Kwant project

Nagy Dániel

Week 3: march 4. - march 10.

2019/03/13

1 Schedule for the semester

Table 1: Original schedule

Week	Scheduled Task
feb. 18. - feb. 24.	Installing Kwant & Running an example
feb. 25. - mar. 3.	Reading the documentation & Running more examples
mar. 4 - mar. 10	Reading theory of 2DEG & Writing a 2DEG calculation
mar. 11. - mar. 17.	2DEG constriction in a magnetic field
mar. 18. - mar. 24.	Graphene focusing
mar. 25. - mar. 31.	Mid term report
apr. 1. - apr. 7.	Topological Anderson Insulator/ Majorana fermion 1.
apr. 8. - apr. 14.	Topological Anderson Insulator/ Majorana fermion 2.
easter holiday	-
apr. 22. - apr. 28.	Topological Anderson Insulator/ Majorana fermion 3.
apr. 29. - may 5.	Topological Anderson Insulator/ Majorana fermion 4.
Eötvös/Pázmány days	-
may 13. - may 19.	Final report

Table 2: Status

Week	Scheduled Task
feb. 18. - feb. 24.	Installing Kwant & Running an example ✓
feb. 25. - mar. 3.	Reading the documentation & Running more examples ✓
mar. 4 - mar. 10	Struggling with graphene minimal conductivity - no result
mar. 11. - mar. 17.	2DEG basics & Eigenstates and LDOS calculation ✓
mar. 18. - mar. 24.	2DEG in magnetic field
mar. 25. - mar. 31.	Mid term report
apr. 1. - apr. 7.	Topological Anderson Insulator/ Majorana fermion 1.
apr. 8. - apr. 14.	Topological Anderson Insulator/ Majorana fermion 2.
easter holiday	-
apr. 22. - apr. 28.	Topological Anderson Insulator/ Majorana fermion 3.
apr. 29. - may 5.	Topological Anderson Insulator/ Majorana fermion 4.
Eötvös/Pázmány days	-
may 13. - may 19.	Final report

2 Cicular Square lattice disk eigenstates

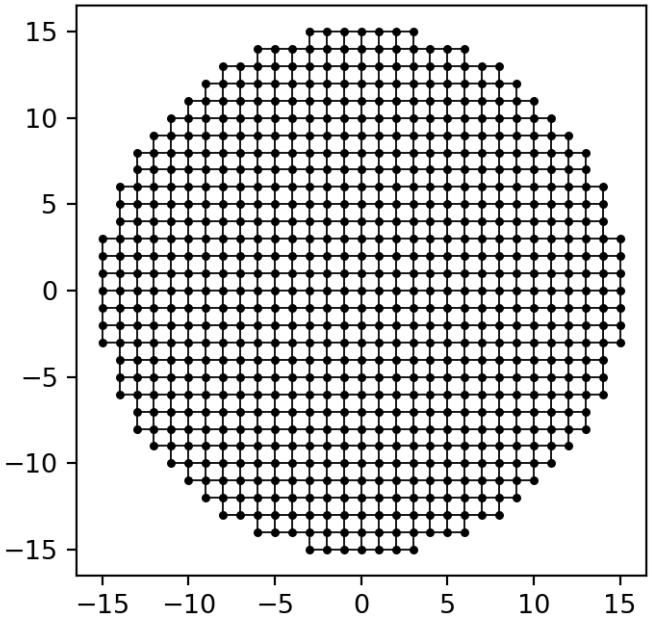
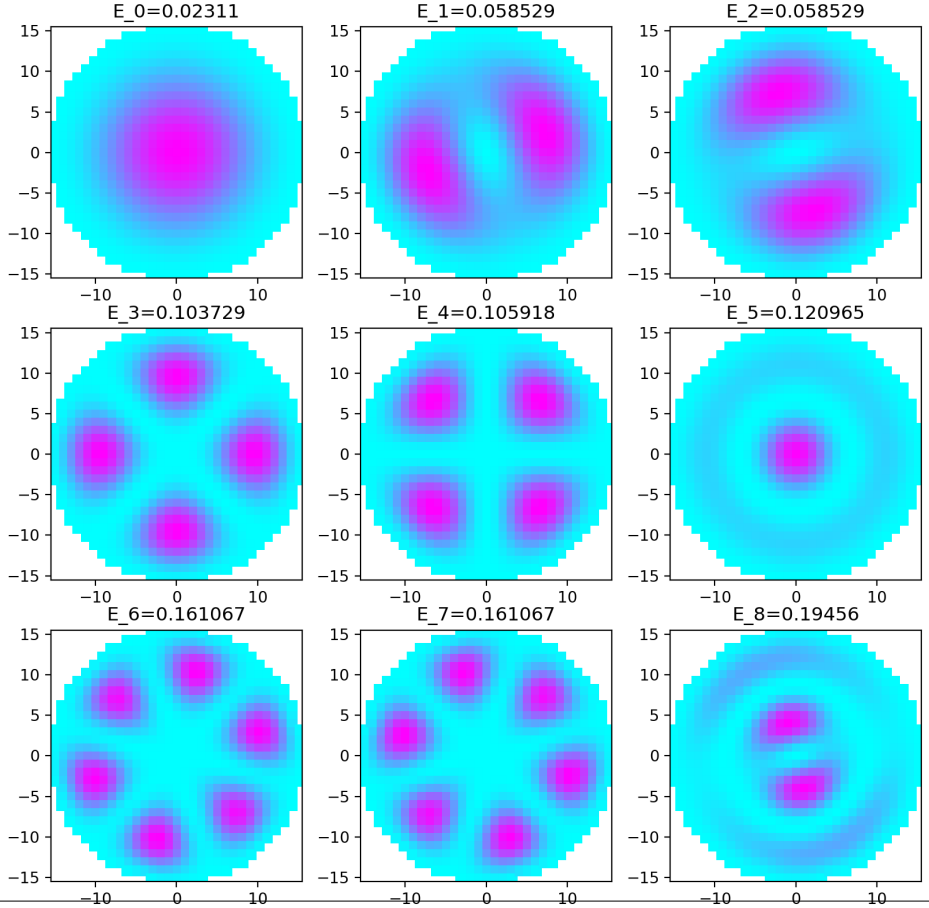


