Modern Physics Lab

Electron Diffraction Experiment

Theory: The wave-particle duality that is assigned to photons also extends to electrons. They behave like waves! This was proposed by Louis de Broglie and the equation that relates the wavelength to the linear momentum of the particle is:

$$\lambda = \frac{h}{p}$$

Where *h* is Planck's constant.

To prove that the electrons behave like waves we will need to observe one of its behavior hallmarks. In the experiment today we will observe diffraction by a powder sample of graphite. Well-ordered graphite, with uniform orientation behaves like diffracting planes with two specific separations:

d_{10} = 0.213 nm
d_{11} = 0.123 nm

However, since the sample is made of many flakes that are randomly oriented, the diffraction pattern will consist of rings instead of the usual fringes.

The equation we will use to get the electrons' wavelength is the same that we employed in the microwave diffraction experiment.