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Many-variable variational Monte-Carlo studies of superconductivity with incipient bands in two-band Hubbard models

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The "incipient" band, which is not within, but close to the Fermi level, can contribute significantly to spin-fluctuation-mediated pairing [1,3,4]. The incipient band pairing can achieve both strong pairing interactions and light electron mass, possibly resulting in extremely high T_c . The previous studies argued that superconductivity with incipient bands can be induced by engineering of band structures and carrier concentrations in the weak coupling regime [2]. On the other hand, in the case of the strong coupling regime, the pairing mechanism continues to be a matter of debate. Using a many-variable variational Monte-Carlo method [5] for two-band Hubbard models, we find a possible evidence for a correlation-driven Lifshitz transition at the emergence of superconductivity with incipient bands. We also find that in the presence of large Fermi surfaces in the weak coupling limit, incipient bands tend to stick to the Fermi level when the electron correlation is increased.

[1] K. Kuroki, T. Higashida, and R. Arita, *Phys. Rev. B* **72**, 212509 (2005).

[2] K. Matsumoto, D. Ogura, and K. Kuroki, *Phys. Rev. B* **97**, 014516 (2018).

[3] P.J. Hirschfeld, M.M. Korshukov, and I.I. Mazin, *Rep. Prog. Phys.* **74**, 124508 (2011).

[4] H. Miao et al., *Nat. Comm.* **6**, 6056 (2015).

[5] <https://github.com/issp-center-dev/mVMC>

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