Chez Pierre

Presents ...

Monday, October 17, 2022
12:00 pm
Duboc Room - 4-331

Chez Pierre Seminar

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"Nematic liquid and unconventional charge-density-waves in BaNi2As2".

Understanding the organizing principles of interacting electrons and the emergence of novel electronic phases is a central endeavor of condensed matter physics. Electronic nematicity, in which the discrete rotational symmetry in the electron fluid is broken while the translational one remains unaffected, is a prominent example of such a phase. It has proven ubiquitous in correlated electron systems, and is of prime importance to understand Fe-based superconductors.
Here, we find that fluctuations of such broken symmetry are exceptionally strong over an extended temperature range above the formation temperature of an incommensurate charge-density-wave order (I-CDW) in $BaNi_2(As_{1-x}P_x)_2$, the nickel homologue to the Fe-based systems. This lends support to a type of electronic nematicity, dynamical in nature, which exhibits a particularly strong coupling to the underlying crystal lattice. Fluctuations between degenerate nematic configurations cause a splitting of phonon lines, without lifting degeneracies nor breaking symmetries, akin to spin liquids in magnetic systems[1].
We further used diffuse and inelastic x-ray scattering to study the formation of the I-CDW in BaNi2As2 and observed strong phonon anomalies associated with it. Its reciprocal space position is well captured by our ab initio calculations, which however indicate that neither Fermi surface nesting, nor enhanced momentum-dependent electron-phonon coupling can account for the I-CDW formation, demonstrating its unconventional nature[2].

[1] Yao et al. arxiv:2207.03161, accepted in Nature Communications (2022)
[2] Souliou et al. arxiv:2207.07191