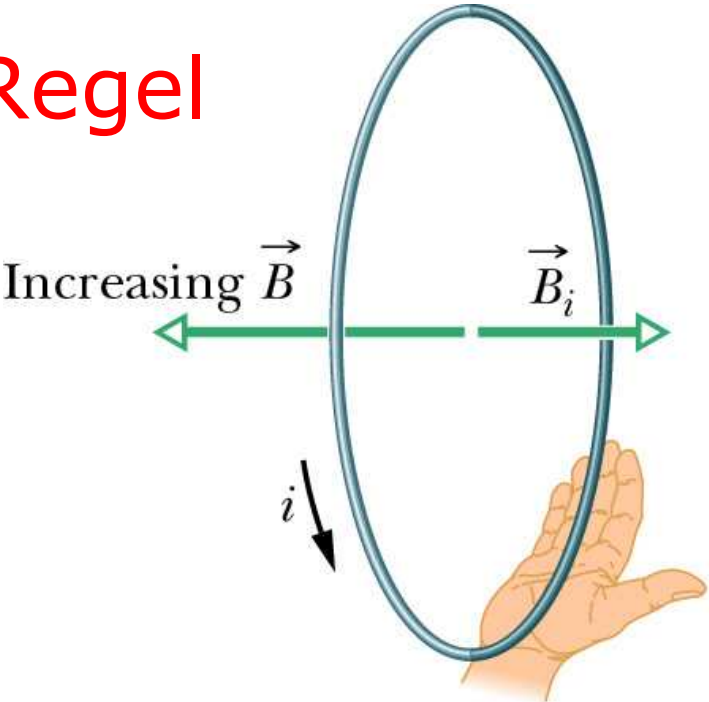
$$\vec{F} = -e \cdot \vec{v} \times \vec{B}$$

Abb. 277 Zur Entstehung der Induktionsspannung in einem anhäufung rechts)

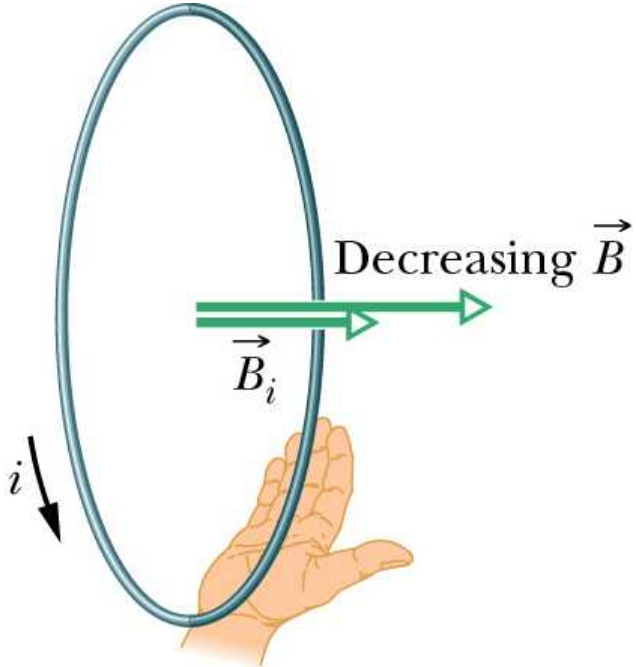
Lenzsche Regel



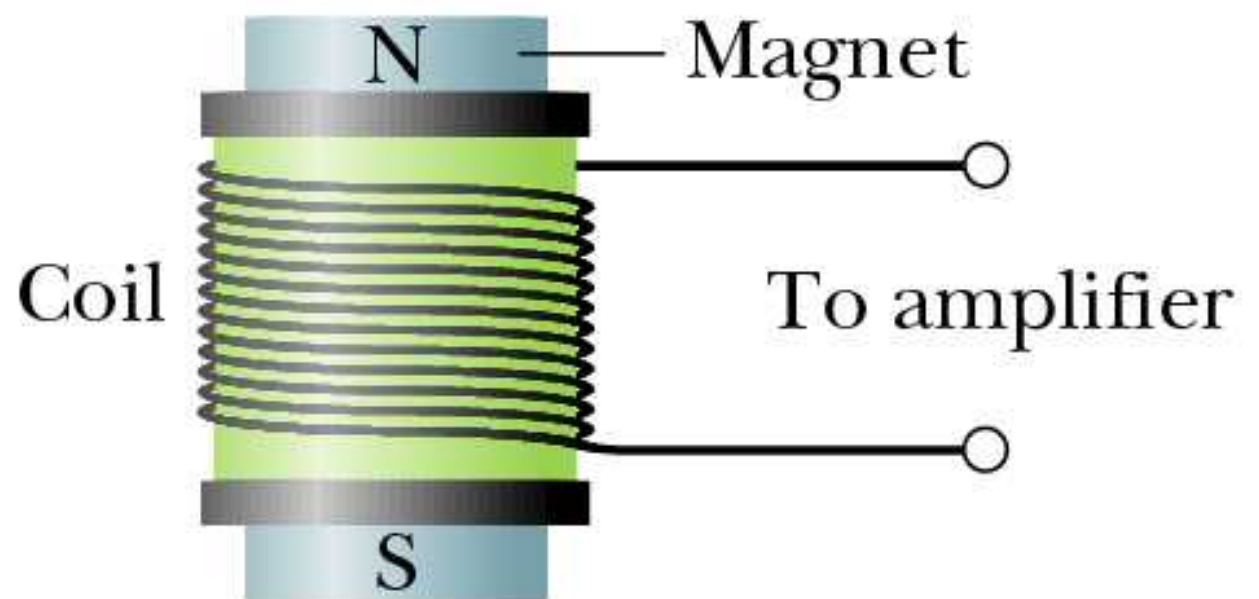
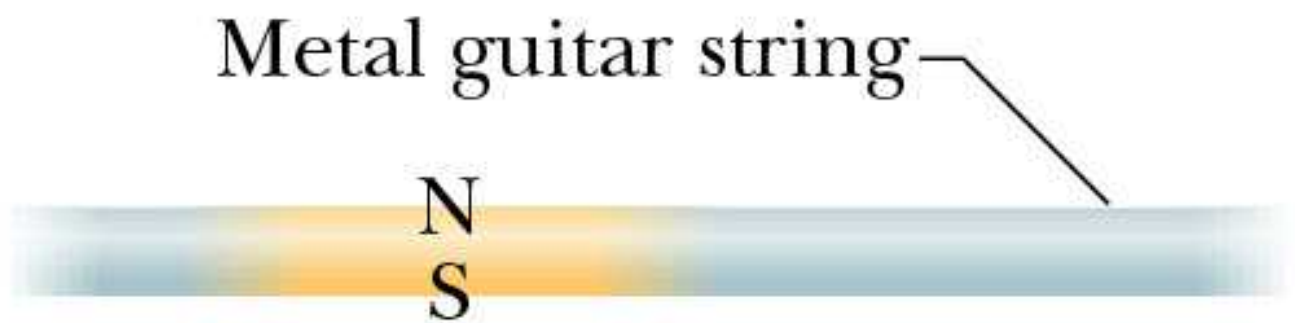
Lenzsche Regel



(c)



(d)



Induktion und Energieerhaltung

