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Mathematical Physics

The BCS gap equation for spin-polarized fermions

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(Submitted on 2 Jul 2011)

We study the BCS gap equation for a Fermi gas with unequal population of spin-up and spin-down states. For $\cosh(\delta_\mu/T) \leq 2$, with T the temperature and δ_μ the chemical potential difference, the question of existence of non-trivial solutions can be reduced to spectral properties of a linear operator, similar to the unpolarized case studied previously in \cite{FHNS,HHSS,HS}. For $\cosh(\delta_\mu/T) > 2$ the phase diagram is more complicated, however. We derive upper and lower bounds for the critical temperature, and study their behavior in the small coupling limit.

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