

One Electron Multi-Level Atoms

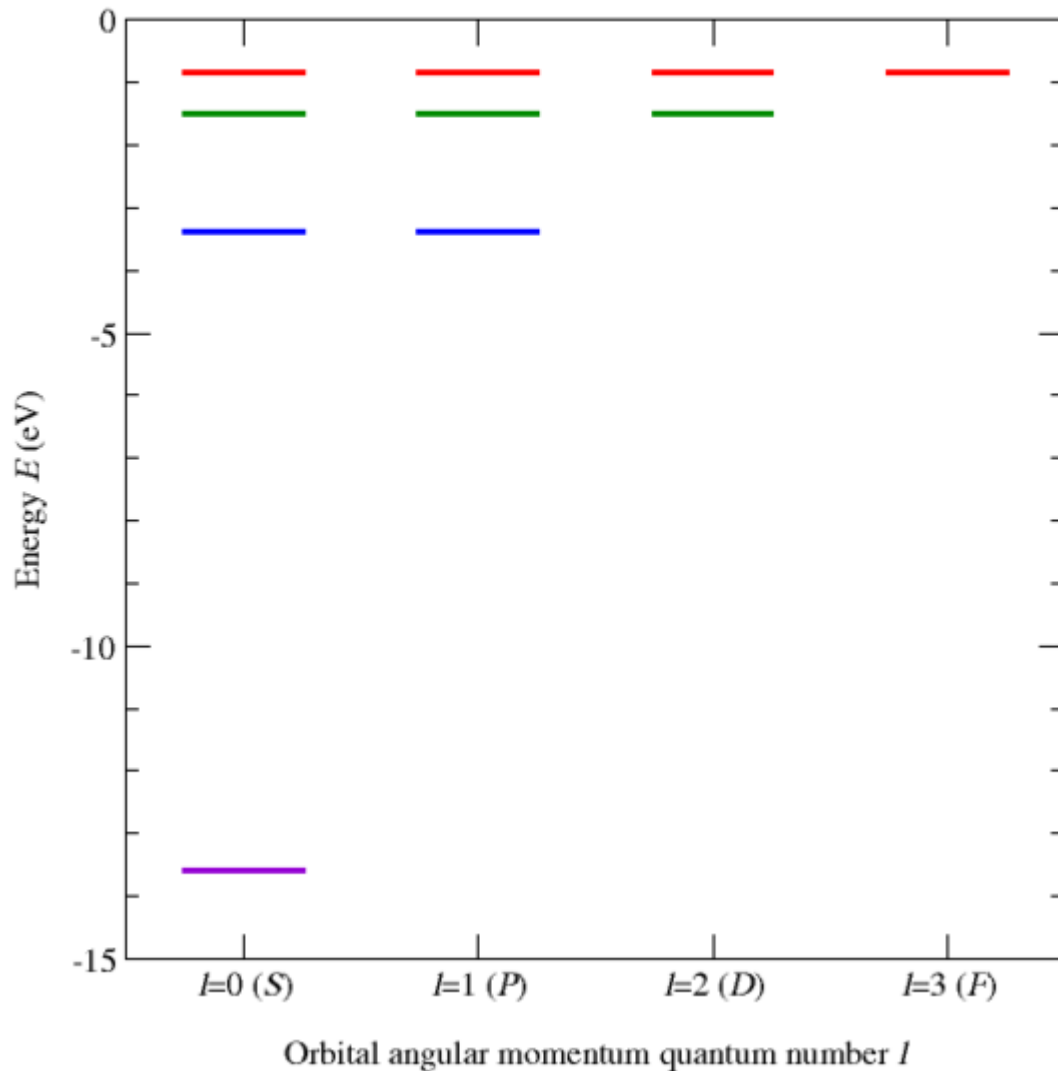
Electronic structure of Alkali elements

Outline

1. Basic structure
2. Fine structure
3. Hyperfine Structure
4. Zeeman splittings in a DC magnetic field.
5. Selection for rules for E-M transitions.

