Tata Institute of Fundamental Research
Survey No. 36/P, Gopanpally Village, Serilingampally, Ranga Reddy Dist., Hyderabad – 500 046

Internal Webinar

Dynamics of momentum-resolved excitons in a 2D semiconductor using TR-μARPES

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Monolayer transition metal dichalcogenides are excellent models for the exploration of semiconductor physics at the 2D limit, with potential applications in electronics, optoelectronics, and quantum devices. The strong Coulomb interactions and distinct structural symmetries in these materials give rise to a rich variety of photoexcited states, including bright and dark excitonic complexes that are tightly bound, and valley-spin polarized. However, directly accessing the momentum-forbidden dark excitons and their dynamics, is not trivial with conventional experimental probes. Here, by performing time and momentum-resolved photoemission spectroscopy on a micron-scale monolayer flake of WSe_2, we directly observe the momentum-forbidden dark excitons and measure their dynamics under different excitation conditions. Our measurements provide a global view over the entire Brillouin Zone of the ultrafast optical response of 2D semiconductors and demonstrate the impact of dark excitons.

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