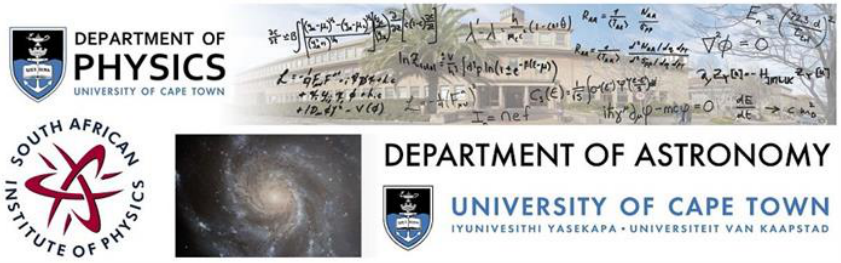

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Precise visualisation of dispersive low-energy features in ARPES spectra

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Abstract content
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It is known that the band structure of crystalline solids can be represented in the form of two dimensional images produced experimentally by Angle Resolved PhotoElectron Spectroscopy (ARPES). The images reproduce the energy of the bands as a function of momentum in reciprocal space.

Various parameters can be extracted from the dispersion of the above mentioned bands and the line shape of the quasi-article peaks associated with them. This provides very valuable information on the interaction between low energy electrons and other excitations, e.g. phonons. It is these interactions that lead to the exciting phenomena found more recently in condensed matter.

When ARPES data is measured, it can be found that the above mentioned parameters are sometimes difficult to extract directly from the raw data due to the nature of the bands formed at low energies.

Recently Zhang and co-workers at the Chinese Academy of Sciences have developed a method [1] which uses the mathematical concept of two-dimensional curvature to better image features in bands, in particular in shallow bands. We have used this technique to analyse the low-energy band dispersion of the correlated oxides Sr₃Ru₂O₇ and Sr₄Ru₃O₁₀ and have accurately extracted the parameters of those bands. Results of this analysis will be shown and discussed.

In particular our analysis reveals the existence of flat bands (of bandwidth ˜ 5 meV), which give rise to van Hove singularities and kinks around the high symmetry points of the first Brillouin zone in the proximity of the Fermi level. These bands are deemed to be responsible for the metamagnetic ground state of these systems.

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