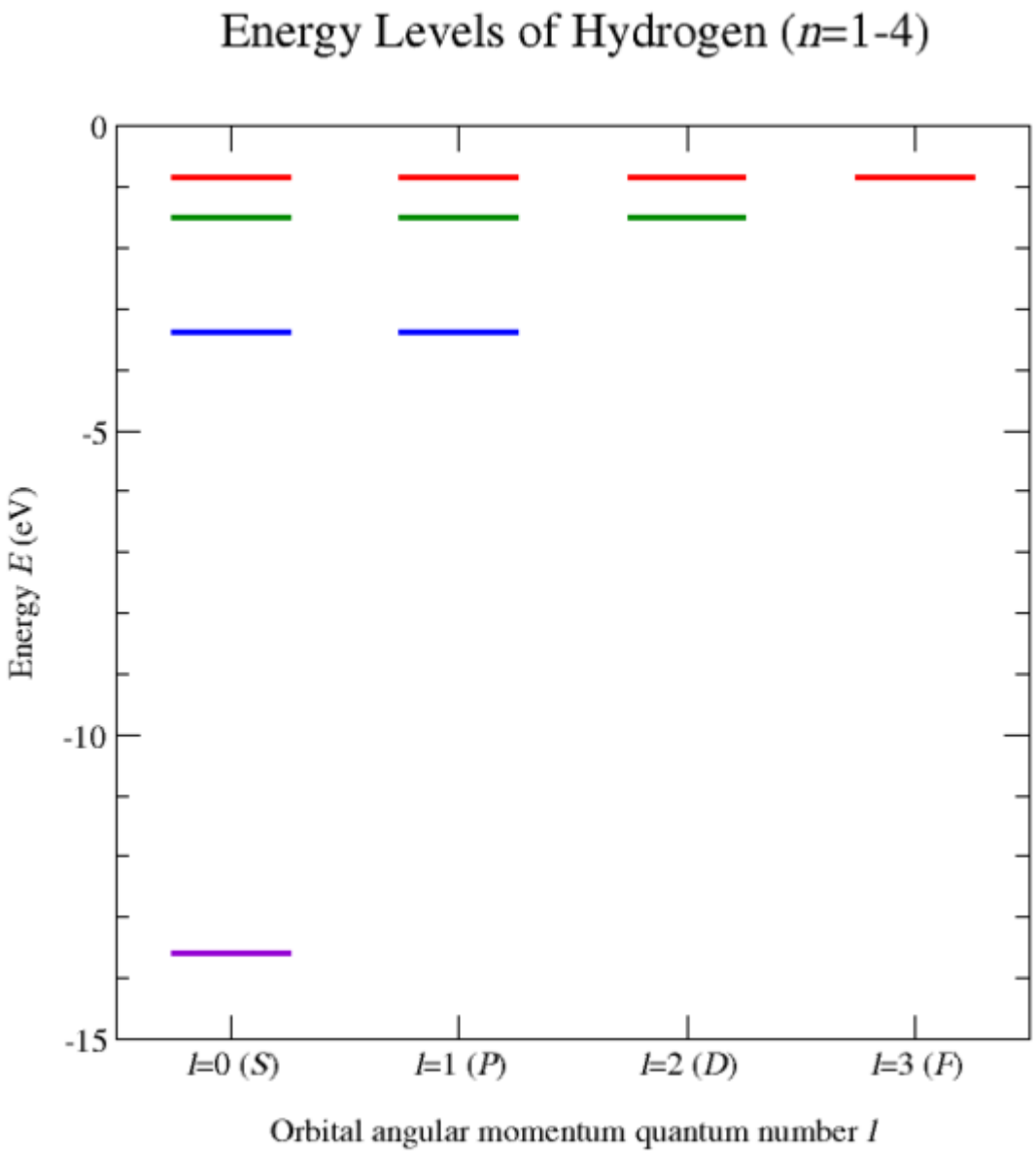
Basic Energy Levels



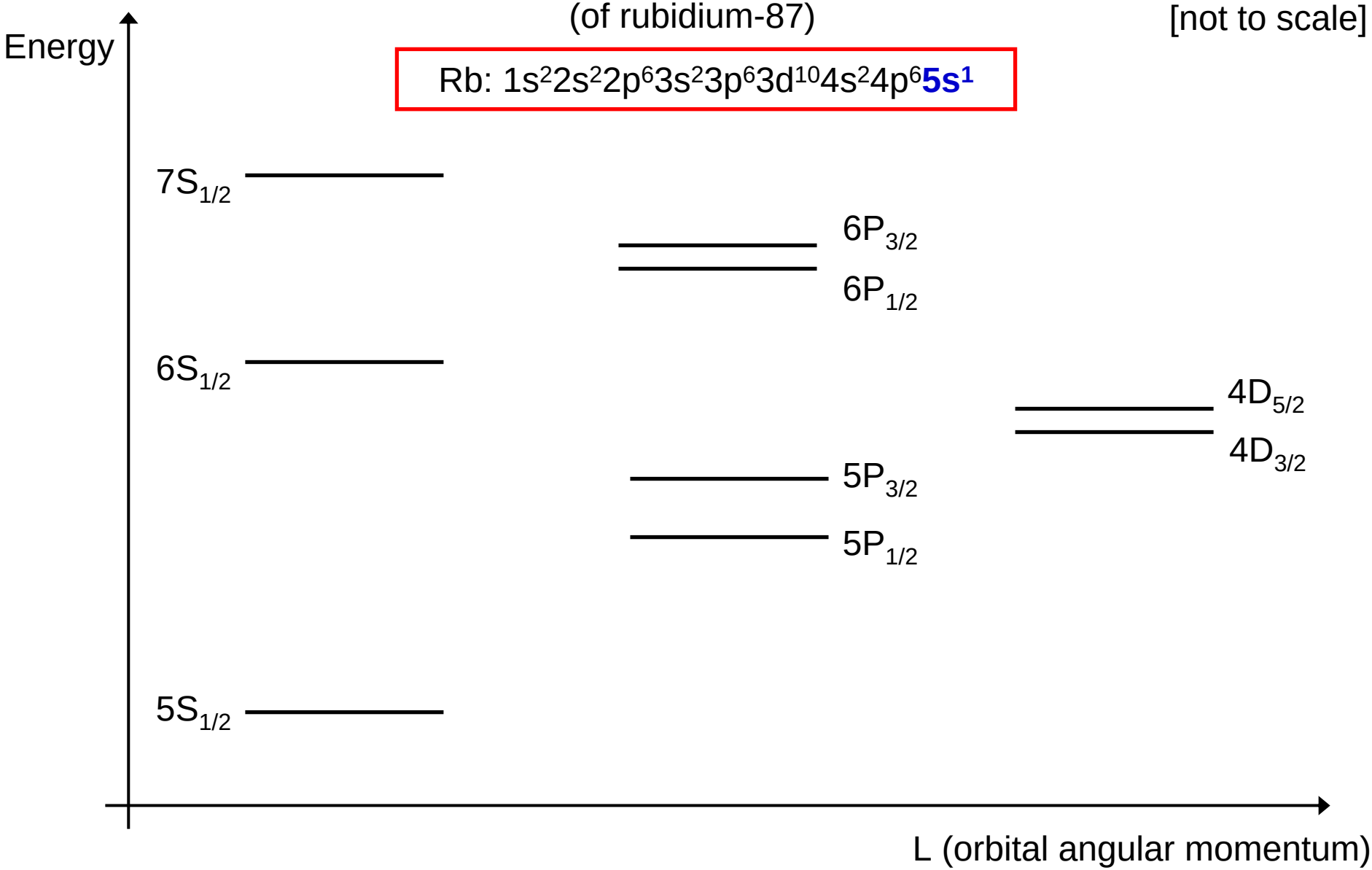
[Figure from wikimedia.org]

Fine Structure

(of rubidium-87)

[not to scale]

