

On the mathematical aspects of quasi-particles in solid state physics

H.D. Cornean

Abstract:

Consider a many-body fermionic Hamiltonian defined with periodic boundary conditions on a two dimensional torus (which models a very long and thin cylinder, i.e. a straight nanotube). We will study the low lying spectrum of this operator, and show that in the Hartree-Fock approximation one can obtain effective one-particle models describing these particular states.

Finally, we will show how these excited states (excitons, trions, etc) influence the optical absorption of a given material. We stress that the main purpose of this talk is to formulate clean mathematical problems related to PDEs, unbounded linear self-adjoint operators, and integral equations."