Quindi si ha:

$$\hat{H} = \sum_{\nu\nu'} T_{\nu\nu'} a^\dagger_\nu a_{\nu'} + \frac{1}{4}\sum_{\mu\mu'\nu\nu'} \bar{V}_{\mu\nu\mu'\nu'} N\left[a^\dagger_\mu a^\dagger_\nu a_{\nu'} a_{\mu'}\right] +$$

$$+ \sum_{\nu\nu' i} \bar{V}_{\nu i \nu' i} N\left[a^\dagger_\nu a_{\nu'}\right] + \frac{1}{2}\sum_{ij} \bar{V}_{ijij} \tag{19}$$

Adesso si usa:

$$N\left[a^\dagger_\nu a_{\nu'}\right] = a^\dagger_\nu a_{\nu'} - \overline{a^\dagger_\nu a_{\nu'}}$$

quindi il termine

$$\sum_{\nu\nu' i} \bar{V}_{\nu i \nu' i} N\left[a^\dagger_\nu a_{\nu'}\right] = \sum_{\nu\nu' i} \bar{V}_{\nu i \nu' i} a^\dagger_\nu a_{\nu'} - \sum_{ij} \bar{V}_{ijij} \tag{20}$$

inserendo 20) in 19) si ha:

$$\hat{H} = \sum_{\nu\nu'} \left(T_{\nu\nu'} + \sum_i \bar{V}_{\nu i \nu' i}\right) a^\dagger_\nu a_{\nu'} + \frac{1}{4}\sum_{\mu\mu'\nu\nu'} \bar{V}_{\mu\nu\mu'\nu'} N\left[a^\dagger_\mu a^\dagger_\nu a_{\nu'} a_{\mu'}\right] - \frac{1}{2}\sum_{ij} \bar{V}_{ijij}$$

Il termine a un corpo è quello che moltiplica $a^\dagger_\nu a_{\nu'}$

$$h_{\nu\nu'} = T_{\nu\nu'} + \sum_i \bar{V}_{\nu i \nu' i}$$

Supponiamo di lavorare in una base di funzioni $|\phi_\nu\rangle$ d'onda in cui $h_{\nu\nu'}$ sia diagonale

$$\langle \nu | \hat{h} | \nu' \rangle = \varepsilon_\nu \qquad \text{ovvero} \qquad \hat{h}\,|\phi_\nu\rangle = \varepsilon_\nu\,|\phi_\nu\rangle$$

L'hamiltoniana 23) produce le energie di singola particella, Eq. 21 diventa

$$\hat{H} = \sum_\nu \varepsilon_\nu a^\dagger_\nu a_\nu - \frac{1}{2}\sum_{ij} \bar{V}_{ijij} + \frac{1}{4}\sum_{\mu\mu'\nu\nu'} \bar{V}_{\mu\nu\mu'\nu'} N\left[a^\dagger_\mu a^\dagger_\nu a_{\nu'} a_{\mu'}\right]$$

$$= \hat{H}_0 + \hat{V}_{res}$$