Simple Tight-Binding Model on Triangular Lattice

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THE MODEL DEFINITION

The simple tight-binding model on the triangular lattice is defined as fellow:

- Only nearest-neighbor hopping is considered

- No spin-flip hopping is involved

- Only one orbit and two spin flavors(spin-up and spin-down) are involved on every lattice site

The model Hamiltonian:

$$H = -t \sum_{<ij>\alpha} c_{i\alpha}^{\dagger} c_{j\alpha} + \mu \sum_{i\alpha} c_{i\alpha}^{\dagger} c_{i\alpha} \tag{1}$$

where $< ij >$ stands for nearest-neighbor and α correspond to spin-up and spin-down.

The resulting dispersion relation is:

$$E_{\boldsymbol{k}} = \mu - 2t(\cos \boldsymbol{k} \cdot \boldsymbol{r}_1 + \cos \boldsymbol{k} \cdot \boldsymbol{r}_2 + \cos \boldsymbol{k} \cdot \boldsymbol{r}_3) \tag{2}$$
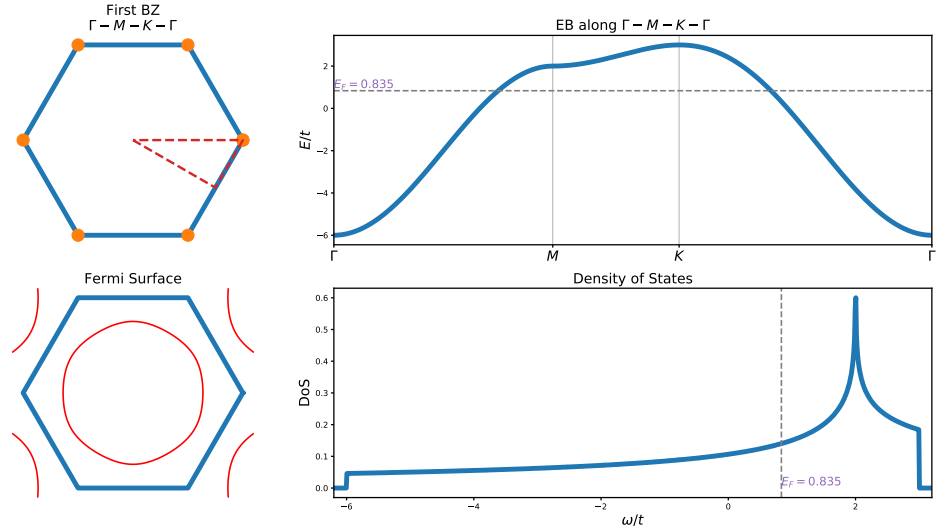
THE BASIC ASPECTS

The basic aspects of this model is shown in Fig. 1.

FIG. 1: The basic aspects of the tight-binding model.