Basic Energy Levels

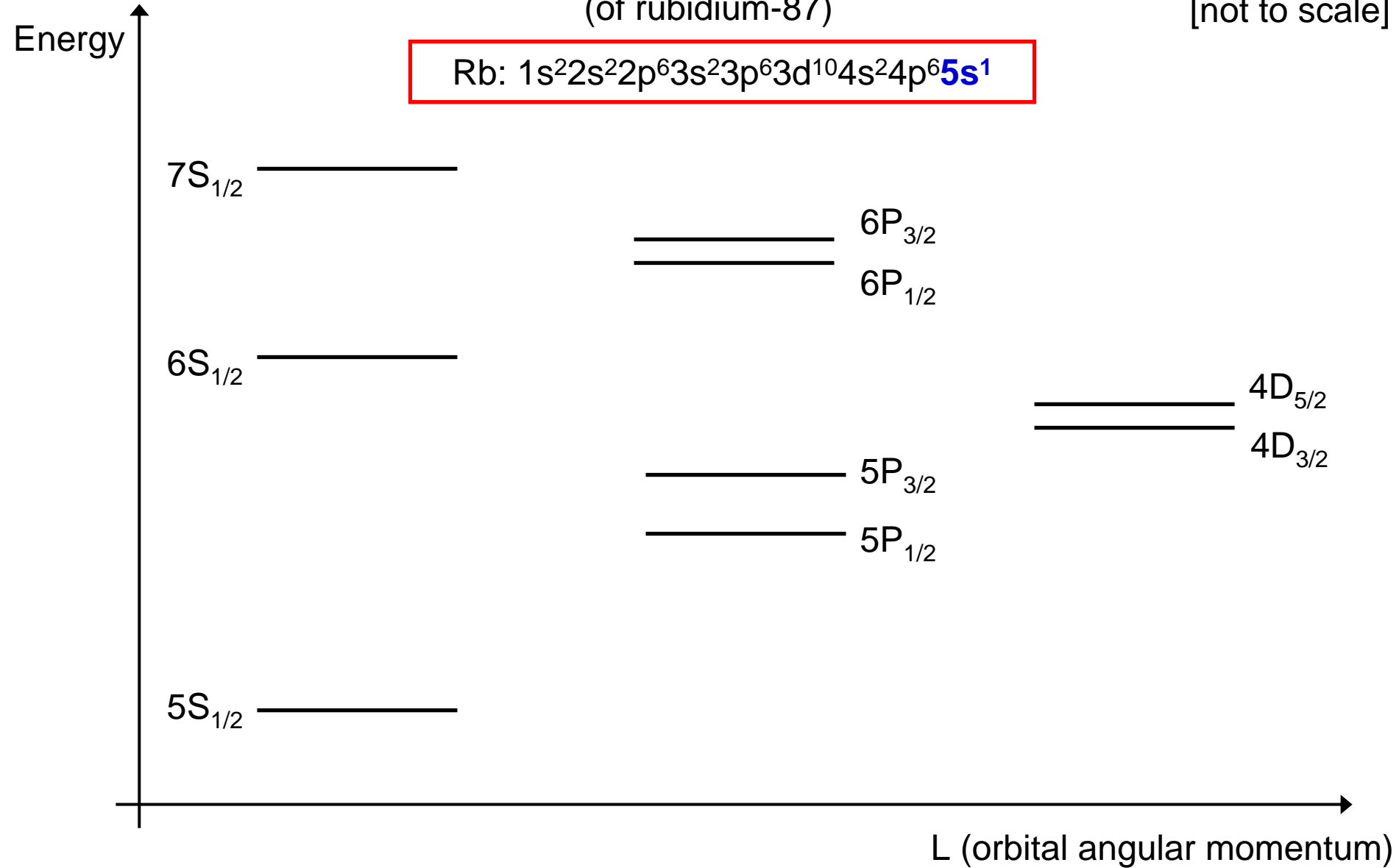
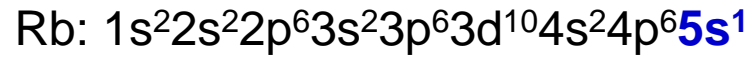
Energy Levels of Hydrogen ($n=1-4$)



