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Bilayer Graphene Electromechanical Systems ALEXANDRE CHAMPAGNE, Concordia University and Universit de Sherbrooke, MATTHEW STORMS, SERAP YIGEN, Concordia University, BERTRAND REULET, Universit de Sherbrooke — Bilayer graphene is an outstanding electromechanical system, and its electronic and mechanical properties, as well as their coupling, are widely tunable. To the best of our knowledge, simultaneous charge transport and mechanical spectroscopy (via RF mixing) has not been realized in bilayer graphene. We present data showing clear electromechanical resonances in three suspended bilayer devices whose length range from 1 to 2 microns. We first describe the low-temperature current annealing of the devices which is crucial to achieve the transconductance, $I - V_G$, necessary to implement a RF mixing detection method. We describe our RF mixing circuit and data. We measure clear mechanical resonances ranging in frequency from 50 to 140 MHz. We show that we can smoothly tune the resonance frequencies of our bilayer resonators with mechanical strain applied via a backgate voltage. We measure quality factors up to 4000. We briefly discuss the effects of the RF driving power on the dispersion of the mechanical resonance. We aim to use these high quality mechanical resonance as a mechanical sensor of the bilayer quantum Hall phase transitions. We show initial data of a bilayer mechanical resonance as a function of magnetic field and quantum Hall phase transitions.

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