Interaction quench in the IHM

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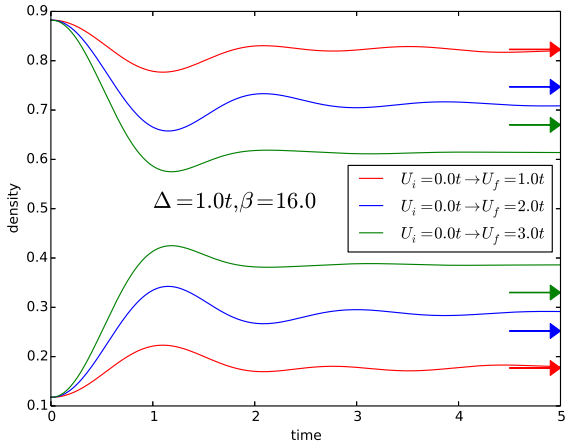
1 Introduction

$$H_{IHM} = -t \sum_{\langle i\in A, j\in B\rangle,\sigma} (\hat{c}^{\dagger}_{j\sigma}\hat{c}_{i\sigma} + hc) + \Delta \sum_{i\in A} \hat{n}_i - \Delta \sum_{i\in B} \hat{n}_i - \mu \sum_{i,\sigma} \hat{c}^{\dagger}_{i\sigma}\hat{c}_{i\sigma} + U \sum_{i} \hat{n}_{i\uparrow}\hat{n}_{i\downarrow} \qquad (1)$$

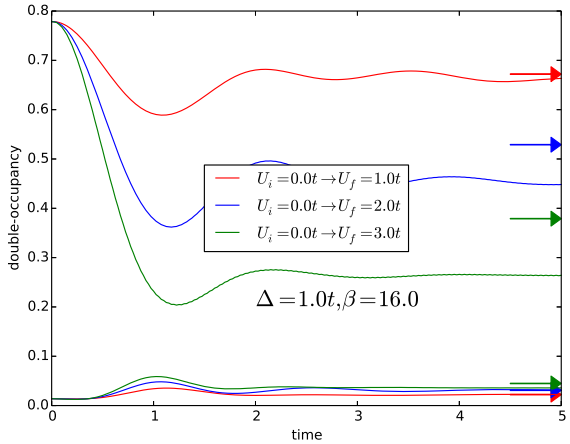
Here t is the nearest neighbor hopping and, U the Hubbard repulsion has been Δ is the staggered one body potential which doubles the unit cell. When Δ is zero it is exactly Hubbard Hamiltonian.

Phase diagram of this model is studied [2, 4]. In non interacting case it is charge density wave(CDW) band insulator. As one increase U in this model CDW stat are suppressed and band insulating phase crossover to correlated metal state. If you increase U farther at certain critical U_c there will be metal to Mott insulating transition in para-magnetic calculation. We want to study at certain U(BI,M,MI) if one suddenly turn on Δ in HM how CDW phase appear in the system. Previously in Hubbard model(HM) interaction quench problem already done for both para[3, 1, 6] and AFM phase[5, 6] using IPT-DMFT. Double occupancy, jump of the distribution function across fermi level has been studied.

2 Density and Double occupency



(a) density of A and B sublattice as function of time for different sudden interaction quench $U_i \rightarrow U_f$. All the cases initial state at $\beta = 16$ with $\Delta = 1.0$



(b) Double occupancy at A and B sublattice as function of time.

Figure 1

In fig 1 density at A and B sub-lattice evolution is plotted as as interaction is quenched from $U_i = 0$ to $U_f = 1.0$, 2.0,3.0 where ionic staggered potential is kept fixed at $\Delta = 1.0t$. All the cases intial state is

at beta=16. IN the density plot lower set of lines are for A sub lattice and uper set are for B sublattice which is negetive orbita potetial compare to A. Corresponding arrows are for euilibium density at A and B sublattice at beta=16. Effective temperature of the system after interaction quench is calculated below and at those temperature equllibium density is give.

3 Energy

Energy at γ ={ A, B} sublattice is defined as

$$E_\gamma = \Delta * n_\gamma + E_{k\gamma} + U_f * d_\gamma \tag{2}$$

where n_γ is the occupation andd d_γ is double occupation at γ sublattice and $E_{k\gamma}$ is kinetic energy = $-2 \int G_\gamma(\tau) G_{\bar{\gamma}}(\beta - \tau)$

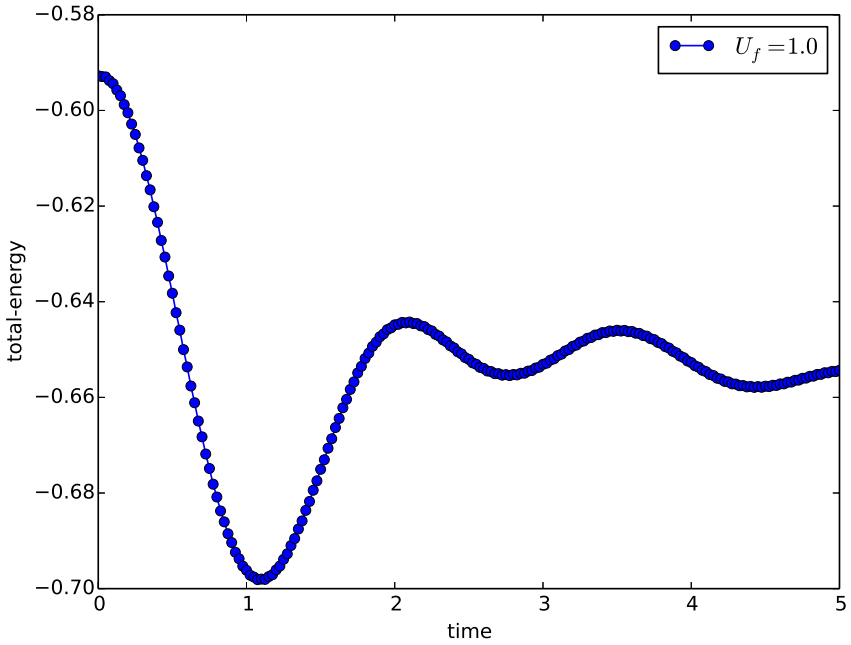


Figure 2: here total energy = $(E_A + E_B)/2.0$

References

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