

ABSTRACT OF THE THESIS

Model calculations of Raman responses for multiband iron-based superconductors

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In this thesis I compute Raman responses for a free electron band structure model based on ARPES measurements on multiband iron-based superconductors. First a constant and then a k -dependent superconducting gap is used. Applying an effective mass approximation leaves A_{1g} and B_{2g} as the only nonvanishing symmetry channels. In the latter only one band contributes and a square root singularity is observed for a constant gap. The k -dependent gap leads to a threshold- \log -singularity structure. The unscreened A_{1g} channel shows the same features but all bands contribute and sum up. The screened single band A_{1g} response vanishes for both gaps. Two band responses with the same constant gap are perfectly screened with identical Raman vertices, unscreened with opposite signs and equal mass ratios and partially screened in all other cases. With two different constant gaps the singularities are removed and a dome-like shape appears except for the vanishing case of equal vertices. The n -band response consists of a sum of two band terms normalized by all n bands and the singularities corresponding to all uniquely present gap values are removed. With the k -dependent gap the singularities are removed and a dome-like shape appears in all combinations of two band responses and in the response for all bands. The dome in the response for all bands shows a flat continuum in between a threshold and a sharp peak produced by the two band terms containing bands of opposite signs.