Time resolved measurement of Rydberg exciton dynamics

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Time resolved(TR) measurement is proven to be a crucial tool to uncover dynamical change in a wide variety of systems such as phase transition in materials, chemical reactions, biological events etc. Thereby, it provides insight into the underlying mechanisms which dictates over all system's behaviour. Here, we study the interaction dynamics of Rydberg exciton with different entities such as impurities, electron-hole plasma etc., by performing pump-probe TR measurement. Essentially, a pump laser pulse is sent for $2\mu s$ which changes the steady state of crystal system and corresponding change is sensed by a continuous wave probe laser. As a reference, figure 1 depicts the TR traces at three different conditions of pump intensities.

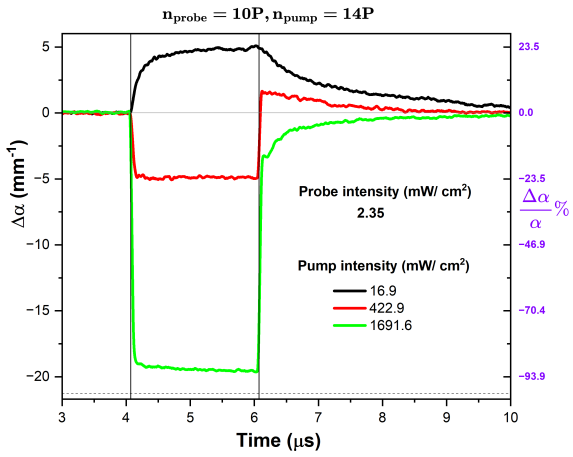

Figure 1: Time resolved traces at 3 different pump intensities while probe laser is set to low intensity of 2.35 $\frac{mW}{cm^2}$. The pump and probe lasers are fixed at 14 and 10P exciton resonance respectively.

To understand the specimens excited by the pump pulse and magnitude of their impact on probe, we segregate and analyse different decays present during the relaxation of system after the end of pump pulse. We found that there are primarily four decays with different decay rates and amplitudes.