Field-stabilized Chern insulator in magic-angle helical trilayer graphene

Aaron Sharpe

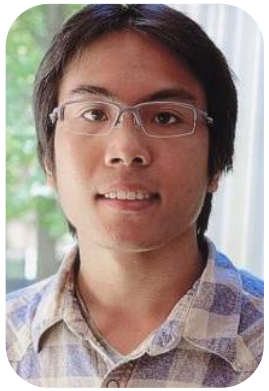
Acknowledgements

Liqiao Xia

Aviram Uri

Sergio de la Barrera

Pablo Jarillo-Herrero



Trithep Devakul

Yves Kwan

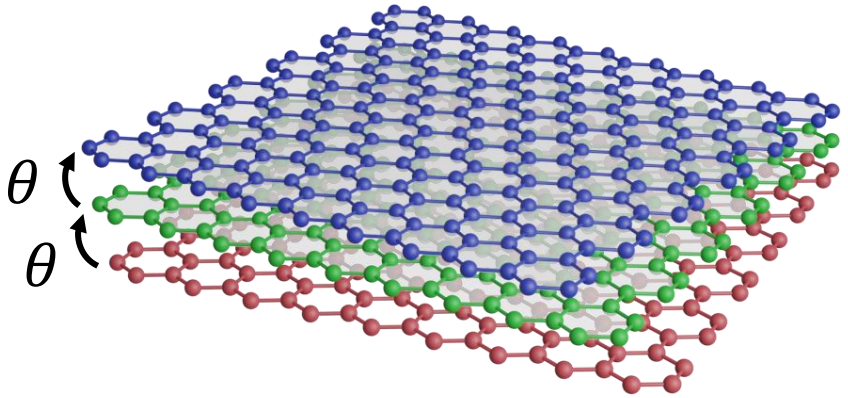
MIT:
Liang Fu

Stanford University:
Zoe Zhu
Marc Kastner
David Goldhaber-Gordon

NIMS:
Takashi Taniguchi
Kenji Watanabe

National High Magnetic Field Lab:
Ali Bangura
Robert Nowell
Scott Hannahs
Andrew Woods
Glover Jones

HTG: C_{2z} breaking domains



Z. Zhu et al. PRB (2020)
N. Nakatsuji et al. PRX (2023)
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L.Q. Xia et al. arXiv.2310.12204

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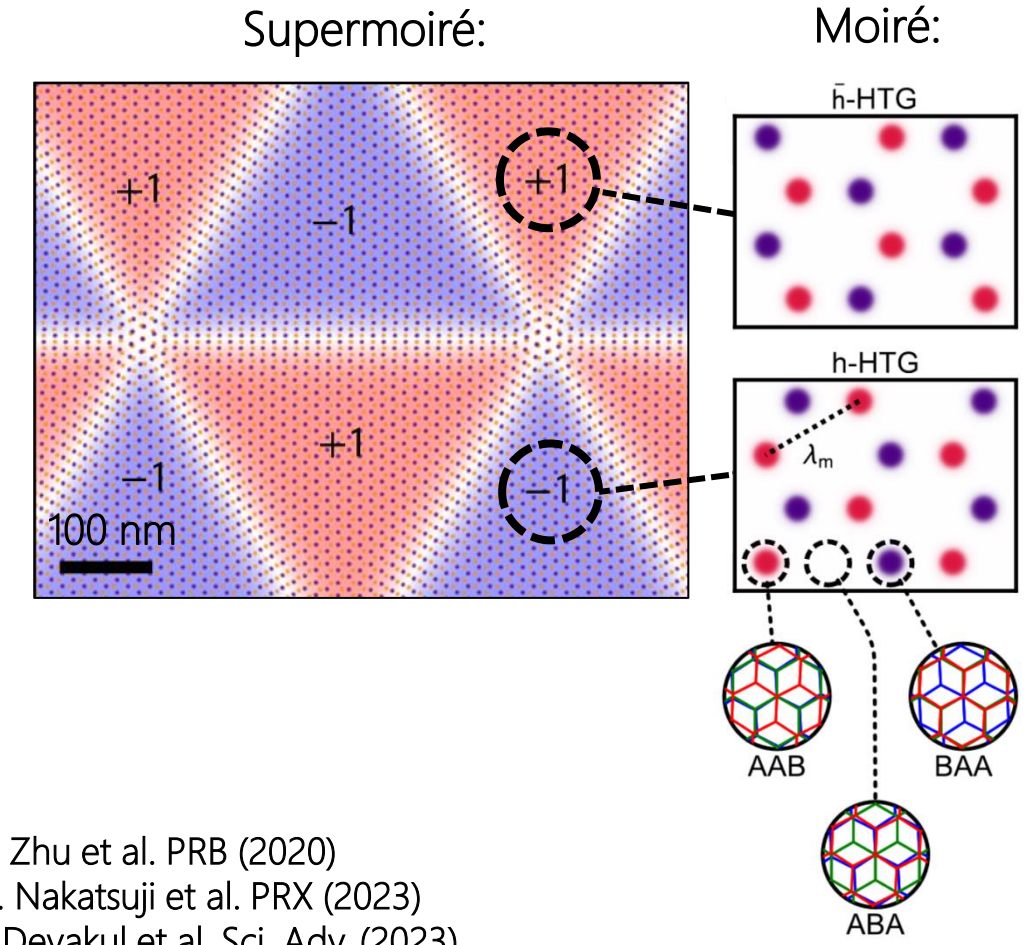

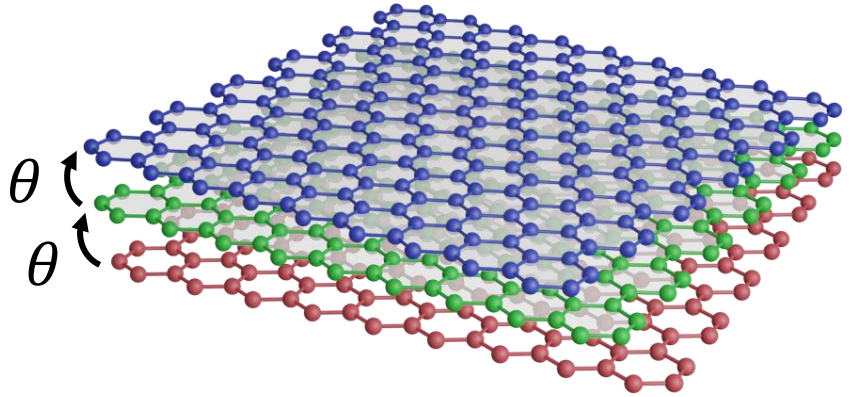

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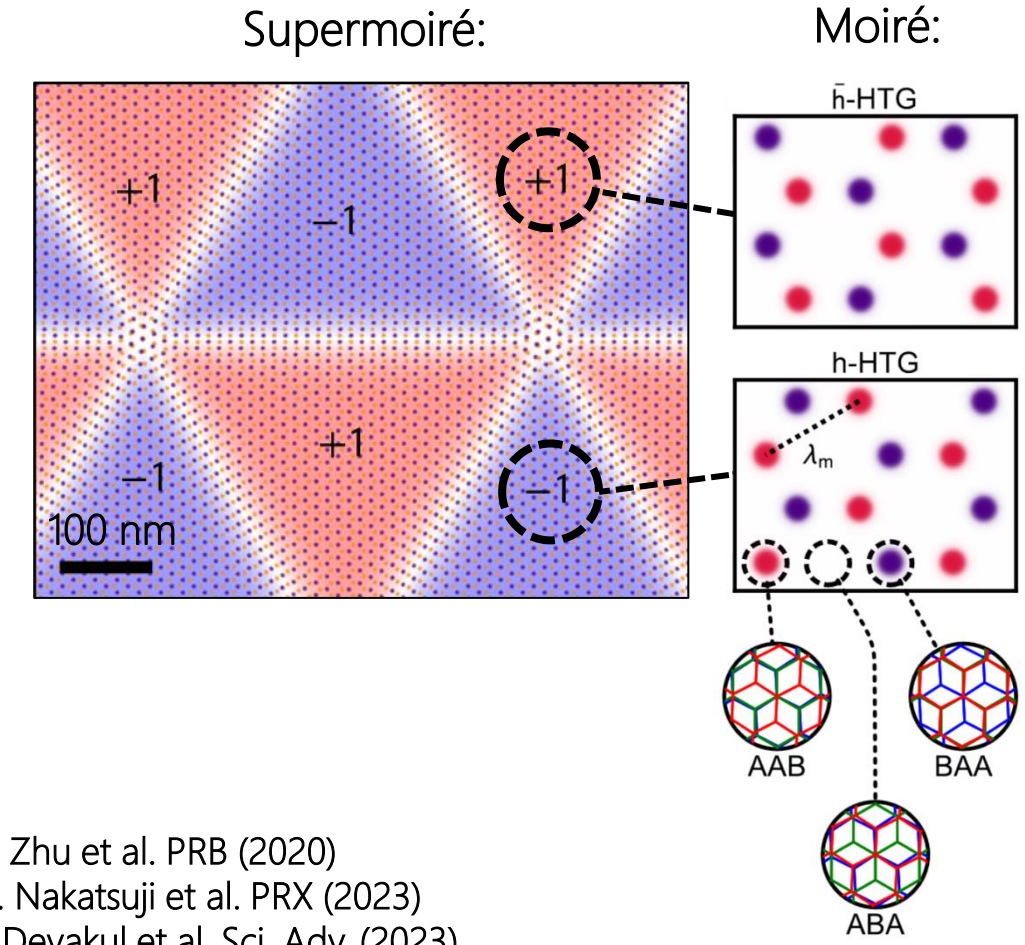

