

seminars

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seminar

Tuesday 7th February

c/Faraday, 9

Conference Hall

Imdea Nanociencia

Ciudad Universitaria de Cantoblanco

12:00h

Collective modes of the excitonic condensate
in 1T-TiSe₂

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Light absorbed by a semiconductor can create an electron-hole bound state called an exciton. In the 1960s it was realized that, if the exciton binding energy were larger than the semiconductor band gap, excitons would spontaneously proliferate. The resulting “excitonic insulator” is a macroscopic condensate of electron-hole pairs with non-zero centre-of-mass momentum, or in other words, a charge-density wave. For 50 years, no experimental technique has been able to unambiguously identify an excitonic insulator phase in any material, despite many candidate materials being investigated. The reason is, that its only tell-tale signature—an electronic “soft mode” with non-zero momentum—could not be detected with any technique. In this talk I will describe how momentum-resolved EELS (electron-energy loss spectroscopy) was recently used to demonstrate the existence of an electronic soft mode in the transition metal dichalcogenide TiSe₂. This study represents the first observation of a soft electronic mode in any material, and the first unambiguous evidence for the existence of an excitonic phase

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Nanoscience and Nanotechnology: small is different