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Gate defined quantum confinement in suspended bilayer graphene MONICA ALLEN, Harvard University, JENS MARTIN, University of Exeter, AMIR YACOBY, Harvard University — Devices that confine electrons in graphene have sparked substantial interest due to applications ranging from spin-based quantum computation to valley filters. However, the absence of an intrinsic bandgap in graphene has limited such devices to on-chip nanopatterned structures to date. Here we present high quality quantum dots in suspended bilayer graphene with tunnel barriers defined by external electric fields that break layer inversion symmetry, thereby eliminating both edge and substrate disorder. We demonstrate clean electron confinement in two regimes: at zero magnetic field B using the single particle energy gap induced by a perpendicular electric field and at B>0 using the quantum Hall ferromagnet v=0 gap. Our devices exhibit clean quantum transport behavior at magnetic fields ranging from zero to seven Tesla, including a highly resistive v=0 quantum Hall state and over forty consecutive Coulomb blockade oscillations with symmetric source-drain coupling. The data indicate that the dots are defined by local top gating and are not disorder formed. Geometric control over oscillation periodicity is confirmed by electrostatic simulations based on lithographic gate geometry.

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