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Ghost Fano Resonance of Excitons in Twisted Bilayer Graphene[1]

YUFENG LIANG, Washington University in St. Louis — Metallic systems are generally considered to be unable to harbor tightly bound excitons because of the strong screening effect as well as the absence of a finite band gap. Previously, exception has only been found in one-dimensional metallic carbon nanotubes due to the depressed screening effects and the symmetry gap. We explore the exciton spectra of twisted bilayer graphene (tBLG) and predict the existence of even more strongly bound exciton (with binding energy as large as 0.5eV) in this system despite of its higher dimensionality. Based on our results from first-principles simulations and effective model calculations, a mechanism known as the ghost Fano resonance is proposed for the bound exciton formation in metallic systems beyond the dimensonality-related argument. Our results shed light on engineering the e-h excitations in the few-layer van der Waals heterojunction.

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