PH160 LAB 8

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Aim :

1.) To visualize and compare the diffraction pattern and intensity plot at different velocities of electron.

2.) Calculate the wavelength of electron from the Bragg's law and De Broglie equation and calculate the difference between them.

3.) To visualize and analyse the change in intensity profile on changing atomic radius.

Theory :

The Davisson–Germer experiment was a 1923-27 experiment by Davisson and Germer at Western Electric (Bell Labs) in which electrons, scattered by the surface of a crystal of nickel metal, displayed a diffraction pattern. This confirmed the hypothesis, advanced by de Broglie in 1924, of wave-particle duality, and was an experimental milestone in the creation of Quantum Mechanics. Intensity of scattered electron was really high at certain angles. And the experimentally calculated wavelength matched the de-Broglie wavelength.

Formulas :

Using Bragg's law we can calculate the thetha (angle) at which intensity curve will peak.

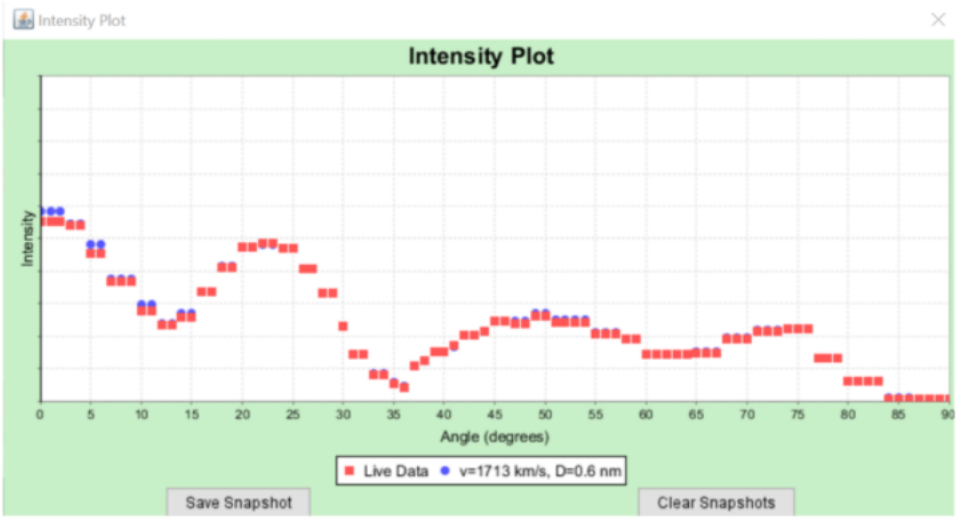
$n\lambda = 2D \sin\theta$

And Using De-Broglie's formula, we get Lambda = h/p

Intensity Plot :

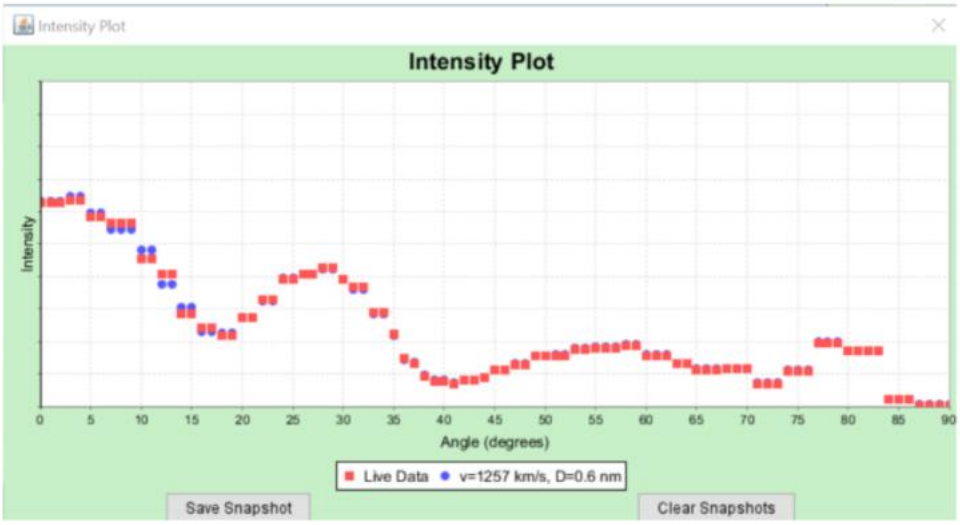
V = 1713 km/s

D = 0.6 nm



V = 1257 km/s

D = 0.6 nm



V = 801 km/s

D = 0.6 nm

Observation Table :

