

Title: Ultrafast dynamics of charge carriers in 2D materials

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Abstract: The goal of this thesis was to study ultrafast dynamics of excitons in monolayers of transient metal dichalcogenides  $\text{WSe}_2$  and  $\text{MoS}_2$  using methods of ultrafast laser spectroscopy. We focus on two types of processes in this thesis. We measured ultrafast dynamics of carrier recombination and inter-valley scattering of excitons. We also focused on ultrafast manipulation with excitonic energy levels which allows us to remove the energy degeneracy in different minima of the band structure using coherent optical effects (optical Stark effect and Bloch-Siegert shifts). In the future, the observed phenomena could contribute to development of new ultrafast optical and optoelectrical devices exploiting so called valley polarization of electrons in the studied materials.

Keywords: Ultrashort laser pulses, time-resolved laser spectroscopy, nonlinear optics, 2D crystals