Reinvestigate NRG

$$\mathcal{H} = \mathcal{H}_0 + \mathcal{H}_{imp}$$

$$\mathcal{H}_0 = \sum_{n=0}^{\infty} \xi_n \left(c^{+}_{n\sigma} c_{n+1\,\sigma} + H.C. \right)$$

$$\mathcal{H}_{imp} = V \left(f^{+}_{\sigma} c_{0\sigma} + H.C. \right) + U n_{f\uparrow} n_{f\downarrow} - \epsilon_f n_f - h S^z_f$$

$\xi_n \sim \Lambda^{-n/2}$

$T_N = c \Lambda^{-(N-1)/2}$ $\quad$ N^{th} iteration, c order of one

- for static quantities all information available since only excitations on the scale T_N are relevant

- for dynamical properties additional energy scales (ω) ~~which~~ larger than temperature might be important

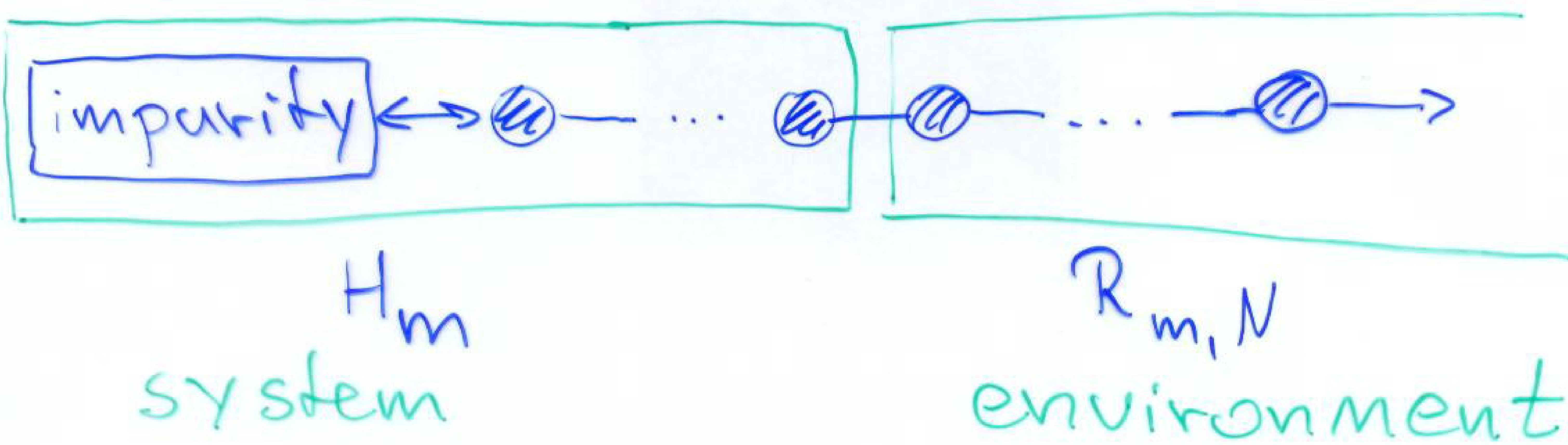
$$A_\sigma(\omega) = \sum_{nm} |\langle m | f_\sigma^\dagger | n \rangle|^2 \, \delta(\omega - E_m + E_n) \times$$

$$\times \frac{e^{-\beta E_m} + e^{-\beta E_n}}{Z}$$

- spectral information at frequencies $\omega \gg T_N$ requires matrix elements between low-lying states that are lost due to truncation

- test $m = \langle n_{f\uparrow} - n_{f\downarrow} \rangle$

$$= \int_{-\infty}^{0} d\omega \, A_\uparrow(\omega) - \int_{-\infty}^{0} d\omega \, A_\downarrow(\omega)$$



$$|\underbrace{\cancel{\alpha}_{imp}, \alpha_0, \ldots \alpha_m}_{r}) \, |\underbrace{\alpha_{m+1}, \ldots \alpha_N}_{e})$$

$|r, e; m) \to |l, e; m)_{dis}$ store these

$|r, e; m) \to |k, e; m)_{kp}$ use these to construct $\mathcal{H}_{m+1}$

$|k \, \alpha_{m+1}, e'; m) \leftarrow$

- at last iteration step all discarded states & states of last iter. step form a complete basis

treat them as discard.

$$\sum_{m=m_{min}}^{N} \sum_{le} |l, e; m)_{dis} \, {}_{dis}(l, e; m| = 1$$

$\Rightarrow$ evaluation of spectral functions will not involve any truncation error $\rightarrow$ Sum rule conserving spectral function