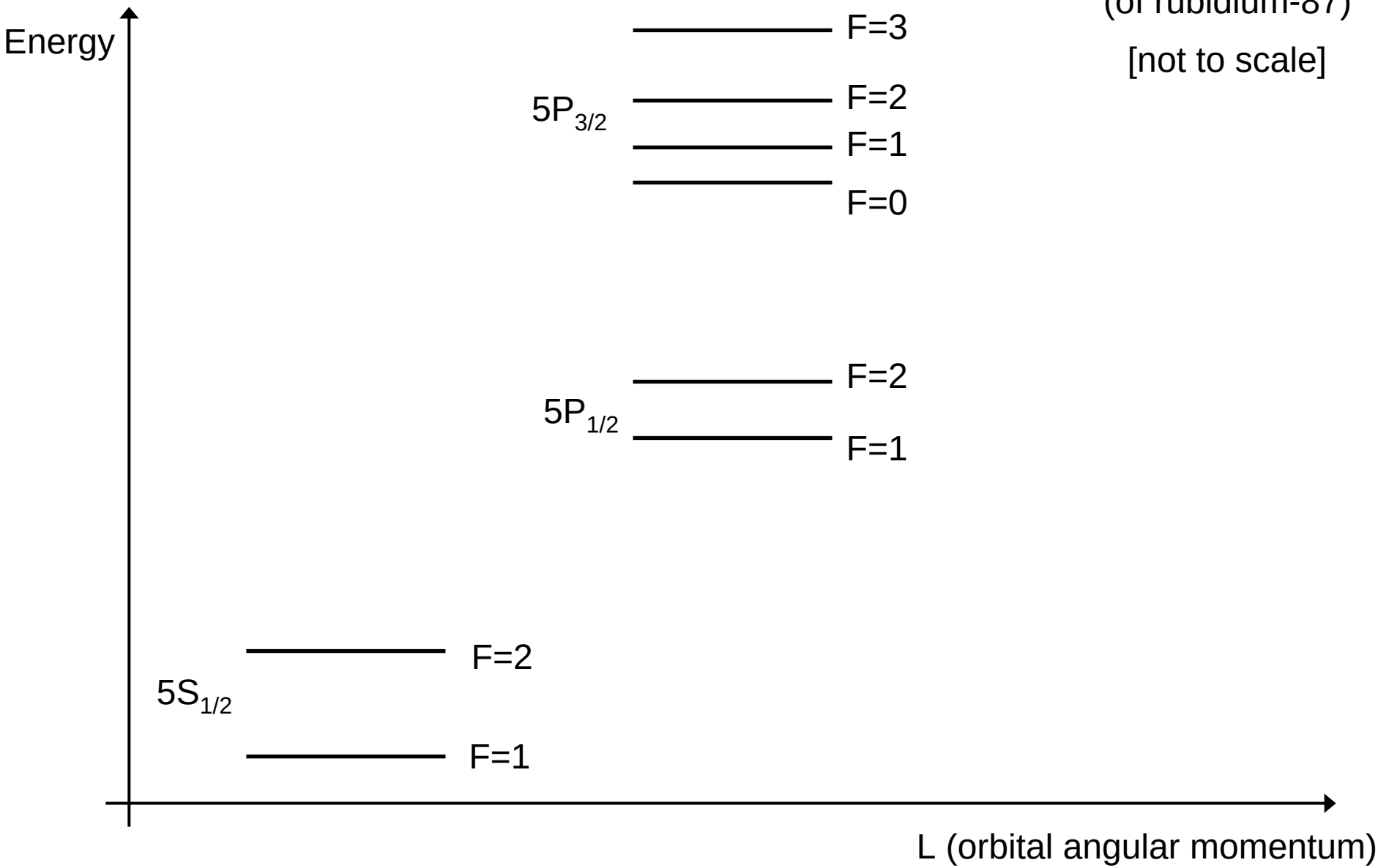
Rb: $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 \mathbf{5s^1}$



