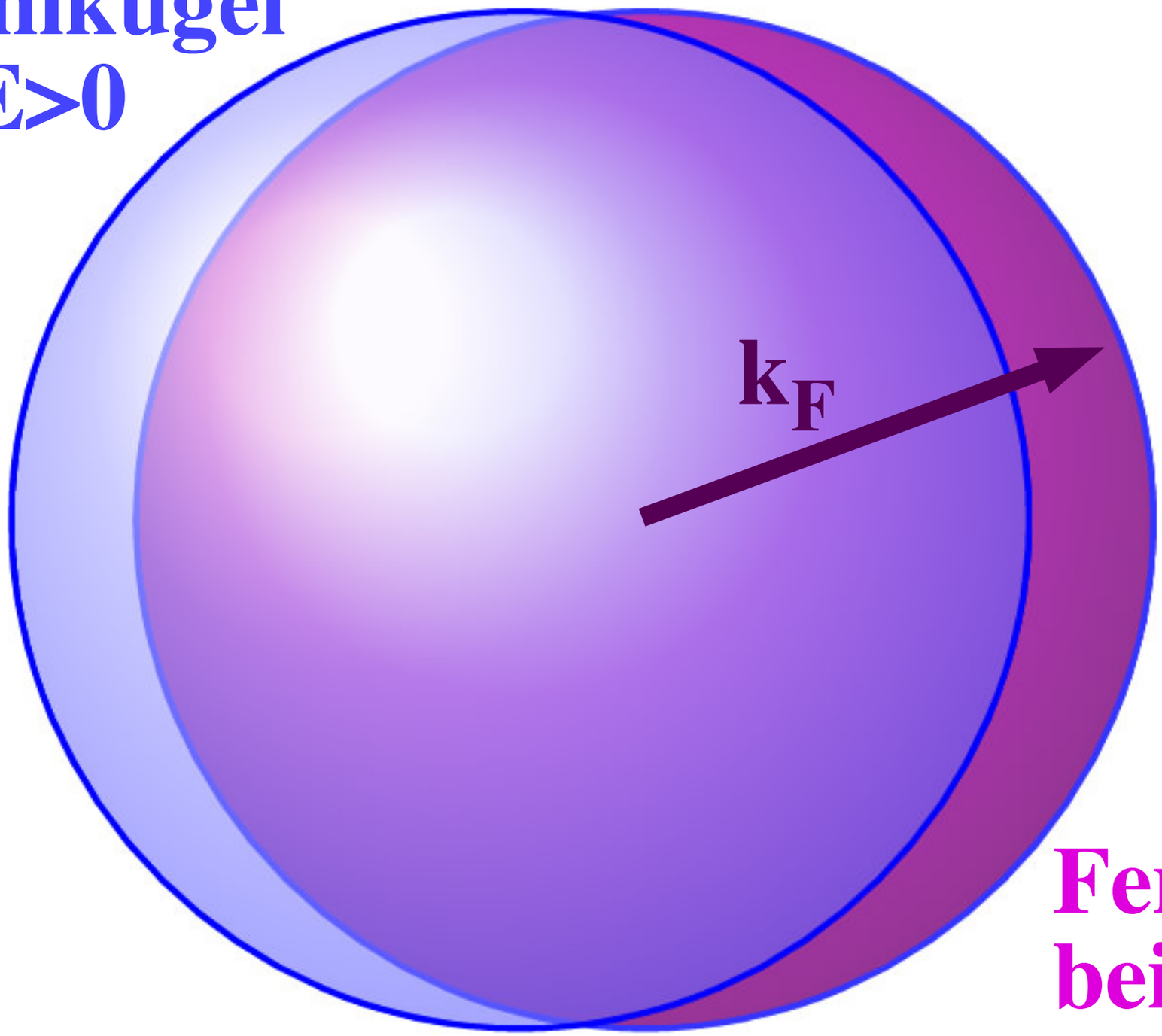
Freie Elektronen

E

Fermikugel bei E>0



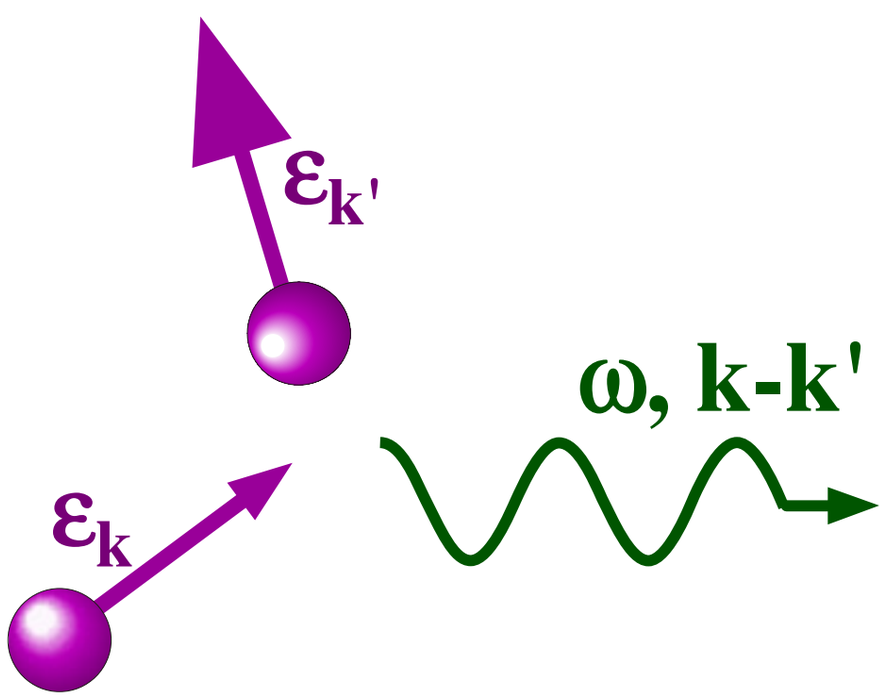
Fermikugel bei E=0

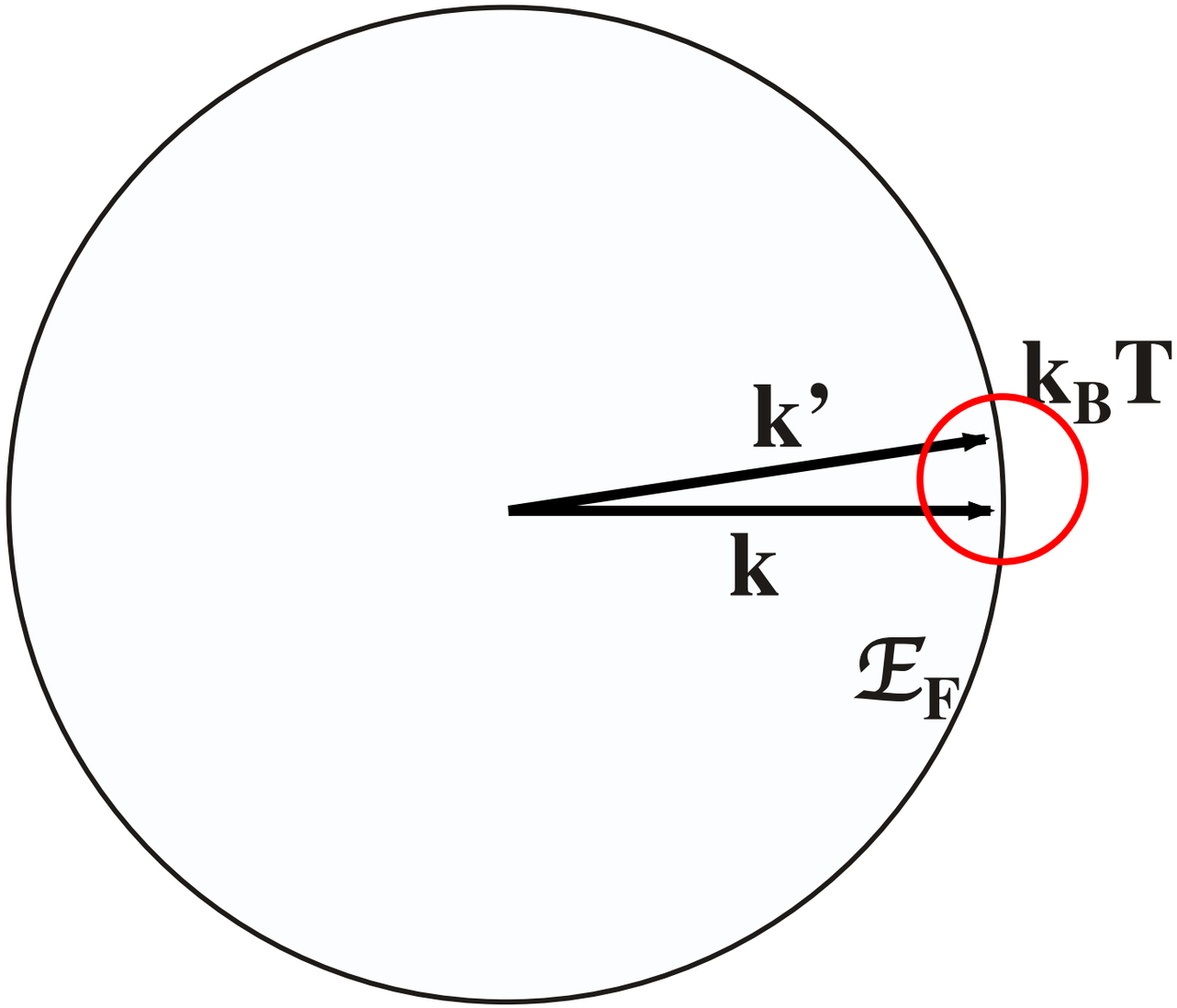
Relaxationszeiten

