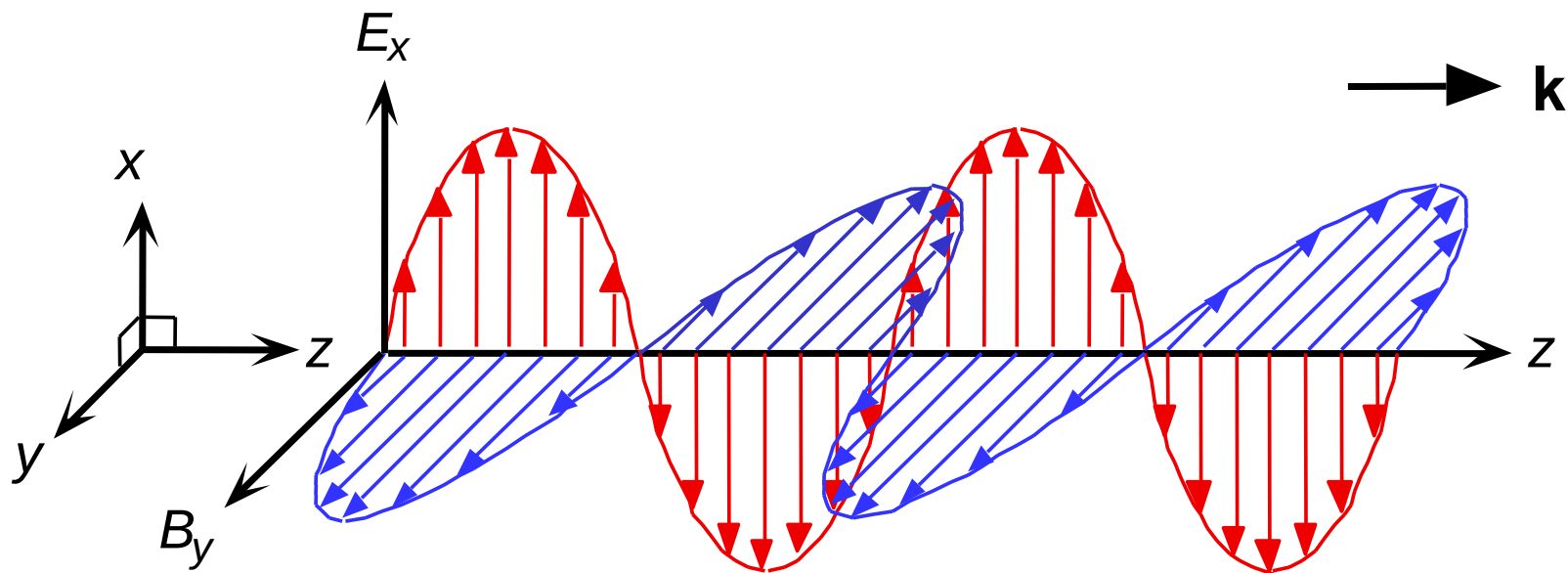


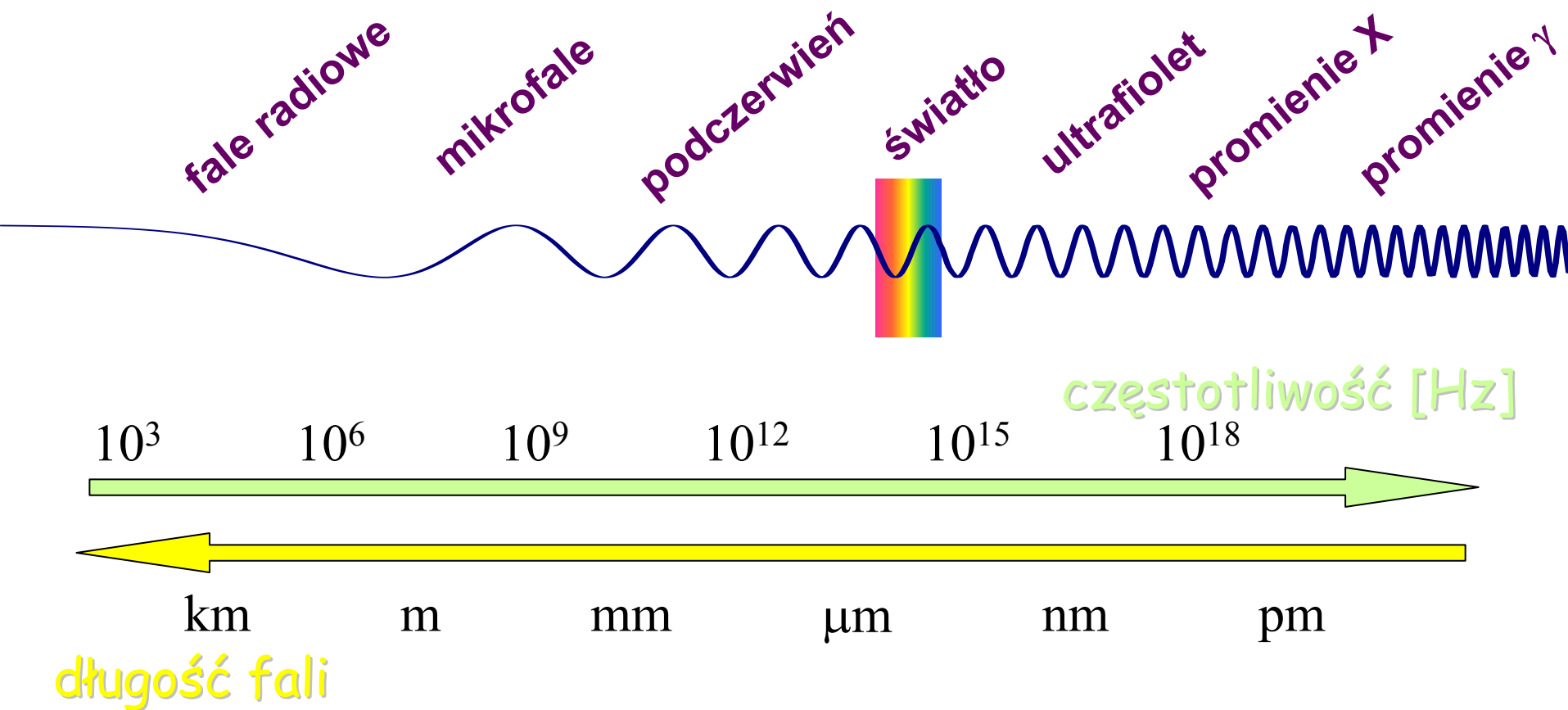
Monochromatyczna, spolaryzowana liniowo fala elektromagnetyczna



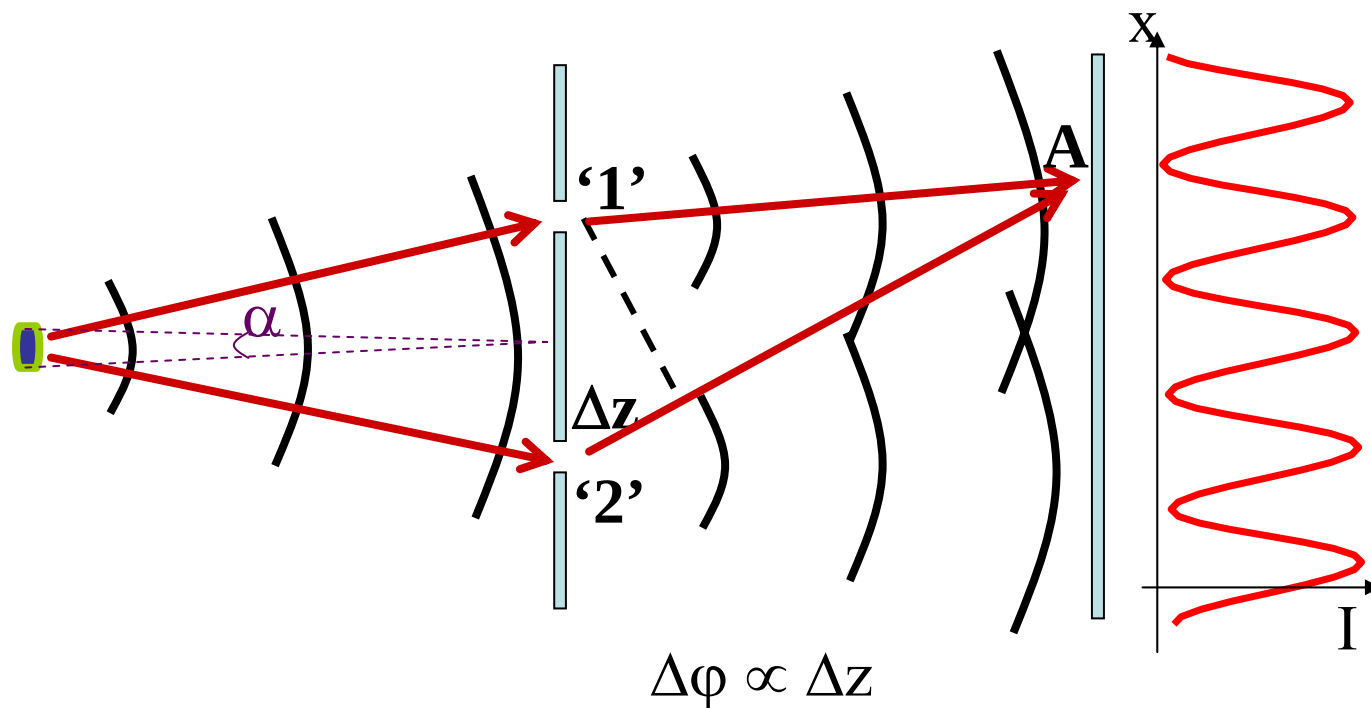
$$E_x = 2A \cos(\omega t \pm kz + \varphi_0) = A \exp(i\omega t \pm ikz + i\varphi_0) + c.c.$$

