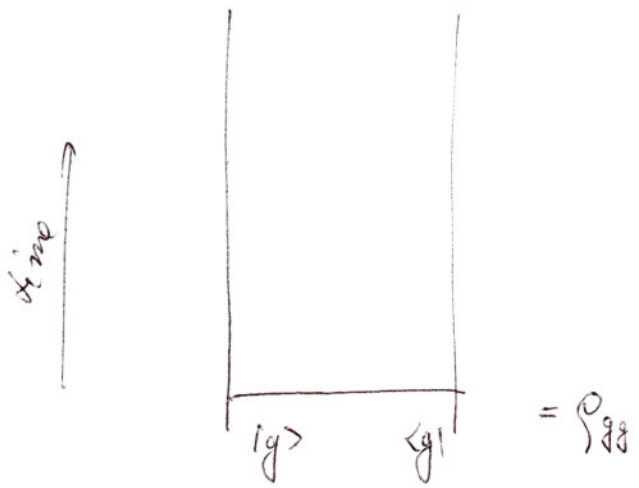
Just an info

Feynman diagrams and Liouville pathways

We could notice that the third order response function stands an evolution of a perturbation to the originally equilibrium density matrix $\rho(t=-\infty)$. It is possible to visualize this by a diagram



arrow ↗ and ↖ means an interaction with the field ~ the action of $\hat{\mu}$ from left a right

Let us follow R_1

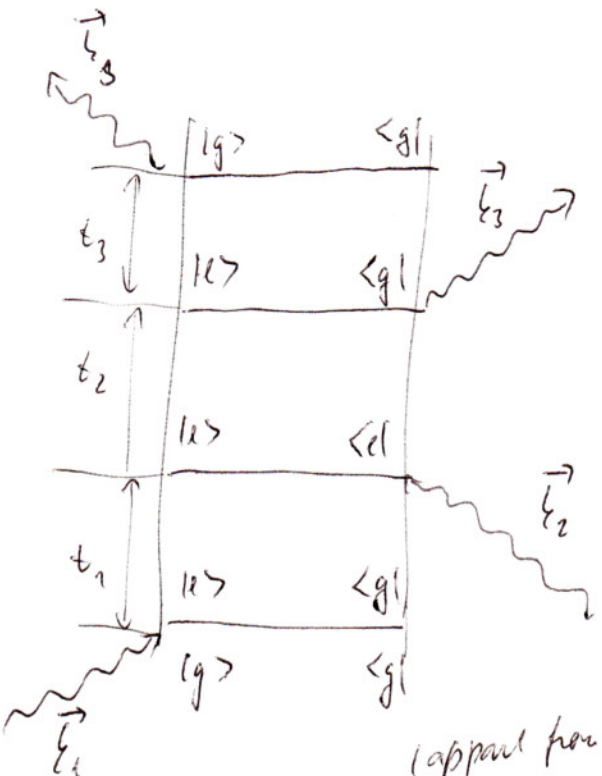
① ρ_{gg}

② $\hat{\mu}\rho_{gg} = \rho_{eg}$ ↕ t_1

③ $\rho_{eg}\hat{\mu} = \rho_{ee}$ ↕ t_2

④ $\rho_{ee}\hat{\mu} = \rho_{eg}$ ↕ t_3

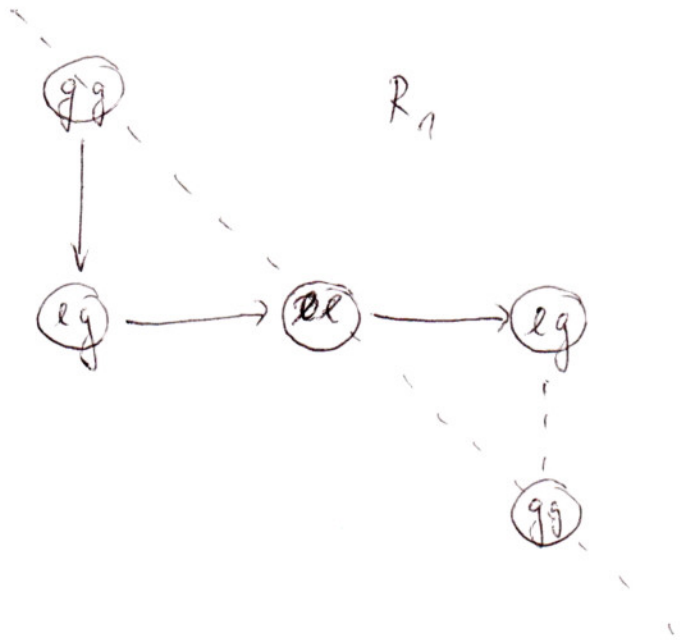
⑤ measurement $\hat{\mu}\rho_{eg} = \rho_{gg}$



(appart from instantaneous)

⇒ odd number of interactions from right mean − sign for the pathway

Similarly one can visualize the changing $\hat{S}$ by the diagram



Both have certain advantages, e.g. in Liouville pathways one can easily recognize mutually complex conjugated pathways because they are just mirror with respect to the line

$\Rightarrow$ R_1^* has sign -1