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Fidelity susceptibility of one-dimensional models with twisted boundary conditions[1] DIPTIMAN SEN, MANISHA THAKURATHI, Indian Institute of Science, Bangalore, AMIT DUTTA, Indian Institute of Technology, Kanpur — It is well-known that the ground state fidelity of a quantum many-body system can be used to detect its quantum critical points (QCPs). If g denotes the parameter in the Hamiltonian with respect to which the fidelity is computed, we find that for one-dimensional models with a large but finite size, the fidelity susceptibility χ_F can detect a QCP provided that the correlation length exponent satisfies $\nu < 2$. We then show that χ_F can be used to locate a QCP even if $\nu \geq 2$ if we introduce boundary conditions labeled by a twist angle $N\theta$, where N is the system size. If the QCP lies at $g = 0$, we find that if N is kept constant, χ_F has a scaling form given by $\chi_F \sim \theta^{-2/\nu} f(g/\theta^{1/\nu})$ if $\theta \ll 2\pi/N$. We illustrate this in a tight-binding model of fermions with a spatially varying chemical potential with amplitude h and period $2q$ in which $\nu = q$. Finally we show that when q is very large, the model has two QCPs at $h = \pm 2$ which cannot be detected by studying the energy spectrum but are clearly detected by χ_F. The peak value and width of χ_F scale as non-trivial powers of q at these QCPs. We argue that these QCPs mark a transition between extended and localized states at the Fermi energy.

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