

Enhanced nonlinearity through interlayer excitons in bilayer MoS_2

Vinod Menon ^{1*}, Abhishek ^{1†}, Biswajit Datta ¹, Pratap Chandra Adak ¹

¹The City college of New York, Center for Discovery and Innovation, 10031 New York, United States

Homobilayer MoS_2 hosts interlayer excitons that show significant oscillator strength owing to their hybridization with the intralayer species. From the standpoint of nonlinear interactions, these interlayer excitons that have strong out-of-plane dipole moment are attractive owing to the dipolar interactions. Here we report enhanced nonlinear optical response of dipolar excitons compared to intralayer excitons using a biased device architecture. The electric field splits the degeneracy of the two intralayer excitons allowing us to probe dipolar interactions between excitons with the same dipole orientation. We observe three times enhancement in the observed blue shift of the excitonic state in the presence of bias compared to the zero-bias scenario. The dipolar excitons also show roughly six times the nonlinearity of intralayer excitons. Our work sets the stage for exploiting dipolar-exciton polaritons for realizing blockade physics and correlations.

*E-mail: vmenon@ccny.cuny.edu

†E-mail: abudarapu@gradcenter.cuny.edu