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Impurity effects in metals and superconductors KURT SCHARNBERG, SIMON SCHEFFLER, CARSTEN RIECK — In the theoretical analyses of impurity effects in superconductors the assumption is usually made that all quantities are slowly varying functions of energy except for the Green functions, whose energy dependence is integrated out. The energy-integrated normals state Green function for the NFE model is $-i$ and the divergent real part is omitted. The argument of any other momentum dependent quantity is replaced by the Fermi momentum. When defects modelled by scattering potentials of finite range, which lead to scattering in infinitely many angular momentum channels, are treated within this so-called Fermi Surface Restricted Approximation, unacceptable results for the selfenergies, the pair breaking parameters and others follow in the strong scattering limit. It has been found necessary to consider the principal value integral involving the real part of the Green function in the T-matrix equation. In this way, the range of the potential is re-introduced as an essential parameter and resonant scattering in different ℓ-channels can occur for moderately large potentials, while δ-function potentials, even when there strength is infinite, do not scatter at all. This generalized theory of impurity effects will be applied to calculations of the local density of states near an impurity and, using the selfconsistent T-matrix approximation for an ensemble of impurities, to calculations of spectral functions.

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