



$$\hat{H}_{\text{eff}} = \left[-2J_{\text{intra}} + \frac{4(t_{\text{intra}})^2}{U} \right] \left(\hat{\vec{S}}_L \cdot \hat{\vec{S}}_R - \frac{1}{4} \hat{n}_L \hat{n}_R \right) - J_{\text{intra}} \hat{n}_L \hat{n}_R$$