Supporting information for:

Charge transport in dual gated bilayer graphene with Corbino geometry

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Sample fabrication methods

Bilayer graphene is mechanically exfoliated on a doped silicon substrate with a 300nm thick oxide layer and characterized by Raman spectroscopy as shown in Fig.S1. The dual-gated Corbino-disk device is fabricated using electron beam lithography and thermal evaporation of chromium (Cr) and gold (Au).

We first define the center source electrode and the outer drain electrode. In this step, only the electrodes on the graphene are fabricated, i.e. without contact leads, as can be seen in the optical image of the sample in Fig.1(c).

In order to form the poly-methyl methacrylate (PMMA) dielectric layers, we take advantage of the fact that PMMA can be used as a positive electron-beam resist at low dosage, and a negative electron-beam resist at high dosage, as follows. A layer of

PMMA is applied to the device. Using electron beam lithography at a dose of 200μC/cm^2, at which PMMA is a positive resist, we expose two holes in the resist over the source and drain electrodes. Following development to remove the exposed resist over the source and drain electrodes, we again expose the resist over the entire bilayer graphene by electron beam with a dosage of 20,000μC/cm^2, at which PMMA is a negative resist. The chip is then soaked in acetone to remove the remaining unexposed PMMA, leaving a dielectric layer over the bilayer graphene but exposing the source and drain electrodes.

The overexposed PMMA resist is stable to subsequent lithography steps using PMMA resist. On top of the overexposed PMMA we fabricate a ring-shaped top gate electrode which encircles the source electrode. After this another layer of overexposed PMMA is made on top of the top gate metal using the same two-step procedure as that for the first overexposed PMMA layer, again leaving holes over the source and drain electrodes which are free of resist. The optical image in Fig.1(c) shows the device up to this fabrication step for the purpose of clarity and illustration.

We eventually define and evaporate the source and drain contact leads over the two holes shown in Fig.1(c). For the device reported in this Letter, we made two source and two drain contact leads to facilitate estimation of the contact resistance.

Raman Spectroscopy of Bilayer Graphene

Raman spectrum of the 2D band of the bilayer graphene device studied in this work. The spectrum was taken at room temperature in ambient with 633nm laser excitation. The spectrum can be fit to four Lorentzian peaks whose relative magnitudes and positions are in good agreement with that previously reported by Ferrari et al.,[s1] indicating Bernal stacked bilayer graphene.

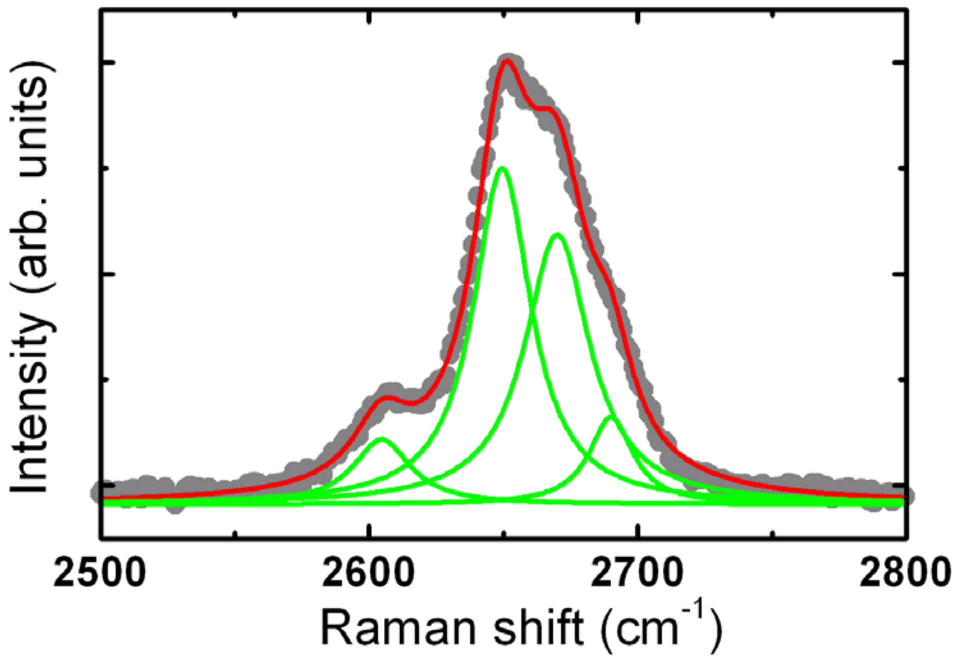

Figure S1. Raman spectrum at 633 nm excitation wavelength of the bilayer graphene device studied in this work showing the characteristic 2D band of Bernal-stacked bilayer graphene.[s1]

References

(s1) Ferrari, A. C.; Meyer, J. C.; Scardaci, V.; Casiraghi, C.; Lazzeri, M.; Mauri, F.; Piscanec, S.; Jiang, D.; Novoselov, K. S.; Roth, S.; Geim, A. K. *Phys. Rev. Lett.* **2006**, 97, 187401.