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$$E = -13.6 \text{eV}/n^2 \qquad E_{photon} = -13.6 \text{eV}\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

look again

$$m v r = n \frac{h}{2\pi}$$

$$2\pi r = n \frac{h}{m v} = n \frac{h}{p} = n\lambda$$

Bohrs condition can be interpreted as how many λ's can safely sit in an orbit (standing wave condition)

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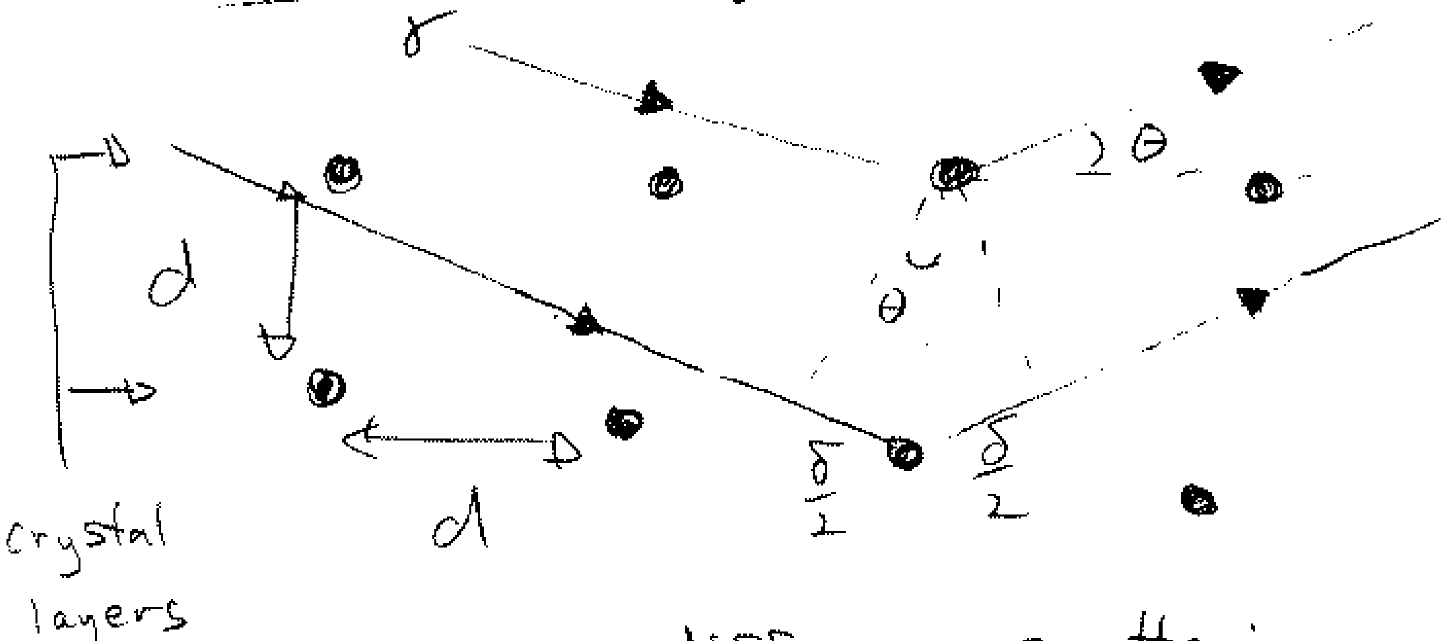
In the compton effect, the λ of the emitted light was measure by looking at the diffraction angle of max intensity

