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Orbital magnetic susceptibility in an integrable system M.X. LOU, J.M.A.S.P. WICKRAMASINGHE, R.A. SEROTA, University of Cincinnati — We investigate, analytically and numerically, the orbital magnetism of free electron gas in a rectangular box, which is a model classically integrable system. We find that both the average orbital susceptibility and its fluctuations are determined by the two-level van Vleck susceptibility that involves the last occupied (Fermi) level and the first unoccupied level. This is in line with previous results for disordered (classically chaotic) systems. The mesoscopic fluctuations, however, are much larger in integrable systems. We find that, in units of μ_B^2/Δ, where Δ is the mean level spacing, the average orbital susceptibility is $\sim \left\langle \left| \widehat{L}_{if} \right|^2 \right\rangle \langle (\varepsilon_f - \varepsilon_i)^{-1} \rangle$, where $\left\langle \left| \widehat{L}_{if} \right|^2 \right\rangle \sim \sqrt{N}$, L is the orbital angular momentum, N is the number of electrons in the box, and $\varepsilon_f - \varepsilon_i$ is the level spacing (in units of Δ) between the last occupied level and the first unoccupied level. $\langle \varepsilon_f - \varepsilon_i)^{-1} \rangle$ is principally divergent and hence determined by the relevant cut-off.

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