

Last lecture

- EM waves absorbed (photo-electric effect) and emitted (accelerate electrons, hit target -X-ray bremsstrahlung) as individual BITS of energy $E=hf=hc/\lambda$
- See this directly in double slit experiment
- Wave interference pattern builds up from individual particle detections
- Wave-particle duality

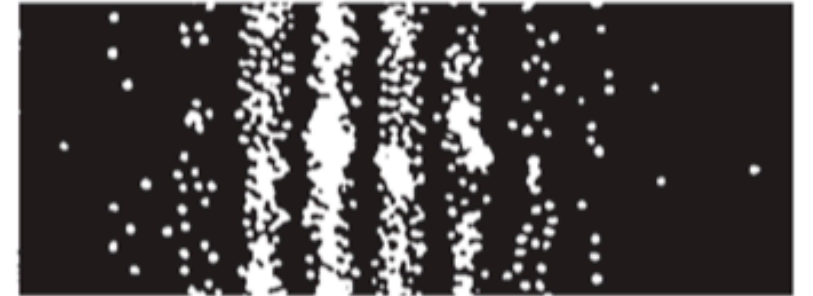
This lecture

- Wave-particle duality gives some fundamental limits to our knowledge – Heisenburg uncertainty principle
- Electrons also show wave-particle duality

After 21 photons reach the screen



After 1000 photons reach the screen



After 10,000 photons reach the screen

