Abstract Submitted
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Out-of-plane dependence of the CDW and superconducting gap in bulk 2*H*-$NbSe_2$ revealed by phonon spectroscopy[1] S. ROSENKRANZ, A.H. SAID, Argonne Natl Lab, F. WEBER, R. HEID, Karlsruhe Institute of Technology — In 2*H*-$NbSe_2$, the CDW energy gap below T_{CDW}=33 K opens only on a small part of the Fermi surface in the (h, k) plane, which explains why superconductivity can emerge in this system at lower temperature T_C=7.2K. However, the interplay between these competing states and their relative evolution upon intercalation or applied pressure remains puzzling. We will discuss our high-energy-resolution inelastic x-ray scattering investigation of the CDW soft phonon mode upon entering the superconducting state. From the observed changes in the phonon lineshapes, we demonstrate that the superconducting gap exhibits an out-of-plane dependence. Reversely, our data imply that the CDW energy gap is strongly localized along k_z, a result that could not be obtained with surface techniques, such as ARPES or STM. This confinement of the CDW gap to a very small momentum region, both within as well as out-of the plane, explains the rather low competition and easy coexistence of CDW order and superconductivity in 2*H*-$NbSe_2$. Our results further provide a microscopic explanation of the decrease/increase of T_C/T_{CDW} in single-layer $NbSe_2$ as compared to the bulk system.

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