$$H_y = \frac{1}{Z} E_x$$

fale elektromagnetyczne



Interferencja światła (interferometr Younga)



spójność przestrzenna: $\gamma \propto 1/\alpha$

$$\gamma = \frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$$

Interferencja światła

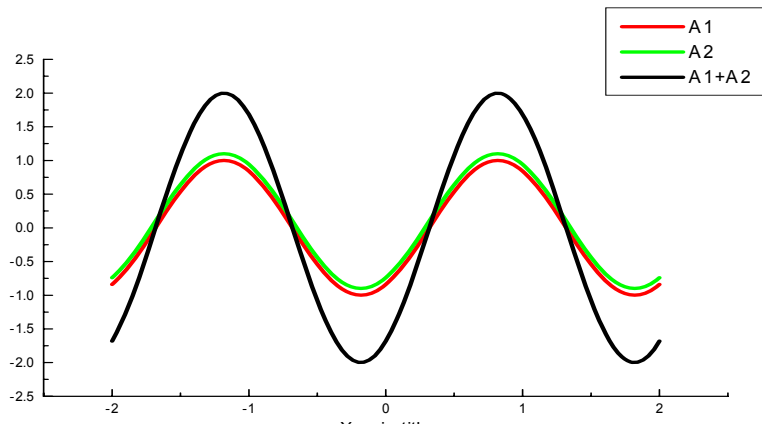
$$I = I_1 + I_2 + 2\sqrt{I_1 I_2} \langle \cos(\Delta\varphi) \rangle = I_1 + I_2 + 2\gamma\sqrt{I_1 I_2} \cos(\Delta\varphi)$$

γ – stopień spójności (koherencji):

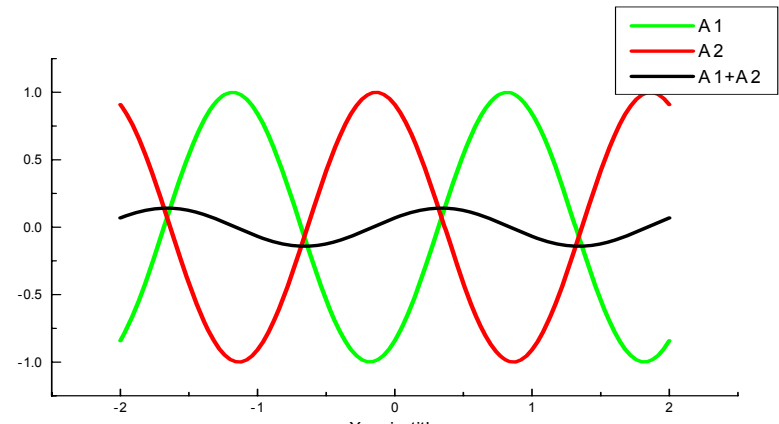
gdy $\Delta\varphi = \text{const}$, $\gamma = 1$ – fale spójne

gdy $\Delta\varphi \neq \text{const}$, $\gamma < 1$ – fale częściowo spójne

lub $\gamma = 0$ fale niespójne

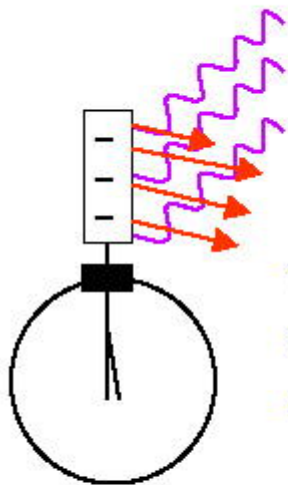


$$\Delta\varphi = 0 + 2\pi m \quad (m=1,2,3\dots)$$



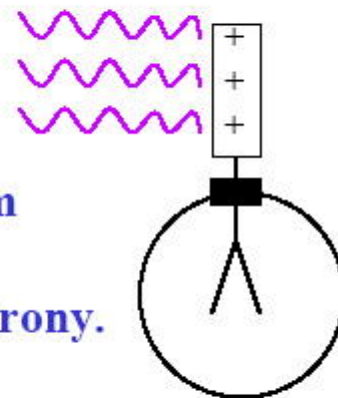
$$\Delta\varphi \approx \pi + 2\pi m \quad (m=1,2,3\dots)$$

Cząstki uwalniane z metalu pod wpływem promieniowania niosą ujemny ładunek



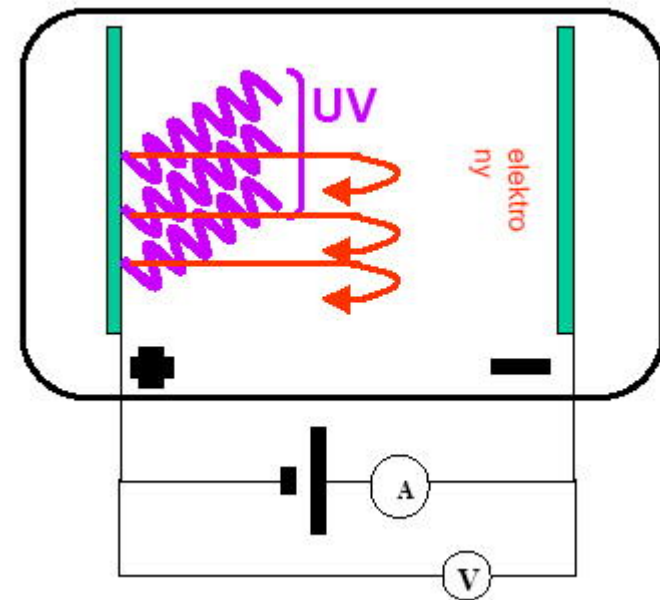
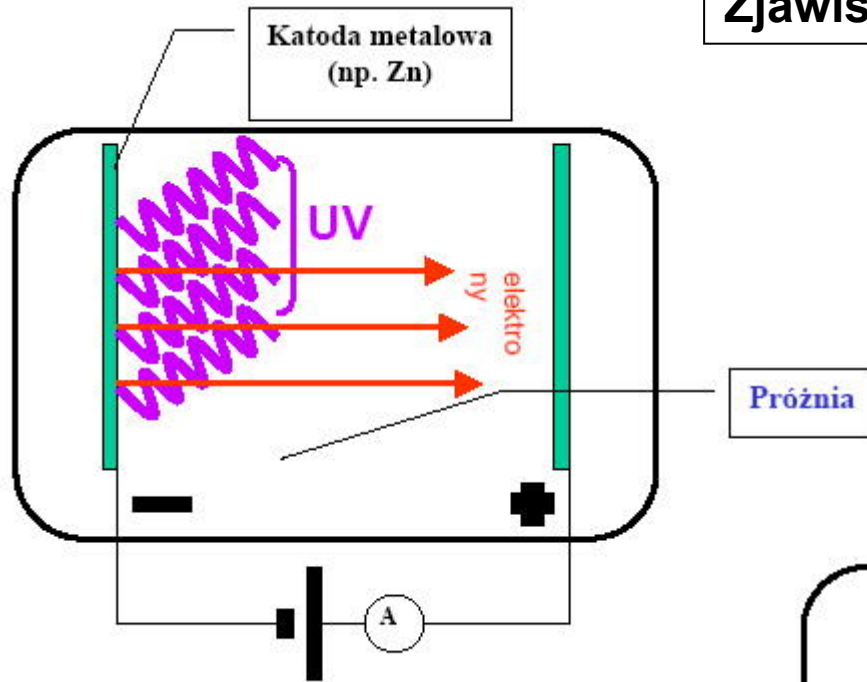
Ujemnie naładowany
elektroskop rozładowuje się.

