THEORETICAL PHYSICS SEMINAR

Title: Revisiting the Pauli paramagnetism and the Landau diamagnetism in metals

Speaker: Dr. Navinder Singh, THEPH PRL

Date/Time/Venue: 15th Thursday (Thursday)/4:00 PM/ Room No. 469

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Tea will be served at 3:30pm outside Room 469

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ABSTRACT

In standard text books on statistical mechanics (Landau-Lifshitz, for example) the calculation of Pauli's paramagnetism is generally performed by neglecting the effect of magnetic field on density of states. However,the criterion of doing so was lacking so far. We work out the criterion of doing so, and thus give the calculation a rigorous foundation. Pauli's calculation is done by three different routes, and so provides a clear understanding. In the strong field limit (\mu_B H> k_B T) it is generally shown that total susceptibility shows de Haas van Alphen (dHvA) oscillations. We point out that even the Pauli paramagnetic susceptibity does show oscillations and a new formula equivalent to Lifshits-Kosevich is derived in terms of Fresnel integrals which goes to the original Pauli result once averaging over the oscillations is performed when low field limit is taken. A new formula in the intermediate temperature regime in terms of PolyLogs is also derived. The effect of electron scattering off bosonic modes on the Lifshits-Kosevich formula is also worked out.

All are welcome to attend