

**Spektroskopi och materiens kvantmekaniska beskrivning,
FYST20, vårterminen 2012**

Reading instruction for Thursday, 2nd February

Spectroscopy on atoms and selection rules

Spectroscopy on atoms has been subject of many articles. Volker Schmidt did a comprehensive review in the field of X-ray spectroscopy:

“Photoionization of atoms using synchrotron radiation”, Report on Progress in Physics, **55**, 1483 (1992)

<http://iopscience.iop.org/0034-4885/55/9/003>

Since most information is gathered in this paper, it can be used for future research. In the context of the course, I just recommend to read a few sections:

1. First one needs a theoretical background to describe atoms with many electrons. This can be found in section §2.4.1 and §2.4.2.
 - a. In these sections, you should extract the methodology and the concepts develop to understand and describe the N-body problem (N = number of electrons).
 - b. Investigate the physical content of equation (2.32). Do not hesitate to look at the annex though it may seem hopeless at a first glance.
2. Concerning the experimental part, I would like you to understand the general features in the observables:
 - a. For direct photo-ionization far from threshold: §3 Intro, §3.1 and §3.3..
 - b. For resonant photo-ionization, you can focus on two dynamical effects §4.2.1 and §4.2.2

In both case a) and b) identify the difficulties of measurement and the limitation of an independent particle description. Try to understand where in eq (2.32) the modeling and computational work is essential.