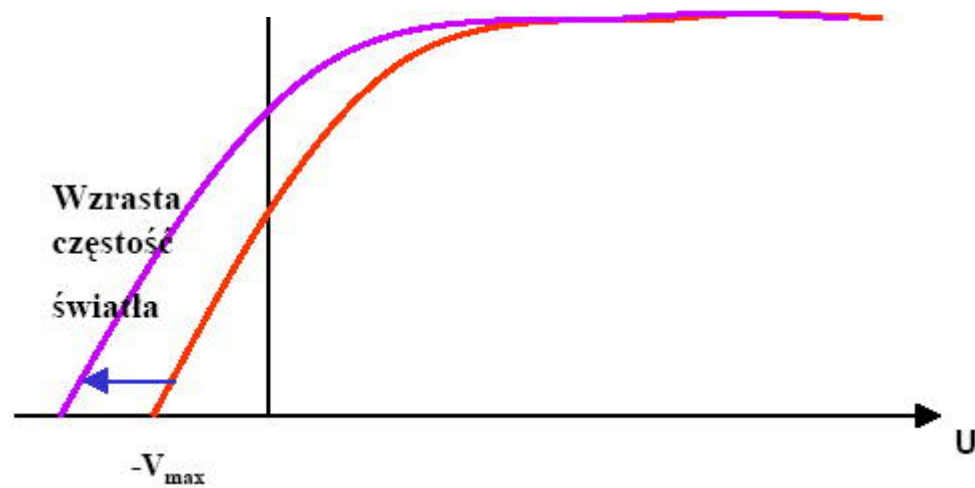
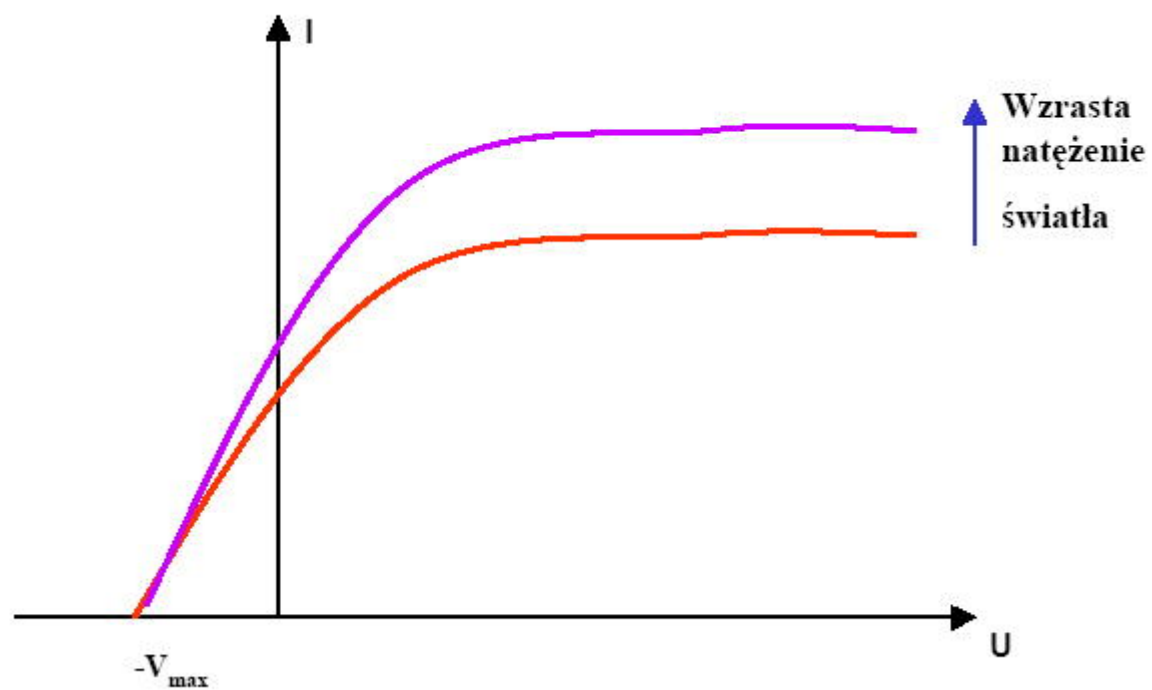
W 1900 Lenart zmierzył e/m
tych ujemnych cząstek i
zidentyfikował je jako elektrony.

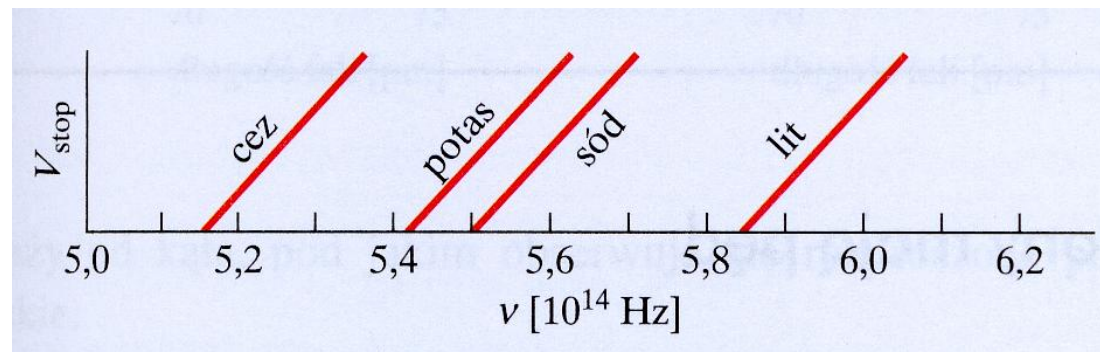
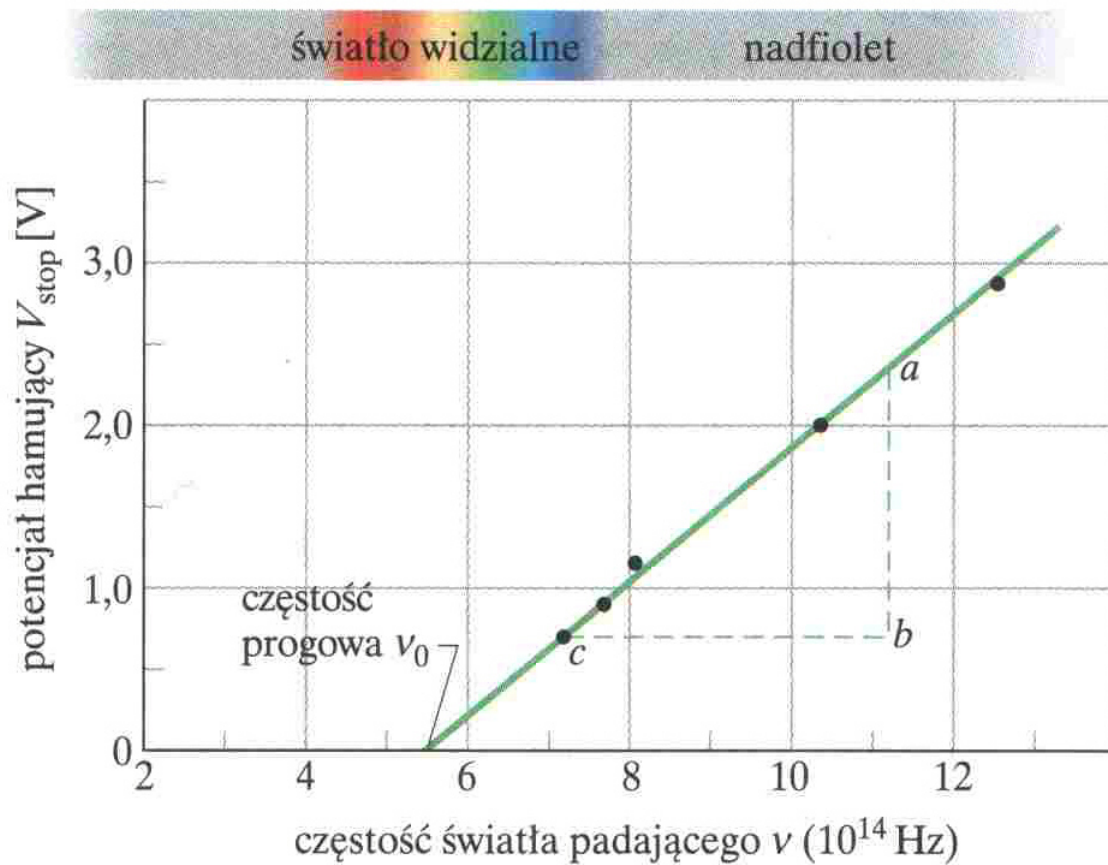


Dodatnio naładowany
elektroskop nie rozładowuje się.