Fine Structure

(of rubidium-87)

[not to scale]



Fine Structure: Notation

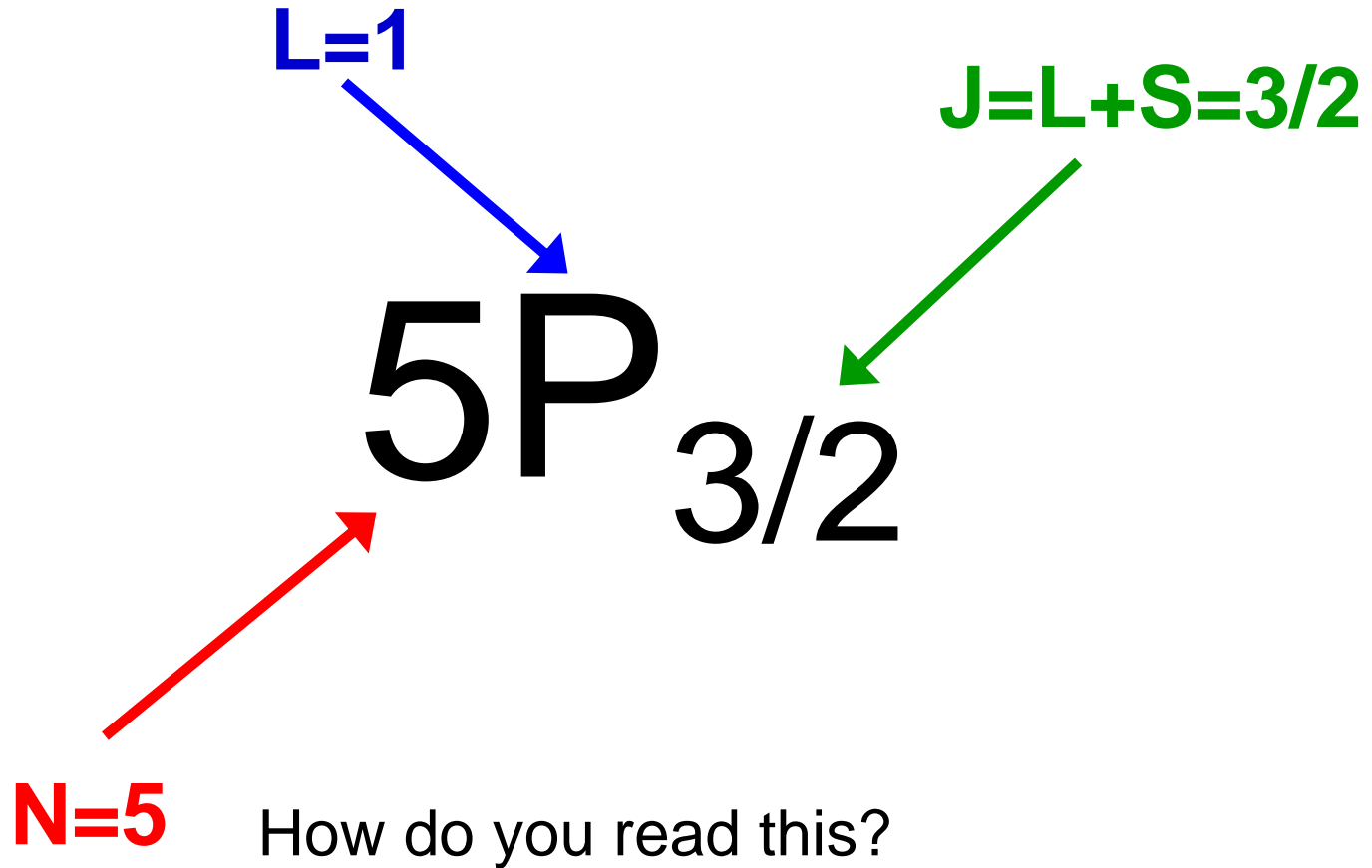
[Russell-Saunders notation]

$5P_{3/2}$

How do you read this?

