

# Possible Projects.

## I. heterobilayer

$$H = -\frac{\hbar^2 \vec{k}^2}{2m^*} + \Delta(\vec{r})$$

$$\Delta(\vec{r}) = 2\sqrt{\sum_{j=1,3,5} \cos(\vec{g}_j \cdot \vec{r} + \psi)}$$

- ① phase diagram at  $\nu=1$   
Mott v.s. Charge transfer insulator
- ② Wigner Crystals at  $\nu=p/q$   
comparison with lattice calculation.

## II heterobilayer, interlayer - coherence

$$H = \begin{pmatrix} -\frac{\hbar^2 \vec{k}^2}{2m_1^*} + \Delta(\vec{r}) & 0 \\ 0 & -\frac{\hbar^2 \vec{k}^2}{2m_2^*} + V_{z,t} \end{pmatrix}$$

exciton insulator

- ① phase diagram, exciton binding energy  
exciton - exciton interaction strength.
- ② generalized Wigner Crystals.

## III homobilayer

Mott insulator v.s. QAH