

# MSSMCT

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## [FFS] 2 Charginos – Higgs

$$C_{251}(\tilde{\chi}_{c1}^-, \tilde{\chi}_{c2}^+, h^0) = \begin{bmatrix} \frac{ie}{\sqrt{2}s_W} (s_\alpha U_{c1,2}^* V_{c2,1}^* - c_\alpha U_{c1,1}^* V_{c2,2}^*) \\ \frac{ie}{\sqrt{2}s_W} (s_\alpha U_{c2,2} V_{c1,1} - c_\alpha U_{c2,1} V_{c1,2}) \end{bmatrix}$$

$$C_{252}(\tilde{\chi}_{c1}^-, \tilde{\chi}_{c2}^+, H^0) = \begin{bmatrix} -\frac{ie}{\sqrt{2}s_W} (c_\alpha U_{c1,2}^* V_{c2,1}^* + s_\alpha U_{c1,1}^* V_{c2,2}^*) \\ -\frac{ie}{\sqrt{2}s_W} (c_\alpha U_{c2,2} V_{c1,1} + s_\alpha U_{c2,1} V_{c1,2}) \end{bmatrix}$$

$$C_{253}(\tilde{\chi}_{c1}^-, \tilde{\chi}_{c2}^+, A^0) = \begin{bmatrix} -\frac{e}{\sqrt{2}s_W} (s_\beta U_{c1,2}^* V_{c2,1}^* + c_\beta U_{c1,1}^* V_{c2,2}^*) \\ \frac{e}{\sqrt{2}s_W} (s_\beta U_{c2,2} V_{c1,1} + c_\beta U_{c2,1} V_{c1,2}) \end{bmatrix}$$

$$C_{254}(\tilde{\chi}_{c1}^-, \tilde{\chi}_{c2}^+, G^0) = \begin{bmatrix} \frac{e}{\sqrt{2}s_W} (c_\beta U_{c1,2}^* V_{c2,1}^* - s_\beta U_{c1,1}^* V_{c2,2}^*) \\ -\frac{e}{\sqrt{2}s_W} (c_\beta U_{c2,2} V_{c1,1} - s_\beta U_{c2,1} V_{c1,2}) \end{bmatrix}$$

## [FFS] 2 Leptons – Higgs

$$C_{183}(e_{j1}, \bar{e}_{j2}, h^0) = \begin{bmatrix} \frac{ie \delta_{j1,j2} m_{e_{j1}} s_\alpha}{2 c_\beta M_W s_W} \\ \frac{ie \delta_{j1,j2} m_{e_{j1}} s_\alpha}{2 c_\beta M_W s_W} \end{bmatrix}$$

$$C_{186}(e_{j1}, \bar{e}_{j2}, A^0) = \begin{bmatrix} \frac{e \delta_{j1,j2} m_{e_{j1}} s_\beta}{2 c_\beta M_W s_W} \\ -\frac{e \delta_{j1,j2} m_{e_{j1}} s_\beta}{2 c_\beta M_W s_W} \end{bmatrix}$$

$$C_{187}(e_{j1}, \bar{e}_{j2}, G^0) = \begin{bmatrix} -\frac{e \delta_{j1,j2} m_{e_{j1}}}{2 M_W s_W} \\ \frac{e \delta_{j1,j2} m_{e_{j1}}}{2 M_W s_W} \end{bmatrix}$$

$$C_{188}(\nu_{j1}, \bar{e}_{j2}, H^-) = \begin{bmatrix} \frac{i e \delta_{j1,j2} m_{e_{j2}} s_\beta}{\sqrt{2} c_\beta M_W s_W} \\ 0 \end{bmatrix}$$

$$C_{189}(\nu_{j1}, \bar{e}_{j2}, G^-) = \begin{bmatrix} -\frac{i e \delta_{j1,j2} m_{e_{j2}}}{\sqrt{2} M_W s_W} \\ 0 \end{bmatrix}$$

$$C_{190}(e_{j1}, \bar{\nu}_{j2}, H^+) = \begin{bmatrix} 0 \\ \frac{i e \delta_{j1,j2} m_{e_{j1}} s_\beta}{\sqrt{2} c_\beta M_W s_W} \end{bmatrix}$$

$$C_{191}(e_{j1}, \bar{\nu}_{j2}, G^+) = \begin{bmatrix} 0 \\ -\frac{i e \delta_{j1,j2} m_{e_{j1}}}{\sqrt{2} M_W s_W} \end{bmatrix}$$

$$C_{203}(e_{j1}, \bar{e}_{j2}, H^0) = \begin{bmatrix} -\frac{i e c_\alpha \delta_{j1,j2} m_{e_{j1}}}{2 c_\beta M_W s_W} \\ -\frac{i e c_\alpha \delta_{j1,j2} m_{e_{j1}}}{2 c_\beta M_W s_W} \end{bmatrix}$$

