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Optical studies of dual gated WSe2 transistors ZEFANG WANG, JIE SHAN, KIN FAI MAK, Penn State University — Recent advances in the development of atomically thin layers of transition metal dichalcogenides (TMDs) have opened up new possibilities for the exploration of novel 2D physics as well as materials for applications. The atomic thickness of these materials allows effective control of their optical and electronic properties by electrostatic gates. In this work, we fabricate dual-gate transistors of monolayer WSe2 and investigate the optical and electronic properties as a function of doping and fields by the absorption and photoluminescence spectroscopy. The combination of the top and bottom gates allows us to independently vary the electric field and doping density in the monolayer over a large range. As a function of doping density, we observe the evolution of the electronic excitations from locally bound excitons, to excitons and charged excitons, to the Fermi edge singularity. We will discuss the effects of external fields on these excitations and the effects of strong Coulomb interactions in 2D semiconductors.

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