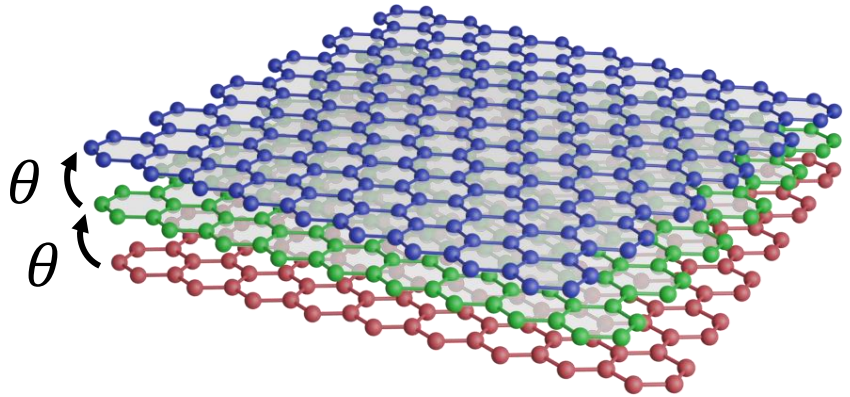

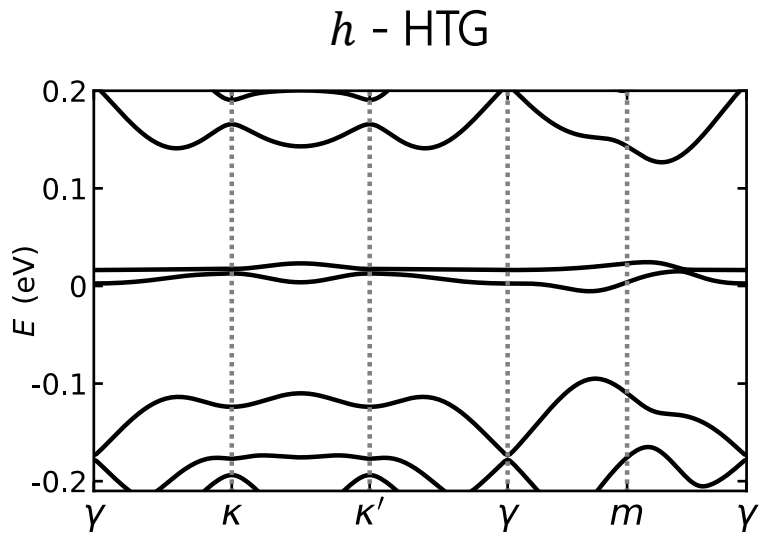

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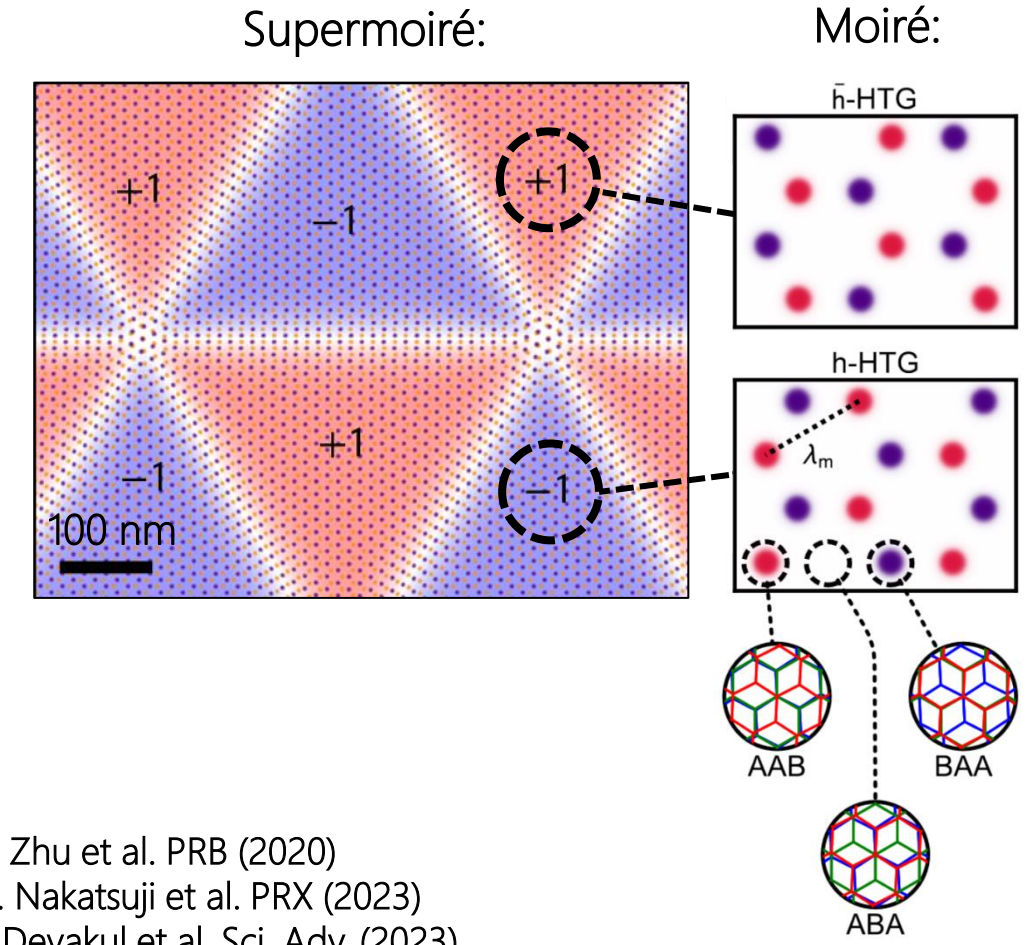

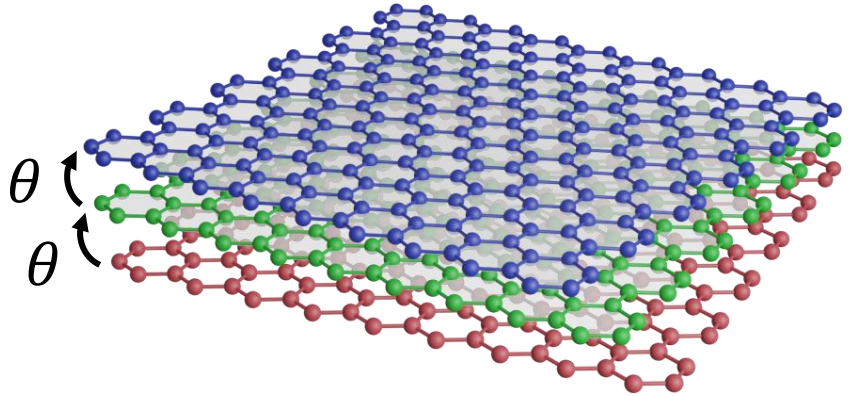

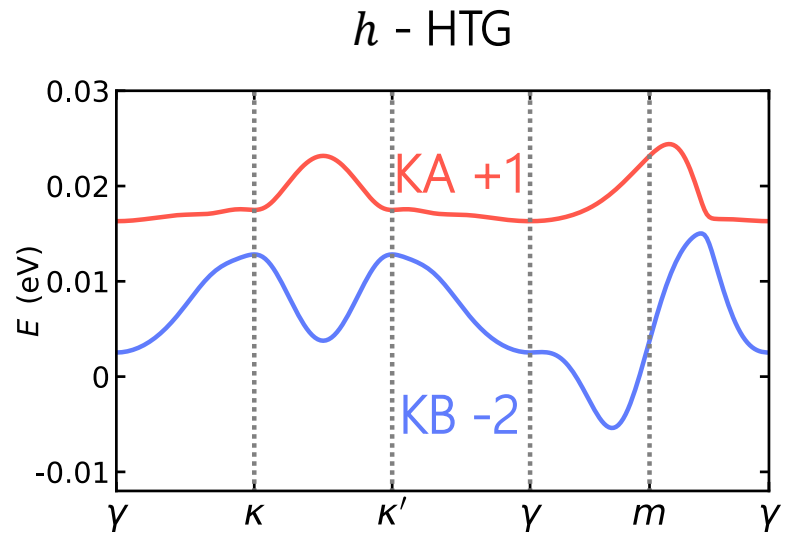

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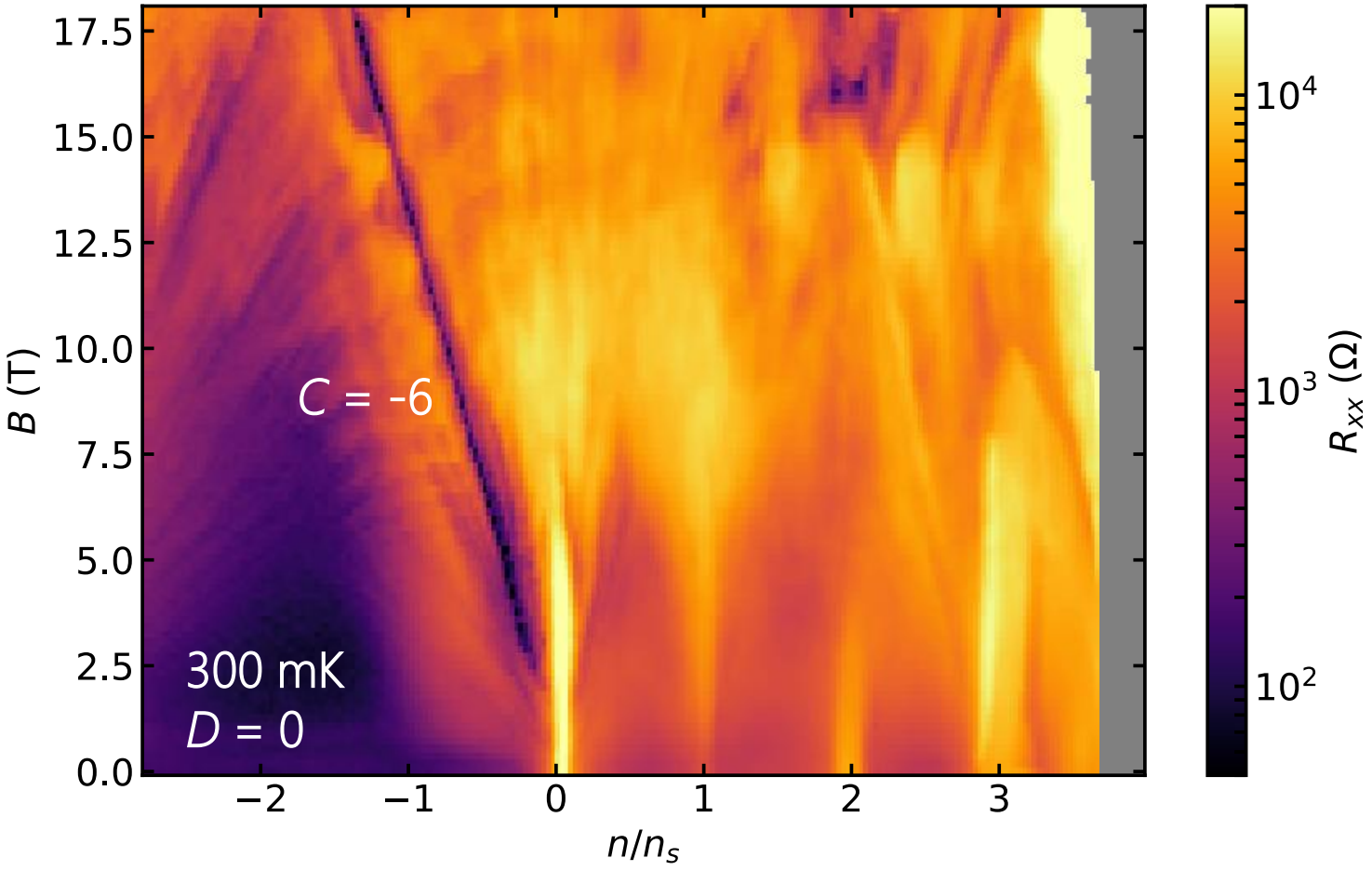
Field-induced Chern insulator?



L.Q. Xia et al. arXiv.2310.12204

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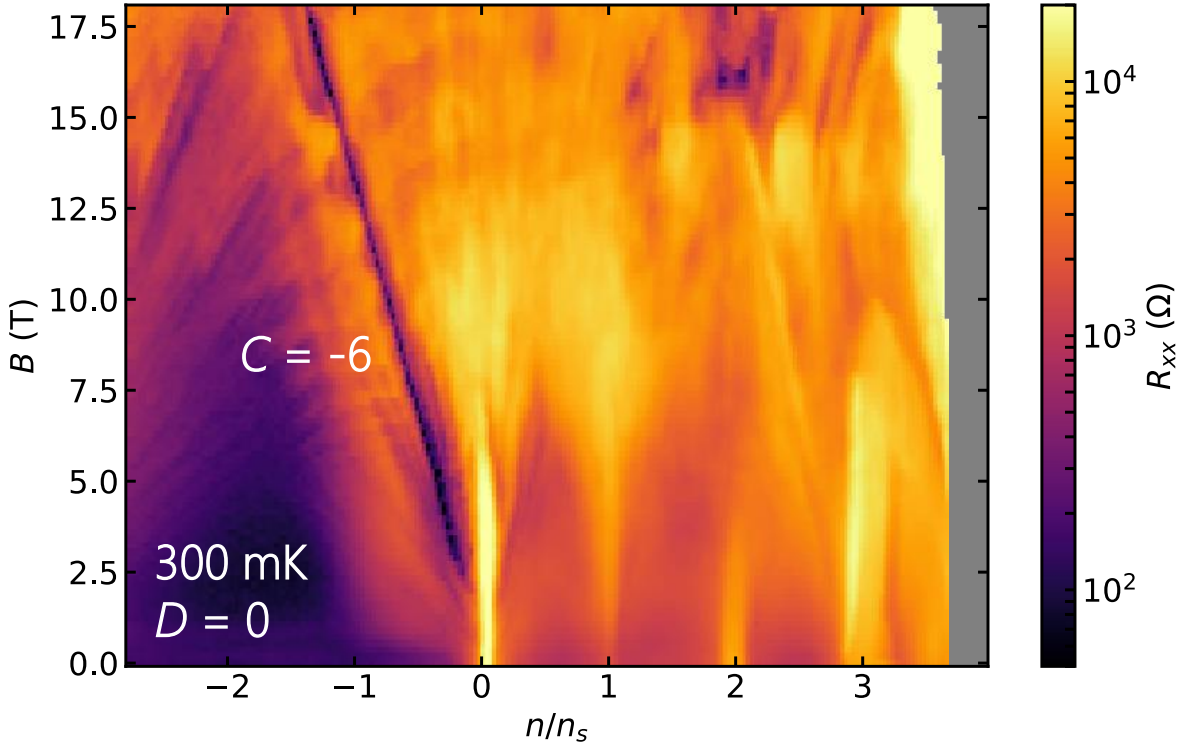
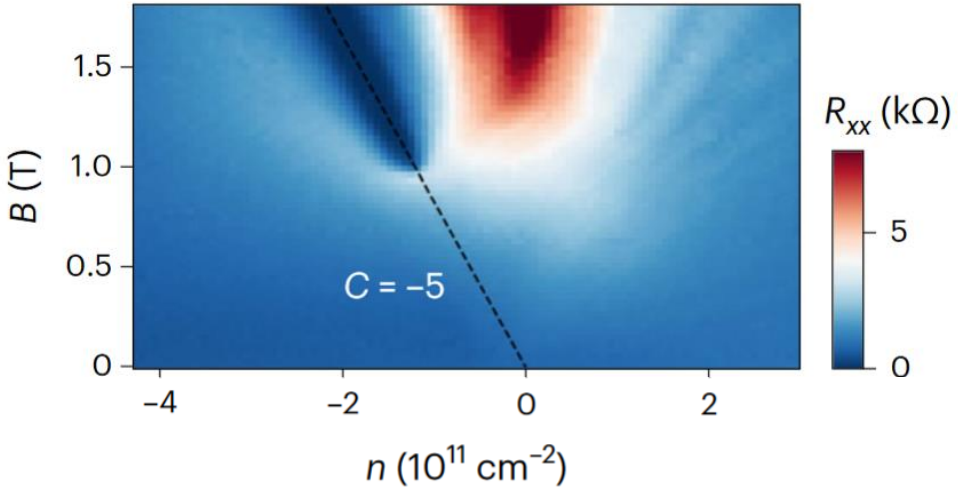
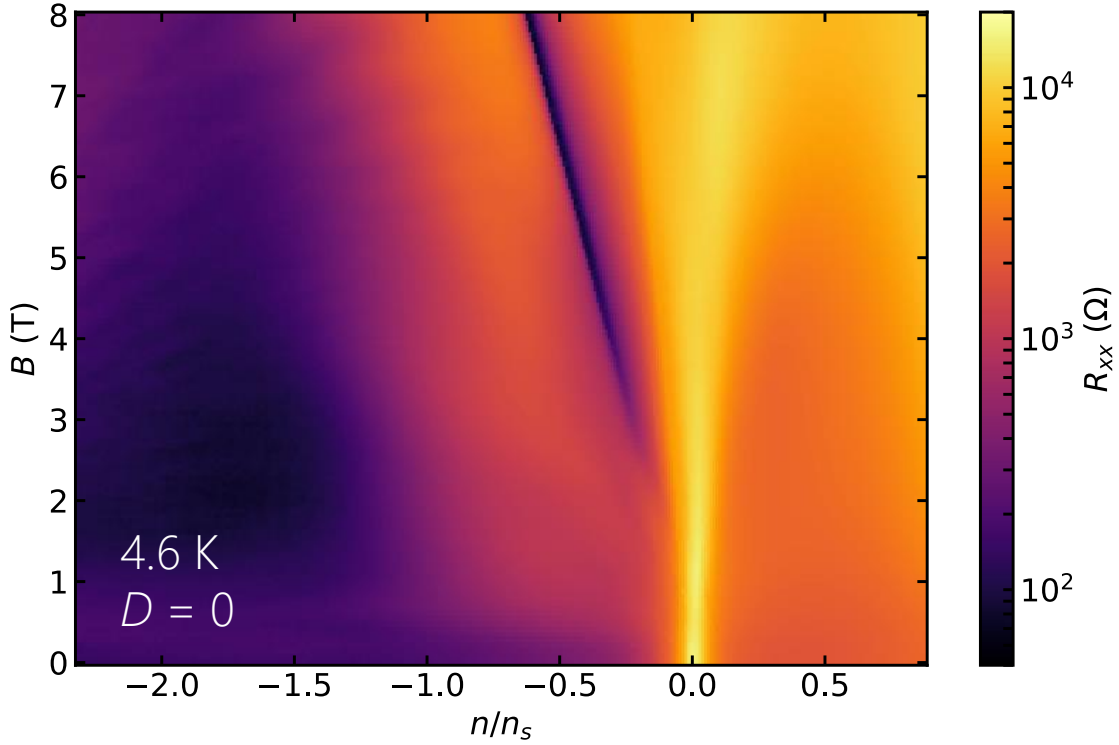