## [FFS] 2 Neutralinos – Higgs

$$C_{247}(\tilde{\chi}_{n2}^0, \tilde{\chi}_{n1}^0, h^0) = \begin{bmatrix} -\frac{i e}{2 c_W s_W} (s_\alpha Z_{n1,3}^* (s_W Z_{n2,1}^* - c_W Z_{n2,2}^*) + c_\alpha Z_{n1,4}^* (s_W Z_{n2,1}^* - c_W Z_{n2,2}^*) + (s_W Z_{n1,1}^* - c_W Z_{n1,2}^*) (s_\alpha Z_{n2,3}^* + c_\alpha Z_{n2,4}^*)) \\ -\frac{i e}{2 c_W s_W} (Z_{n1,4} (c_\alpha s_W Z_{n2,1} - c_\alpha c_W Z_{n2,2}) + Z_{n1,3} (s_\alpha s_W Z_{n2,1} - c_W s_\alpha Z_{n2,2}) + (s_W Z_{n1,1} - c_W Z_{n1,2}) (s_\alpha Z_{n2,3} + c_\alpha Z_{n2,4})) \end{bmatrix}$$

$$\begin{aligned}
C_{248}(\tilde{\chi}_{n2}^0, \tilde{\chi}_{n1}^0, H^0) &= \left[ \begin{aligned} &\frac{ie}{2c_W s_W} (c_\alpha Z_{n1,3}^* (s_W Z_{n2,1}^* - c_W Z_{n2,2}^*) - Z_{n1,4}^* (s_\alpha s_W Z_{n2,1}^* - c_W s_\alpha Z_{n2,2}^*) + (s_W Z_{n1,1}^* - c_W Z_{n1,2}^*) (c_\alpha Z_{n2,3}^* - s_\alpha Z_{n2,4}^*)) \\ &\frac{ie}{2c_W s_W} (c_\alpha Z_{n1,3} (s_W Z_{n2,1} - c_W Z_{n2,2}) - Z_{n1,4} (s_\alpha s_W Z_{n2,1} - c_W s_\alpha Z_{n2,2}) + (s_W Z_{n1,1} - c_W Z_{n1,2}) (c_\alpha Z_{n2,3} - s_\alpha Z_{n2,4})) \end{aligned} \right] \\
C_{249}(\tilde{\chi}_{n2}^0, \tilde{\chi}_{n1}^0, A^0) &= \left[ \begin{aligned} &\frac{e}{2c_W s_W} (s_\beta Z_{n1,3}^* (s_W Z_{n2,1}^* - c_W Z_{n2,2}^*) - Z_{n1,4}^* (c_\beta s_W Z_{n2,1}^* - c_\beta c_W Z_{n2,2}^*) + (s_W Z_{n1,1}^* - c_W Z_{n1,2}^*) (s_\beta Z_{n2,3}^* - c_\beta Z_{n2,4}^*)) \\ &-\frac{e}{2c_W s_W} (s_\beta Z_{n1,3} (s_W Z_{n2,1} - c_W Z_{n2,2}) - Z_{n1,4} (c_\beta s_W Z_{n2,1} - c_\beta c_W Z_{n2,2}) + (s_W Z_{n1,1} - c_W Z_{n1,2}) (s_\beta Z_{n2,3} - c_\beta Z_{n2,4})) \end{aligned} \right] \\
C_{250}(\tilde{\chi}_{n2}^0, \tilde{\chi}_{n1}^0, G^0) &= \left[ \begin{aligned} &-\frac{e}{2c_W s_W} (c_\beta Z_{n1,3}^* (s_W Z_{n2,1}^* - c_W Z_{n2,2}^*) + s_\beta Z_{n1,4}^* (s_W Z_{n2,1}^* - c_W Z_{n2,2}^*) + (s_W Z_{n1,1}^* - c_W Z_{n1,2}^*) (c_\beta Z_{n2,3}^* + s_\beta Z_{n2,4}^*)) \\ &\frac{e}{2c_W s_W} (c_\beta Z_{n1,3} (s_W Z_{n2,1} - c_W Z_{n2,2}) + s_\beta Z_{n1,4} (s_W Z_{n2,1} - c_W Z_{n2,2}) + (s_W Z_{n1,1} - c_W Z_{n1,2}) (c_\beta Z_{n2,3} + s_\beta Z_{n2,4})) \end{aligned} \right]
\end{aligned}$$

## [FFS] 2 Quarks – Higgs

$$C_{184}(u_{j1}, \bar{u}_{j2}, h^0) = \left[ \begin{aligned} &-\frac{ie c_\alpha \delta_{j1,j2} m_{u_{j1}}}{2 M_W s_\beta s_W} \\ &-\frac{ie c_\alpha \delta_{j1,j2} m_{u_{j1}}}{2 M_W s_\beta s_W} \end{aligned} \right]$$

$$C_{185}(d_{j1}, \bar{d}_{j2}, h^0) = \left[ \begin{aligned} &\frac{ie \delta_{j1,j2} m_{d_{j1}} s_\alpha}{2 c_\beta M_W s_W} \\ &\frac{ie \delta_{j1,j2} m_{d_{j1}} s_\alpha}{2 c_\beta M_W s_W} \end{aligned} \right]$$

