

THEORETISCH PHYSIKALISCHES KOLLOQUIUM

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Why it is so hard to detect Luttinger liquids in ARPES?

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The problem of photoemission from a quasi-1D material is studied. We identify two issues that play a key role in the detection of gapless Tomonaga-Luttinger liquid (TLL) phase. Firstly, we show how a disorder - backward scattering as well as forward scattering component, is able to significantly obscure the TLL states, hence the initial state of ARPES. Secondly, we investigate the photo-electron propagation towards a sample's surface. We focus on the scattering path operator contribution to the final state of ARPES. We show that, in the particular conditions set by the 1D states, one can derive exact analytic solution for this intermediate stage of ARPES. The solution shows that for particular energies of incoming photons the intensity of photo-current may be substantially reduced. In the final part of the talk, I will put together the two aspects (the disorder and the scattering path operator) to show the full, disruptive force of any inhomogeneities on the ARPES amplitude.