Zjawisko fotoelektryczne

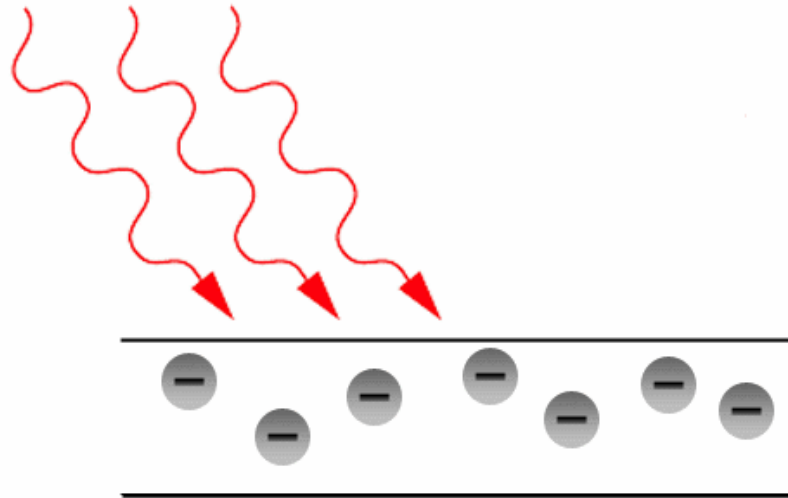
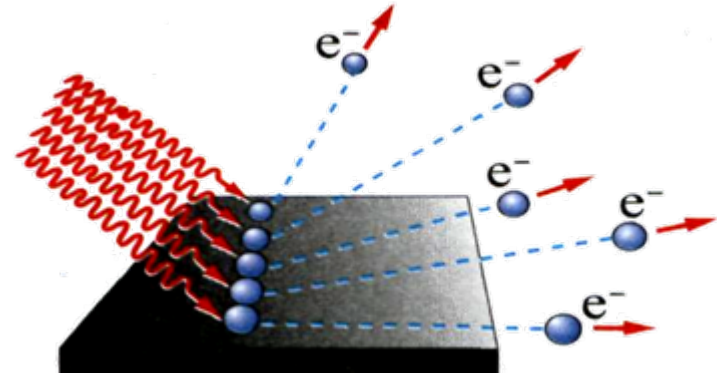
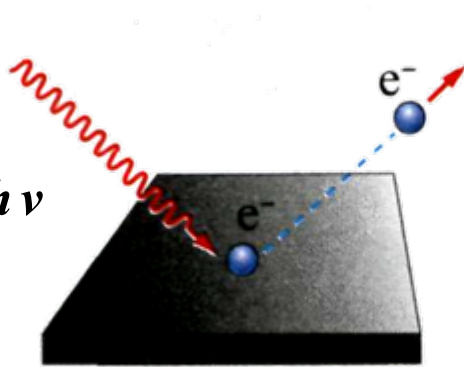




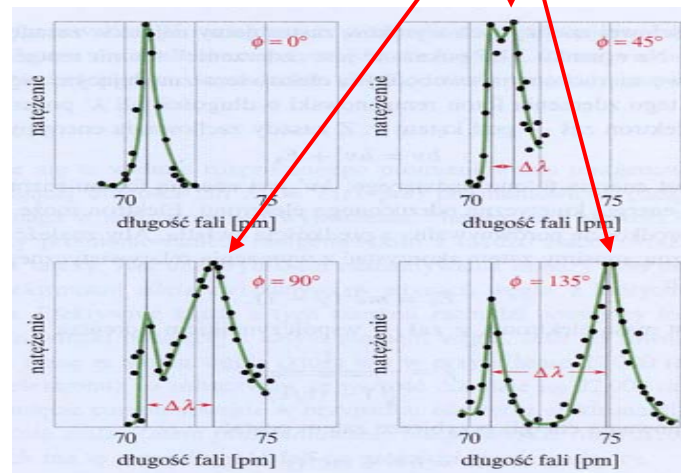
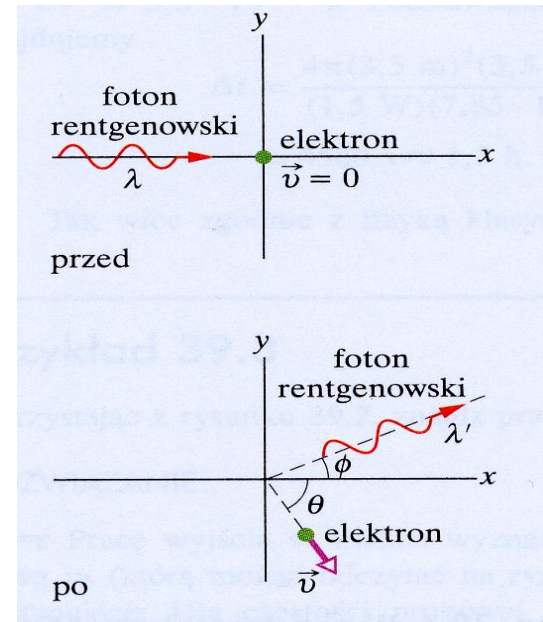
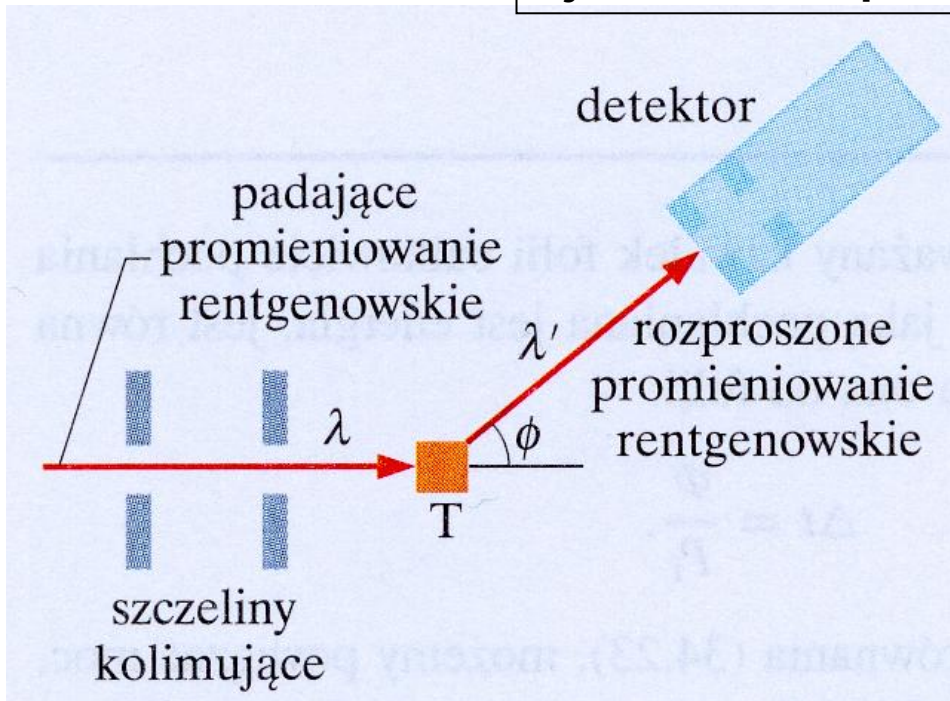