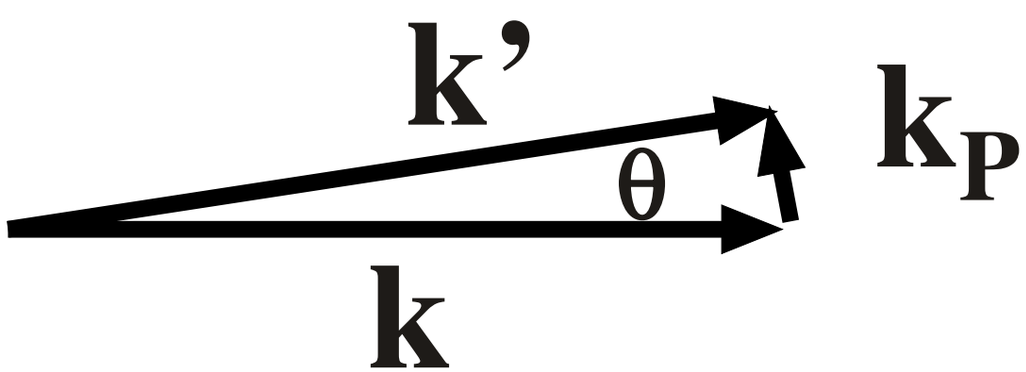
in 10^{-14} s

ELEMENT	77 K	273 K	373 K
Li	7.3	0.88	0.61
Na	17	3.2	
K	18	4.1	
Rb	14	2.8	
Cs	8.6	2.1	
Cu	21	2.7	1.9
Ag	20	4.0	2.8
Au	12	3.0	2.1
Be		0.51	0.27
Mg	6.7	1.1	0.74
Ca		2.2	1.5
Sr	1.4	0.44	
Ba	0.66	0.19	
Nb	2.1	0.42	0.33
Fe	3.2	0.24	0.14
Zn	2.4	0.49	0.34
Cd	2.4	0.56	
Hg	0.71		
Al	6.5	0.80	0.55
Ga	0.84	0.17	
In	1.7	0.38	0.25
Tl	0.91	0.22	0.15
Sn	1.1	0.23	0.15
Pb	0.57	0.14	0.099
Bi	0.072	0.023	0.016
Sb	0.27	0.055	0.036