Consider a crystal Lattice



get a path difference scattering off of different layers

$$\delta = 2d\sin\theta$$

{ maxima when $2d\sin\theta = m\lambda$ Bragg diffraction

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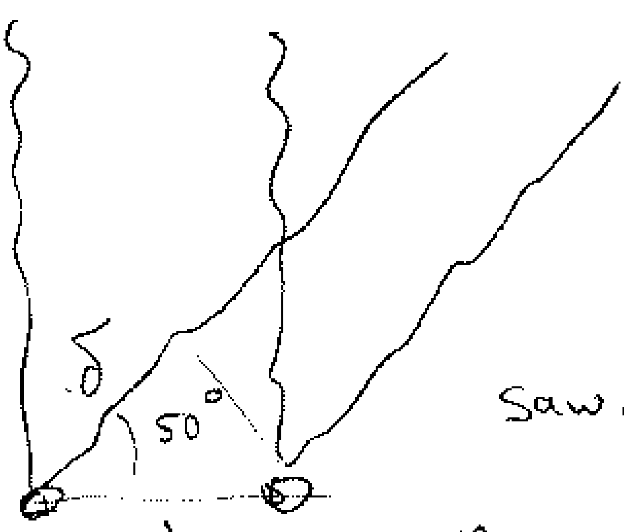

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Saw a peak @ 50°

$d\sin\theta = \lambda$ (1st max)

$2.15\times10^{-10}m \sin 50° = 1.65nm$

pretty close

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<u>ex</u> get diffraction with electrons, but, how about one electron at a time through 2 slits?

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You can think about the electron or photon existing as probabilities

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a photon's probability function consists of the probability it goes through one slit & probability it goes through another

$$\Psi(x,t) = \Psi_1(x,t) + \Psi_2(x,t)$$

wave function — "wave" or Probability functions

$$= A_1 \sin(\underbrace{kx-\omega t}_{\theta_1}) + A_2 \sin(\underbrace{kx-\omega t+\phi}_{\theta_2})$$

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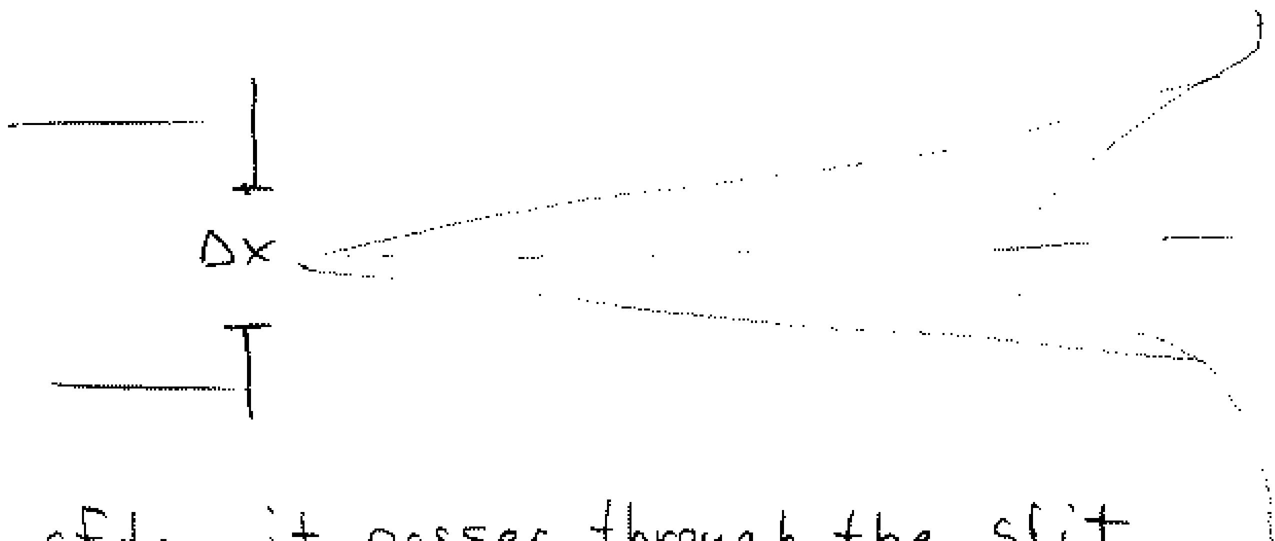
as the wave passes through the slit, we are forcing the wave to exist only in the area of the slit