Figure 1: A circular square lattice without leads


E_0=0.02311
E_1=0.058529
E_2=0.058529
E_3=0.103729
E_4=0.105918
E_5=0.120965
E_6=0.161067
E_7=0.161067
E_8=0.19456

3 Cicular Square lattice disk LDOS

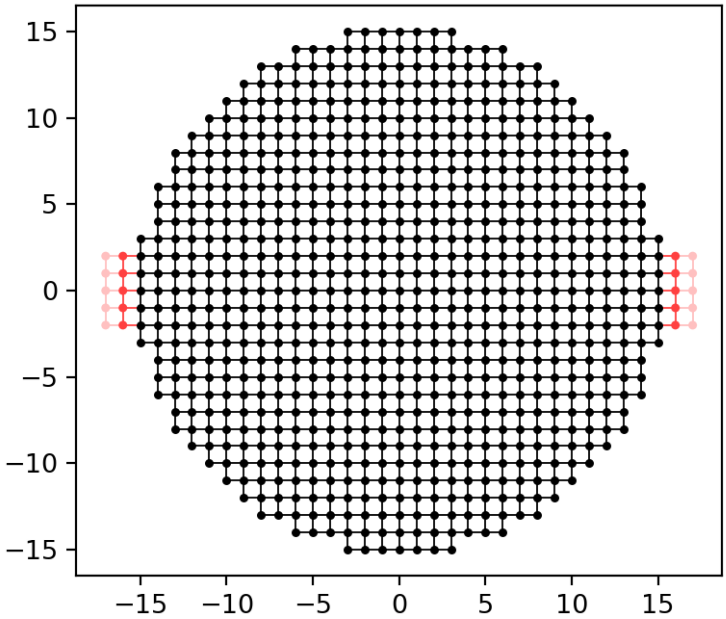


Figure 3: A circular square lattice with leads attached to it

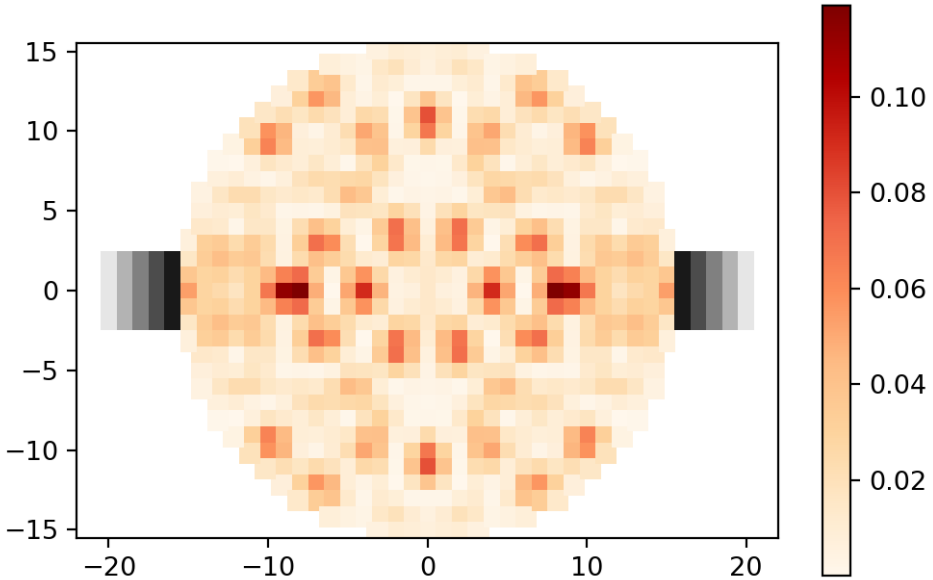


Figure 4: Local density of states of the system, calculated with kwant.