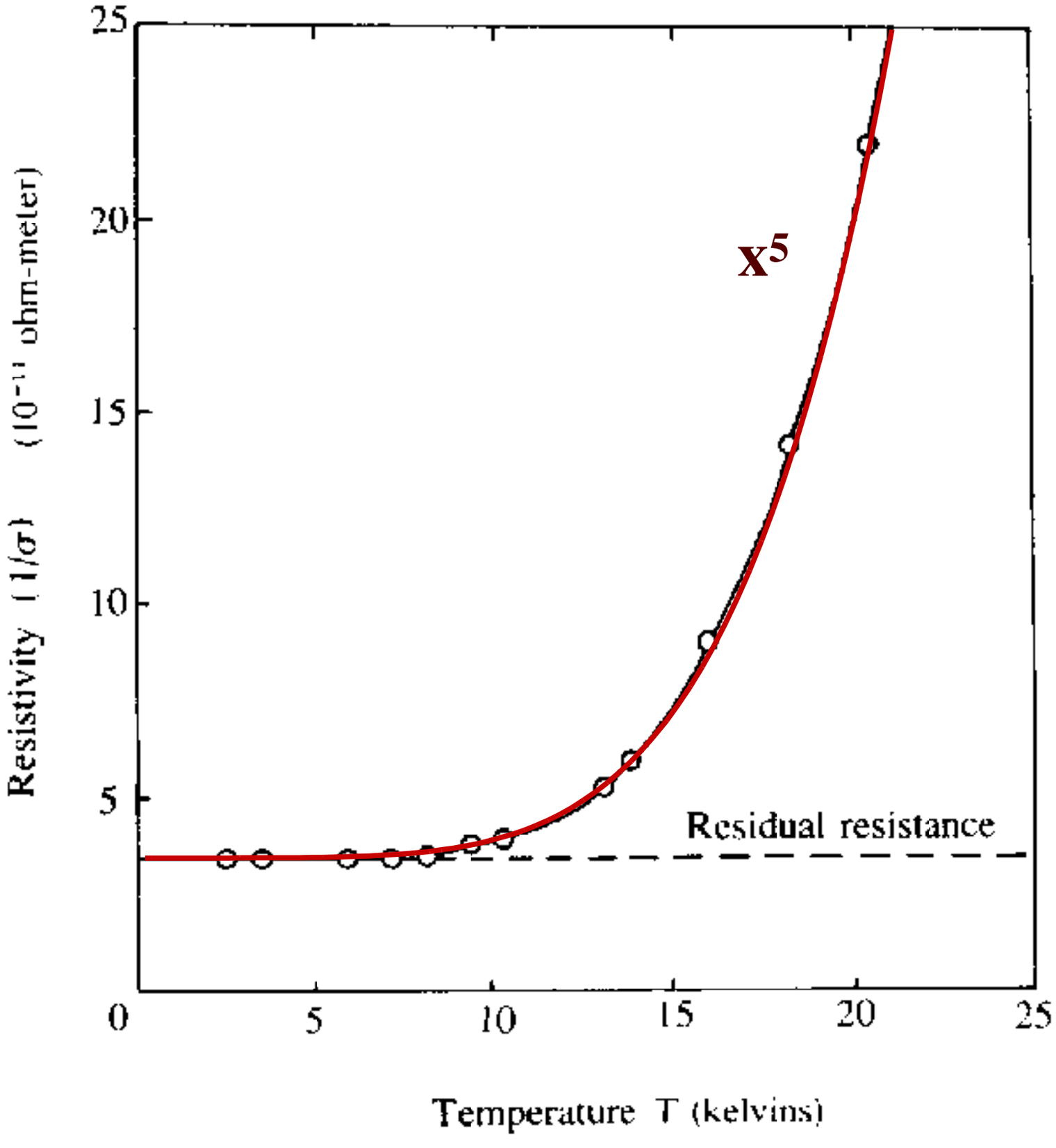
Streuung an Phononen



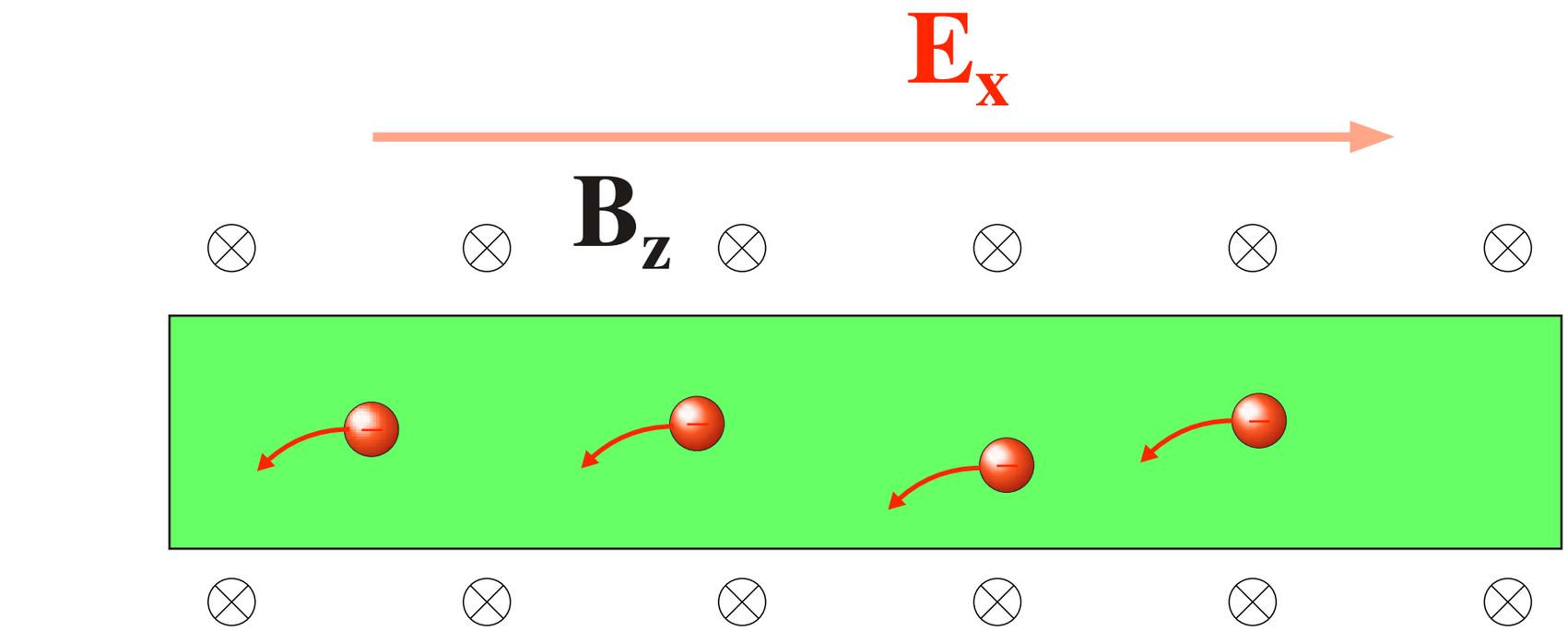


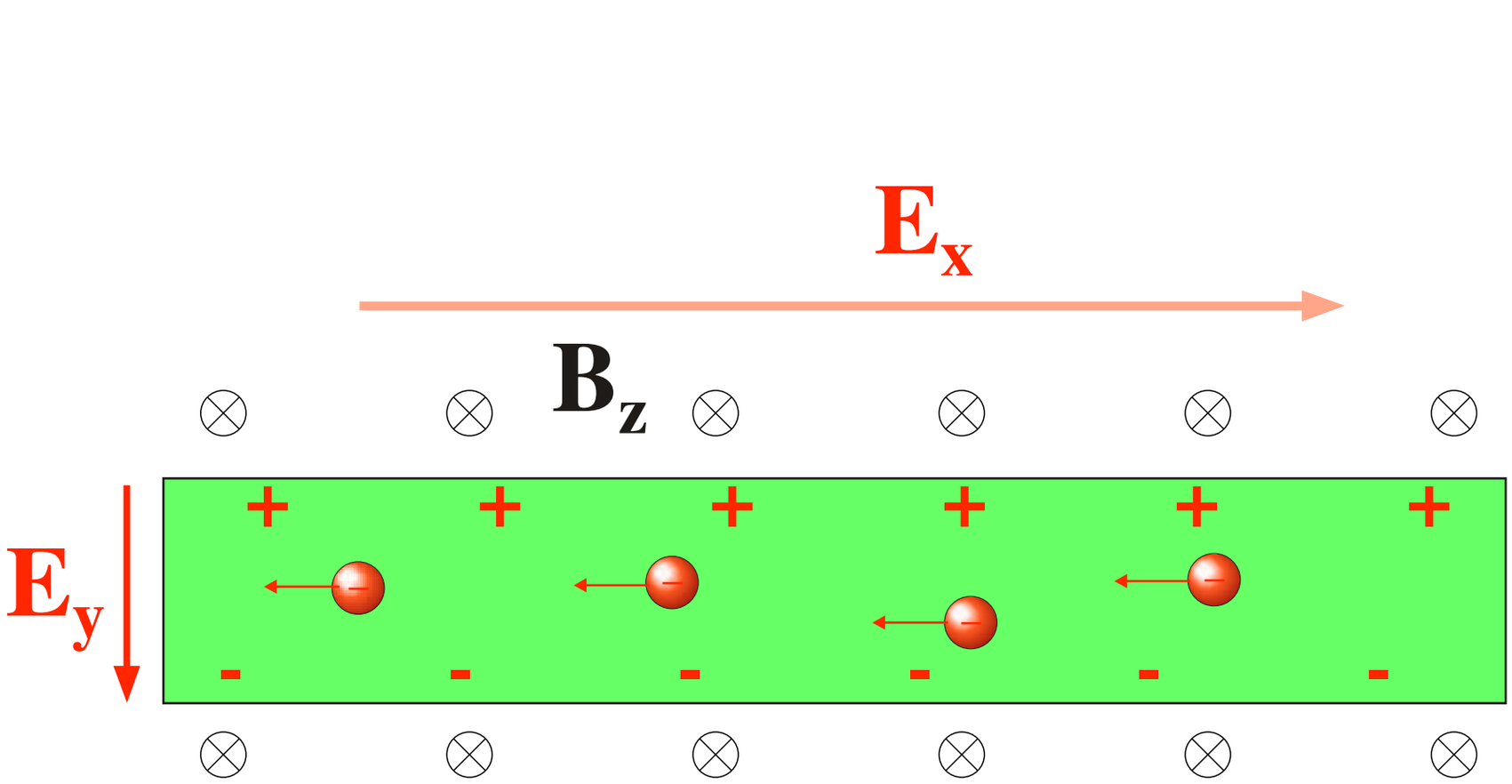


Temperaturabhängigkeit

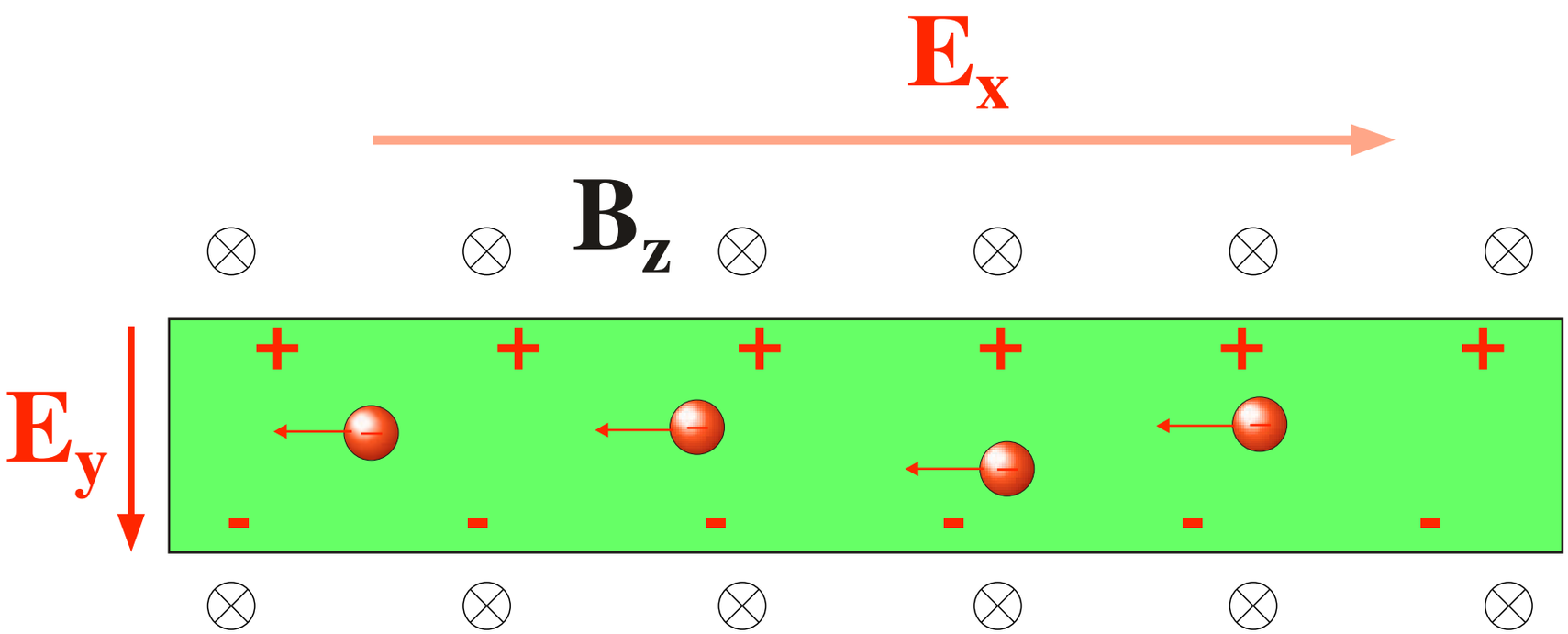


Freie Elektronen





Hall Effekt



Bewegungsgleichung

