UNIVERSITY OF BIRMINGHAM

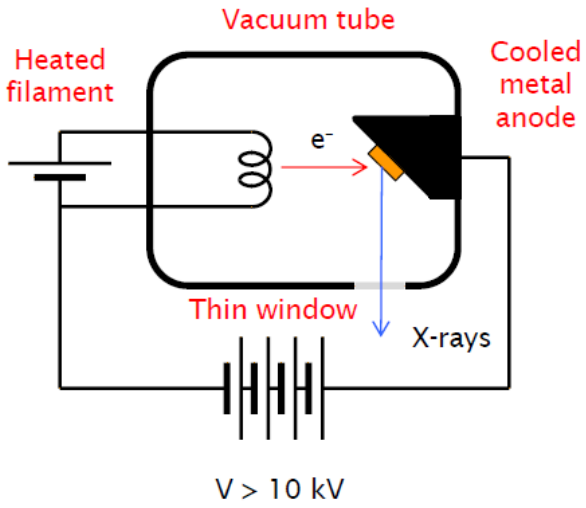
Recap of Lecture 4

- Atomic emission/absorption spectra
- Sharp lines in these are more evidence for quantised energy levels
- Bohr model lets us predict energy level splittings for H, single electron ions
- In general, spectra are very complex – orbitals, fine splitting, hyperfine..

In this lecture

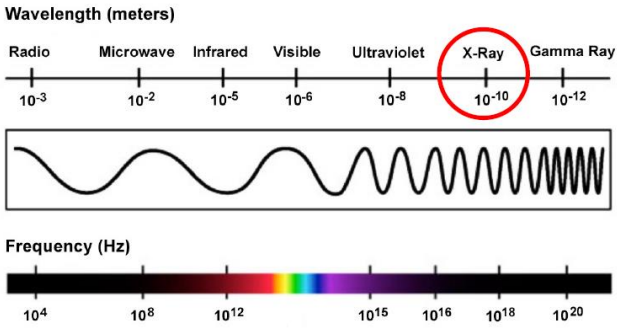
- The production of X-rays
- How to measure the wavelength of X-rays
- Bragg scattering of X-rays by crystals and the Bragg conditions

X-Ray source



Wilhelm Röntgen
(1845–1923)

X-Rays



$E_{X\text{-}ray}$ keV	λ nm
0.1	10
1	1
10	0.1
100	0.01
1000	0.001

Soft X-rays

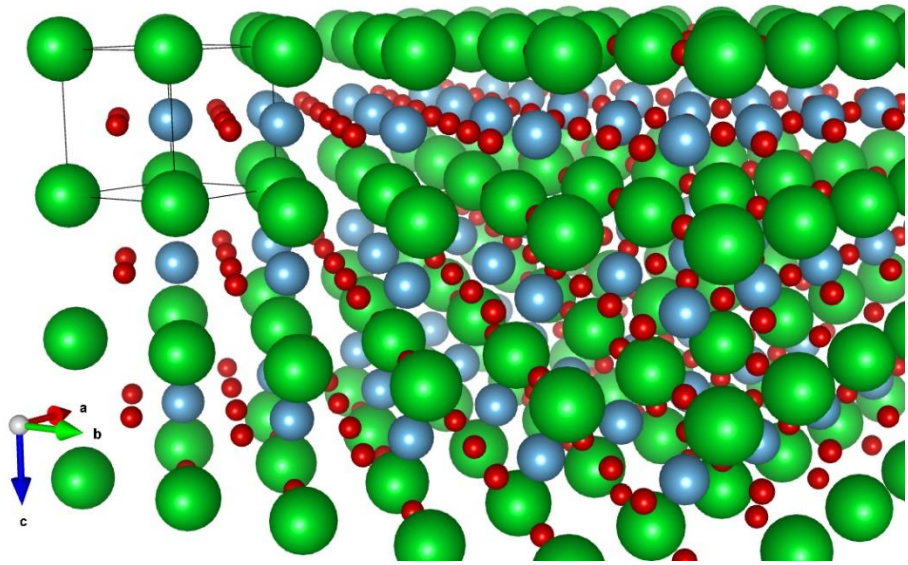
Hard X-rays

Gamma rays

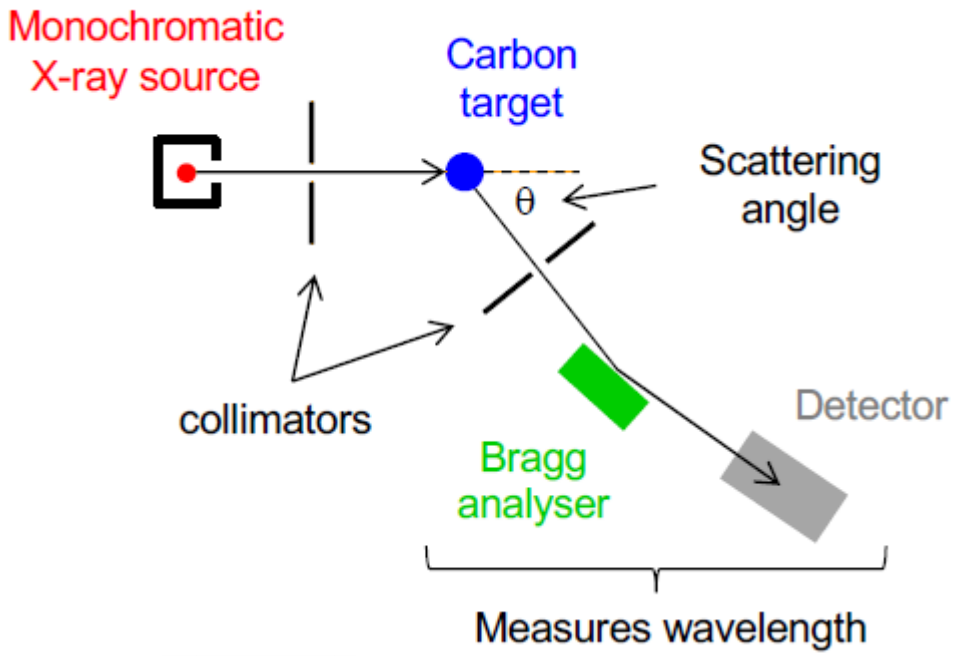
X-ray crystallography
Medical X-rays
Airport security

Crystaline materials as diffraction gratings

($SrTiO_3$) – 0.389 nm spacing between green Sr atoms



Compton Scattering - Setup



X-Rays for crystallography

diamond