Fine Structure: Notation

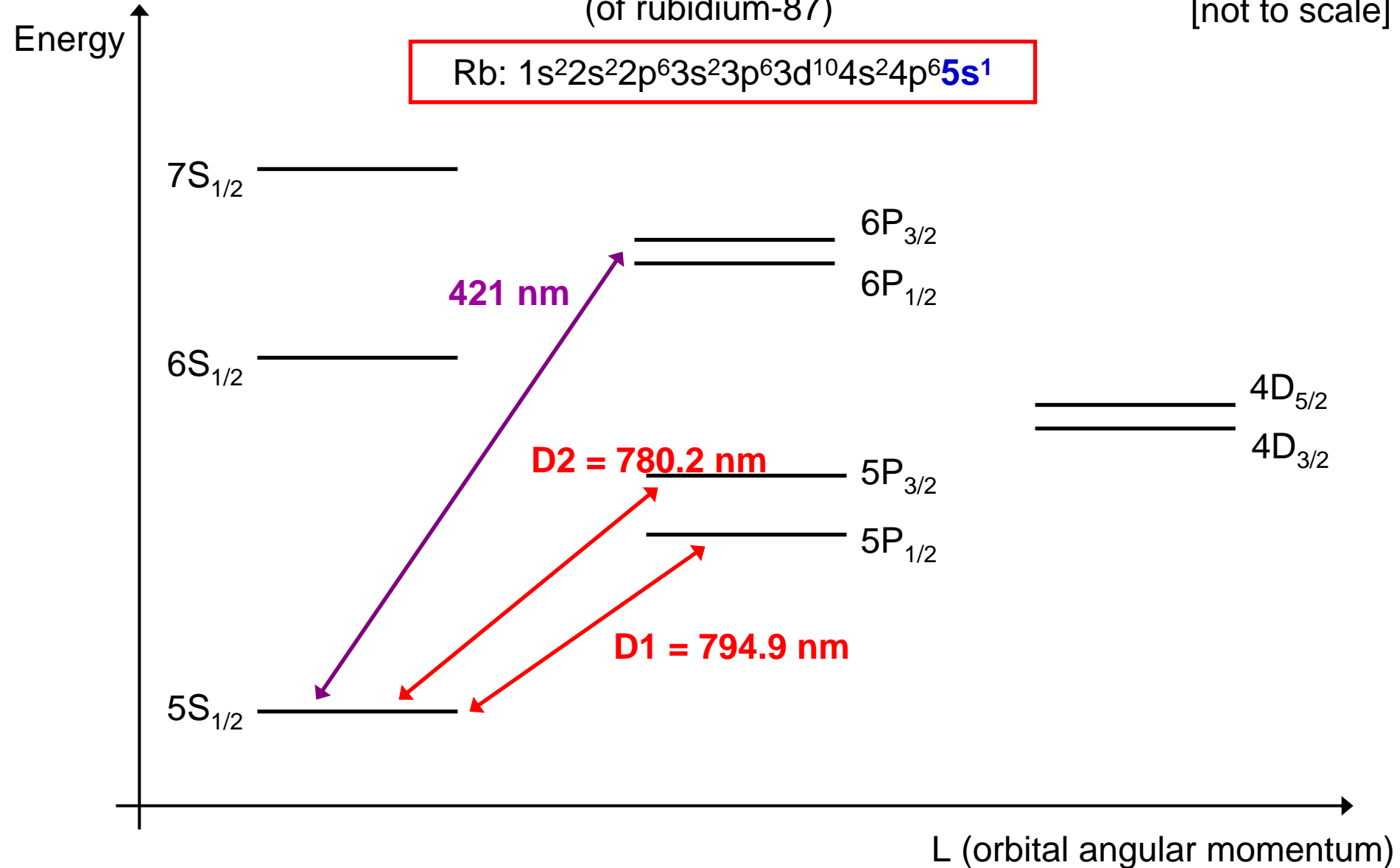
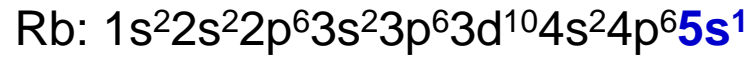
[Russell-Saunders notation]



