# TT 23: Poster Session: Emerging Phenomena in Superconducting Low Dimensional Hybrid Systems

Time: Thursday 13:30–15:30 Location: P

TT 23.1 Thu 13:30 P

**Electronic structure and charge density wave order in monolayer $NbS_2$** — •Timo Knispel[1], Jeison A. Fischer[1], Jan Berges[2], Arne Schobert[2], Erik van Loon[2,3], Wouter Jolie[1], Daniela Mohrenstecher[1], Tim Wehling[2], and Thomas Michely[1] — [1]Institute of Physics II, University of Cologne, Zülpicher Str. 77, 50937 Cologne, Germany — [2]Institut für Theoretische Physik, Bremen Center for Computational Materials Science and MAPEX Center for Materials and Processes, Otto-Hahn-Allee 1, University of Bremen, 28359 Bremen, Germany — [3]Department of Physics, Lund University, Professorsgatan 1, 223 63, Lund, Sweden

We investigated monolayer 1H-$NbS_2$ grown in-situ on graphene/Ir(111) by high-resolution scanning tunneling microscopy and spectroscopy at temperatures down to 0.4K. The characteristic 3x3 CDW pattern is present only in the monolayer, but absent in the bilayer. We analyze the CDW gap, contrast inversion in the dI/dV maps towards both sides of the gap and the suppression of the CDW pattern in the gap. Furthermore, quasiparticle interference is observed at island edges and defects and enables us to measure the dispersion of the hole-like pocket around the Γ-point. Density of states, dispersion around the Γ-point and the properties of the CDW are compared to density functional theory calculations.

Support from the Deutsche Forschungsgemeinschaft, CRC 1238 (project number 277146847, subprojects A01 and B06) is gratefully acknowledged.

TT 23.2 Thu 13:30 P

**Dynamics of collective modes in an unconventional charge density wave system $BaNi_2As_2$** — •Amrit raj Pokharel[1], Vladimir Grigorev[1], Arjan Mejas[2], Amir a. Haghighirad[3], Rolf Heid[3], Yi Yao[3], Michael Merz[3], Matthieu Le tacon[3], and Jure Demsar[1] — [1]Institute of Physics, JGU Mainz, Mainz, Germany — [2]Institute of Solid State Physics, TU Wein, Vienna, Austria — [3]Institute of Quantum Materials and Technologies, KIT, Karlsruhe, Germany

$BaNi_2As_2$ is a non-magnetic analogue of $BaFe_2As_2$, the parent compound of a prototype pnictide high temperature superconductor displaying superconductivity already at ambient pressure. Recent diffraction studies demonstrated the existence of two types of periodic lattice distortions above and below the triclinic phase transition, suggesting the existence of an unconventional charge-density-wave (CDW) order. Upon doping, CDW order is suppressed, resulting in a sixfold increase of the superconducting transition temperature and enhanced nematic fluctuations. Here, we apply time-resolved optical spectroscopy to investigate collective response of the CDWs in $BaNi_2As_2$. By performing temperature and excitation density dependent studies we demonstrate the existence of collective modes of the CDW order. The smooth evolution of these modes through the structural phase transition implies the CDW order in the triclinic phase evolves from the unidirectional CDW in the tetragonal phase and may indeed trigger the structural phase transition.

[1] V. Grigorev, et. al., arXiv:2102.09926 (2021)

TT 23.3 Thu 13:30 P

**Electronic phase diagram of the excitonic insulator candidates $Ta_2Ni(Se_{1-x}S_x)_5$** — •Pavel Volkov[1], Mai Ye[1], Himanshu Lohani[2], Irena Feldman[2], Amit Kanigel[2], and Girsh Blumberg[1,3] — [1]Rutgers University — [2]Technion — [3]NICPB, Tallin

Excitonic insulator is a phase driven by Coulomb attraction between electrons and holes leading to a proliferation of particle-hole pairs. However, excitonic insulators break lattice symmetries, raising the question of whether a particular transition is excitonic or structural. I will demonstrate that electronic Raman scattering can be used to elucidate the transition origin in the $Ta_2Ni(Se_{1-x}S_x)_5$ family of candidate materials. In particular, at low x the transition is excitonic-driven and shows deviations from mean-field predictions indicating strong correlations. At large sulfur content, the contribution of excitons diminishes and the transition becomes purely structural. The study reveals a quantum phase transition of an excitonic insulator masked by a preemptive structural order.