SoSe 2017

ÜBUNGEN ZUR VORLESUNG

Feynman Path Integral in Solid State Physics

Blatt 7

Spectral Representation

1) Using the Lehmann-spectral representation derive the expression for one-electron Green Function for the single interacting atom with the Hamiltonian:

$$\hat{H} = \sum_{\sigma} \varepsilon \hat{c}_{\sigma}^{+} \hat{c}_{\sigma} + \frac{1}{2} \sum_{\sigma,\sigma\prime} U \hat{c}_{\sigma}^{+} \hat{c}_{\sigma\prime}^{+} \hat{c}_{\sigma\prime} \hat{c}_{\sigma}$$

where $\sigma = (\uparrow, \downarrow)$ are the spin projections.

2) Using the spin-polarized one-electron Green function:

$$G_{\sigma}(\overrightarrow{k}, i\omega) = \frac{1}{i\omega + \mu - \varepsilon_{\sigma}(\overrightarrow{k})}$$

obtain an expression for a magnetic susceptibility:

$$\chi_{\uparrow\downarrow}(q) = -\sum_{k} G_{\uparrow}(k) G_{\downarrow}(k+q)$$

where the 4-dimensional vector defined as:

$$\begin{aligned} k &= (\overrightarrow{k}, i\omega) \\ \sum_{k} &= T \sum_{\omega_n} \int \frac{d\overrightarrow{k}}{(2\pi)^3} \end{aligned}$$