Contribution ID: **64** Type: **Talk**

Phonon renormalization explained by electron-momentum dependent electron-phonon coupling

Thursday, December 10, 2020 4:00 PM (15 minutes)

Electron-phonon coupling, i.e., the scattering of lattice vibrations by electrons and vice versa, is a common phenomenon in solids and can lead to emergent ground states such as superconductivity and charge-density wave order. Signatures of strong electron-phonon coupling, e.g. softening and broadening of phonons on cooling, are typically assigned to the presence of nested parts of the Fermi surface or lattice anharmonicity. Here, we unravel a third scenario in the seminal strong-coupling material YNi_2B_2C. The three-dimensional Fermi surface features a large value of the electronic joint density-of-states but only fro a particular value of the electron out-of-plane momentum k_z. Using a combination of inelastic neutron scattering and angle-resolved photoemission spectroscopy analyzed based on *ab-initio* lattice dynamical calculations we show that this peak of the electronic joint density-of-states as function of k_z is likely the origin for the spectacular phonon renormalization in YNi_2B_2C. Thus, our study rationalizes strong phonon anomalies in the absence of both classic, i.e. phonon-momentum dependent nesting and anharmonicity.

Primary authors: Mr KURZHALS, Philipp (Karlsruhe Institute of Technology); Dr KREMER, Geoffrey (University of Fribourg); Dr JAOUEN, Thomas (University of Fribourg); Dr NICHOLSON, Chris (University of Fribourg); Dr HEID, Rolf (Karlsruhe Institute of Technology); Dr NAGEL, Peter (Karlsruhe Institute of Technology); Dr CASTELLAN, John-Paul (Karlsruhe Institute of Technology); Dr IVANOV, Alexander (Institut Laue Langevin); Dr STROCOV, Vladimir (Paul-Scherrer Institut); Prof. MONNEY, Claude (University of Fribourg); Prof. REZNIK, Dmitry (University of Colorado at Boulder); WEBER, Frank (Karlsruhe Institute of Technology)

Presenter: WEBER, Frank (Karlsruhe Institute of Technology)

Session Classification: DN2020: Materials

Track Classification: DN: Materials