Zjawisko fotoelektryczne

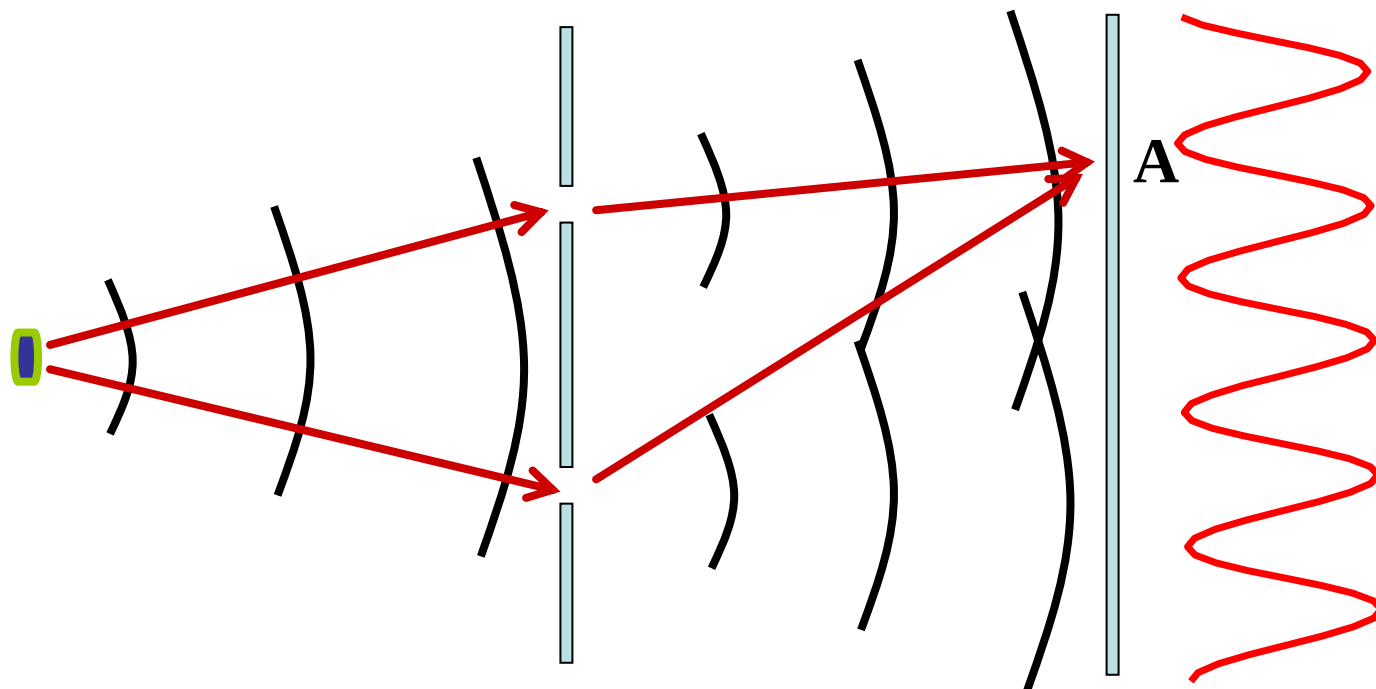
$$E = h\nu$$



Zjawisko Comptona

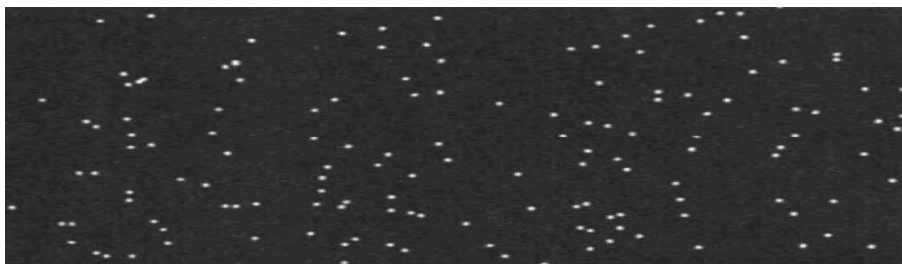


Interferencja fotonów





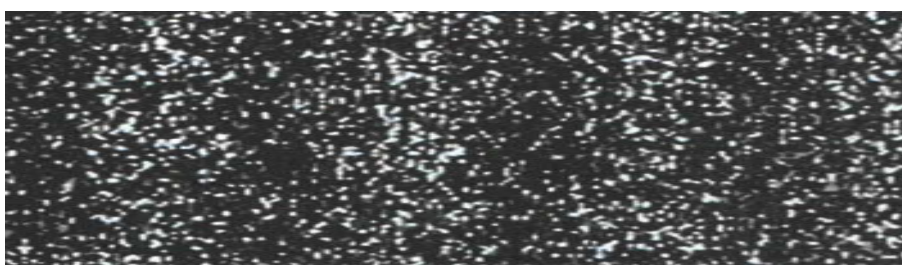
6



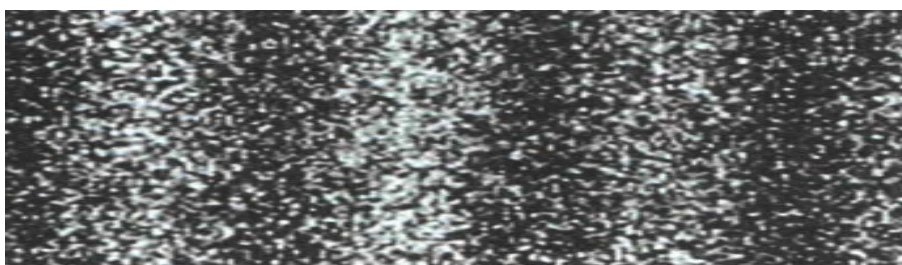
100



3 000

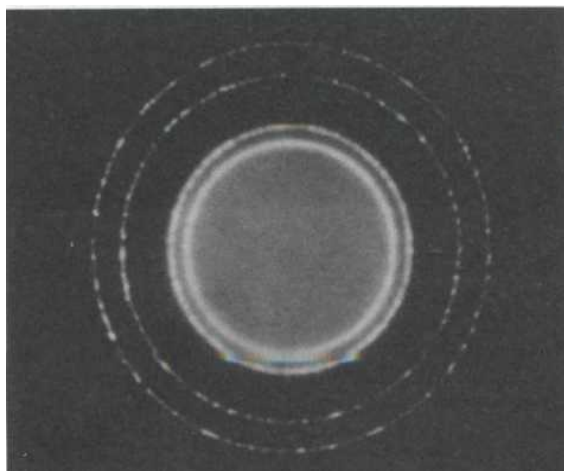


20 000

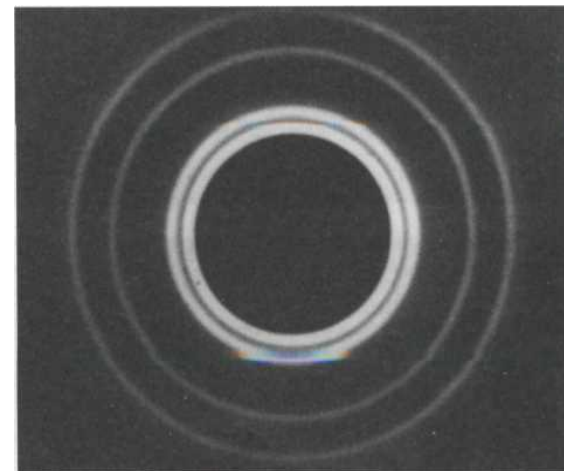
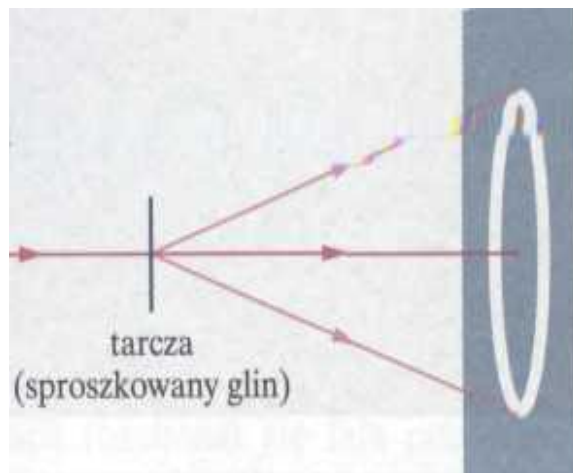