Hyperfine Structure

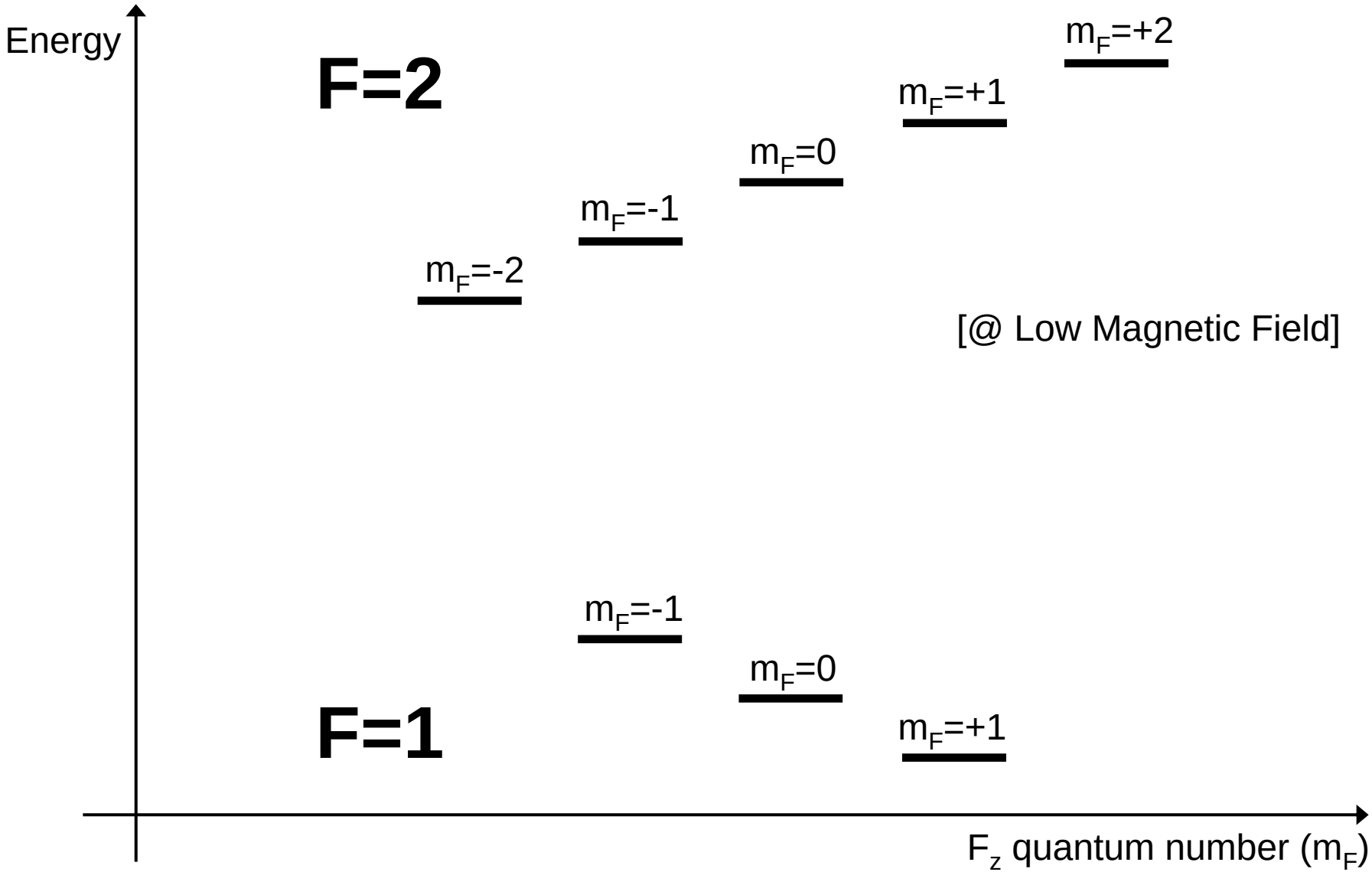
(of rubidium-87)

[not to scale]

