Special seminar

Wednesday, October 22, 2025
1:00 pm
ZNN, Seminar room EG 0.001
Exclusively in person

"Understanding trion resonances in monolayer and bilayer TMDs"

If you wish to discuss with the speaker, please reach out to Amine Ben Mhenni, who will organize a slot for you!

Trions and attractive polarons are key signatures in the optical spectra of two-dimensional transition metal dichalcogenides (TMDs) and provide powerful probes of the rich electronic states in these materials. In this talk, I will present two of our recent studies [1,2] that advance our understanding of these signatures. First, I will address the role of exchange interactions and mass imbalance in 1s trions of monolayer TMDs, showing that they strongly influence both trion binding energies and internal structure [1], especially in WSe2. Second, I will discuss trions or attractive polarons formed from Rydberg excitons and charge carriers located in the same or nearby TMD layers. Our results reveal that the trion resonances observed in this case originate from hybridization between the 2s exciton and either 2p or interlayer excitons [2]. Consequently, the observed energy splitting relative to the 2s exciton is primarily governed by the splitting between these excitonic levels, rather than by the genuine trion binding energy. Developing a more accurate picture of these trions and polarons is crucial for disentangling complex optical spectra and for identifying novel many-body states in TMD systems.

[1] A. Christianen, A. Imamoglu, Asymmetric trions in monolayer transition metal dichalcogenides, arXiv:2507.16643
[2] A. Christianen, A. Seiler, A. Tügen, A. Imamoglu, Hybridization of excitonic resonances mediated by electrons, in preparation

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