$$\hbar \, d\vec{k}/dt = -e[\vec{E} + \vec{v}\times\vec{B}] - \delta\vec{k}/\tau = 0$$

stationärer Zustand für B ∥ z

$$v_x = (-e\,\tau / m)\, E_x - \omega_c\, \tau\, v_y$$

$$v_y = (-e\,\tau / m)\, E_y + \omega_c\, \tau\, v_x$$

$$v_z = (-e\,\tau / m)\, E_z$$

Zyklotronfrequenz

$$\omega_c = eB/m$$

Hall Koeffizienten

Metall	# Valenz-elektronen	$\frac{-1}{R_H ne}$
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
In	3	-0.3
Al	3	-0.3

Hall Koeffizienten

Metall	R_H $[10^{-10}\frac{m^3}{C}]$	$n = \frac{1}{R_H e}$ $[10^{28}\ m^{-3}]$	$n_A = \frac{N_L \rho}{M}$ $[10^{28}\ m^{-3}]$	
Na	2.5	2.5	2.54	
K	4.2	1.49	1.32	
Cu	0.55	11.3	8.45	
Ag	0.85	7.34	5.86	
Al	0.3	20.8	6.02	
Bi	0.0054	0.001	2.82	Halbmetall
W	-1.18	-5.29	6.31	
Zn	-0.33	-18.9	6.57	Lochleitung
Cd	-0.6	-10.4	4.63	
Fe	-0.25	-25.0	8.48	