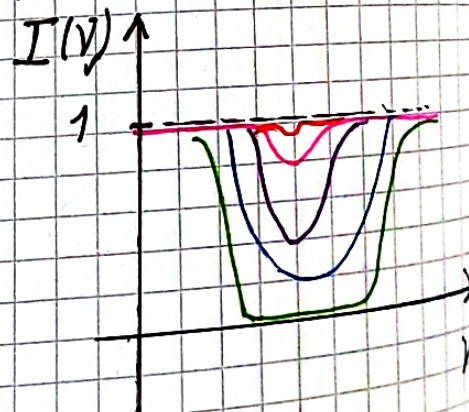


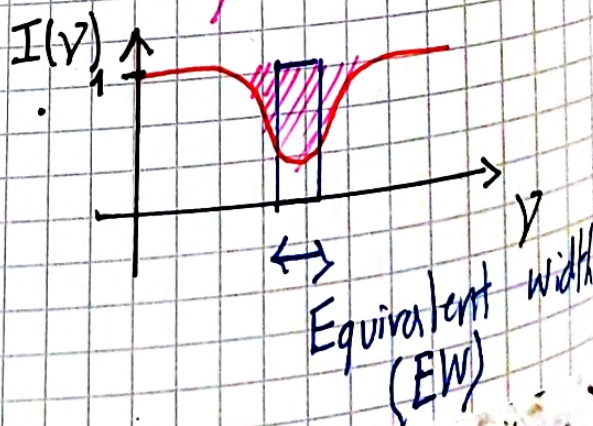
Shapes/profiles of absorption lines

$$\frac{I(\nu)}{I_0(\nu)} = e^{-\chi(\nu)} = e^{-N \frac{h\nu^2}{mc^2} f_{nu} \phi(\nu)}$$



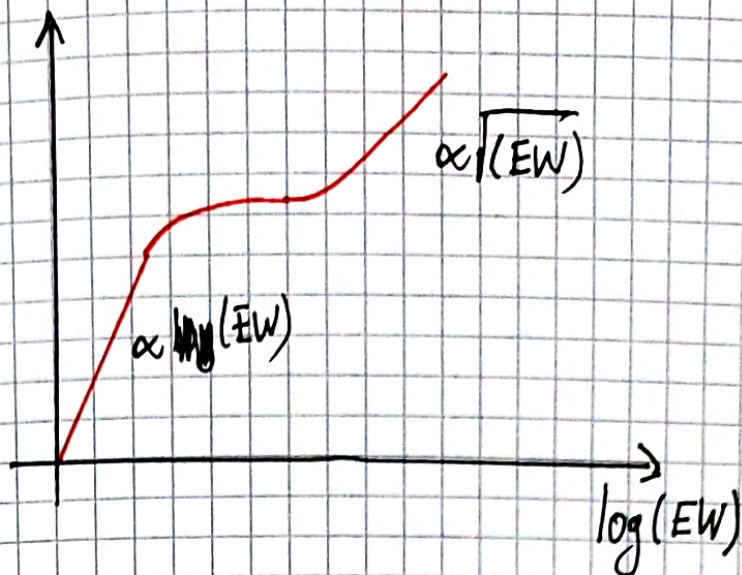
Connection of measurements with this theory

Equivalent width



$\log N$

Curve of Growth



Measure equivalent width
 \Rightarrow Get column density

Boltzmann equation:

We assume thermal equilibrium

first ionization

$$\rightarrow \frac{N_A}{N_B}$$

$$= \frac{g_A}{g_B} e^{-\frac{E_A - E_B}{kT}}$$

partition functions

second ionization

$$g_A = \frac{1}{M} \sum_i^M e^{-\frac{E_i - E_A}{kT}} = \frac{1}{M} \sum_i^M e^{-(E_i - E_A)/kT}$$

a sum of all states

Saha equation:

$$\frac{N_{i+1}}{N_i} = 2 \frac{\sqrt{2\pi m_e kT}}{n_e h^3} \frac{g_{i+1}}{g_i} e^{-\frac{E_{i+1} - E_i}{kT}}$$