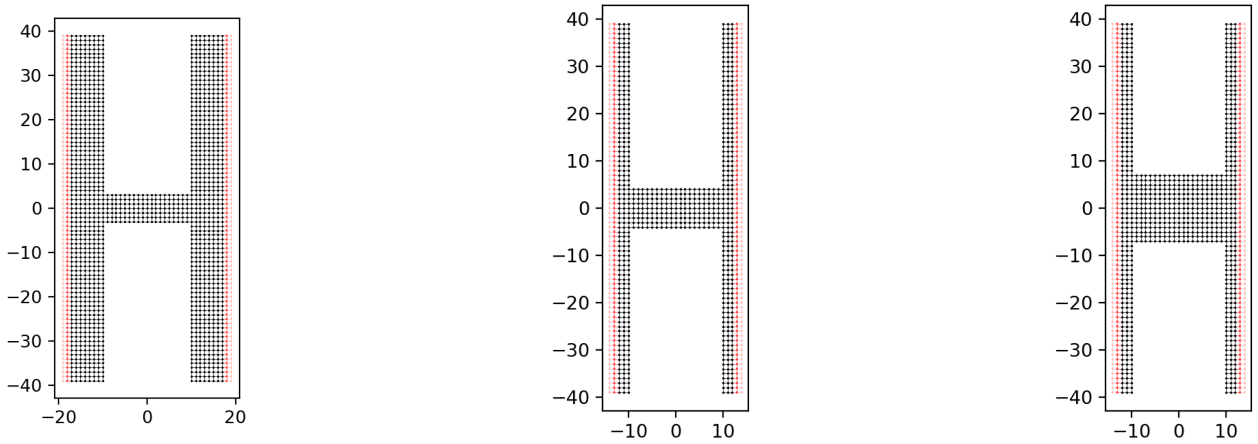


Figure 5: Three different point contact layouts tested with kwant.

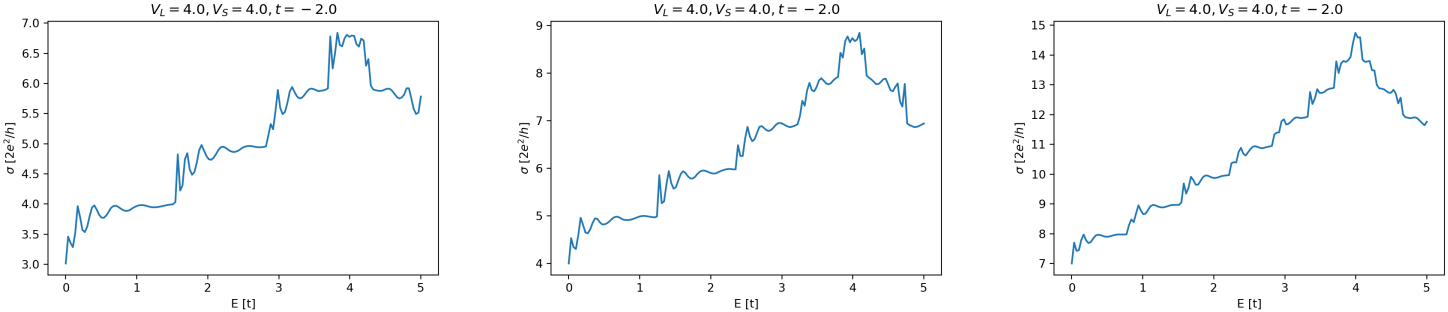


Figure 6: Conductances computed for the three systems at $V_L = 4$ and $V_S = 4$.

