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Cyclotron resonance of single valley Dirac fermions in a gapless HgTe quantum well JONATHAN LUDWIG, Florida State University and National High Magnetic Field Laboratory, YU. B. VASILYEV, Ioffe Physical Technical Institute RAS, N.N. MIKHAILOV, A.V. Rzhanov Institute of Semiconductor Physics SB RAS, J.M. POUMIROL, National High Magnetic Field Laboratory, Z. JIANG, School of Physics, Georgia Institute of Technology, O. VAFEK, Florida State University and National High Magnetic Field Laboratory, D. SMIRNOV, National High Magnetic Field Laboratory — We report on the Landau level spectroscopy study of two HgTe quantum wells (QW) at and near the critical thickness, where the band gap vanishes. In magnetic fields up to $B = 16$ T, oriented perpendicular to the QW plane, we observe a $\sqrt{B}$ dependence for the energy of the dominant cyclotron resonance (CR) transition characteristic of 2D Dirac fermions. The dominant CR line exhibits either a single or double absorption line shape for the gapless or gapped QW, respectively. We will show that the CR transitions can be quantitatively described by an effective Dirac model. Using this model, we extract a band velocity $v_F = 6.4 \times 10^5$ m/s in both QWs and interpret the double absorption of the gapped QW as arising from the addition of a small relativistic mass.

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