Department of Physics
University of Paderborn

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Exercise

Computational Optoelectronics and Photonics

Dr. M. Reichelt SS 2016

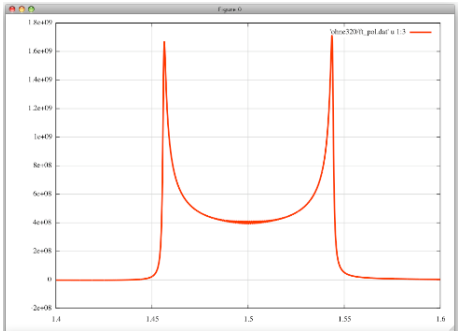
PROBLEM SHEET VII
Please prepare by next exercise.

8. **Linear Absorption Spectrum - band structure**
Solve the p-equation which has been motivated in the lecture

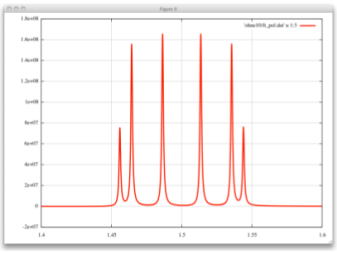
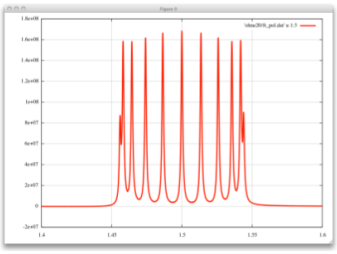
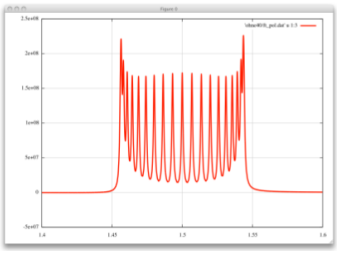
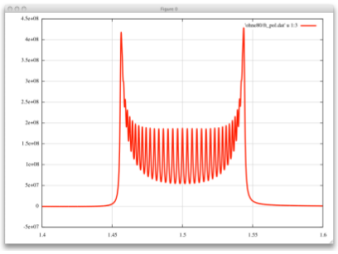
$$-i\hbar\frac{\partial}{\partial t}p_{12} = -\sum_j T^e_{2j}p_{1j} - \sum_j T^h_{j1}p_{j2} + E\mu^*_{12} \tag{14}$$

and perform a subsequent Fourier Transformation in order to determine the absorption spectrum via $\mathrm{Im}[P(\omega)]$.

The final result[1] should look like this[2]:



A converging series with less sites ($N = 10, 20, 40, 80$) could be:

[1] Calculation with $N = 320$ sites
[2] Basically, the 1d-density of states $\propto \frac{1}{\sqrt{\hbar\omega - E_g}}$ can be seen.