$$C_{192}(u_{j1}, \bar{u}_{j2}, A^0) = \left[ \begin{aligned} &\frac{e c_\beta \delta_{j1,j2} m_{u_{j1}}}{2 M_W s_\beta s_W} \\ &-\frac{e c_\beta \delta_{j1,j2} m_{u_{j1}}}{2 M_W s_\beta s_W} \end{aligned} \right]$$

$$C_{193}(u_{j1}, \bar{u}_{j2}, G^0) = \begin{bmatrix} \frac{e \delta_{j1,j2} m_{u_{j1}}}{2 M_W s_W} \\ -\frac{e \delta_{j1,j2} m_{u_{j1}}}{2 M_W s_W} \end{bmatrix}$$

$$C_{194}(d_{j1}, \bar{d}_{j2}, A^0) = \begin{bmatrix} \frac{e \delta_{j1,j2} m_{d_{j1}} s_\beta}{2 c_\beta M_W s_W} \\ -\frac{e \delta_{j1,j2} m_{d_{j1}} s_\beta}{2 c_\beta M_W s_W} \end{bmatrix}$$

$$C_{195}(d_{j1}, \bar{d}_{j2}, G^0) = \begin{bmatrix} -\frac{e \delta_{j1,j2} m_{d_{j1}}}{2 M_W s_W} \\ \frac{e \delta_{j1,j2} m_{d_{j1}}}{2 M_W s_W} \end{bmatrix}$$

$$C_{204}(u_{j1}, \bar{u}_{j2}, H^0) = \begin{bmatrix} -\frac{i e \delta_{j1,j2} m_{u_{j1}} s_\alpha}{2 M_W s_\beta s_W} \\ -\frac{i e \delta_{j1,j2} m_{u_{j1}} s_\alpha}{2 M_W s_\beta s_W} \end{bmatrix}$$

$$C_{205}(d_{j1}, \bar{d}_{j2}, H^0) = \begin{bmatrix} -\frac{i e c_\alpha \delta_{j1,j2} m_{d_{j1}}}{2 c_\beta M_W s_W} \\ -\frac{i e c_\alpha \delta_{j1,j2} m_{d_{j1}}}{2 c_\beta M_W s_W} \end{bmatrix}$$

$$C_{208}(u_{j1}, \bar{d}_{j2}, H^-) = \begin{bmatrix} \frac{i e m_{d_{j2}} \text{CKM}_{j1,j2}^* s_\beta}{\sqrt{2} c_\beta M_W s_W} \\ \frac{i e c_\beta m_{u_{j1}} \text{CKM}_{j1,j2}^*}{\sqrt{2} M_W s_\beta s_W} \end{bmatrix}$$

$$C_{209}(u_{j1}, \bar{d}_{j2}, G^-) = \begin{bmatrix} -\frac{i e m_{d_{j2}} \text{CKM}_{j1,j2}^*}{\sqrt{2} M_W s_W} \\ \frac{i e m_{u_{j1}} \text{CKM}_{j1,j2}^*}{\sqrt{2} M_W s_W} \end{bmatrix}$$

$$C_{210}(d_{j1}, \bar{u}_{j2}, H^+) = \begin{bmatrix} \frac{i e c_\beta m_{u_{j2}} \text{CKM}_{j2,j1}}{\sqrt{2} M_W s_\beta s_W} \\ \frac{i e m_{d_{j1}} \text{CKM}_{j2,j1} s_\beta}{\sqrt{2} c_\beta M_W s_W} \end{bmatrix}$$

$$C_{211}(d_{j1}, \bar{u}_{j2}, G^+) = \begin{bmatrix} \frac{i e m_{u_{j2}} \text{CKM}_{j2,j1}}{\sqrt{2} M_W s_W} \\ -\frac{i e m_{d_{j1}} \text{CKM}_{j2,j1}}{\sqrt{2} M_W s_W} \end{bmatrix}$$

**[FFS] Chargino – Lepton – Slepton**

$$C_{269}(\tilde{\chi}_{c1}^-, \bar{e}_{j2}, \tilde{\nu}_{j1}) = \begin{bmatrix} \frac{i e \delta_{j1,j2} m_{e_{j1}} U_{c1,2}^*}{\sqrt{2} c_\beta M_W s_W} \\ -\frac{i e \delta_{j1,j2} V_{c1,1}}{s_W} \end{bmatrix}$$

$$C_{270}(\tilde{\chi}_{c1}^+, \bar{\nu}_{j1}, \tilde{e}_{j2}^{s2}) = \begin{bmatrix} 0 \\ \frac{i e \delta_{j1,j2}}{2 s_W} \left( \frac{\sqrt{2} m_{e_{j1}} U_{c1,2} U_{s2,2}^{\tilde{e}j1*}}{c_\beta M_W} - 2 U_{c1,1} U_{s2,1}^{\tilde{e}j1*} \right) \end{bmatrix}$$

