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Magneto-phonon resonance in graphene YOUNGHEE KIM, J.-M. POUMIROL, National High Magnetic Field Laboratory, Tallahassee, FL 32310, USA, A. LOMBARDO, Engineering Department, Cambridge University, Cambridge, CB3 0FA, UK, N.G. KALUGIN, Department of Materials and Metallurgical Engineering, New Mexico Tech, Socorro, NM 87801, USA, J. KONO, Department of Electrical & Computer Engineering, Rice University, Houston, TX 77005, USA, T. GEORGIOU, A.K. GEIM, K.S. NOVOSELOV, School of Physics & Astronomy, University of Manchester, Oxford Road, Manchester M13 9PL, UK, A.C. FERRARI, Engineering Department, Cambridge University, Cambridge, CB3 0FA, UK, D. SMIRNOV, National High Magnetic Field Laboratory, Tallahassee, FL 32310, USA — Recently, much attention has been paid to electron-phonon coupling in graphene. In particular, significant re-normalization and broadening of long-wavelength optical phonons are predicted to occur through resonant interaction with Landau-quantized Dirac fermions. We report a high-field magneto-Raman spectroscopy study of single-layer graphene in magnetic fields up to 45 T. The Raman G peak exhibits clear splitting at approximately 30 T, which we attribute to the fundamental magneto-phonon resonance associated with (0,1) inter Landau level transitions. The coupled electron-phonon modes exhibit characteristic anti-crossing behavior allowing for an accurate determination of the electron-phonon coupling strength in graphene.

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