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Electric Field Dependent Photoluminescence in Atomically Thin Transition Metal Dichalcogenides van der Waals Heterostructures. LUIS A. JAUREGUI, ALEX A. HIGH, ALAN DIBOS, ANDREW JOE, ELGIN GULPINAR, HONGKUN PARK, PHILIP KIM, Harvard University, Department of Physics — uregui, Alex A. High, Alan Dibos, Andrew Joe, Elgin Gulpinar, Hongkun Park, Philip Kim Harvard University, Physics Department -abstract- Single layer transition metal dichalcogenides (TMDC) are 2-dimensional (2D) semiconductors characterized by a direct optical bandgap and large exciton binding energies (>100 meV). We fabricate CQW heterostructures made of 2D TMDCs with hexagonal Boron nitride (BN) as atomically thin barrier and gate dielectric, with top and bottom gate electrodes. We study the evolution of photoluminescence (PL) spectrum with varying BN barrier thickness, electric field, temperature and polarization. Our measured low-temperature (T = 3K) PL peaks show full width at half maxima on the order of ˜3meV. We identify the photoluminescence peaks, corresponding to the charged exciton emission, which red shifts and its brightness increases while the neutral exciton emission becomes darker for increasing electric field.

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