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Quantum Hall resistance standard in graphene devices under relaxed experimental conditions F. SCHOPFER, R. RIBEIRO-PALAU, F. LAFONT, J. BRUN-PICARD, LNE, D. KAZAZIS, Laboratoire de Photonique et de Nanostructures, CNRS, A. MICHON, Centre de Recherche sur l Heteroepitaxie et ses Applications, CNRS, F. CHEYNIS, Aix Marseille Universite, CNRS, CINaM, O. COUTURAUD, C. CONSEJO, B. JOUAULT, Laboratoire Charles Coulomb, CNRS, Montpellier Universite, W. POIRIER, LNE — Large-area and high-quality graphene devices synthesized by CVD on SiC are used to develop reliable electrical resistance standards, based on the quantum Hall effect (QHE), with state-of-the-art accuracy of $1x10^{-9}$ and under an extended range of experimental conditions of magnetic field (down to 3.5 T), temperature (up to 10 K) or current (up to 0.5 mA). These conditions are much relaxed as compared to what is required by GaAs/AlGaAs standards and will enable to broaden the use of the primary quantum electrical standards to the benefit of Science and Industry for electrical measurements. Furthermore, by comparison of these graphene devices with GaAs/AlGaAs standards, we demonstrate the universality of the QHE within an ultimate uncertainty of $8.2x10^{-11}$. This suggests the exact relation of the quantized Hall resistance with the Planck constant and the electron charge, which is crucial for the new SI to be based on fixing such fundamental constants. These results show that graphene realizes its promises and demonstrates its superiority over other materials for a demanding application. Nature Nanotech. 10, 965-971, 2015, Nature Commun. 6, 6806, 2015

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