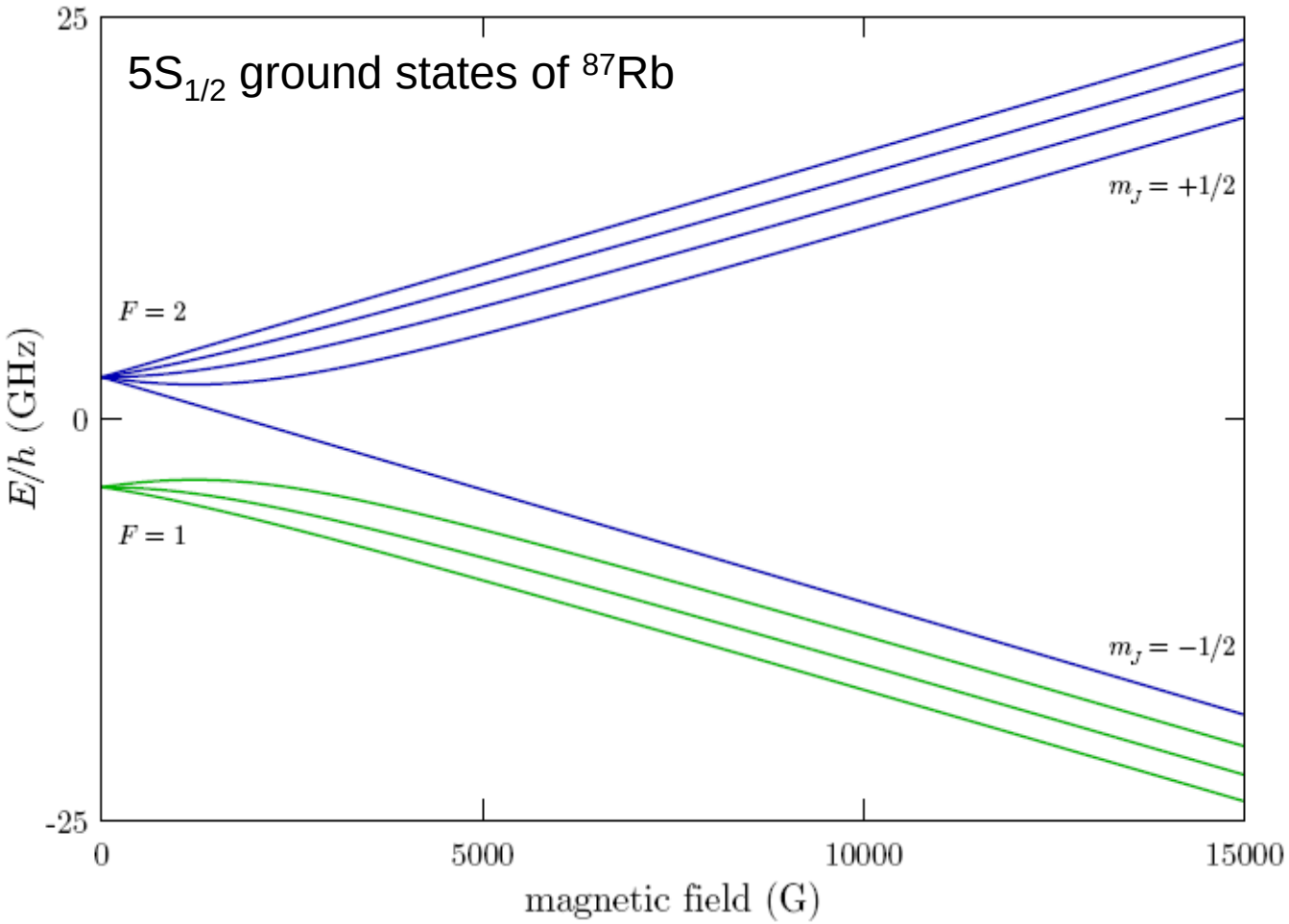


Zeeman Sub-Structure

[^{87}Rb, ^{39}K, ^{41}K]



Zeeman Sub-Structure at High B-field



[Figure adapted from steck.us by Prof. Dan Steck, U. of Oregon (2010)]

Breit-Rabi Formula

The Breit-Rabi formula for the Zeeman shift of atomic ground states is given by:

