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Resonant Tunneling in Double Bilayer Graphene Heterostructures[1] BABAK FALLAHAZAD, KAYOUNG LEE, SANGWOO KANG, JIAMIN XUE, STEFANO LARENTIS, CHRISTOPHER CORBET, KYOUNGHWAN KIM, HEMA MOVVA, Univ of Texas, Austin, TAKASHI TANIGUCHI, KENJI WATANABE, National Institute for Materials Science, Japan, LEONARD REGISTER, SANJAY BANERJEE, EMANUEL TUTUC, Univ of Texas, Austin — We present the realization and characterization of independently contacted and rotationally aligned double bilayer graphene heterostructures, that show gate-tunable tunneling resonances and negative differential resistance in their interlayer current-voltage characteristics. Our devices are fabricated by successively stacking mechanically exfoliated bilayer graphene and hexagonal boron nitride dielectric using a layer-by-layer transfer technique. The bilayers are rotationally aligned during the device fabrication by selecting flakes with straight edges, and using them as a reference for alignment. We determine the heterostructure energy band alignment at the tunneling resonance using the individual layer carrier densities, and including the chemical potential dependence on the carrier density. Our analysis show that the tunneling resonances occur when the charge neutrality points of the two bilayer graphene are energetically aligned, which suggests the resonances stem from the momentum conserving tunneling.

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