

Abstract Submitted
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Observation of an Excitonic Sound Wave in TiSe₂ with meV-resolution EELS ANSHUL KOGAR, MELINDA RAK, SEAN VIG, ALI HUSAIN, Univ of Illinois - Urbana, YOUNG IL JOE, NIST, PETER ABBAMONTE, Univ of Illinois - Urbana — The charge density wave (CDW) in TiSe₂ has been attributed to an excitonic instability by many authors. In a conventional CDW material, there exists a soft phonon at the transition temperature, which, below the transition temperature, gives way to the phase and amplitude collective excitations of the CDW order parameter. In TiSe₂, a soft phonon has indeed been observed with inelastic X-ray scattering. In the 1960s, though, W. Kohn predicted that one of the signatures of an excitonic instability would be the presence of a soft electronic excitation which similarly gives way to an excitonic sound mode in the condensed phase. In this talk, I will present data showing that the TiSe₂ exhibits a collective excitation consistent with the excitonic sound wave prediction, which emerges out of the normal phase plasmon. This provides strong evidence that excitonic correlations play a role in the CDW formation in TiSe₂. Hence, a more nuanced view of the charge density wave transition in TiSe₂ is needed where both excitonic effects and electron-phonon coupling must be taken into consideration.

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