Pentalayer rhombohedral graphene



T. Han, et al. Nat. Nanotech. (2023)
L.Q. Xia et al. arXiv.2310.12204

Quantized Hall resistance



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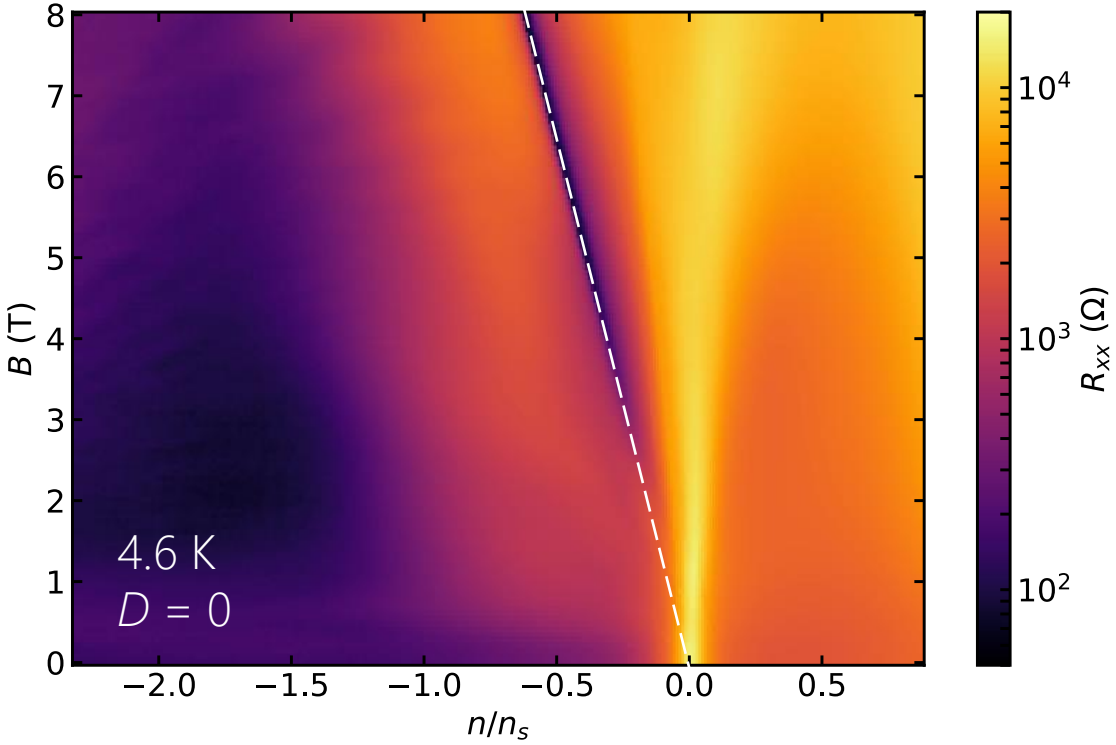
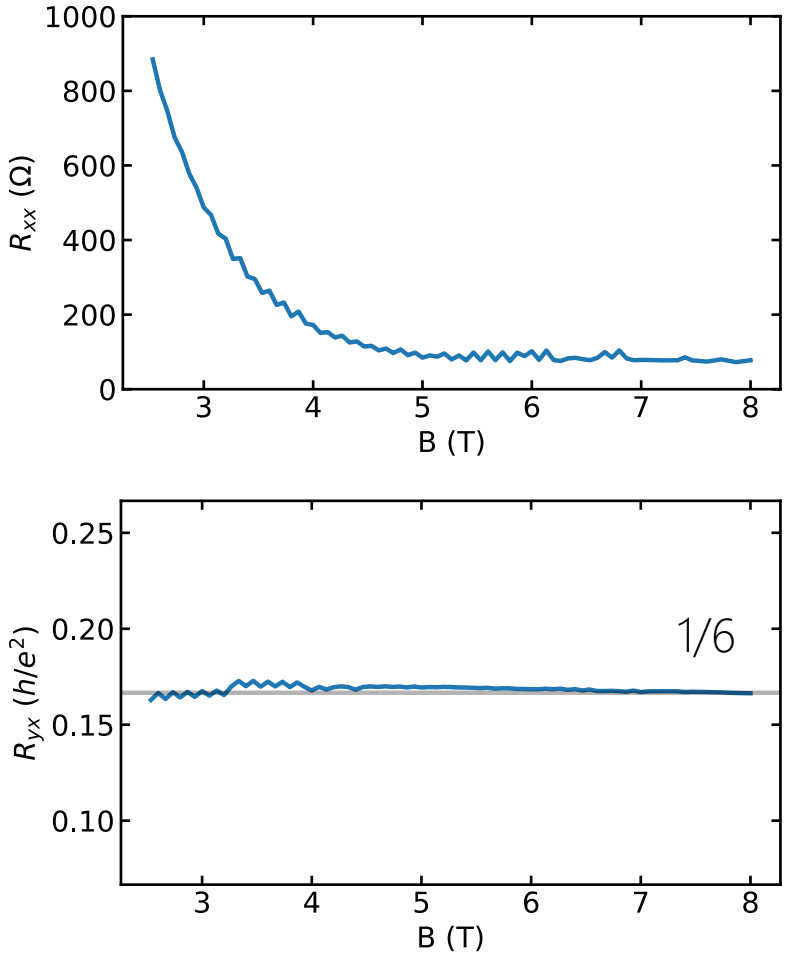
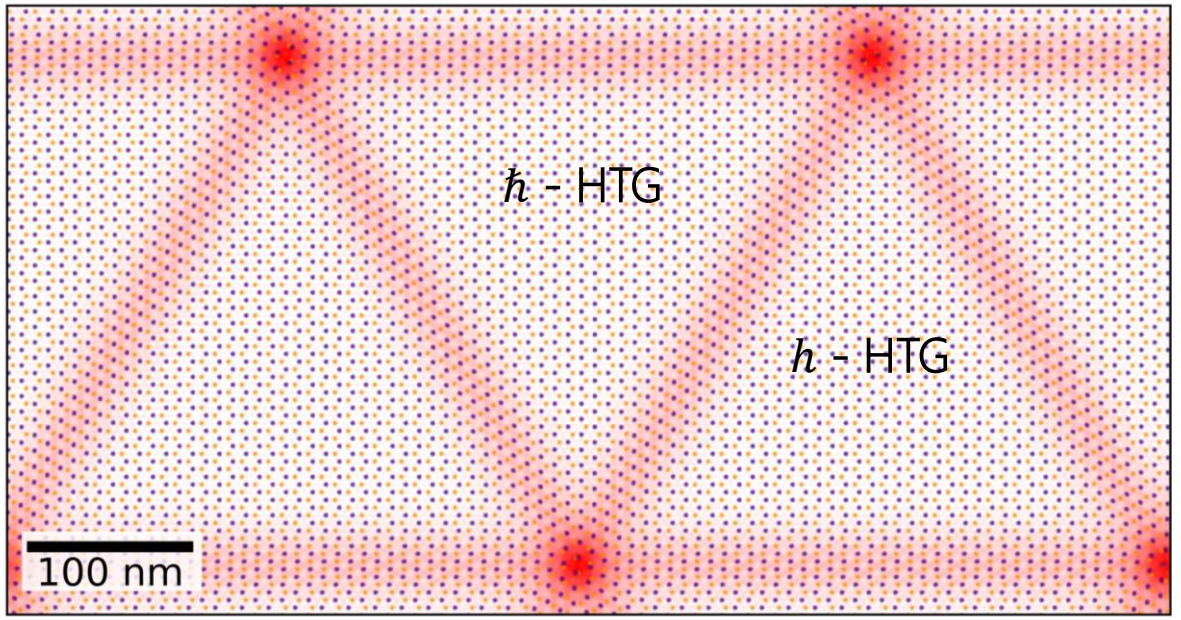




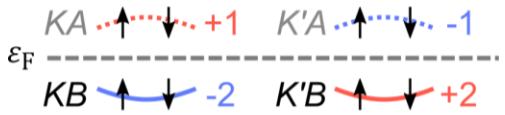
Quantization?



N. Nakatsuji et al. PRX (2023)
Y. Kwan et al. arXiv:2308.09706

Quantization?

h - HTG



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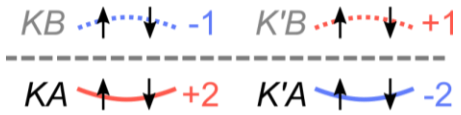

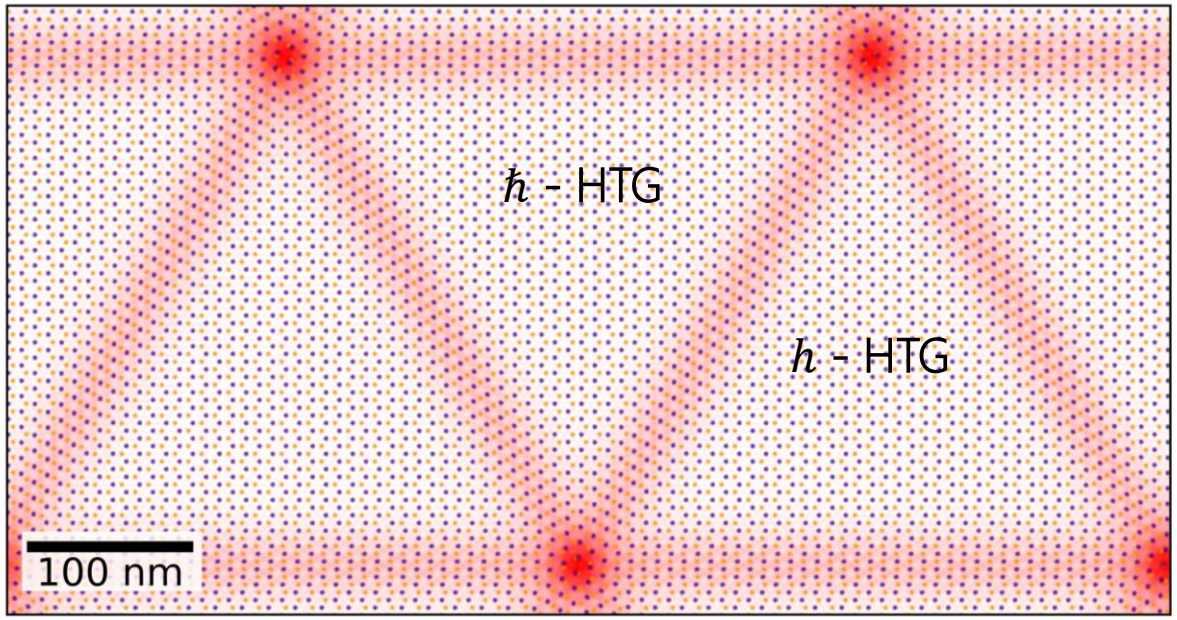

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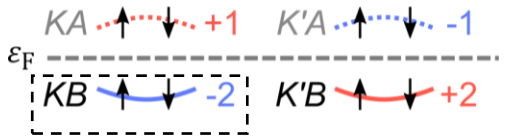

