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Disorder induced failure of topological protection in fractal quantum Hall effect

In this work, by using an order N computational approach to compute the exact Kubo formulas for the dissipative and the Hall conductivities, we show the instability of the topological protection of quantized conductance plateaus, driven by disorder-induced floating up and merging of extended states with different chiralities, which result in cancellation or addition of Chern numbers. This prediction should be accessible experimentally by tuning the temperature.

References

[1]   Nicolas Leconte, Stephan Roche, Jeil Jung and Allan MacDonald (in preparation)
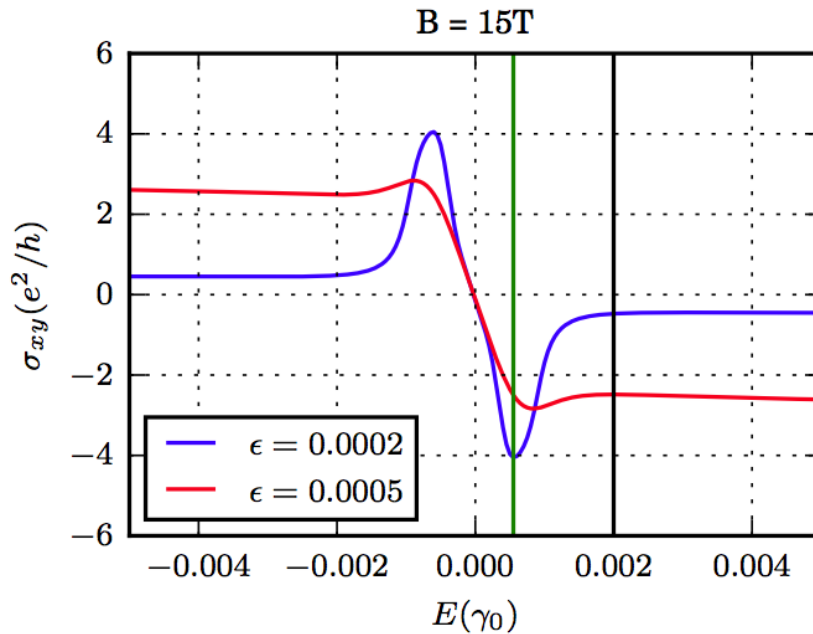
Figures

Figure 1: Calculated transverse conductivity at B=15T for graphene on hBN for two values of disorder, ε = 0.0002 and 0.0005γ0.