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Ultrafast Optical Spectroscopy of Excitons in Monolayer WSe₂ GRANT AIVAZIAN, University of Washington, HONGYI YU, University of Hong Kong, SANFENG WU, AARON JONES, University of Washington, NIRMAL GHIMIRE, University of Tennessee, JIAQIANG YAN, Oak Ridge National Laboratory, DAVID MANDRUS, University of Tennessee, DAVID COBDEN, University of Washington, WANG YAO, University of Hong Kong, XIAODONG XU, University of Washington — Recently there has been tremendous interest in monolayer transition metal dichalcogenides due to their true two-dimensional nature and strong excitonic properties. Photoluminescence measurements have shown strong emission from both neutral and charged exciton species, as well as valley-selective optical excitation and even signatures of valley coherence. Here we report on the dynamic nature of these excitons by resonant optical excitation in monolayer tungsten diselenide. Using ultrafast degenerate pump/probe spectroscopy we probe the differential reflection signal as a function of excitation energy and time delay. We have developed a theory from which we are able to extract the excited exciton population and lifetimes. These measurements provided critical information for future excitonic devices involving tungsten diselenide and opens up future work investigating the rich two-dimensional physics inherent in this material.

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