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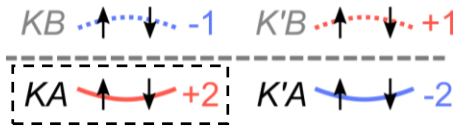

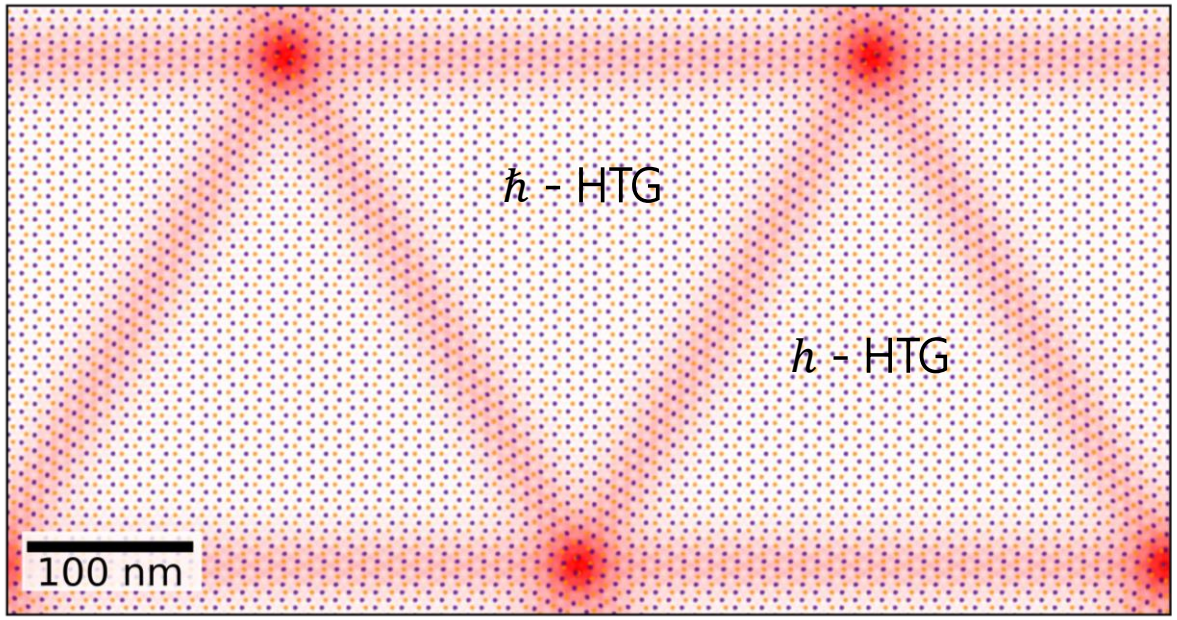

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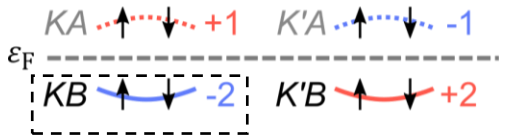

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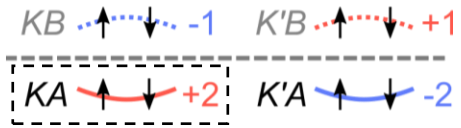

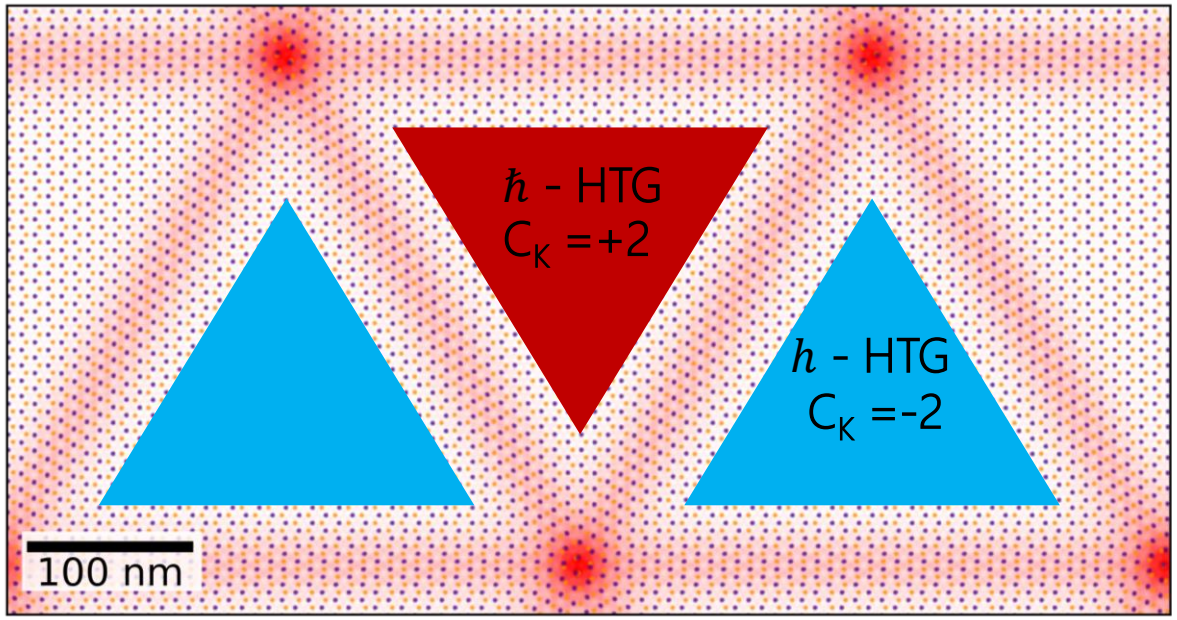

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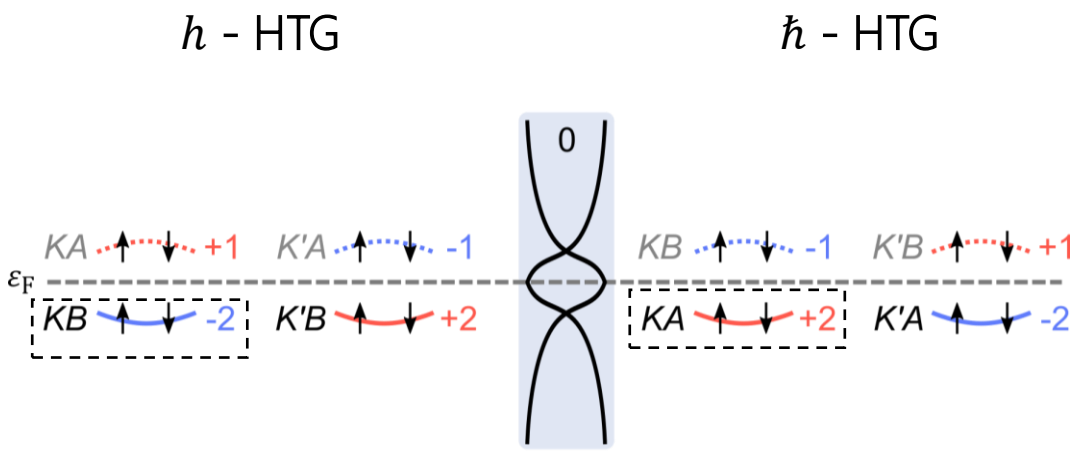

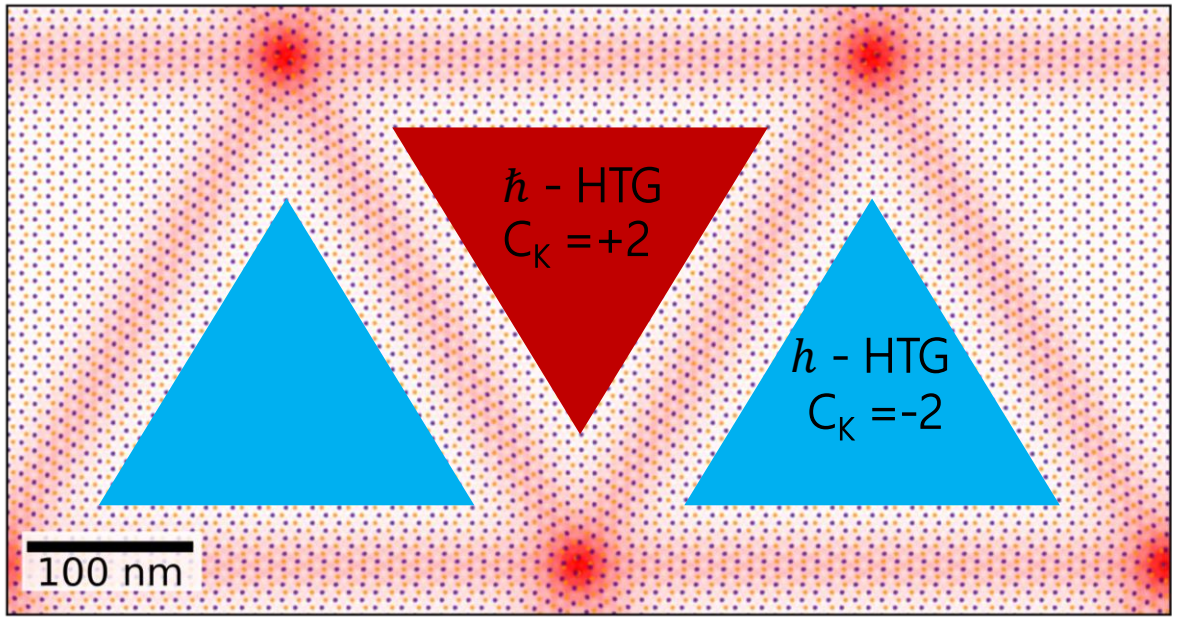

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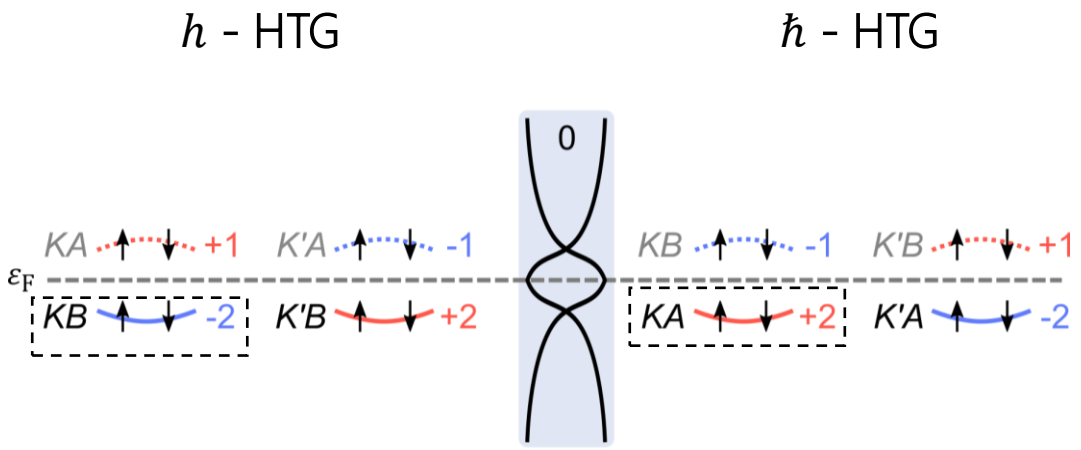

