Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Study of the optical phonons on gated twisted bilayer graphene TING FUNG CHUNG, Purdue Univ, RUI HE, Univ of Northern Iowa, TAI-LUNG WU, YONG P. CHEN, Purdue Univ — In twisted bilayer graphene (tBLG), the low-energy van-Hove singularities (vHs) in the density of states (DOS) can be continuously tuned by twisting the two layers, leading to distinct electronic and optical properties compared to Bernal-stacked BLG (AB-BLG). This effect has been explored using resonance Raman scattering, showing enhanced Raman G and ZO' (low frequency, layer breathing vibration) bands when the vHs energy resonates with excitation laser energy. We have studied the influence on vHs and Raman bands in gated tBLG devices (at resonant twist angle $\sim 13^\circ$ under a 532 nm laser light). We observed that the G band splits with increasing doping, attributed to asymmetric doping of charge carriers in the two layers. The strongly quenched G band intensity at high doping level is ascribed to the suppression of resonant interband transitions between the two saddle points (in conduction and valence bands) which are displaced in the momentum space by gate-tuning. We have also measured the doping dependence of ZO' band and R band in tBLG. Our results demonstrate that electric-field can be used to tune the optoelectronic and vibrational properties in tBLG devices.

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Date submitted: 07 Nov 2014 Electronic form version 1.4