70 000

Doświadczalne potwierdzenie falowej natury elektronu

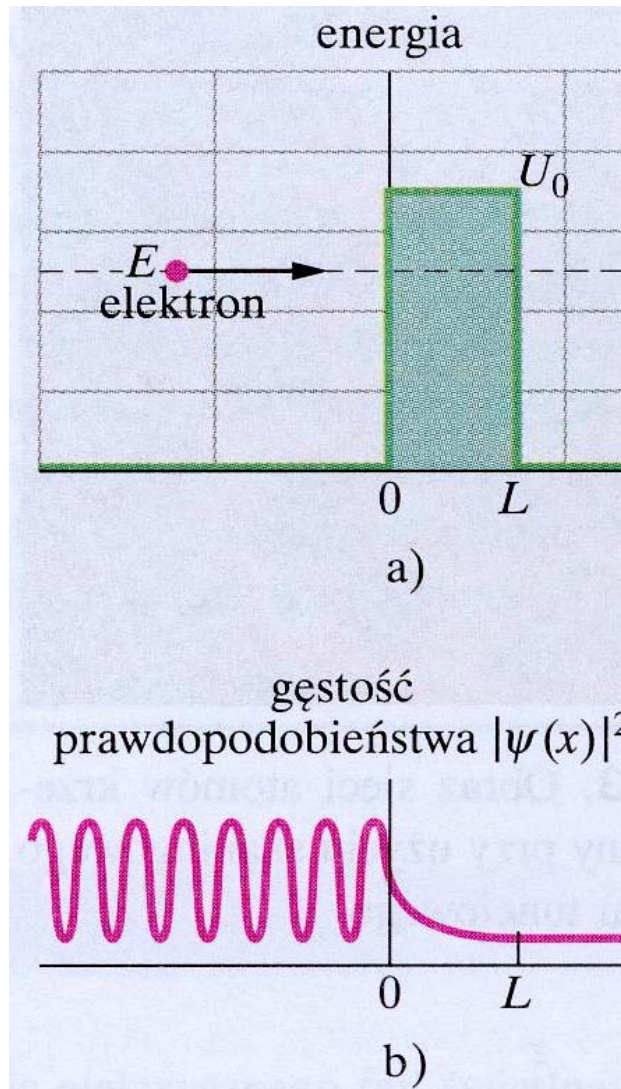


dyfrakcja promieni X

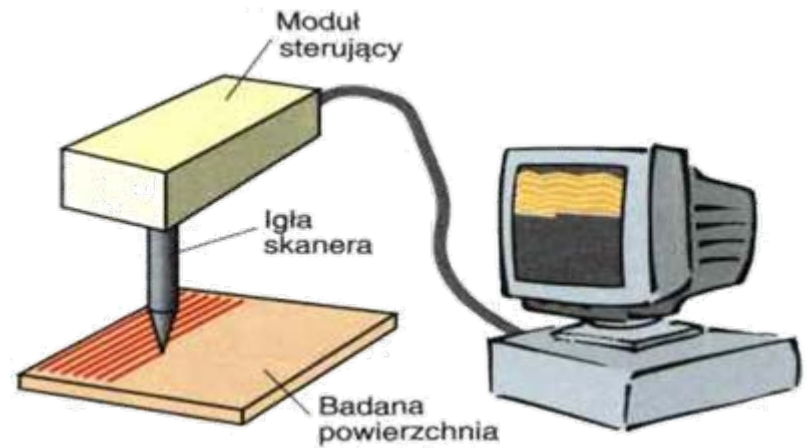
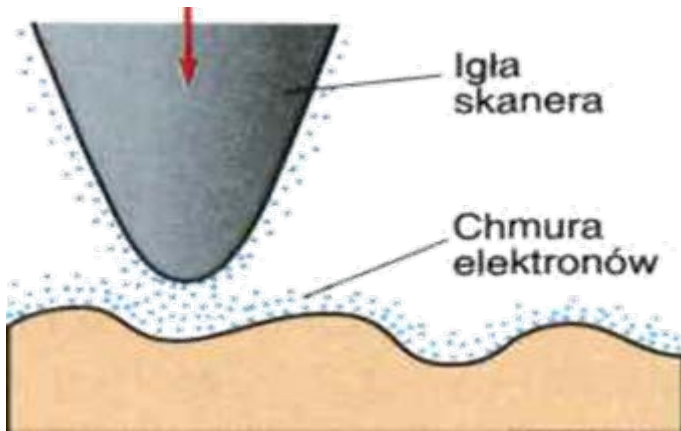


