

Diffuse Scattering in Strongly Correlated Systems

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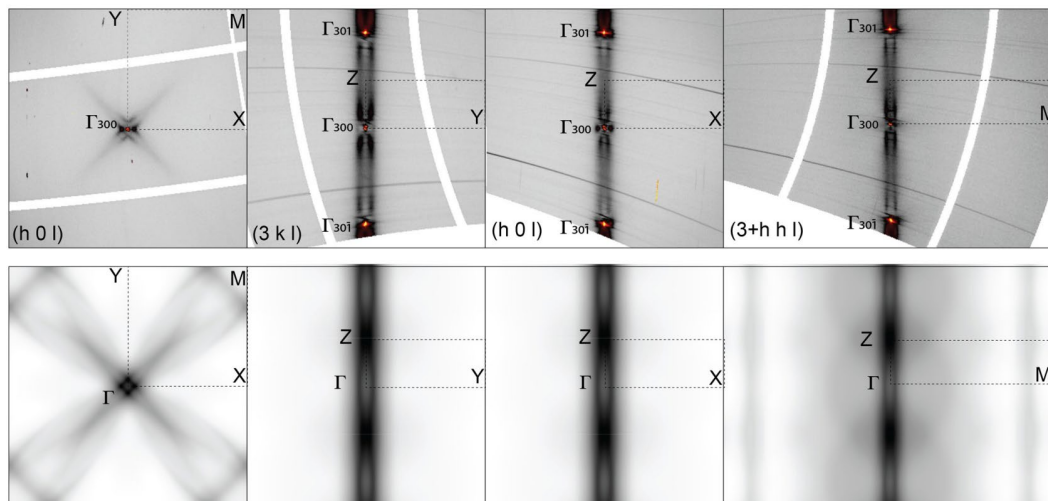
Measuring the phonon dispersions can be complemented and sometimes even replaced by the measurement of thermal diffuse scattering. In the latter case energy-integrated intensity maps can be collected very fast in large regions of reciprocal space. The newly constructed diffraction/diffuse scattering station of the ID28 ESRF beamline [1], in conjunction with the existing inelastic X-ray scattering spectrometer, provides a unique opportunity of combined studies.

Quasi-2D correlated systems appear to be particularly favorable for the mapping of nesting-related anomalies by TDS. The obtained information corresponds to the bulk properties, which, for instance, can bring new insights to the interpretation of results of surface-sensitive photoelectron spectroscopy.

Among the successful applications we can cite the following systems:

- LaAgSb₂ – soft phonon instability with extremely large real space periodicity [2]
- ErTe₃ – phonon anomalies, giving rise to two families of incommensurate modulation

In both cases the momentum transfer resolution of the diffuse scattering measurements was critical for the analysis, otherwise a full tracing of anomalies with inelastic scattering alone would become extremely difficult if even possible.



Comparison of DS maps of LaAgSb₂ with the corresponding calculated maps of intraband electronic susceptibility

[1] A. Girard, T. Nguyen-Thanh, S.-M. Souliou, M. Stekiel, W. Morgenroth, L. Paolasini, A. Minelli, D. Gambetti, B. Winkler, A. Bosak, J. Synchrotron Rad. 26, 272–279 (2019)

[2] A. Bosak, S.-M. Souliou, C. Faugeras, R. Heid, M.R. Molas, R.-Y. Chen, N.-L. Wang, M. Potemski, M. Le Tacon, Phys. Rev. Research 3, 033020 (2021)