Displaced Drude peak from vertex corrections to optical conductivity in correlated metals

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Susceptibilities and optical conductivity are examples of two-particle response functions that are the key quantities for connecting theoretical predictions with experimental results. It can however become highly non-trivial to calculate them, especially in cases when vertex corrections are important. In my talk I will explain what vertex corrections to response functions are and when they become important. I will then present diagrammatic methods of their computation with the focus on parquet equations. I will show results for a special type of vertex corrections to optical conductivity, the pi-tons [1], that are present in systems with antiferromagnetic or charge density wave fluctuations. These vertex corrections lead to a displaced Drude peak in correlated metals [2].

[1] A. Kauch,P. Pudleiner,K. Astleithner,P.Thunström,T. Ribic, K. Held, Phys. Rev. Lett. 124, 047401 (2020)
[2] J. Krsnik, O. Simard, P. Werner, A. Kauch, and K. Held, Phys. Rev. B 110, 075118 (2024)