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Improving device quality in graphene heterostructures SCOTT DIETRICH, JESSE BALGLEY, CORY DEAN, Columbia University Physics Department — Improving the quality of van der Waals heterostructures remains an important issue for the fabrication of novel electronic devices and the study of the interesting physics. In particular, heterostructures based on graphene have been shown to exhibit ballistic behavior at length scales of tens of microns yet observation of many fractional Quantum Hall states has been less clear than expected. To elucidate this issue, we characterize disorder in various graphene devices through analysis of low-field Shubnikov-de Haas oscillations. Our results demonstrate that the quantum lifetime is improved by an order of magnitude through the encapsulation of graphene by hexagonal boron nitride. Comparison with the mean scattering lifetime measured at zero magnetic field gives some clues about the origin of the remnant disorder in these devices. Implications and prospects for future device improvements will be discussed.

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