Fine Structure

(of rubidium-87)

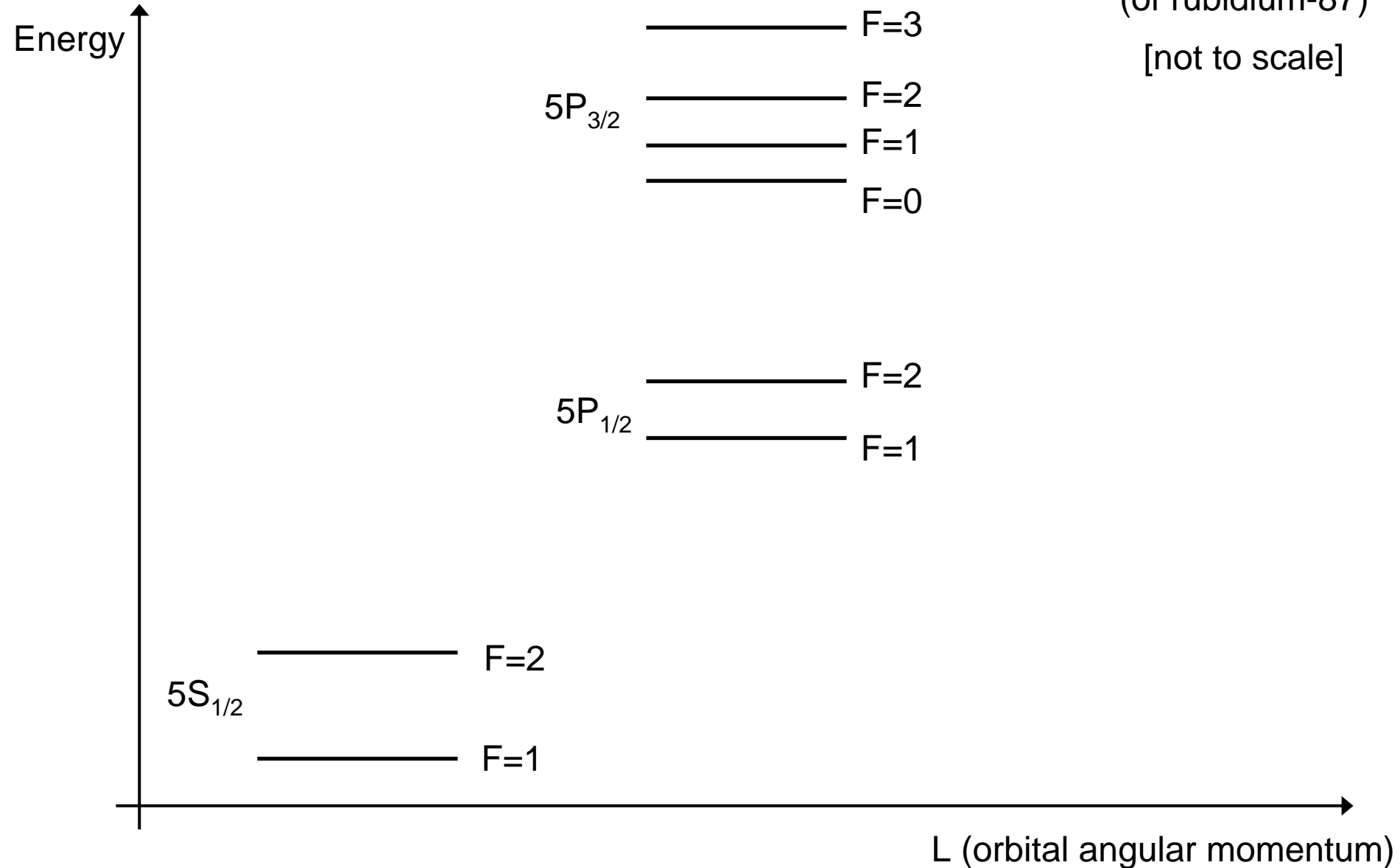
[not to scale]