$$C_{273}(e_{j2}, \tilde{\chi}_{c1}^+, \tilde{\nu}_{j1}^\dagger) = \begin{bmatrix} -\frac{i e \delta_{j1,j2} V_{c1,1}^*}{s_W} \\ \frac{i e \delta_{j1,j2} m_{e_{j1}} U_{c1,2}}{\sqrt{2} c_\beta M_W s_W} \end{bmatrix}$$

$$C_{274}(\nu_{j1}, \tilde{\chi}_{c1}^-, \tilde{e}_{j2}^{s2,\dagger}) = \begin{bmatrix} \frac{i e \delta_{j1,j2}}{2 s_W} \left( \frac{\sqrt{2} m_{e_{j1}} U_{c1,2}^* U_{s2,2}^{\tilde{e}j1}}{c_\beta M_W} - 2 U_{c1,1}^* U_{s2,1}^{\tilde{e}j1} \right) \\ 0 \end{bmatrix}$$

**[FFS] Chargino – Neutralino – Higgs**

$$C_{255}(\tilde{\chi}_{n1}^0, \tilde{\chi}_{c2}^+, H^-) = \begin{bmatrix} -\frac{i e c_\beta}{s_W} \left( V_{c2,1}^* Z_{n1,4}^* + \frac{V_{c2,2}^*}{\sqrt{2}} \left( \frac{s_W Z_{n1,1}^*}{c_W} + Z_{n1,2}^* \right) \right) \\ -\frac{i e s_\beta}{s_W} \left( U_{c2,1} Z_{n1,3} - \frac{U_{c2,2}}{\sqrt{2}} \left( \frac{s_W Z_{n1,1}}{c_W} + Z_{n1,2} \right) \right) \end{bmatrix}$$

$$C_{256}(\tilde{\chi}_{n1}^0, \tilde{\chi}_{c2}^+, G^-) = \begin{bmatrix} -\frac{i e s_\beta}{s_W} \left( V_{c2,1}^* Z_{n1,4}^* + \frac{V_{c2,2}^*}{\sqrt{2}} \left( \frac{s_W Z_{n1,1}^*}{c_W} + Z_{n1,2}^* \right) \right) \\ \frac{i e c_\beta}{s_W} \left( U_{c2,1} Z_{n1,3} - \frac{U_{c2,2}}{\sqrt{2}} \left( \frac{s_W Z_{n1,1}}{c_W} + Z_{n1,2} \right) \right) \end{bmatrix}$$

$$C_{257}(\tilde{\chi}_{c2}^-, \tilde{\chi}_{n1}^0, H^+) = \begin{bmatrix} -\frac{i e s_\beta}{s_W} \left( U_{c2,1}^* Z_{n1,3}^* - \frac{U_{c2,2}^*}{\sqrt{2}} \left( \frac{s_W Z_{n1,1}^*}{c_W} + Z_{n1,2}^* \right) \right) \\ -\frac{i e c_\beta}{s_W} \left( V_{c2,1} Z_{n1,4} + \frac{V_{c2,2}}{\sqrt{2}} \left( \frac{s_W Z_{n1,1}}{c_W} + Z_{n1,2} \right) \right) \end{bmatrix}$$

$$C_{258}(\tilde{\chi}_{c2}^-, \tilde{\chi}_{n1}^0, G^+) = \begin{bmatrix} \frac{i e c_\beta}{s_W} \left( U_{c2,1}^* Z_{n1,3}^* - \frac{U_{c2,2}^*}{\sqrt{2}} \left( \frac{s_W Z_{n1,1}^*}{c_W} + Z_{n1,2}^* \right) \right) \\ -\frac{i e s_\beta}{s_W} \left( V_{c2,1} Z_{n1,4} + \frac{V_{c2,2}}{\sqrt{2}} \left( \frac{s_W Z_{n1,1}}{c_W} + Z_{n1,2} \right) \right) \end{bmatrix}$$

**[FFS] Chargino – Quark – Squark**

$$C_{267}(\tilde{\chi}_{c1}^-, \bar{d}_{j2}, \tilde{u}_{j1}^{s1}) = \begin{bmatrix} \frac{i e m_{d_{j2}} \text{CKM}_{j1,j2}^* U_{c1,2}^* U_{s1,1}^{\tilde{u},j1*}}{\sqrt{2} c_\beta M_W s_W} \\ -\frac{i e \text{CKM}_{j1,j2}^*}{2 M_W s_\beta s_W} \left( 2 M_W s_\beta U_{s1,1}^{\tilde{u},j1*} V_{c1,1} - \sqrt{2} m_{u_{j1}} U_{s1,2}^{\tilde{u},j1*} V_{c1,2} \right) \end{bmatrix}$$

