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Our measurement strategy was as follows. We have first accurately measured the longitudinal voltage $V_x$ at 4.2 K in several points in magnetic field. This was done using ±2.5 μA source-drain current reversal technique and long integration time to eliminate all spurious voltages while the superconducting magnet was kept in persistent mode at a particular fixed field. As a result, a 6 nV precision in $V_x$ was achieved, corresponding to 2.4 mΩ uncertainty in $R_{xx}$. With this accuracy we have found vanishing $R_{xx}$ at 14 T. At this field and temperature we have measured a current-voltage characteristic (see Figure 2d in the main text) to establish the breakdown current at which the voltage began to deviate from zero: at 14 T it was about 5 μA. The field was then reversed and again we found that $R_{xx}$=0 with the same accuracy. After that the temperature was reduced to 300 mK and the procedure was repeated revealing a breakdown current just over 13 μA at $B$=14 T (the increase, which we attribute to the measurement being made away from the exact filling factor $\nu = 2$) and vanishing $R_{xx}$ established with less than 0.2 mΩ uncertainty using $I_{sd}$=12 μA. The contact resistance was ohmic within the range of vanishing $R_{xx}$.

Direct comparison of the GaAs and the graphene samples is difficult to arrange as they both require cryogenic temperatures, but different magnetic fields. We therefore used a thoroughly characterized 100 Ω resistor thermally stabilized at room temperature as a transfer standard. The measurements on the graphene and the semiconductor samples were done only one week apart such that drift in the transfer standard was negligible (<< 1 part in $10^9$). The comparison was performed using a cryogenic current comparator (CCC) bridge with the overall relative measurement uncertainty also below 1 part in $10^9$.

The convergence of the measurement process has been analysed using the Allan deviation (see Figure 3b in the main text), as is commonly accepted in precision metrology. The Allan deviation for a finite number of measurements M carried out with a minimum interval $\tau_0$ is defined as $\hat{\sigma}_y(\tau) = \sqrt{\frac{\sum_{k=1}^{P_0}[\bar{y}_{k+1}(\tau) - \bar{y}_k(\tau)]^2}{2P_0}}$, where $\bar{y}_k$ is the average value of the measurements in the k$^{th}$ interval, $P_0$ is the number, Int(M/n)-1, of pairs of $\bar{y}$ and $\tau = n\tau_0$.



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