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Electric field induced variations of excited state lifetimes and photoluminescence spectra in 2D heterostructures MICHAEL ENGEL, MATHIAS STEINER, IBM Research — Optical properties of 2D nanomaterials are of fundamental interest because of their potential use in integrated optoelectronic devices. To understand fundamental limitations of device operation further insight into the dynamics of photo-excited carriers is needed. Here we present experimental results measured on WS_2/MoS_2 vertical heterostructures integrated with electrical contacts on an optically transparent sample stack. Using high resolution, inverted optical immersion spectroscopy, we measure the change in the photoluminescence spectrum and fluorescence decay under vertical electrical fields. We find that the integrated photoluminescence intensity and fluorescence lifetimes can be significantly altered upon application of external electric fields. We quantify the measured effects and discuss the mechanisms responsible for the electric-field induced photoluminescence modifications

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