$$\begin{aligned}
C_{268}(\tilde{\chi}_{c1}^+, \bar{u}_{j1}, \tilde{d}_{j2}^{s2}) &= \left[ \begin{array}{c} \frac{i e m_{u_{j1}} \text{CKM}_{j1,j2} U_{s2,1}^{\tilde{d},j2*} V_{c1,2}^*}{\sqrt{2} M_W s_\beta s_W} \\ -\frac{i e \text{CKM}_{j1,j2}}{2 c_\beta M_W s_W} \left( 2 c_\beta M_W U_{c1,1} U_{s2,1}^{\tilde{d},j2*} - \sqrt{2} m_{d_{j2}} U_{c1,2} U_{s2,2}^{\tilde{d},j2*} \right) \end{array} \right] \\
C_{271}(d_{j2}, \tilde{\chi}_{c1}^+, \tilde{u}_{j1}^{s1,\dagger}) &= \left[ \begin{array}{c} -\frac{i e \text{CKM}_{j1,j2}}{2 M_W s_\beta s_W} \left( 2 M_W s_\beta U_{s1,1}^{\tilde{u},j1} V_{c1,1}^* - \sqrt{2} m_{u_{j1}} U_{s1,2}^{\tilde{u},j1} V_{c1,2}^* \right) \\ \frac{i e m_{d_{j2}} \text{CKM}_{j1,j2} U_{c1,2} U_{s1,1}^{\tilde{u},j1}}{\sqrt{2} c_\beta M_W s_W} \end{array} \right] \\
C_{272}(u_{j1}, \tilde{\chi}_{c1}^-, \tilde{d}_{j2}^{s2,\dagger}) &= \left[ \begin{array}{c} -\frac{i e \text{CKM}_{j1,j2}^*}{2 c_\beta M_W s_W} \left( 2 c_\beta M_W U_{c1,1}^* U_{s2,1}^{\tilde{d},j2} - \sqrt{2} m_{d_{j2}} U_{c1,2}^* U_{s2,2}^{\tilde{d},j2} \right) \\ \frac{i e m_{u_{j1}} \text{CKM}_{j1,j2}^* U_{s2,1}^{\tilde{d},j2} V_{c1,2}}{\sqrt{2} M_W s_\beta s_W} \end{array} \right]
\end{aligned}$$

**[FFS] Gluino – Quark – Squark**

$$\begin{aligned}
C_{409}(\tilde{g}, \bar{u}_{j1}, \tilde{u}_{j2}^{s2}) &= \left[ \begin{array}{c} \sqrt{2} \text{SqrtEGLC} i g_s \delta_{j1,j2} T_{o1,o2}^{g1} U_{s2,2}^{\tilde{u},j1*} \\ -\sqrt{2} \text{SqrtEGL} i g_s \delta_{j1,j2} T_{o1,o2}^{g1} U_{s2,1}^{\tilde{u},j1*} \end{array} \right] \\
C_{410}(\tilde{g}, \bar{d}_{j1}, \tilde{d}_{j2}^{s2}) &= \left[ \begin{array}{c} \sqrt{2} \text{SqrtEGLC} i g_s \delta_{j1,j2} T_{o1,o2}^{g1} U_{s2,2}^{\tilde{d},j1*} \\ -\sqrt{2} \text{SqrtEGL} i g_s \delta_{j1,j2} T_{o1,o2}^{g1} U_{s2,1}^{\tilde{d},j1*} \end{array} \right] \\
C_{411}(\tilde{g}, u_{j1}, \tilde{u}_{j2}^{s2,\dagger}) &= \left[ \begin{array}{c} -\sqrt{2} \text{SqrtEGLC} i g_s \delta_{j1,j2} T_{o2,o1}^{g1} U_{s2,1}^{\tilde{u},j1} \\ \sqrt{2} \text{SqrtEGL} i g_s \delta_{j1,j2} T_{o2,o1}^{g1} U_{s2,2}^{\tilde{u},j1} \end{array} \right] \\
C_{412}(\tilde{g}, d_{j1}, \tilde{d}_{j2}^{s2,\dagger}) &= \left[ \begin{array}{c} -\sqrt{2} \text{SqrtEGLC} i g_s \delta_{j1,j2} T_{o2,o1}^{g1} U_{s2,1}^{\tilde{d},j1} \\ \sqrt{2} \text{SqrtEGL} i g_s \delta_{j1,j2} T_{o2,o1}^{g1} U_{s2,2}^{\tilde{d},j1} \end{array} \right]
\end{aligned}$$



**[FFS] Lepton – Neutralino – Slepton**

$$C_{259}(\tilde{\chi}_{n1}^0, \bar{\nu}_{j1}, \tilde{\nu}_{j2}) = \begin{bmatrix} 0 \\ \frac{i e \delta_{j1,j2}}{\sqrt{2} c_W s_W} (s_W Z_{n1,1} - c_W Z_{n1,2}) \end{bmatrix}$$

$$C_{260}(\tilde{\chi}_{n1}^0, \bar{e}_{j1}, \tilde{e}_{j2}^{s2}) = \begin{bmatrix} -\frac{i e \delta_{j1,j2}}{\sqrt{2} c_\beta c_W M_W s_W} (2 c_\beta M_W s_W U_{s2,2}^{\tilde{e}j1*} Z_{n1,1}^* + c_W m_{e_{j1}} U_{s2,1}^{\tilde{e}j1*} Z_{n1,3}^*) \\ -\frac{i e \delta_{j1,j2}}{\sqrt{2} c_\beta c_W M_W s_W} (c_W m_{e_{j1}} U_{s2,2}^{\tilde{e}j1*} Z_{n1,3} - c_\beta M_W U_{s2,1}^{\tilde{e}j1*} (s_W Z_{n1,1} + c_W Z_{n1,2})) \end{bmatrix}$$

