Instabilities of coupled Cu$_2$O$_5$ ladders

FLORIAN SCHUETZ, BRAD MARSTON, Brown University, Providence, RI — The spin-ladder compound Sr$_{14-x}$Ca$_x$Cu$_{24}$O$_{41}$ has a complex phase diagram including charge-density-wave order as well as unconventional superconductivity under high pressure. Due to its quasi-one-dimensional nature fundamental questions about the high-T$_c$ cuprates might be more easily addressed in this context. However, due to the spatial proximity of neighboring ladders inter-ladder Coulomb repulsion as well as hopping between ladders might still be important. Using the functional renormalization group and an analysis of generalized susceptibilities, we study a model of coupled Cu$_2$O$_5$ ladders. We investigate instabilities towards charge, spin, and pairing order as a function of hole doping, inter-ladder hopping, and interaction strength starting from experimentally relevant hopping parameters.

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