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Layer resolved capacitive probing of graphene bilayers ALEXANDER ZIBROV, Depatment of Physics, UC Santa Barbara, Santa Barbara, CA 93106, USA, FRANOIS PARMENTIER, Service de Physique de l'Etat Condense, DSM/IRAMIS/SPEC, CNRS UMR 3680, CEA Saclay, 91191 Gif sur Yvette cedex, France, JIA LI, Department of Physics, Columbia University, New York, NY 10027, USA, LEI WANG, Department of Electrical Engineering, Columbia University, New York, NY 10027, USA, BENJAMIN HUNT, Physics Department, Carnegie Mellon University ,Pittsburgh, PA 15213, CORY DEAN, Department of Physics, Columbia University, New York, NY 10027, USA, JAMES HONE, Department of Mechanical Engineering, Columbia University, New York, NY 10027, USA, TAKASHI TANIGUCHI, KENJI WATANABE, National Institute for Materials Science, 1-1 Namiki, Tsukuba, Japan, ANDREA YOUNG, Depatment of Physics, UC Santa Barbara, Santa Barbara, CA 93106, USA — Compared to single layer graphene, graphene bilayers have an additional which-layer degree of freedom that can be controlled by an external electric field in a dual-gated device geometry. We describe capacitance measurements capable of directly probing this degree of freedom. By performing top gate, bottom gate, and penetration field capacitance measurements, we directly extract layer polarization of both Bernal and twisted bilayers. We will present measurements of hBN encapsulated bilayers at both zero and high magnetic field, focusing on the physics of the highly degenerate zero-energy Landau level in the high magnetic field limit where spin, valley, and layer degeneracy are all lifted by electronic interactions.

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