$$C_{263}(\nu_{j1}, \tilde{\chi}_{n1}^0, \tilde{\nu}_{j2}^\dagger) = \begin{bmatrix} \frac{i e \delta_{j1,j2}}{\sqrt{2} c_W s_W} (s_W Z_{n1,1}^* - c_W Z_{n1,2}^*) \\ 0 \end{bmatrix}$$

$$C_{264}(e_{j1}, \tilde{\chi}_{n1}^0, \tilde{e}_{j2}^{s2,\dagger}) = \begin{bmatrix} \frac{i e \delta_{j1,j2}}{\sqrt{2} c_\beta c_W M_W s_W} (c_\beta M_W s_W U_{s2,1}^{\tilde{e}j1} Z_{n1,1}^* + c_\beta c_W M_W U_{s2,1}^{\tilde{e}j1} Z_{n1,2}^* - c_W m_{e_{j1}} U_{s2,2}^{\tilde{e}j1} Z_{n1,3}^*) \\ -\frac{i e \delta_{j1,j2}}{\sqrt{2} c_\beta c_W M_W s_W} (2 c_\beta M_W s_W U_{s2,2}^{\tilde{e}j1} Z_{n1,1} + c_W m_{e_{j1}} U_{s2,1}^{\tilde{e}j1} Z_{n1,3}) \end{bmatrix}$$

**[FFS] Neutralino – Quark – Squark**

$$C_{261}(\tilde{\chi}_{n1}^0, \bar{u}_{j1}, \tilde{u}_{j2}^{s2}) = \begin{bmatrix} \frac{i e \delta_{j1,j2}}{3 \sqrt{2} c_W M_W s_\beta s_W} (4 M_W s_\beta s_W U_{s2,2}^{\tilde{u}j1*} Z_{n1,1}^* - 3 c_W m_{u_{j1}} U_{s2,1}^{\tilde{u}j1*} Z_{n1,4}^*) \\ -\frac{i e \delta_{j1,j2}}{3 \sqrt{2} c_W M_W s_\beta s_W} (3 c_W m_{u_{j1}} U_{s2,2}^{\tilde{u}j1*} Z_{n1,4} + M_W s_\beta U_{s2,1}^{\tilde{u}j1*} (s_W Z_{n1,1} + 3 c_W Z_{n1,2})) \end{bmatrix}$$

$$C_{262}(\tilde{\chi}_{n1}^0, \bar{d}_{j1}, \tilde{d}_{j2}^{s2}) = \begin{bmatrix} -\frac{i e \delta_{j1,j2}}{3 \sqrt{2} c_\beta c_W M_W s_W} \left( 2 c_\beta M_W s_W U_{s2,2}^{\tilde{d},j1*} Z_{n1,1}^* + 3 c_W m_{d_{j1}} U_{s2,1}^{\tilde{d},j1*} Z_{n1,3}^* \right) \\ -\frac{i e \delta_{j1,j2}}{3 \sqrt{2} c_\beta c_W M_W s_W} \left( 3 c_W m_{d_{j1}} U_{s2,2}^{\tilde{d},j1*} Z_{n1,3} + c_\beta M_W U_{s2,1}^{\tilde{d},j1*} (s_W Z_{n1,1} - 3 c_W Z_{n1,2}) \right) \end{bmatrix}$$

$$C_{265}(u_{j1}, \tilde{\chi}_{n1}^0, \tilde{u}_{j2}^{s2,\dagger}) = \begin{bmatrix} -\frac{i e \delta_{j1,j2}}{3 \sqrt{2} c_W M_W s_\beta s_W} \left( M_W s_\beta s_W U_{s2,1}^{\tilde{u},j1} Z_{n1,1}^* + 3 c_W \left( M_W s_\beta U_{s2,1}^{\tilde{u},j1} Z_{n1,2}^* + m_{u_{j1}} U_{s2,2}^{\tilde{u},j1} Z_{n1,4}^* \right) \right) \\ \frac{i e \delta_{j1,j2}}{3 \sqrt{2} c_W M_W s_\beta s_W} \left( 4 M_W s_\beta s_W U_{s2,2}^{\tilde{u},j1} Z_{n1,1} - 3 c_W m_{u_{j1}} U_{s2,1}^{\tilde{u},j1} Z_{n1,4} \right) \end{bmatrix}$$

$$C_{266}(d_{j1}, \tilde{\chi}_{n1}^0, \tilde{d}_{j2}^{s2,\dagger}) = \begin{bmatrix} -\frac{i e \delta_{j1,j2}}{3 \sqrt{2} c_\beta c_W M_W s_W} \left( c_\beta M_W s_W U_{s2,1}^{\tilde{d},j1} Z_{n1,1}^* - 3 c_\beta c_W M_W U_{s2,1}^{\tilde{d},j1} Z_{n1,2}^* + 3 c_W m_{d_{j1}} U_{s2,2}^{\tilde{d},j1} Z_{n1,3}^* \right) \\ -\frac{i e \delta_{j1,j2}}{3 \sqrt{2} c_\beta c_W M_W s_W} \left( 2 c_\beta M_W s_W U_{s2,2}^{\tilde{d},j1} Z_{n1,1} + 3 c_W m_{d_{j1}} U_{s2,1}^{\tilde{d},j1} Z_{n1,3} \right) \end{bmatrix}$$