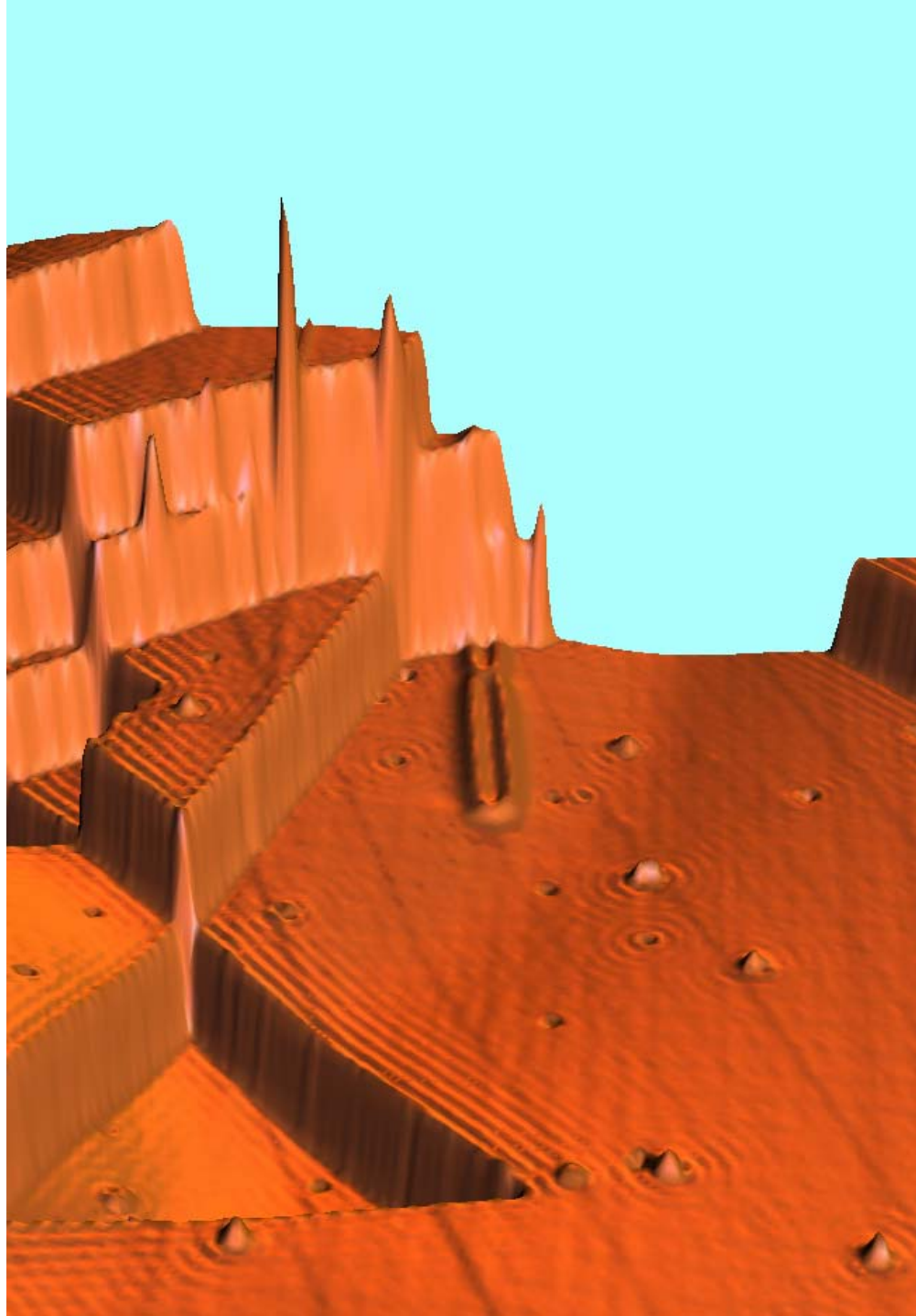
dyfrakcja elektronów

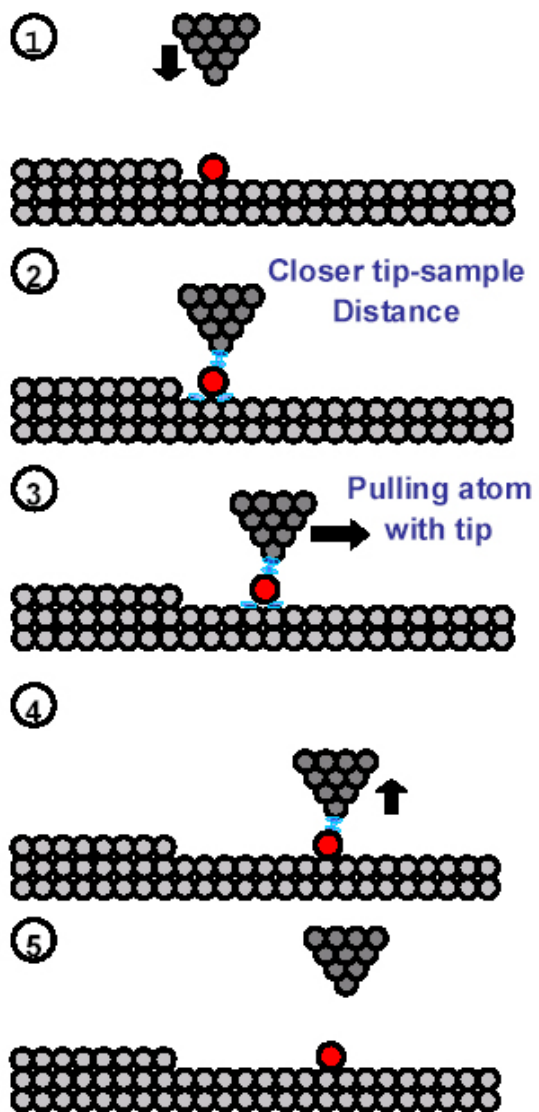
Zjawisko tunelowe

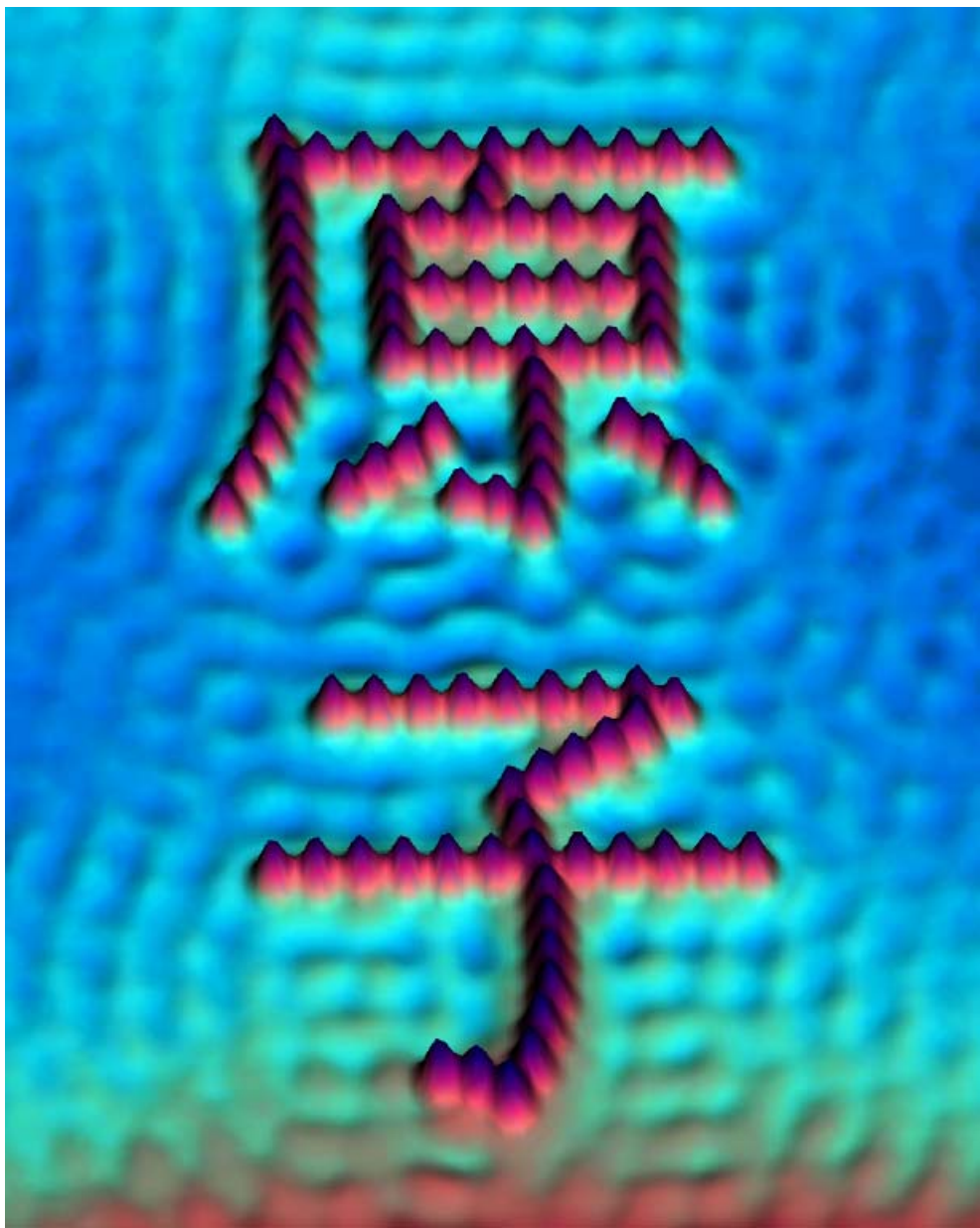


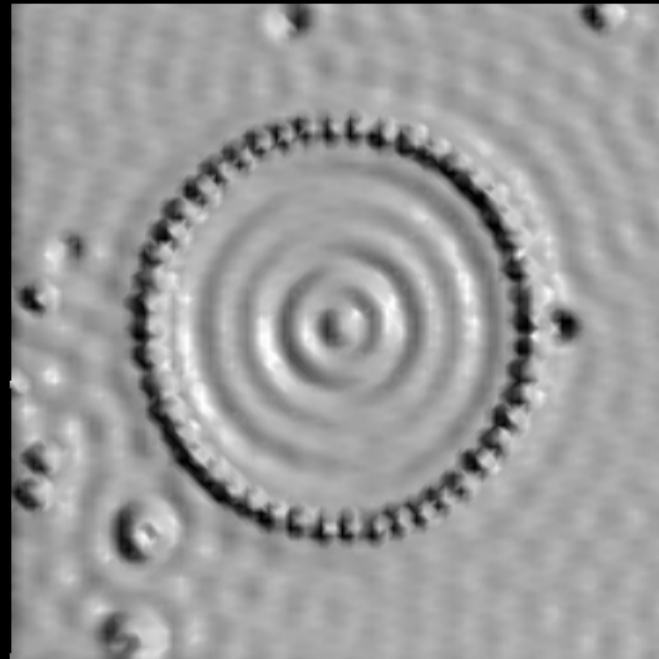
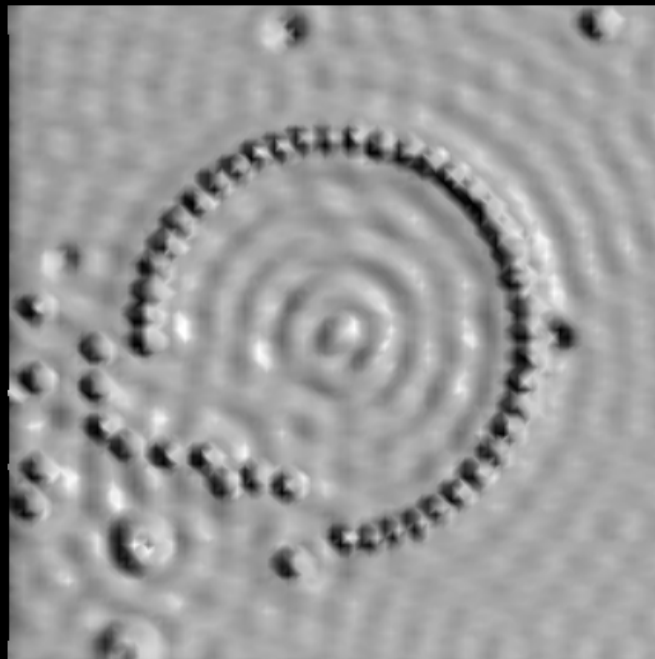
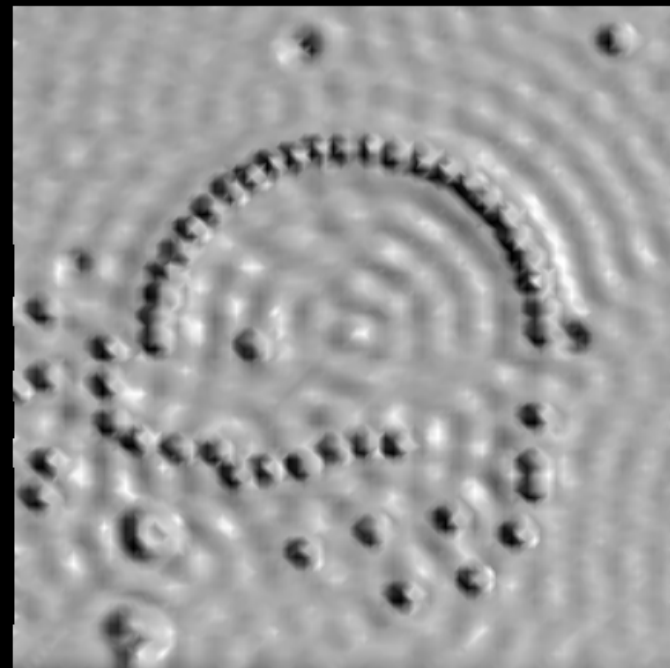
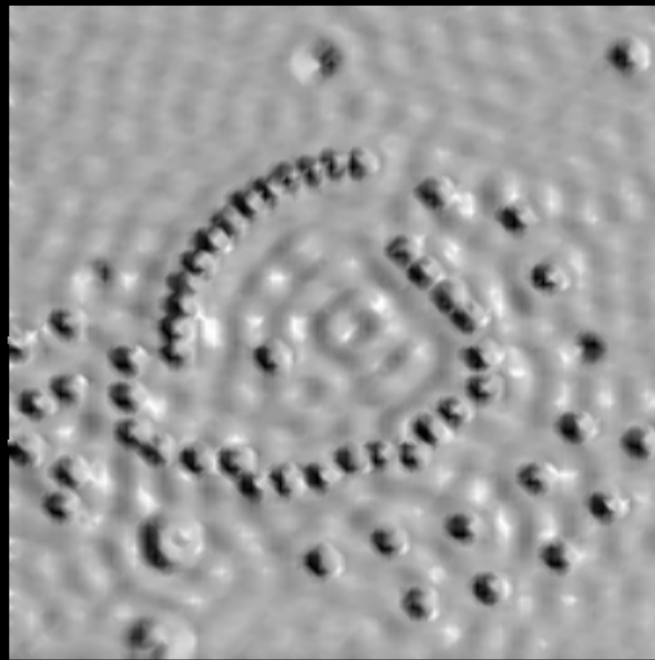
Mikroskopia tunelowa

