Tunneling of correlated electrons through a narrow domain wall in magnetic nanowires

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9.7 cm

Electron transmission through a narrow domain wall in a ferromagnetic one dimensional metal is studied taking into account both potential and spin dependent scattering at the wall. This introduces transmission amplitudes with or without spin reversal. We consider a model electron-electron interaction which is local and includes a spin dependent term. Then, the correction to the bare scattering amplitudes is calculated to first order in the electron-electron interaction, within a Hartree-Fock theory. Such correction diverges logarithmically with the bandwidth cutoff. Using a poor man's renormalization group approach for the electron interactions, where the coupling constants and transmission amplitudes are renormalized as the bandwidth cutoff is progressively reduced, we obtain analytical expressions for the conductance at any temperature. We also compare our results to those obtained from bosonization techniques and discuss the implications to domain wall movement.

13.4 cm

Subject category :

1. Correlated Electrons and High Temperature Superconductors

Presentation mode :
poster

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