## [FFV] 2 Charginos – Gauge Boson

$$C_{278}(\tilde{\chi}_{c2}^+, \tilde{\chi}_{c1}^-, \gamma) = \begin{bmatrix} i e \delta_{c1,c2} \\ i e \delta_{c1,c2} \end{bmatrix}$$

$$C_{279}(\tilde{\chi}_{c2}^+, \tilde{\chi}_{c1}^-, Z) = \begin{bmatrix} \frac{i e}{c_W s_W} \left( \frac{U_{c1,2}^* U_{c2,2}}{2} - \delta_{c1,c2} s_W^2 + U_{c1,1}^* U_{c2,1} \right) \\ \frac{i e}{c_W s_W} \left( \frac{V_{c1,2} V_{c2,2}^*}{2} - \delta_{c1,c2} s_W^2 + V_{c1,1} V_{c2,1}^* \right) \end{bmatrix}$$

**[FFV] 2 Gluinos – Gluon**

$$C_{406}(\tilde{g}, \tilde{g}, g) = \begin{bmatrix} -g_s f^{g^1, g^2, g^3} \\ -g_s f^{g^1, g^2, g^3} \end{bmatrix}$$

**[FFV] 2 Leptons – Gauge Boson**

$$C_{196}(\bar{e}_{j2}, e_{j1}, \gamma) = \begin{bmatrix} i e \delta_{j1, j2} \\ i e \delta_{j1, j2} \end{bmatrix}$$

$$C_{199}(\bar{\nu}_{j2}, \nu_{j1}, Z) = \begin{bmatrix} -\frac{i e \delta_{j1, j2}}{2 c_W s_W} \\ 0 \end{bmatrix}$$

$$C_{200}(\bar{e}_{j2}, e_{j1}, Z) = \begin{bmatrix} -\frac{i e \delta_{j1, j2}}{2 c_W s_W} (1 - 2 c_W^2) \\ -\frac{i e \delta_{j1, j2} s_W}{c_W} \end{bmatrix}$$

$$C_{206}(\bar{e}_{j2}, \nu_{j1}, W^-) = \begin{bmatrix} -\frac{i e \delta_{j1, j2}}{\sqrt{2} s_W} \\ 0 \end{bmatrix}$$

$$C_{207}(\bar{\nu}_{j2}, e_{j1}, W^+) = \begin{bmatrix} -\frac{i e \delta_{j1, j2}}{\sqrt{2} s_W} \\ 0 \end{bmatrix}$$

## [FFV] 2 Neutralinos – Gauge Boson

$$C_{275}(\tilde{\chi}_{n1}^0, \tilde{\chi}_{n2}^0, Z) = \begin{bmatrix} -\frac{ie}{2c_W s_W} (Z_{n1,3} Z_{n2,3}^* - Z_{n1,4} Z_{n2,4}^*) \\ \frac{ie}{2c_W s_W} (Z_{n1,3}^* Z_{n2,3} - Z_{n1,4}^* Z_{n2,4}) \end{bmatrix}$$

## [FFV] 2 Quarks – Gauge Boson

$$C_{197}(\bar{u}_{j2}, u_{j1}, \gamma) = \begin{bmatrix} -\frac{2ie\delta_{j1,j2}}{3} \\ -\frac{2ie\delta_{j1,j2}}{3} \end{bmatrix}$$

$$C_{198}(\bar{d}_{j2}, d_{j1}, \gamma) = \begin{bmatrix} \frac{ie\delta_{j1,j2}}{3} \\ \frac{ie\delta_{j1,j2}}{3} \end{bmatrix}$$

$$C_{201}(\bar{u}_{j2}, u_{j1}, Z) = \begin{bmatrix} \frac{ie\delta_{j1,j2}}{6c_W s_W} (1 - 4c_W^2) \\ \frac{2ie\delta_{j1,j2} s_W}{3c_W} \end{bmatrix}$$

$$C_{202}(\bar{d}_{j2}, d_{j1}, Z) = \begin{bmatrix} \frac{ie\delta_{j1,j2}}{6c_W s_W} (1 + 2c_W^2) \\ -\frac{ie\delta_{j1,j2} s_W}{3c_W} \end{bmatrix}$$

$$C_{212}(\bar{d}_{j2}, u_{j1}, W^-) = \begin{bmatrix} -\frac{ie\text{CKM}_{j1,j2}^*}{\sqrt{2}s_W} \\ 0 \end{bmatrix}$$

$$C_{213}(\bar{u}_{j2}, d_{j1}, W^+) = \begin{bmatrix} -\frac{i e \text{CKM}_{j2,j1}}{\sqrt{2} s_W} \\ 0 \end{bmatrix}$$

