$\mathcal{H}_{Cr-Cr} =$	$ \left(\begin{array}{c} 0 \\ t_{A,Cr}e^{i(-k_1+k_1+k_2)} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $	$egin{array}{ccccc} t_{A,Cr}e^{i(k_1-k_2)} & 0 & & & & & & & & & & & & & & & & & $	$t_{A,Cr}e^{ik_2} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ t$	$t_{in,Cr}e^{ik_2}$ $t_{in,Cr}e^{ik_2}$ $t_{z,Cr}e^{ik_3}$ $t_{out,Cr}e^{i(k_2+k_3)}$ t	$egin{array}{ccccc} 0 & t_{in} & t_{in,Cr} & & & & & & & & & & & & & & & & & & &$	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$t_{z,Cr}e^{-ik_3}$ $t_{out,Cr}e^{-ik_3}$ $t_{in,Cr}e^{-ik_2}$	$0 \\ 0 \\ t_{out,Cr}e^{-i(k_2+k_3)} \\ t_{out,Cr}e^{-ik_3} \\ t_{z,Cr}e^{-ik_3} \\ t_{in,Cr}e^{-ik_2} \\ t_{in,Cr} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0$	$0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ t_{in,Cr}e^{-ik_1} \\ t_{in,Cr} \\ t_{z,Cr}e^{ik_3} \\ t_{out,Cr}e^{i(-k_1+k_3)} \\ t_{out,Cr}e^{i(-k_1+k_3)}$	$0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ t_{in,Cr}e^{ik_1} \\ 0 \\ t_{in,Cr}e^{ik_1} \\ t_{out,Cr}e^{ik_1} \\ t_{out,Cr}e^{i(k_1+k_3)} \\ t_{z,Cr}e^{ik_3} \\ t_{out,Cr}e^{i(k_1+k_3)}$	$0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ t_{in,Cr} \\ t_{in,Cr} e^{-ik_1} \\ 0 \\ t_{out,Cr} e^{ik_3} \\ t_{out,Cr} e^{i(-k_1+k_3)} \\ t_{z,Cr} e^{ik_3}$	$\begin{matrix} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ t_{z,Cr}e^{-ik_3} \\ t_{out,Cr}e^{-i(k_1+k_3)} \\ t_{out,Cr}e^{-ik_3} \\ 0 \\ t_{in,Cr}e^{-ik_1} \\ t_{in,Cr} \end{matrix}$	$0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ t_{out,Cr}e^{i(k_1-k_3)} \\ t_{z,Cr}e^{-ik_3} \\ t_{out,Cr}e^{i(k_1-k_3)} \\ t_{in,Cr}e^{ik_1} \\ 0 \\ t_{in,Cr}e^{ik_1}$	$t \sim e^{-i(\kappa_1 + \kappa_3)}$
							$\psi_{Cr} = \begin{pmatrix} d_{R_{+,1}} \\ d_{R_{+,2}} \\ d_{R_{+,3}} \\ d_{R_{-,1}} \\ d_{R_{-,2}} \\ d_{R_{-,3}} \\ d_{L_{+,1}} \\ d_{L_{+,2}} \\ d_{L_{+,3}} \\ d_{L_{-,1}} \\ d_{L_{-,2}} \\ d_{L_{-,3}} \\ d_{z,1} \\ d_{z,2} \\ d_{z,3} \end{pmatrix}$							
		1 +	$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 $	$t - e^{-ik_3}$	$0 \\ 0 \\ t_{out,Fe}e^{-i(k_1+k_2+k_3)} \\ t_{out,Fe}e^{-i(k_1+k_2+k_3)} \\ t_{z,Fe}e^{-ik_3} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $	$t_{z,Fe}e^{ik_3} \ t_{out,Fe}e^{ik_3} \ t_{out,Fe}e^{i(k_1+k_2+k_3)} \ t_o \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ $	$t_{out,Fe}e^{ik_3}$ t_{out} $t_{z,Fe}e^{ik_3}$ t_{out} $t_{vt,Fe}e^{i(k_1+k_2+k_3)}$ 0 0 0 0 0 0 0 0 0 0 0 0 0	$t,Fee^{i(-k_1-k_2+k_3)} \ t,Fee^{i(-k_1-k_2+k_3)} \ t,Fee^{i(-k_1-k_2+k_3)} \ t_{z,Fe}e^{ik_3} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ $	$egin{array}{cccccccccccccccccccccccccccccccccccc$	$t_{in,Fe} \ 0 \ 0$	$egin{array}{ccccc} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 $	$e^{ik_2} \begin{array}{c} 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ t_{in,Fe} \\ t_{in,Fe} e^{-ik_2} \\ 0 \\ 0 \\ 0 \\ 0 \end{array}$	0 0 0 0 0 0	
