

Term Project – Part-II

Phys 438/538: Atomic, Molecular and Optical Physics

Due Date: Tuesday, 3 May 2016 [Till 23:59]

version: 19 March 2016

Part-2: *Laser Noise and Linewidth* – 50%

Prepare a term paper having the following essential parts:

- Theory: a pedagogical discussion of laser noise and its mathematical formulation
- Results: a simple (such as rate equation based) simulation code that reproduces a typical laser noise inc. its Fourier transform showing the steady-state frequency spectra/linewidth

Minimal Requirements/Details:

- A single **pdf** file (no other attachments), emailed to me by the deadline.
- Minimum of 8 pages (single-spaced), preferably typeset in \LaTeX .
- In the regular paper format: introduction (a short literature survey), theory, results, conclusions, an appendix, and references.
- Generated plots should be discussed in the Results section of the report, with clear captions and the associated parameters you used.
- The appendix should contain your computer code.
- You can use any computer language you like, Matlab, Python, Fortran, C etc.
- You need to make a number of decisions for which you are (and should be) on your own ...

Suggested Starting References:

1. L. W. Anderson and J. E. Lawler, “A simple derivation of the band width of a laser”, American Journal of Physics, 1978.
2. C. H. Henry, “Theory of the linewidth of semiconductor lasers”, IEEE Journal of Quantum Electronics, 1982.
3. L. Chusseau, J. Arnaud, F. Philippe, “Rate-equation approach to atomic-laser light statistics”, Physical Review A, 2002.
4. L. Davidovich, “Sub-Poissonian processes in quantum optics”, Reviews of Modern Physics, 1996.
5. I. Fatadin, et al. “Numerical simulation of intensity and phase noise from extracted parameters for CW DFB lasers”, IEEE Journal of Quantum Electronics, 2006.