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Soft X-ray ARPES Investigation of High-temperature Superconductors

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When performing ARPES using low photon energies the experiments suffer from a number of limitations, e.g. a limited probing depth. In connection, there have been questions raised regarding the electronic structure amongst the layered cuprates being 2D or 3D in nature. To discern a possible kz-dependence using low photon-energies is a very tricky task. To interpret the data correctly one needs to account for the fact that the final state is not free electron like. Further, at low photon energies the probe depth is of the order 4 A, which implies a large uncertainty, dkz=1/4 A−1. In most of the high-temperature superconductors, the lattice parameter c is large and the Brillouin zone (BZ) is hence "compressed"in kz. Consequently, dkz is more than half the BZ. When using soft x-rays, the probe depth is ˜15 A, i.e. dkz=1/15 A−1. This improvement in kz-resolution makes it much easier to distinguish a kz-dependence of the Fermi surface (FS) topology. Among other things, SX-ARPES data probing the electronic structure of the high-Tc cuprate La1.48Nd0.4Sr0.12CuO4 will be presented. The FS topology at is remarkably different, indicating kz-dispersion from strong interlayer coupling.

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Poster

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Multiple order parameter systems

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