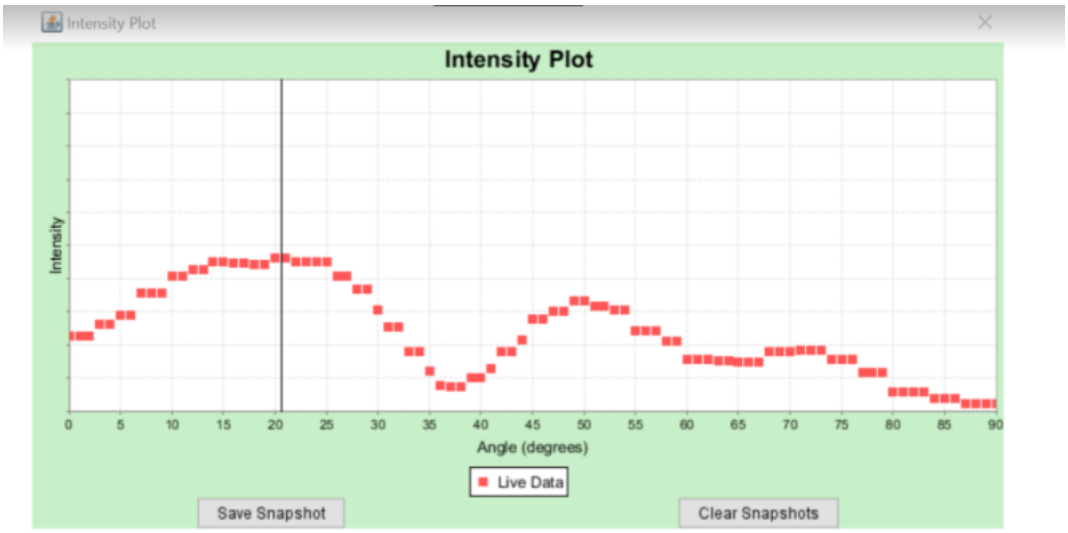
1.) Changing Atomic radius

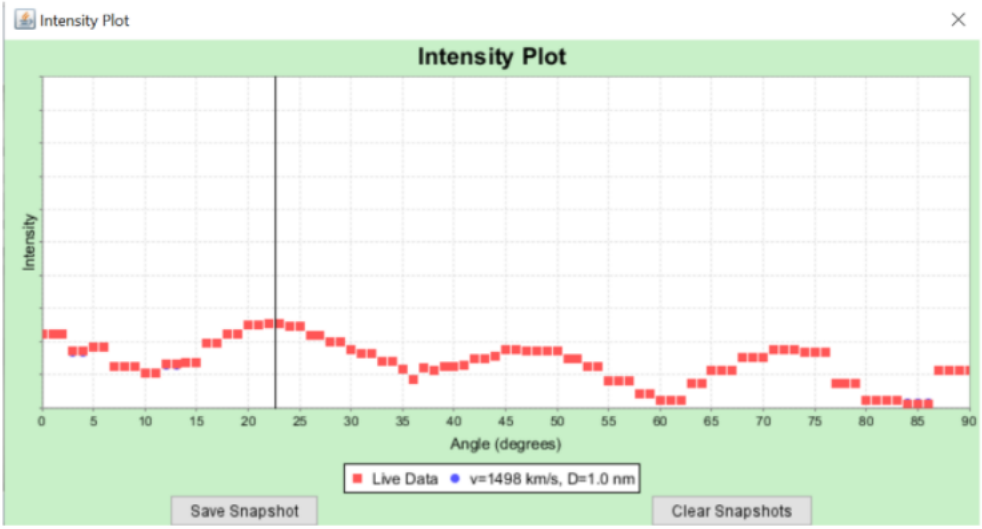
Sr No.	Atomic Radius (nm)	Atomic Separation (D) (nm)	Velocity of electron (m/s)	Angle of Diffraction (°C)	Wavelength $n\lambda = 2D \sin\theta$ (nm)	Wavelength $\lambda = h/p$ (nm)
1	0.25	1.0	1029000	24.393°	0.8134	0.7085
2	0.20	1.0	1029000	20.497°	0.6840	0.7085
3	0.15	1.0	1029000	20.497°	0.6840	0.7085

2.) Changing Velocity

Sr No.	Atomic Radius (nm)	Atomic Separation (D) (nm)	Velocity of electron (m/s)	Angle of Diffraction (°C)	Wavelength $n\lambda = 2D \sin\theta$ (nm)	Wavelength $\lambda = h/p$ (nm)
1	0.10	1.0	700000	24.556°	0.8134	0.0589
2	0.10	1.0	1270000	16.578°	0.5812	0.9232
3	0.10	1.0	1840000	20.515°	0.6840	0.1337

3) To visualize and analyse the change in Intensity profile on changing atomic radius.





Conclusion :

From the above experiment we can observe that the theoretical value changed when we changed the velocity, since the formula to calculate the theoretical value includes only velocity as a variable and the actual value of wavelength changes with change in the atomic radius.

Thank You