Université de Bourgogne
M2-QT-PPN
Quantum Solid State Physics
Final Homework
Deadline : January 25th, 2023

This assignment relies on the conventions introduced during the lectures and applied in the lecture notes as well as during the practical sessions.

Objectives of the homework

This homework shall exploit the suite of Octave/Matlab/Pythons scripts developped by the student during the practical sessions in order to compute the electron band structure of the 14 semiconductors listed in Table 3.2 of the lecture notes following the Brillouin zone path defined in exercice 3.8.6 of the lecture notes. This path can be defined by the function BZpath.m that was provided to the student in a precedent e-mail.

The correctness of your results shall be checked against the results of the paper of M.L. COHEN & T. K. BERGSTRESSER, Physical Review **141**, 789 (1966) that was sent to you in a precedent e-mail. For this purpose, care must be taken in order that the zero of the energy scale is set to the top of the valence band by adjusting the value of $V_{\mathbf{G}=0}$ (In the input file Cohen-Bergstresser1966.m, for a material `i`, $V_{\mathbf{G}=0} =$ `ff(i,1)`). For each material, this requires a preliminary analysis of the results at the Γ points obtained by a first run using $V_{\mathbf{G}=0} = 0$.

Deliverables :

(a) Octave/Matlab/Python scripts where the comments refer to the equation numbers of the lecture notes.

(b) Readable pdf file showing the plots of the dispersion relations in appropriate units. In the same file, these plots shall be compared to the results of the paper of M.L. COHEN & T. K. BERGSTRESSER, Physical Review **141**, 789 (1966).

Deadline : January 25th, 2023 at 17 :00 by e-mail to alain.dereux@u-bourgogne.fr