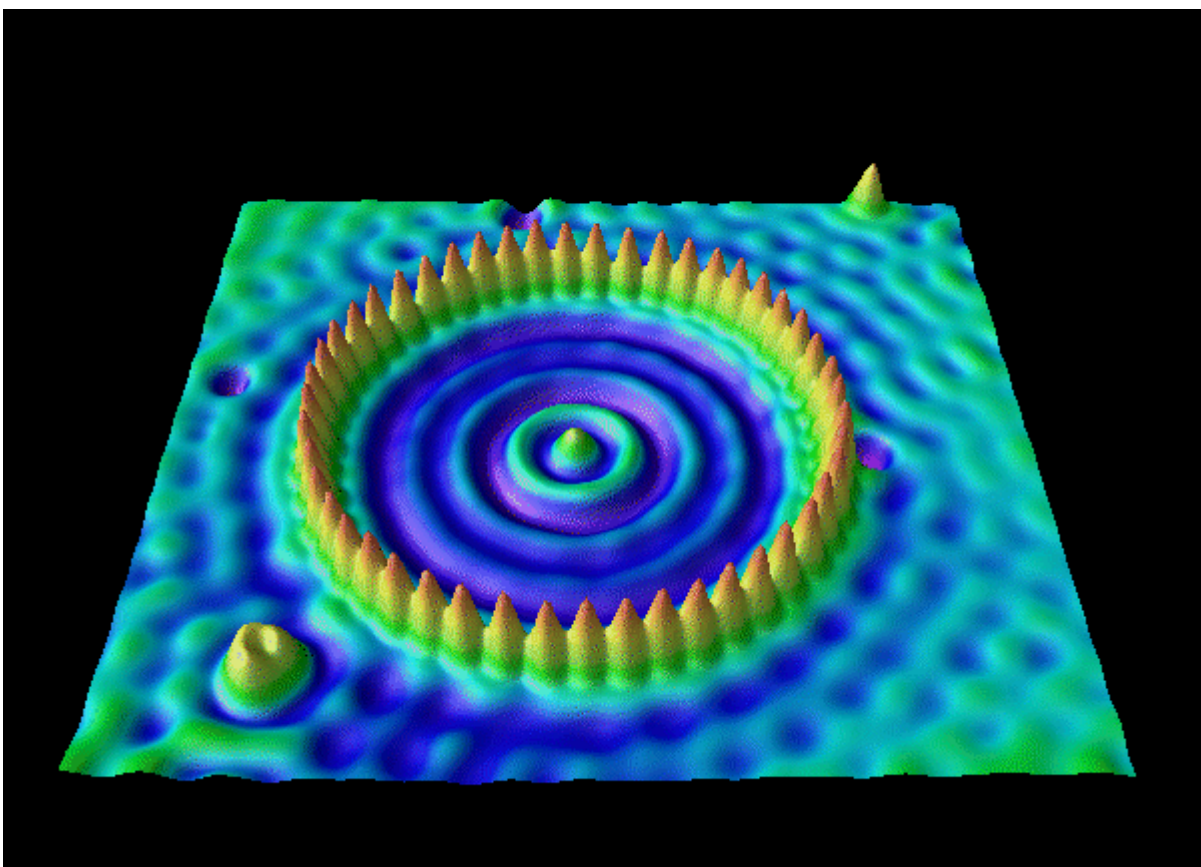


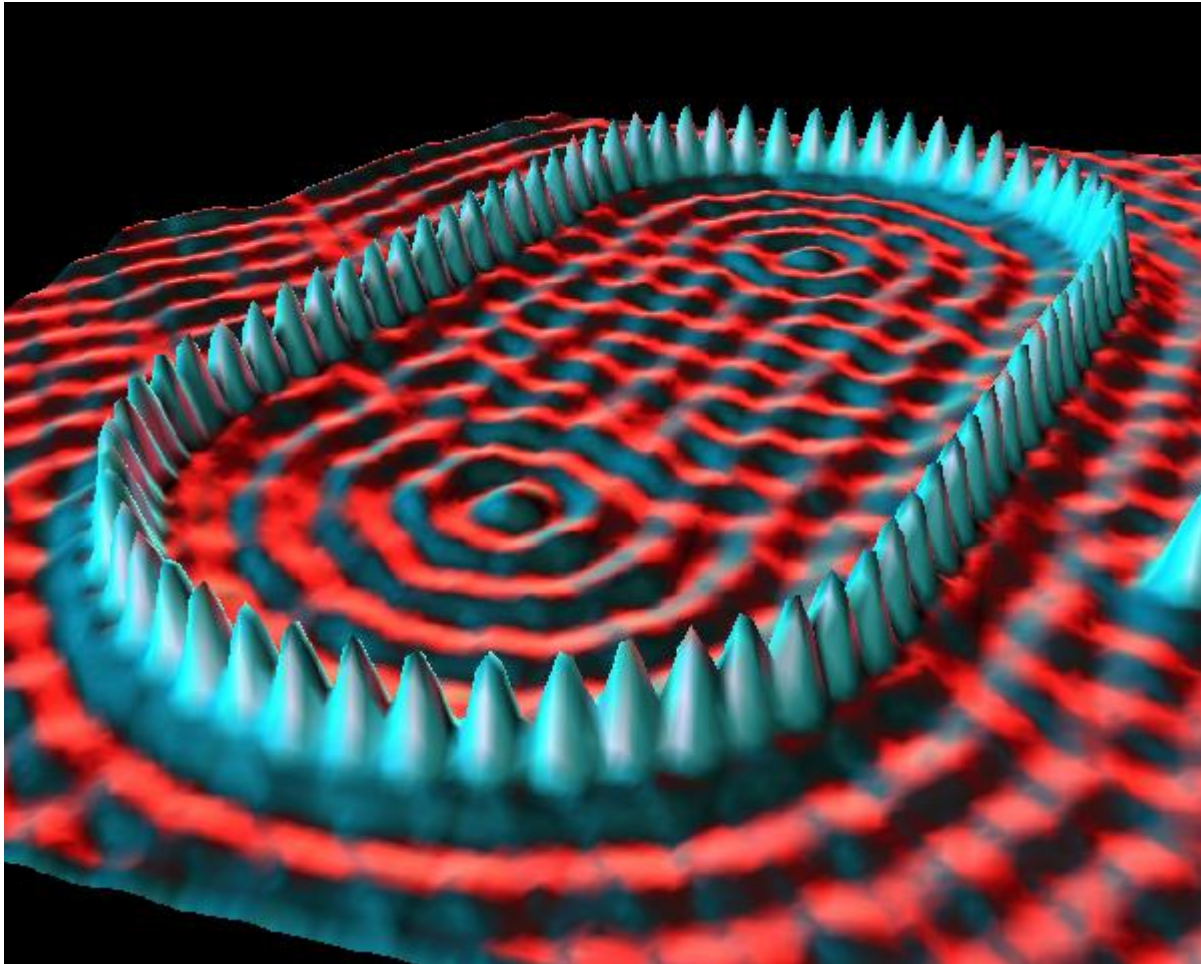












Mikroskop sił atomowych

