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Tunneling between two independently contacted graphene layers CHRISTOPHER CORBET, SEYOUNG KIM, DAVID C. DILLEN, BABAK FALLAH, MICHAEL RAMON, EMANUEL TUTUC, SANJAY BANERJEE, The University of Texas at Austin — We study the tunneling between two overlapped, independently contacted graphene monolayers. We use micromechanical exfoliation to deposit graphene monolayers on separate substrates. Using electron beam lithography (EBL) patterning and etching we isolate the two monolayers and remove the multilayer graphene in their close proximity. Once patterned, one monolayer was removed from the substrate and manually aligned to the other monolayer with an overlap region of a few square micrometers. EBL and metal deposition were used to define hall bars on the two separate monolayers. This design allows the extraction of each sheet's mobility and density using standard four-point resistance measurements. Using a finite element model, we calculate the current flow in each layer, as well as in between the two layers. The tunneling resistance is modeled as a contact resistance between the two graphene layers in this overlap region. We extract an upper limit for the specific tunneling resistance between the two graphene layers of 1.4E-4 Ohms*cm^2. We discuss the current density and potential dependence on the shape of the overlap region.

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