Umeå University
Department of Physics
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Assignment 5

To be submitted on May 26, 2010

Consider resonance fluorescence from a number of atoms which have natural and collisional line broadening. Define the *scattering rate*, R, as the number of scattered photons per unit time.

Use Eqs. (8.2.6), (8.2.7), (8.2.9), (4.10.7), (4.10.10) in Loudon's book and obtain an expression for R in terms of the incident irradiance $\bar{I}_{in}$.

The discussion just after Eq. (8.1.2) may be helpful when you think about the surface element. To simplify the calculation, assume (although it may not be completely correct) that all the scattered light has a frequency equal to the resonance frequency ω_0.

Simplify your result for R in the limits of weak and strong incident beam. Draw a rough qualitative curve of R as a function of $\bar{I}_{in}$.

The solution should be submitted to Emil Lundh (`lundh@tp.umu.se`) no later than May 26, 15:00. If the solution is submitted electronically, I will only accept platform independent formats (pdf strongly recommended!). Answers on paper are of course also accepted.