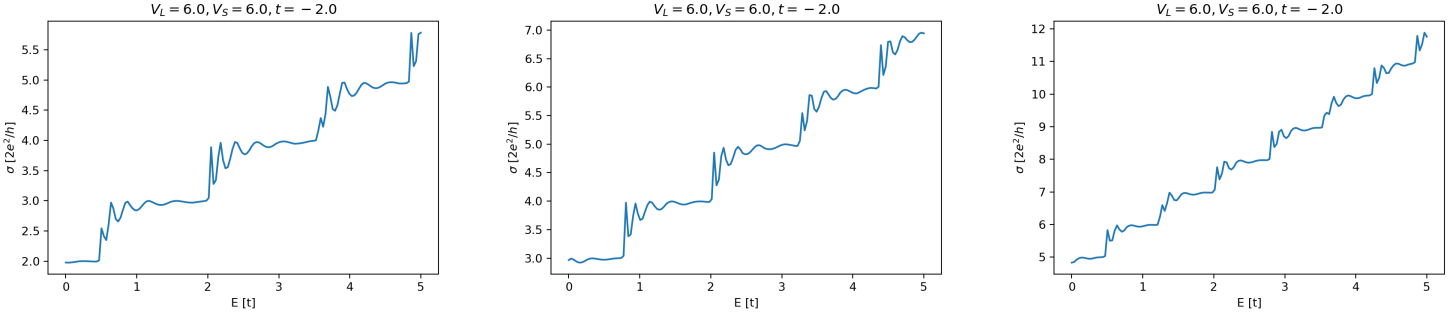


Figure 7: Conductances computed for the three systems at $V_L = 6$ and $V_S = 6$.

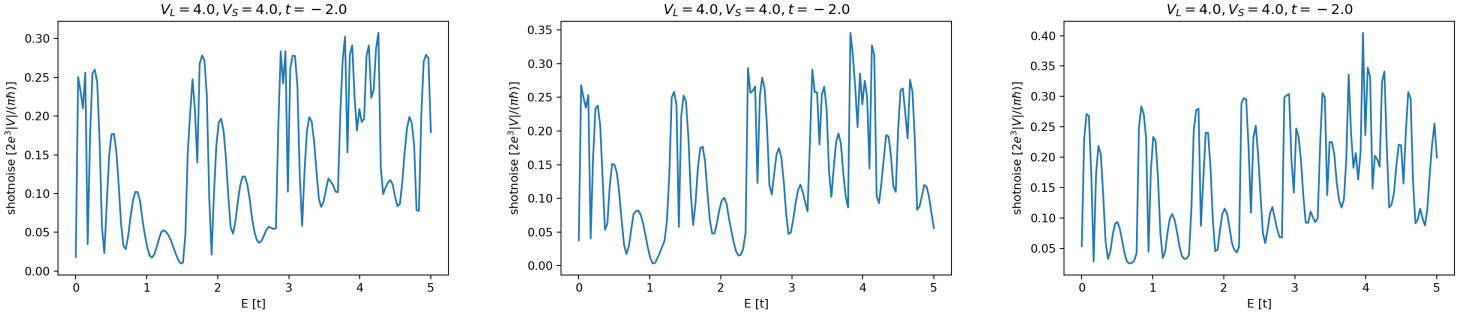


Figure 8: Shot-noises computed for the three systems at $V_L = 4$ and $V_S = 4$.

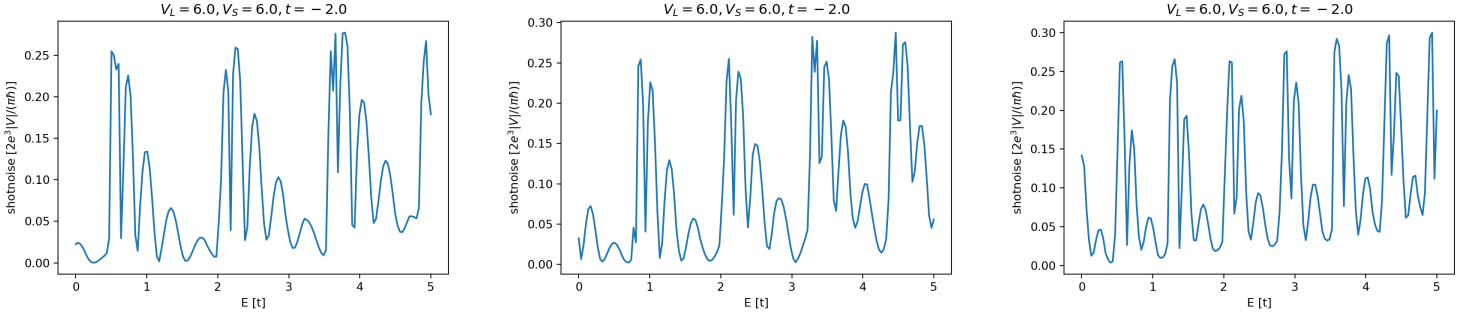


Figure 9: Shot-noises computed for the three systems at $V_L = 6$ and $V_S = 6$.