Hyperfine Structure

(of rubidium-87)

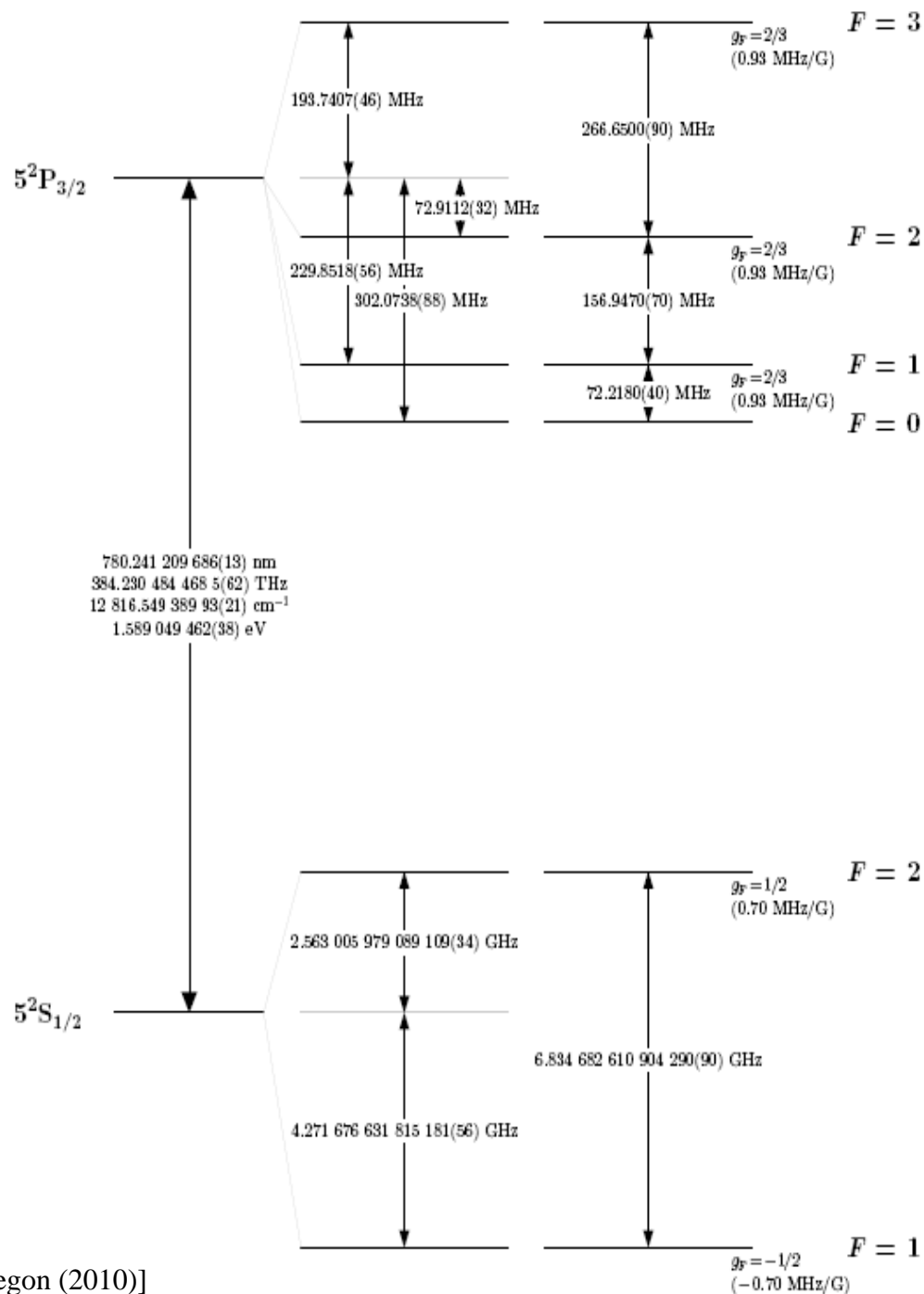