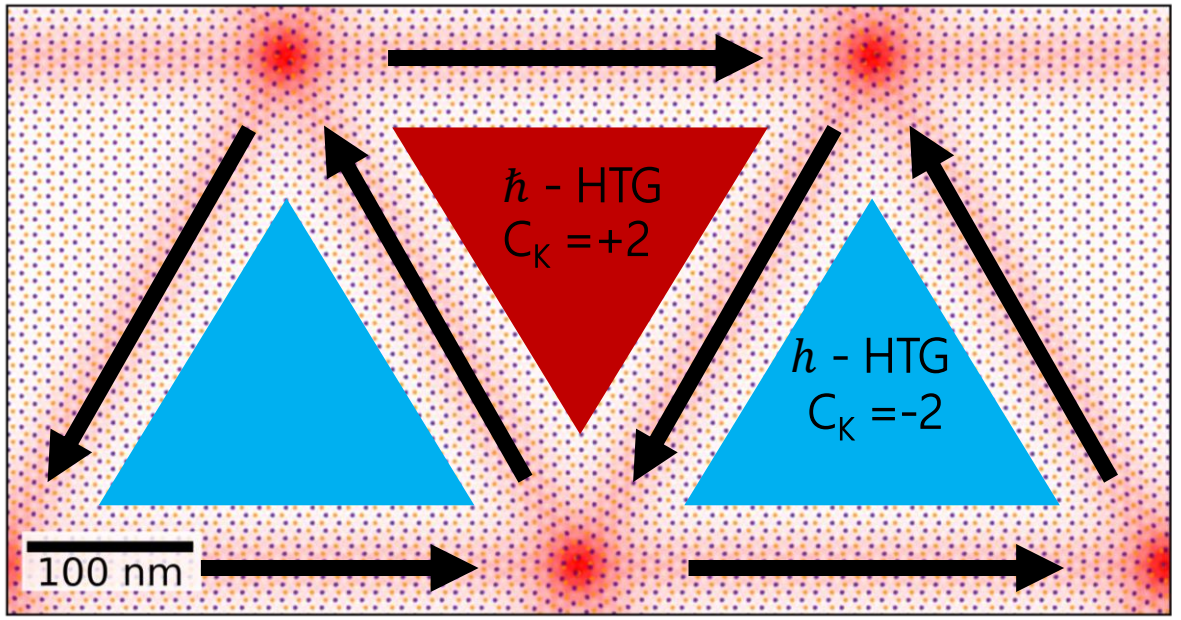

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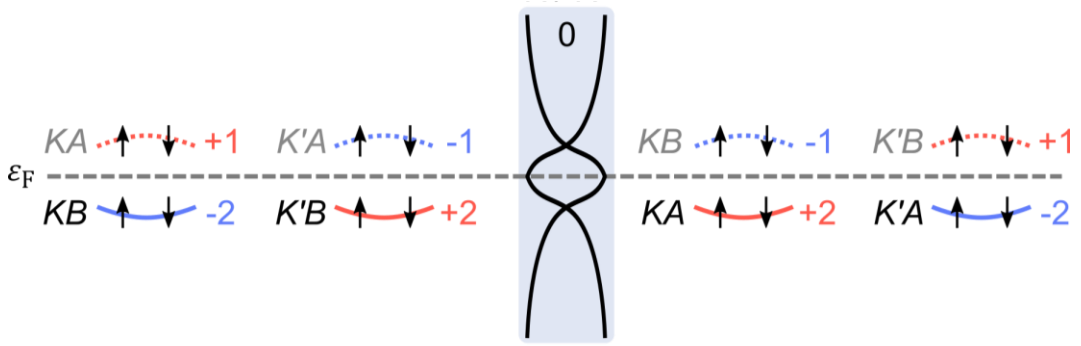
Strong-coupling schematic

B = 0, C=0

h - HTG

$\hbar$ - HTG



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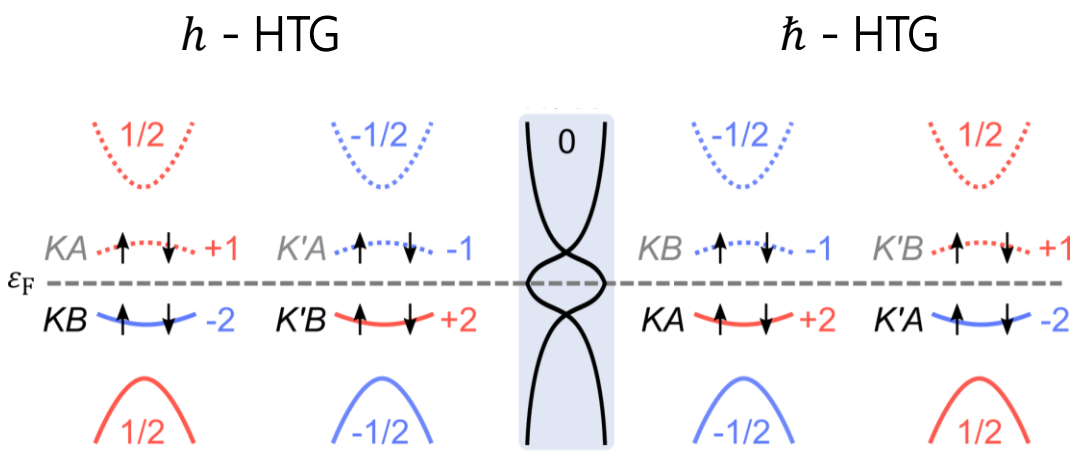

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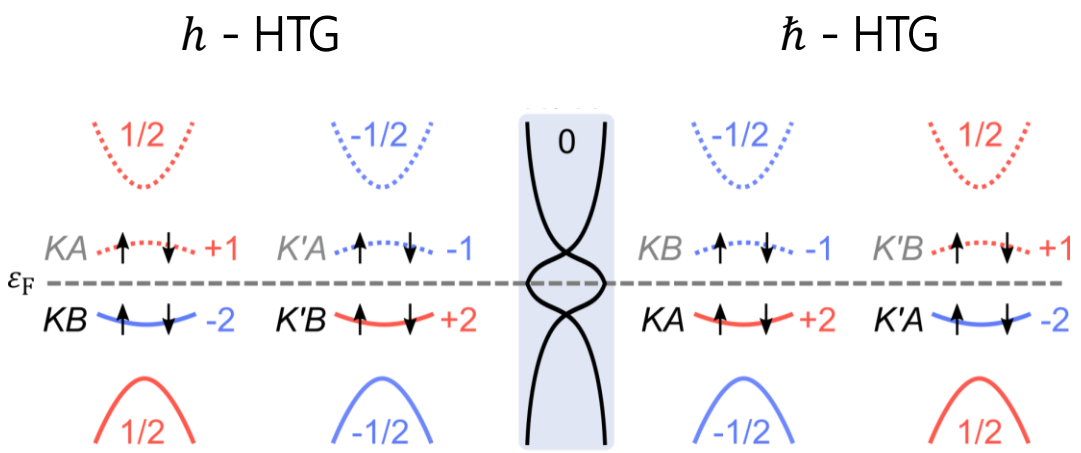
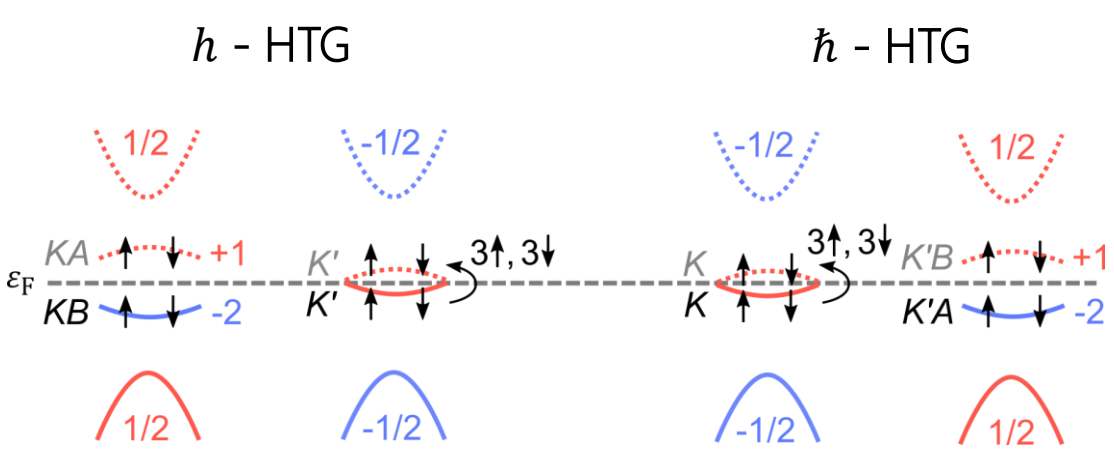


$B = B_c$



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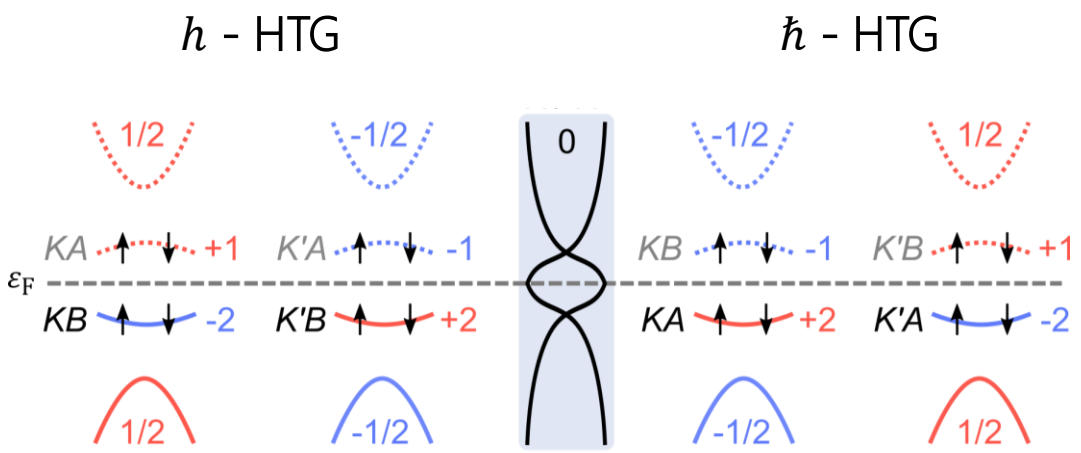
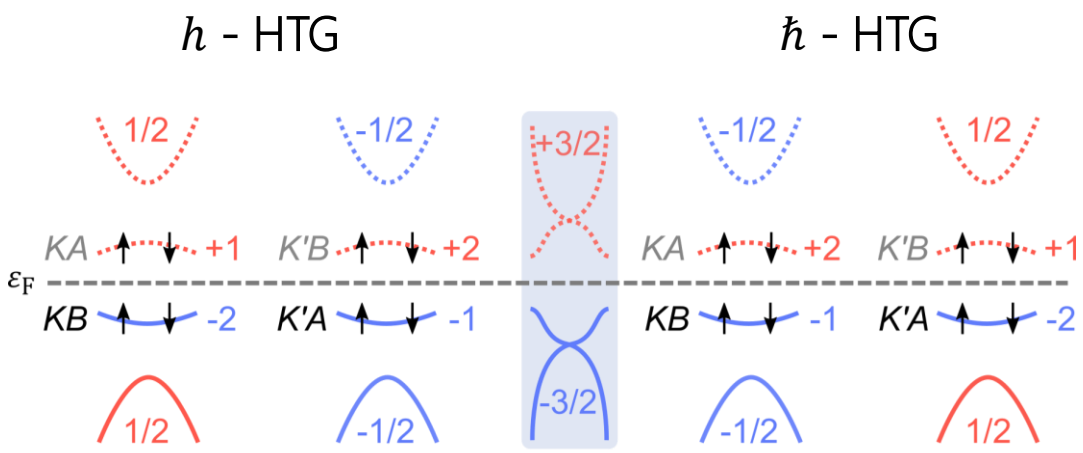


$B > B_c$, C=-6



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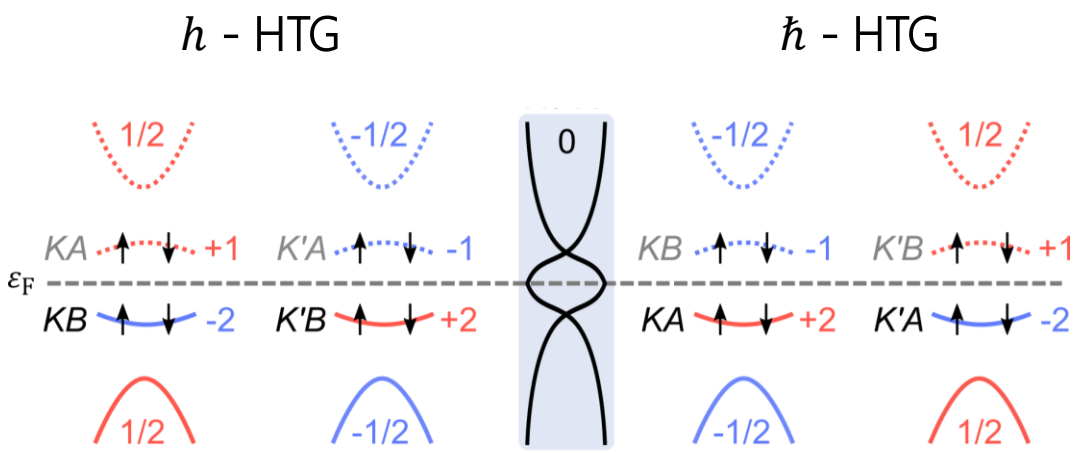

