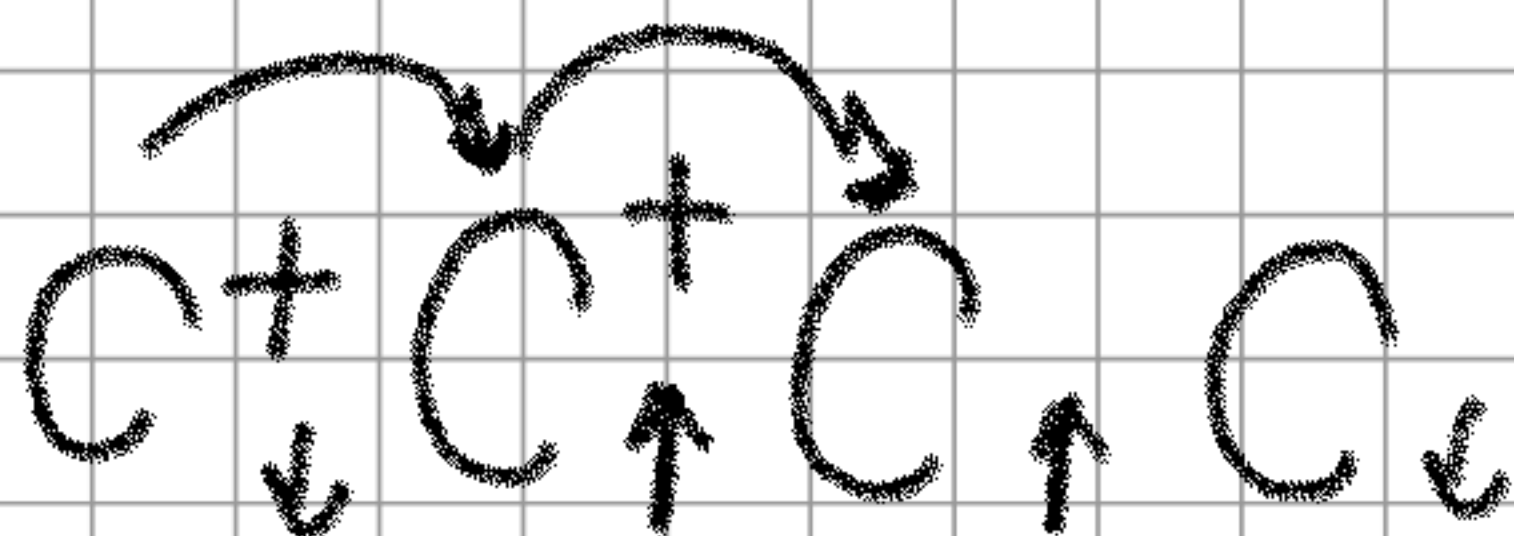


i	j	k	l	U	$c_i^{\dagger} c_j^{\dagger}$	U_{ijne}	$C_e C_n$
1d	1u	1d	1u	57.95			



$$(-1)^2 C_{\uparrow}^{\dagger} C_{\uparrow} C_{\downarrow}^{\dagger} C_{\downarrow}$$

an orbitals are ordered as

val	orb chb
val	

Vll

overall coefficient : $-7\alpha_{22}^2$

4 BANDS

$$U_{ij\ell\kappa} = C_i^\dagger C_j^\dagger U_{\bar{i}\bar{j}\kappa\ell} C_\ell C_\kappa$$

i	j	k	l
1	1	4	4
1	2	4	3
2	1	3	4
2	2	3	3
1	3	4	2
3	1	2	4
2	3	3	2
3	2	2	3
3	3	2	2
1	4	4	1
4	1	1	4
2	4	3	1
4	2	1	3
3	4	2	1
4	3	1	2
4	4	1	1

[illegible]

+ density term $f_2^+ f_2$
 + density term $f_3^+ f_3$
 + density term $f_4^+ f_4$
 + density term $f_1^+ f_1$

$V_{ff}^{(9)}$

4 BANDS

$i \quad j \quad k \quad l$

1 1 4 4

-1

1 2 4 3

-1

2 1 3 4

-1

2 2 3 3

-1

1 3 4 2

+1

3 1 2 4

+1

2 3 3 2

+1

3 2 2 3

+1

3 3 2 2

-1

1 4 4 1

+1

4 1 1 4

+1

2 4 3 1

+1

4 2 1 3

+1

3 4 2 1

-1

4 3 1 2

-1

4 4 1 1

-1

+ $f_2^+ f_2$

+ $f_3^+ f_3$

+ $f_1^+ f_1$

+ $f_4^+ f_4$

to add to double counting

$$- \lambda \alpha_{22} \quad 2 (f_1^\dagger f_1^\dagger + f_2^\dagger f_2 + f_3^\dagger f_3 + f_4^\dagger f_4)$$

then the band-hole terms
 $\langle f^\dagger f^\dagger \rangle$ CC

X term

valley	orb	valley	orb	coeff (· -λ α ₂₂)
1	1	2	3	α ₁₁
1	2	2	4	β
1	3	2	1	α ₁₁
1	4	2	2	β
2	1	1	3	α ₁₁
2	2	1	4	β
2	3	1	1	α ₁₁
2	4	1	2	β

4 term

valley	orb	valley	orb	coeff ($\cdot -2\alpha_{rc}$)
1	1	2	3	$i\alpha_{11}$
1	2	2	4	$-i\beta$
1	3	2	1	$-i\alpha_{11}$
1	4	2	2	$-i\beta$
2	1	1	3	$+i\alpha_{11}$
2	2	1	4	$+i\beta$
2	3	1	1	$+i\alpha_{11}$
2	4	1	2	$+i\beta$

these two are added when we decouple V_{gc} as $\langle f f^\dagger \rangle c^\dagger c$

the densities $\langle f^\dagger f^\dagger \rangle$ are the following

valley	ab	valley	ab	coeff	l. element of g_{11}
1	1	2	2	1	-i
1	2	2	1	1	-i
2	1	1	2	1	i
2	2	1	1	1	i
				x term	y term

These need to be summed over and multiplied by every one of the previous terms.

$$f^+ g \langle c^+ c \rangle$$

the opposite process

Vac term

$$\langle c^+ c \rangle c^+ c$$

do two times the decoupling cc