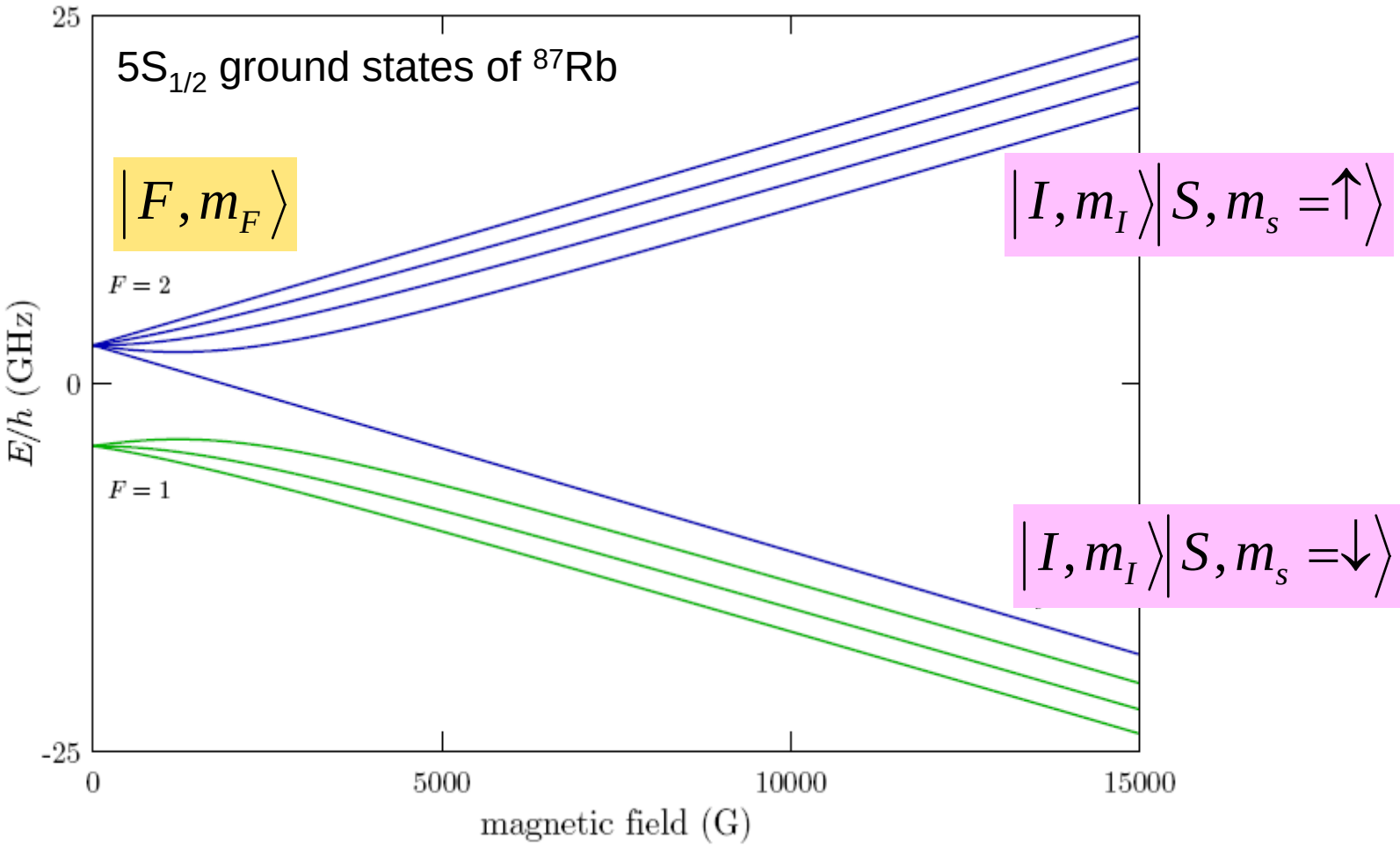
$$U(m_F, B) = g_I \mu_B m_F B + \frac{E_{hfs}}{2}(\pm(1 + \frac{4m_F x}{2I+1} + x^2)^{1/2} - \frac{1}{2I+1}),$$

where the $\pm$ is used for the $F = I \pm J$ state, respectively, and

$$x \equiv \frac{(g_J - g_I)\mu_B B}{E_{hfs}}.$$

PhD Thesis of J. Obrecht, U. of Colorado (2007)]

Zeeman Sub-Structure at High B-field



[Figure adapted from steck.us by Prof. Dan Steck, U. of Oregon (2010)]