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$$\Delta x \, \Delta p_x \geq \frac{h}{4\pi} \qquad E = pc$$

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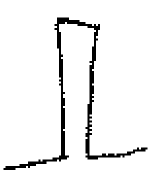

when you work with these you notice you get a lot of noise on sensitive equipment

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as we squeeze Δx (make it smaller)
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$$\cancel{\frac{\Delta x}{c} \Delta pc}$$

Actually this is a rough form of the uncertainty principle

$$\Delta x \, \Delta p_x \geq \frac{h}{4\pi}$$ more precisely

It's because there are a lot of different frequencies going into making that sharp pulse

$\Rightarrow$ you know where an edge is extremely well, so you induce a spread of Δp if you like

or Δt is known very well

$\Delta E = h \Delta f$ is big

$$\Delta t (h \Delta f) \geq \frac{h}{4\pi}$$

$$\Delta t \, \Delta \omega \geq \frac{1}{2}$$

We can see this by looking at a small portion of the x axis when we add together some cosines

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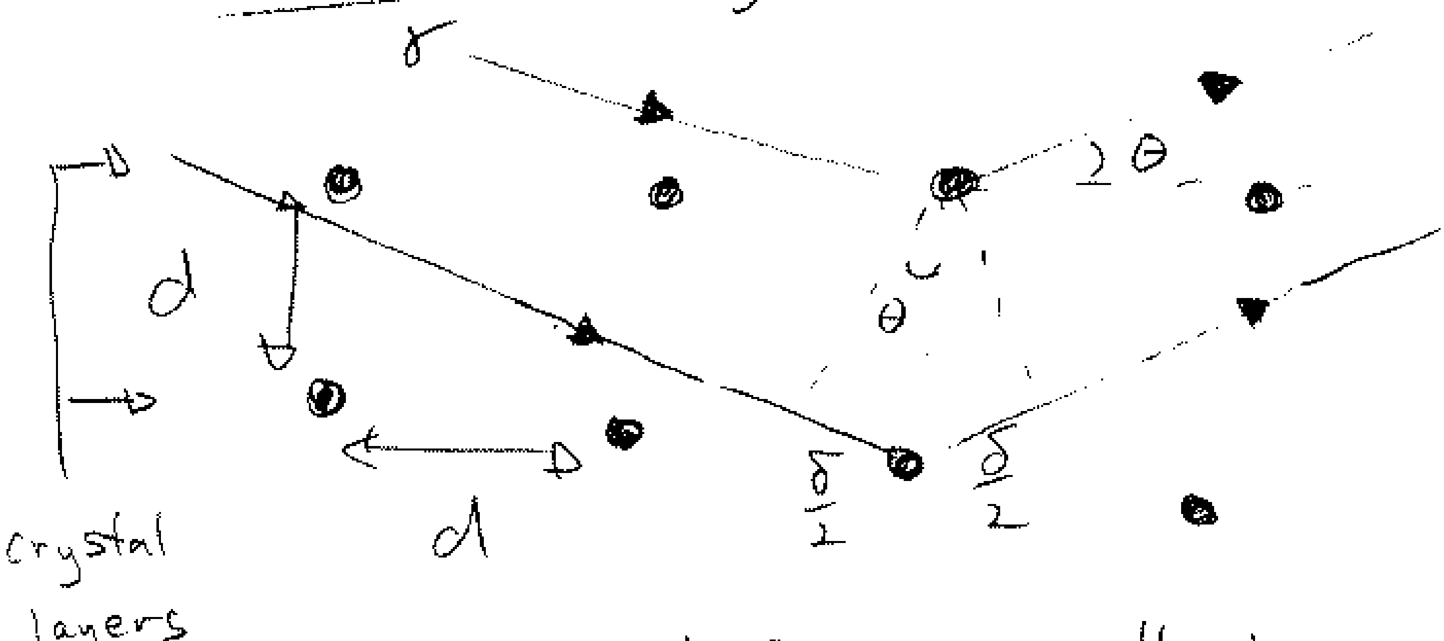