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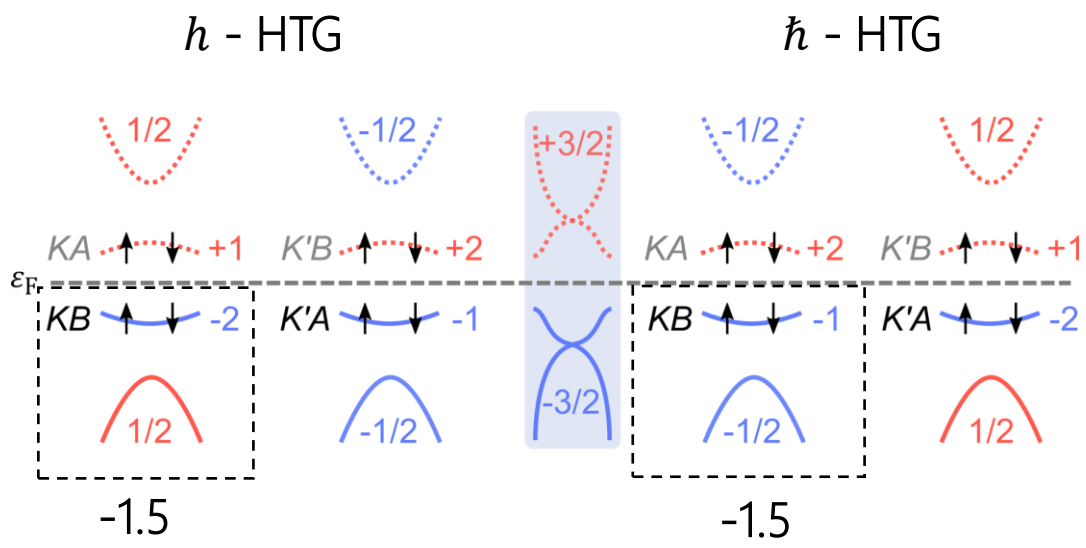

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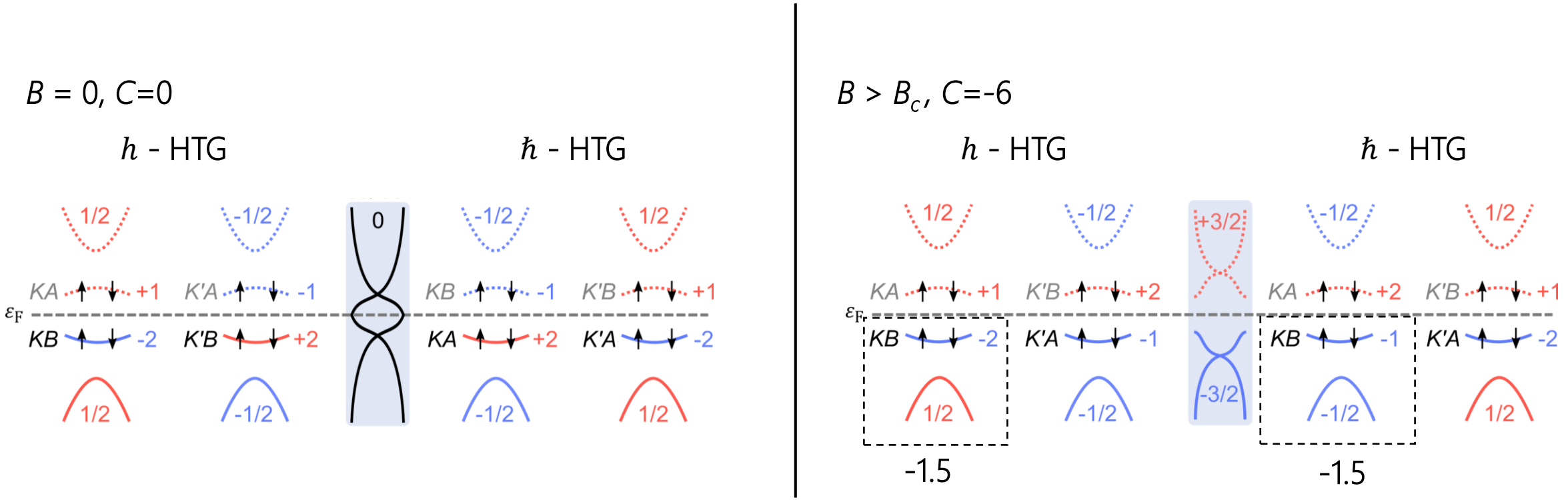
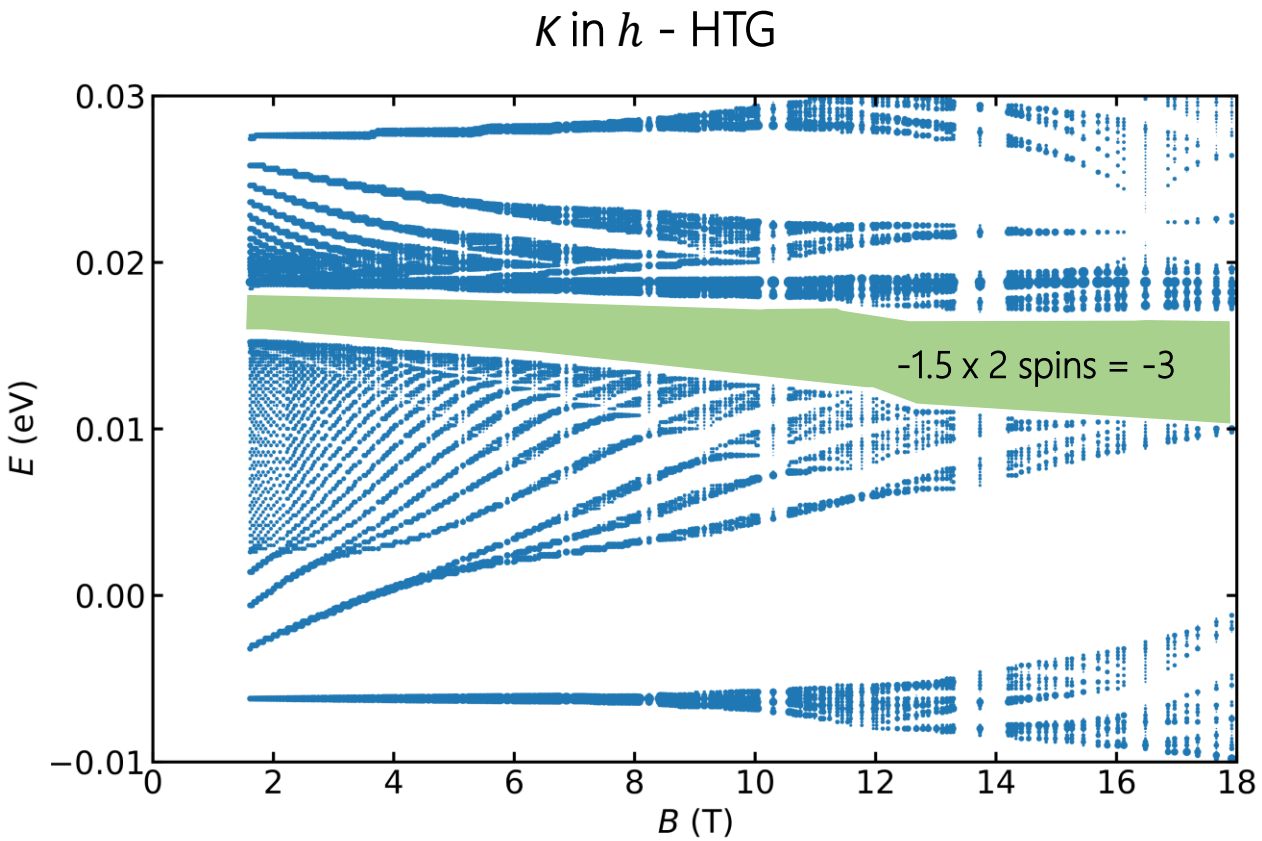


- Only possible arrangement of bands that yields constant total valley Chern number
  - Spatially varying Chern number of the flat band

N. Nakatsuji et al. PRX (2023)
Y. Kwan et al. arXiv:2308.09706

Hofstadter spectrum of h - HTG



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J. Herzog-Arbeitman, et al. PRL (2020)

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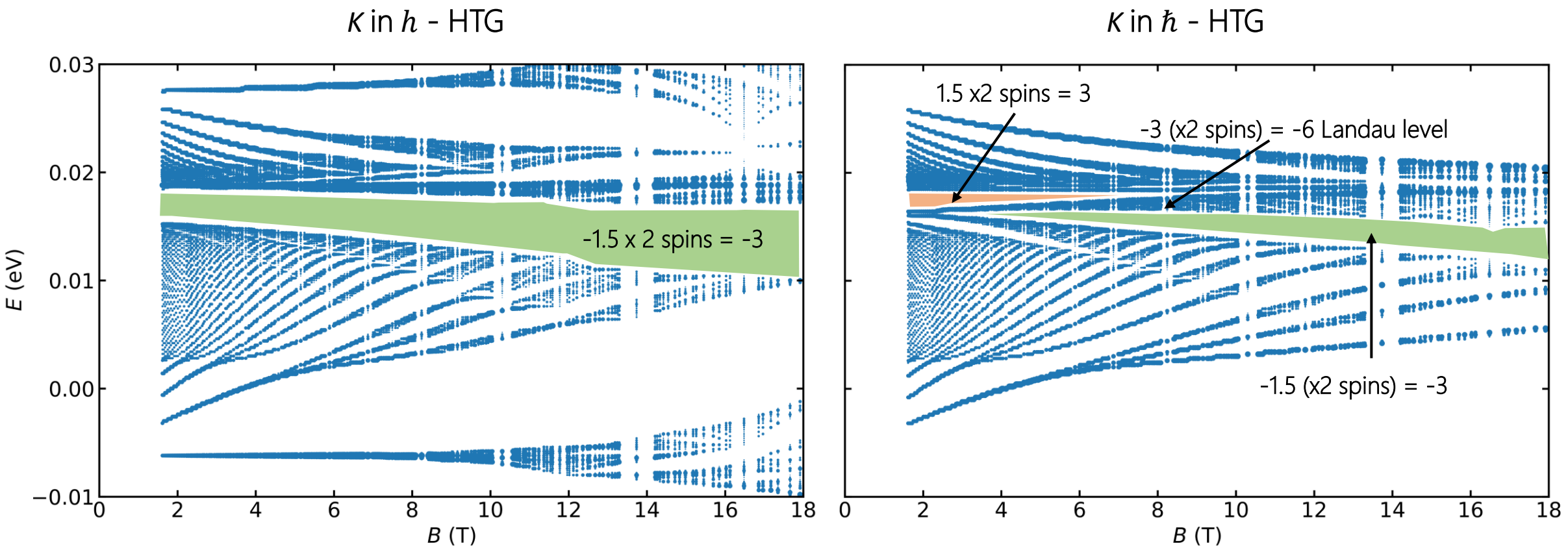

