How to observe an excitonic Bose-Einstein condensate

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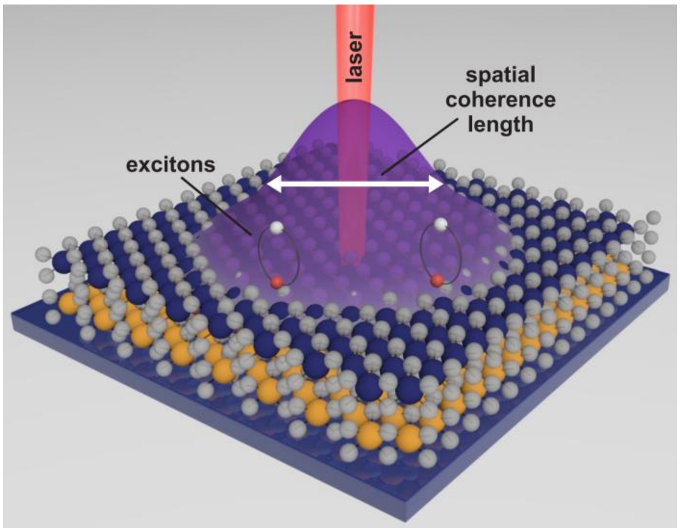
One of the true "holy grails" in exciton physics is the search for a Bose-Einstein condensate of excitons at elevated temperatures. I will introduce the necessary experimental prerequisites such that an exciton condensation can be claimed. Particularly, I highlight the example of interlayer excitons formed in van der Waals $MoSe_2/WSe_2$ heterobilayers. There, we could demonstrate an extended spatial coherence of interlayer exciton ensembles as characterized by point-inversion Michelson-Morley interferometry. Below 10 K, the measured spatial coherence length of the interlayer excitons reaches values equivalent to the lateral expansion of the exciton ensembles. In this regime, the light emission of the excitons turns out to be homogeneously broadened in energy with a high temporal coherence. At higher temperatures, both the spatial coherence length and the temporal coherence time decrease, most likely because of thermal processes. The presented findings point towards a spatially extended, coherent many-body state of interlayer excitons at low temperature [1].

Reference:

[1] M. Troue, J. Figueiredo, L. Sigl, C. Paspalides, M. Katzer, T. Taniguchi, K. Watanabe, M. Selig, A. Knorr, U. Wurstbauer, and A.W. Holleitner, Phys. Rev. Lett. 131, 036902 (2023).



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