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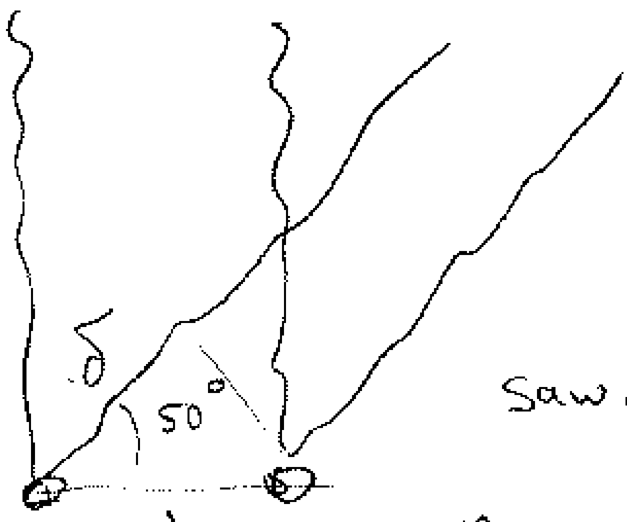

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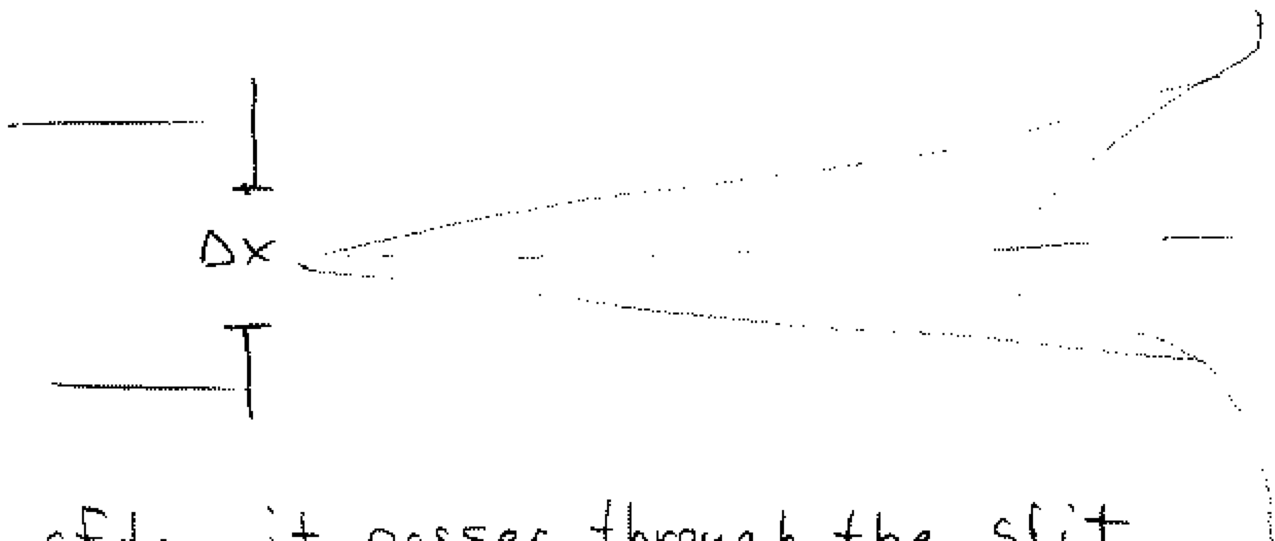

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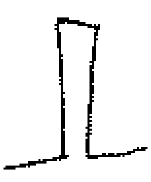

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