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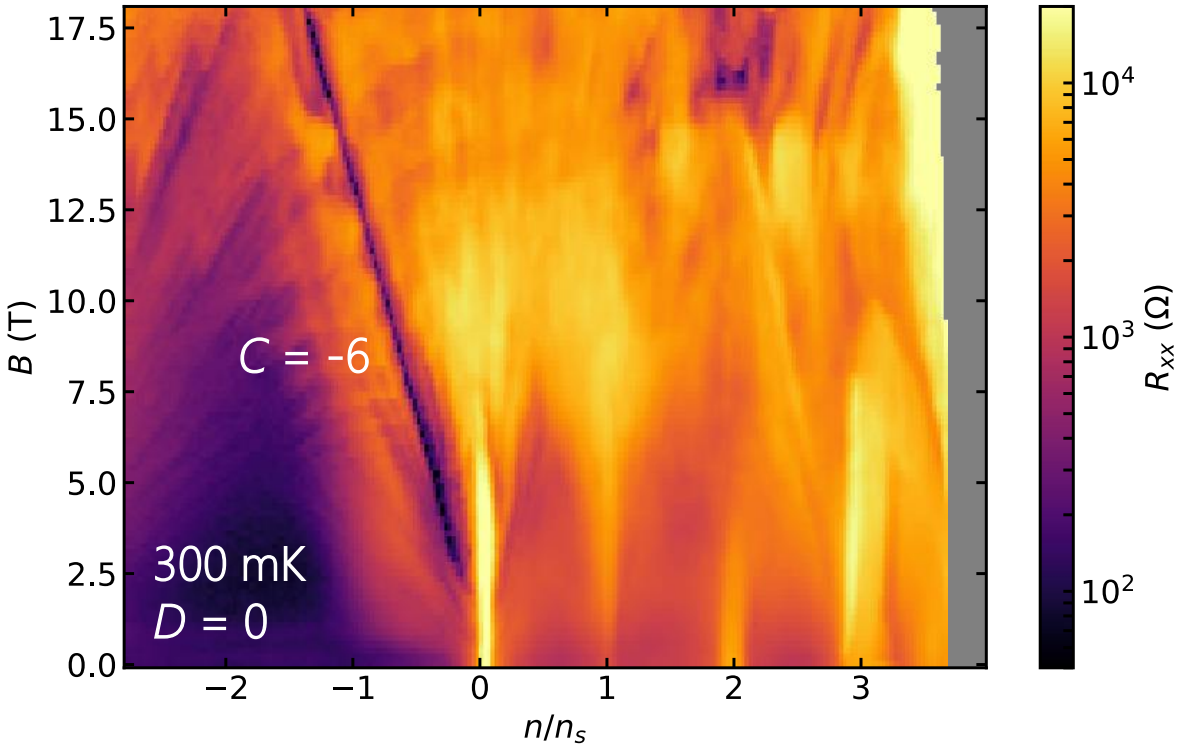
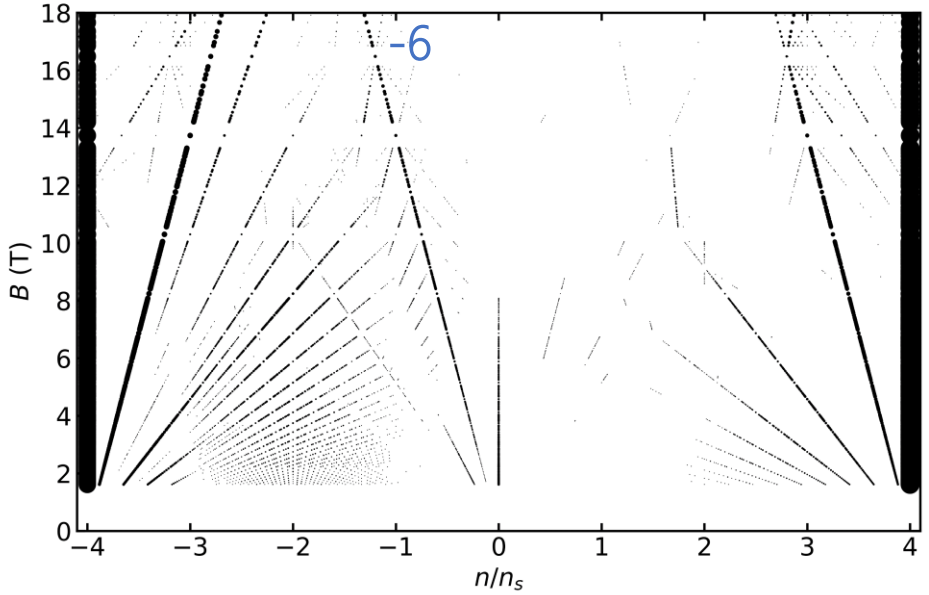
C=-6 gap in domain and walls



Domain (both valleys)



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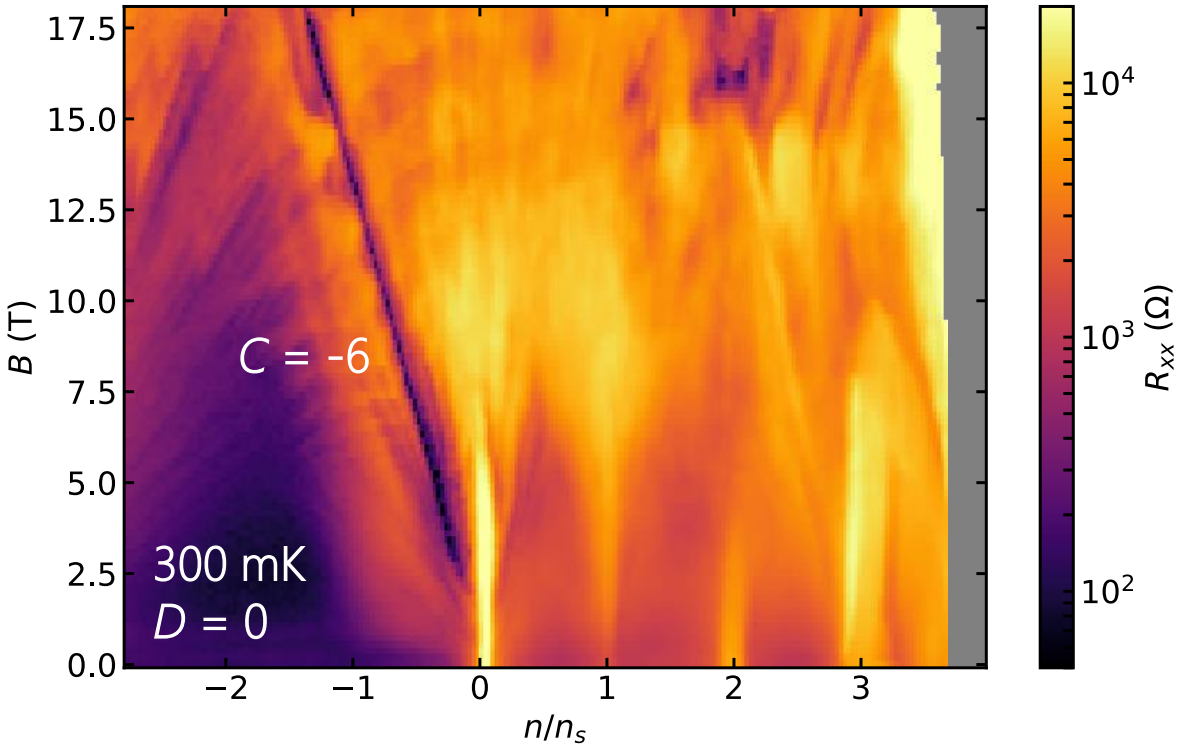

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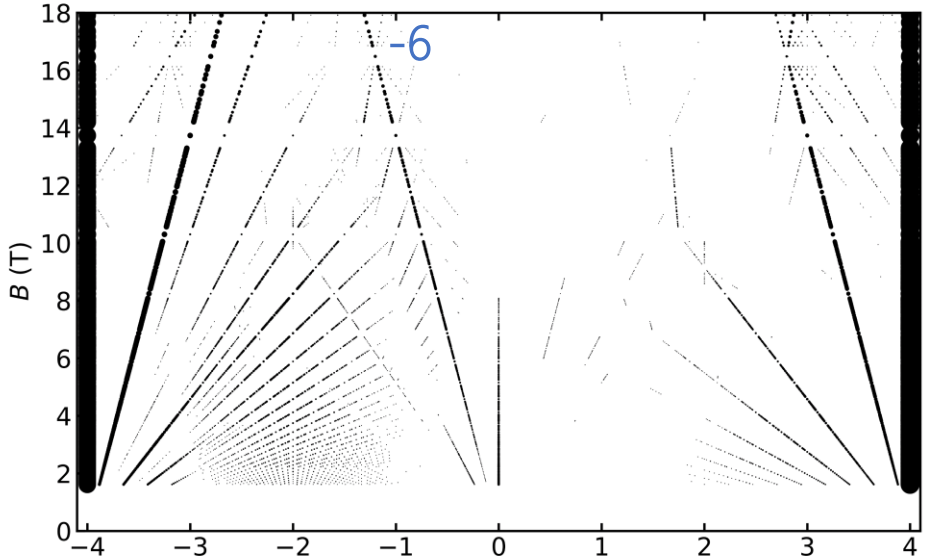
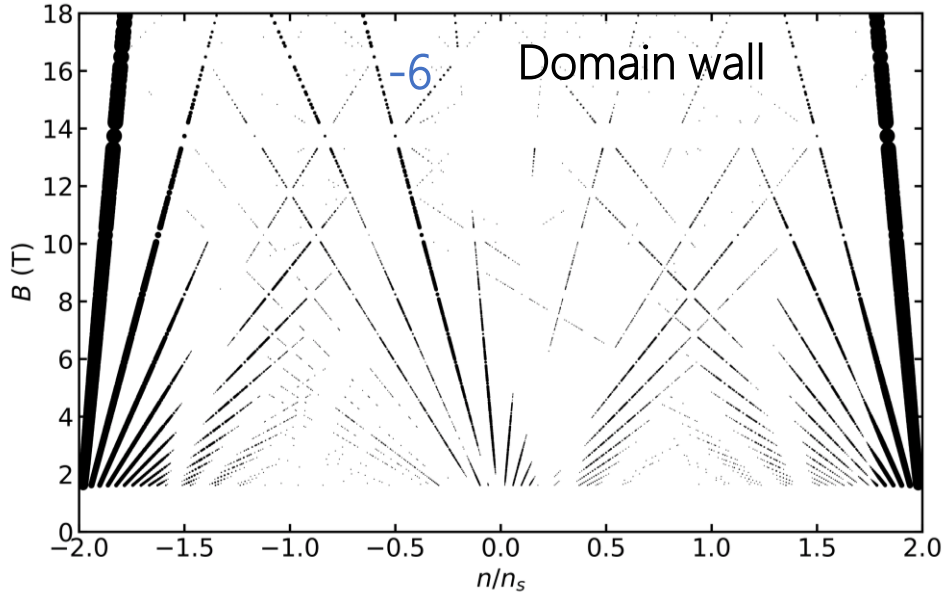
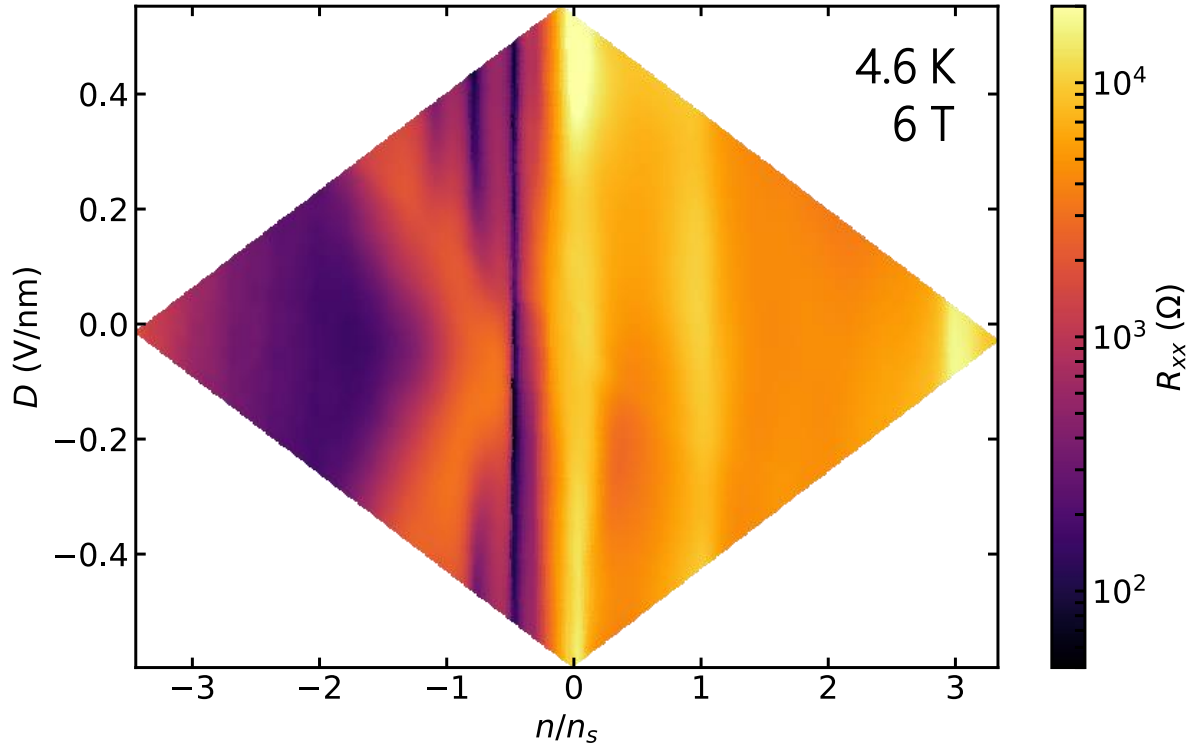
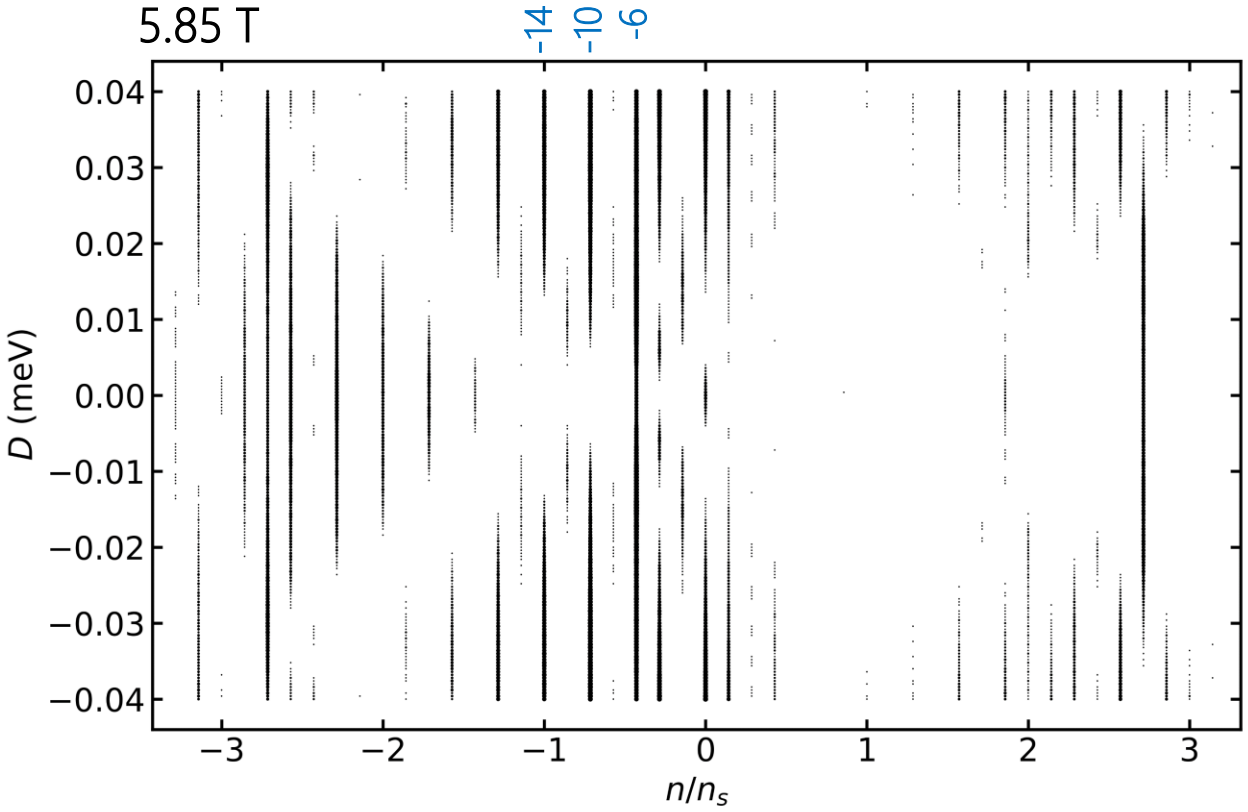


