1044-81-59   **Christian Hainzl*** (`hainzl@math.uab.edu`), 1300 University Boulevard, Birmingham, AL 35294, AL 35294. *Mathematical aspects of the Bardeen-Cooper-Schrieffer equation of superfluidity.*

Although the BCS-gap equation is highly non-linear, we are able to give a precise characterization of the interaction potentials which give rise to a non-trivial solution, or in physics terms, a superfluid state. Moreover we evaluate the asymptotic behavior of the critical temperature and the energy gap in the limit of small coupling, as well as in the small density limit. We thereby improve the formulas from the Physic's literature. We achieve this by the precise spectral analysis of operators whose kinetic symbol degenerates on a manifold of co-dimension one. (Received August 11, 2008)