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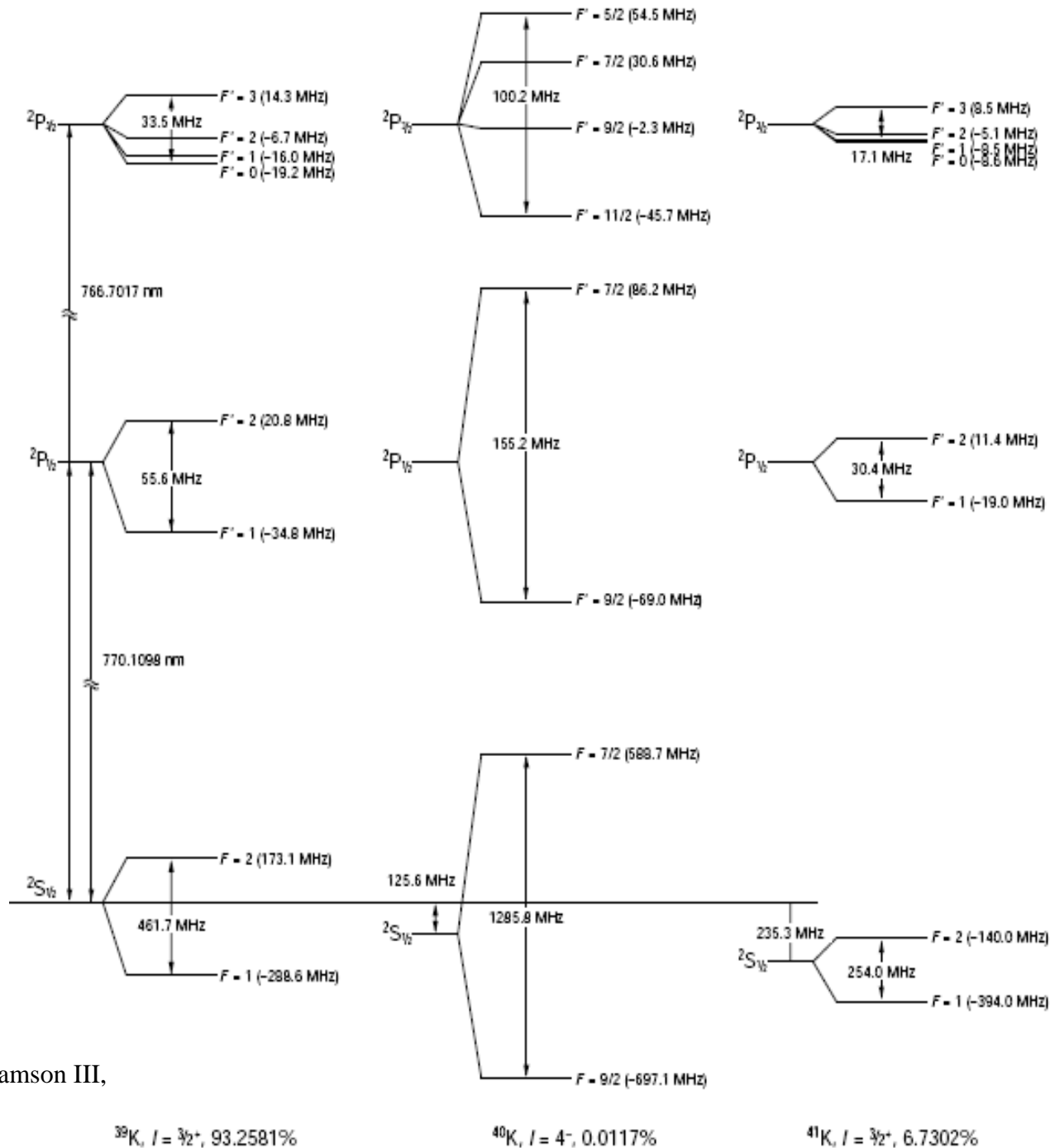
Rubidium-87:

D2 line

Nuclear Spin:
I=3/2

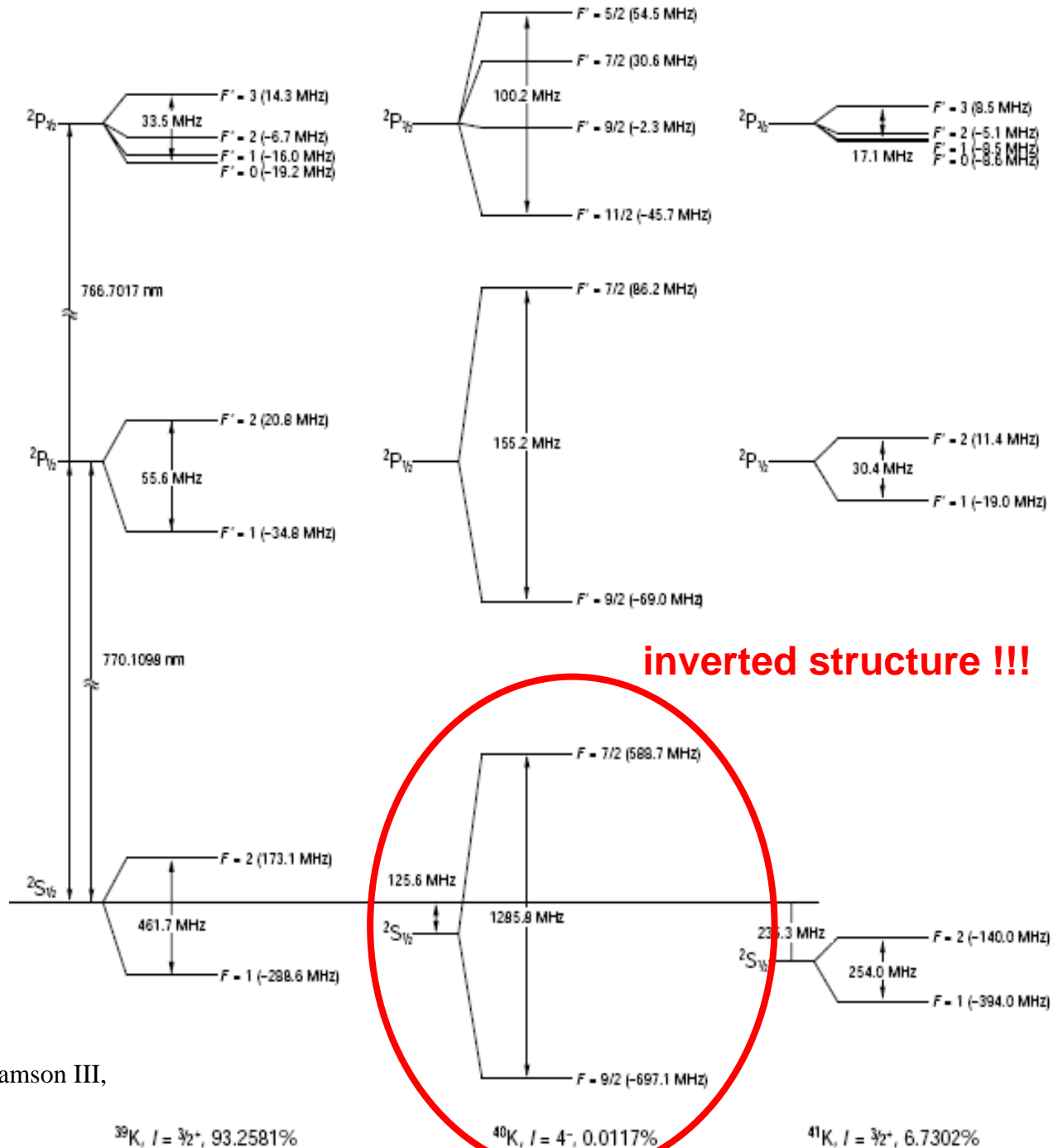


Potassium: D1 and D2 lines



[Figure adapted from PhD Thesis of R. Williamson III, U. of Wisconsin-Madison (1997)]

Potassium: D1 and D2 lines



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