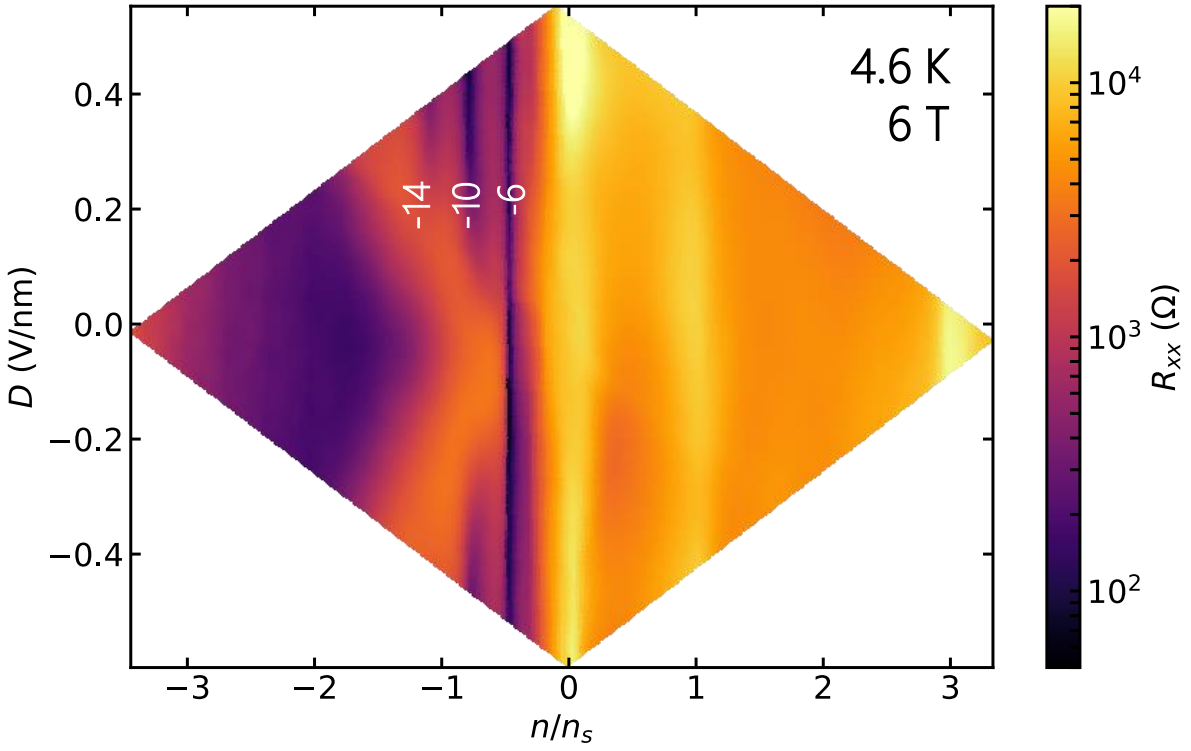


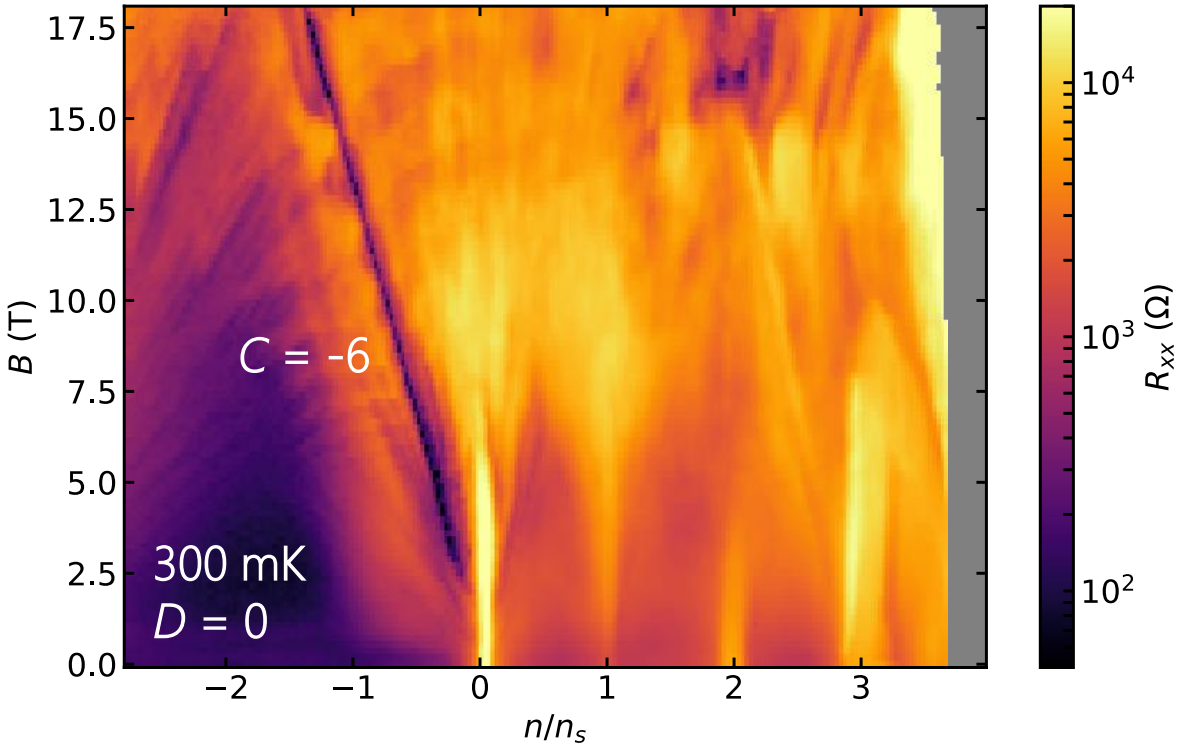
Layer potential dependences of Hofstadter gaps

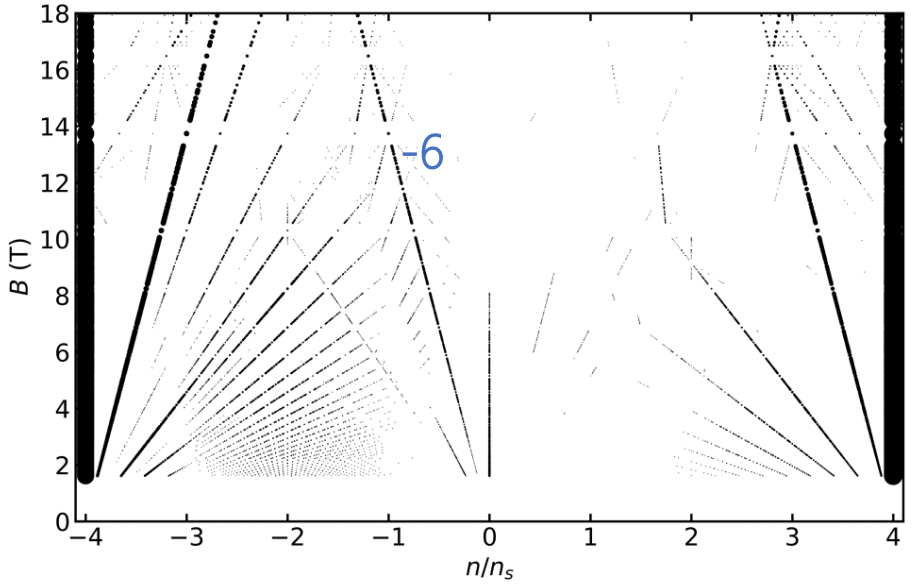


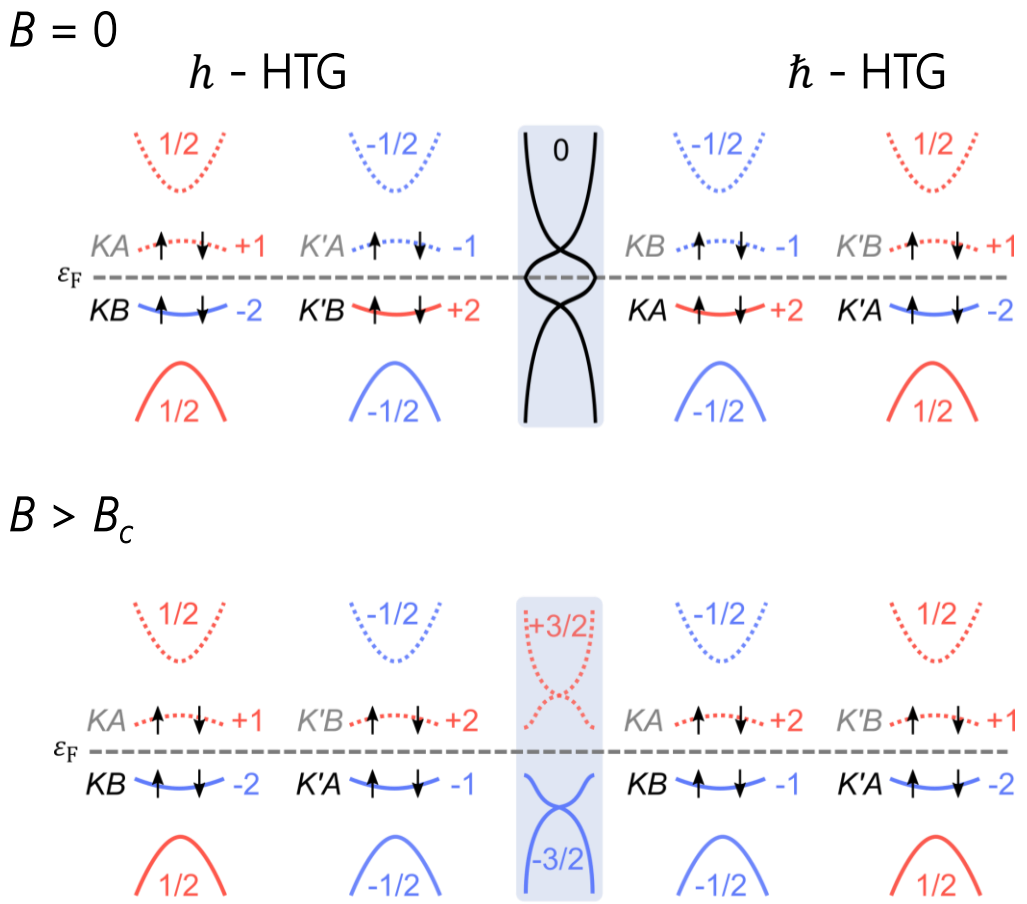
Layer potential dependences of Hofstadter gaps











- HTG is a new moiré platform for topological bands
  - Local Chern domains related by C_{2z}
- Chern insulator induced by a small *B* field
  - Quantization requires understanding the supermoiré
  - *C*=-6 Chern insulator understandable by both strong coupling and Hofstadter