							$\psi_{Fe} = \begin{pmatrix} d_{z_{+,1}} \\ d_{z_{+,2}} \\ d_{z_{+,3}} \\ d_{z_{-,1}} \\ d_{z_{-,2}} \\ d_{z_{-,3}} \\ d_{R_1} \\ d_{R_2} \\ d_{R_3} \\ d_{L_1} \\ d_{L_2} \\ d_{L_3} \\ d_{\pi,1} \\ d_{\pi,2} \\ d_{\pi,3} \end{pmatrix}$							
	$\mathcal{H}_{Cr-Fe}=% {\displaystyle\int\limits_{0}^{\infty }} \left\{ {\displaystyle\int\limits_{0}^{\infty }} {\int\limits_{0}^{\infty }} {\int\limits_{0}^$	0 0 0 0	$0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ t_{Cr-Fe} \\ t_{Cr-Fe} e^{i(k_1+i_1)} \\ t_{Cr-Fe} e^{ik_1}$	$\begin{array}{c} 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ t_{Cr-Fe}e^{-i(k_1+k_2)}\\ t_{Cr-Fe}e^{-ik_2} \end{array}$	$\begin{matrix} 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ t_{Cr-Fe}e^{ik_3}\\ t_{Cr-Fe}e^{i(k_1+k_2+k_3)}\\ t_{Cr-Fe}e^{i(k_1+k_3)}\end{matrix}$	$\begin{matrix} 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ 0\\ t_{Cr-Fe}e^{ik_3}\\ t_{Cr-Fe}e^{i(k_1+k_2+k_3)}\\ t_{Cr-Fe}e^{i(k_1+k_3)}\\ \end{matrix}$	$ \begin{array}{cccc} 0 & & & & & & \\ 0 & & & & & & \\ 0 & & & & & & \\ 0 & & & & & & \\ 0 & & & & & & \\ t & & & & & & & \\ i(-k_1 - k_2 + k_3) & & & & \\ \end{array} $	$t'_{Cr-Fe}e^{i(\kappa_1+\kappa_3)} \ t'_{Cr-Fe}e^{i(k_1+k_3)} \ t'_{Cr-Fe}e^{ik_1} \ t'_{Cr-Fe}e^{ik_1} \ t'_{Cr-Fe}e^{ik_1} \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ $	$t_{Cr-Fe} \ t_{Cr-Fe}' \ t_{Cr-Fe}' \ t_{Cr}' \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ $	$t_{re}^{eik3} = 0$ $t_{re}^{eik4} = 0$ t_{r	t_{Cr-Fe}^{i+k3} $t_{Cr-Fe}^{i}e^{e^{i(k)}}$ $t_{Cr-Fe}^{i}e^{ik_1}$ $t_{Cr-Fe}^{i}e^{i(k_1-Fe)}$	(k_2+k_3) t'_{Cr-F} (k_2+k_3) t'_{Cr-F} (k_2+k_3) t'_{Cr-F} (k_1+k_2) t'_{Cr-F} (k_1+k_2) t'_{Cr-F} (k_1+k_2) t'_{Cr-F}	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	0 0 0 0 0 0 0 0 0 0 0

$$\mathcal{H}_{NM} = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} \bigotimes \mathcal{H}_{Cr-Cr} + \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix} \bigotimes \mathcal{H}_{Cr-Fe} + \begin{pmatrix} 0 & 0 \\ 1 & 0 \end{pmatrix} \bigotimes \mathcal{H}_{Cr-Fe}^{\dagger} + \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix} \bigotimes \mathcal{H}_{Fe-Fe}^{\dagger}$$