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Title: **Fermionic Bubbles and Foam**

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The positioning of one or more bubbles inside a many fermion does not affect the volume, surface or curvature terms in the liquid drop expansion of the total energy. If Coulomb effects are irrelevant, the only contribution to the ground state energy of a system with one or more voids arises from quantum effects, which is similar to the Casimir effect in vacuum or in critical phenomena. We discuss the characteristics of such systems, the interplay among various effects, such as shell corrections and chaotic behavior, and briefly mention the role of the temperature and pairing [1]. As an example we consider the neutron matter at subnuclear densities in the neutron star crust which is unstable towards the formation of inhomogeneities. Depending on the average value of the neutron density one can observe the appearance of either bubbles, rods, tubes or plates embeded in a neutron gas. We estimate the quantum corrections to the ground state energy (which could be termed either shell correction or Casimir energy) of such phases of neutron matter. The calculations are performed by evaluating the contribution of the shortest periodic orbits in the Gutzwiller trace formula for the density of states. The magnitude of the quantum corrections to the ground state energy of neutron matter are of the same order as the energy differences between various phases [2].

References

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