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Band edge identification and carrier dynamics of CVD MoS2 monolayer measured by broadband Femtosecond Transient Absorption Spectroscopy SHROUQ ALEITHAN, MAKSIM LIVSHITS, Ohio Univ, JEFFREY RACK, University of New Mexico, MARTIN KORDESCH, ERIC STINAFF, Ohio Univ — Two-dimensional atomic crystals of transition metal dichalcogenides are considered promising candidates for optoelectronics, valleytronics, and energy harvesting devices. These materials exhibit excitonic features with high binding energy as a result of confinement effect and reduced screening when the material is thinned to monolayer. However, previous theoretical and experimental studies report different binding energy results. This work further examines the electronic structure and binding energy in this material using broadband Femtosecond Transient Absorption Spectroscopy. Samples of MoS2 were grown by chemical vapor deposition, pumped with femtosecond laser, and probed by femtosecond white light resulting in broadband differential absorption spectra with three distinct features related to the three dominant absorption peaks in the material: A, B, and C. The dependence of the transient absorption spectra on excitation wavelength and layer number provides evidence of a band gap located at C (2.9 eV) and therefore an excitonic binding energy of 1 eV. Additional features in the spectra identified as a broadening of the absorption features caused by carrier scattering, surface defects and trap states.

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