**[FFV] 2 Quarks – Gluon**

$$C_{404}(\bar{u}_{j1}, u_{j2}, g) = \begin{bmatrix} -i g_s \delta_{j1,j2} T_{o1,o2}^{g1} \\ -i g_s \delta_{j1,j2} T_{o1,o2}^{g1} \end{bmatrix}$$

$$C_{405}(\bar{d}_{j1}, d_{j2}, g) = \begin{bmatrix} -i g_s \delta_{j1,j2} T_{o1,o2}^{g1} \\ -i g_s \delta_{j1,j2} T_{o1,o2}^{g1} \end{bmatrix}$$

**[FFV] Chargino – Neutralino – Gauge Boson**

$$C_{276}(\tilde{\chi}_{n2}^0, \tilde{\chi}_{c1}^+, W^-) = \begin{bmatrix} -\frac{i e}{s_W} \left( \frac{V_{c1,2}^* Z_{n2,4}}{\sqrt{2}} - V_{c1,1}^* Z_{n2,2} \right) \\ \frac{i e}{s_W} \left( \frac{U_{c1,2} Z_{n2,3}^*}{\sqrt{2}} + U_{c1,1} Z_{n2,2}^* \right) \end{bmatrix}$$

$$C_{277}(\tilde{\chi}_{c1}^-, \tilde{\chi}_{n2}^0, W^+) = \begin{bmatrix} -\frac{i e}{s_W} \left( \frac{V_{c1,2} Z_{n2,4}^*}{\sqrt{2}} - V_{c1,1} Z_{n2,2}^* \right) \\ \frac{i e}{s_W} \left( \frac{U_{c1,2}^* Z_{n2,3}}{\sqrt{2}} + U_{c1,1}^* Z_{n2,2} \right) \end{bmatrix}$$

[SSS] **3 Higgs**

$$C_{43}(h^0, h^0, h^0) = -\frac{3ie c_{2\alpha} M_W s_{\alpha+\beta}}{2c_W^2 s_W}$$

$$C_{44}(h^0, h^0, H^0) = \frac{ie M_W}{2c_W^2 s_W} (c_{2\alpha} c_{\alpha+\beta} - 2s_{2\alpha} s_{\alpha+\beta})$$

$$C_{45}(h^0, H^0, H^0) = \frac{ie M_W}{2c_W^2 s_W} (2c_{\alpha+\beta} s_{2\alpha} + c_{2\alpha} s_{\alpha+\beta})$$

$$C_{46}(H^0, H^0, H^0) = -\frac{3ie c_{2\alpha} c_{\alpha+\beta} M_W}{2c_W^2 s_W}$$

$$C_{47}(h^0, A^0, A^0) = -\frac{ie c_{2\beta} M_W s_{\alpha+\beta}}{2c_W^2 s_W}$$

$$C_{48}(h^0, G^0, G^0) = \frac{ie c_{2\beta} M_W s_{\alpha+\beta}}{2c_W^2 s_W}$$

$$C_{49}(h^0, A^0, G^0) = -\frac{ie M_W s_{2\beta} s_{\alpha+\beta}}{2c_W^2 s_W}$$

$$C_{50}(H^0, A^0, A^0) = \frac{ie c_{2\beta} c_{\alpha+\beta} M_W}{2c_W^2 s_W}$$

$$C_{51}(H^0, G^0, G^0) = -\frac{ie c_{2\beta} c_{\alpha+\beta} M_W}{2c_W^2 s_W}$$

$$C_{52}(H^0, A^0, G^0) = \frac{ie c_{\alpha+\beta} M_W s_{2\beta}}{2c_W^2 s_W}$$

$$C_{53}(h^0, H^-, H^+) = -\frac{ie M_W}{2c_W^2 s_W} \left( c_\alpha s_\beta \left( c_{2\beta} + 2c_W^2 \right) - c_\beta s_\alpha \left( 1 + 2c_W^2 s_\beta^2 - 2c_\beta^2 s_W^2 \right) \right)$$

$$C_{54}(h^0, G^-, G^+) = \frac{ie c_{2\beta} M_W s_{\alpha+\beta}}{2c_W^2 s_W}$$

$$C_{55}(h^0, H^-, G^+) = \frac{i e M_W}{2 c_W^2 s_W} \left( c_{2\beta} c_{\alpha+\beta} c_W^2 - s_{2\beta} s_{\alpha+\beta} s_W^2 \right)$$

$$C_{56}(h^0, G^-, H^+) = \frac{i e M_W}{2 c_W^2 s_W} \left( c_{2\beta} c_{\alpha+\beta} c_W^2 - s_{2\beta} s_{\alpha+\beta} s_W^2 \right)$$

$$C_{57}(H^0, H^-, H^+) = -\frac{i e M_W}{2 c_W^2 s_W} \left( s_\alpha s_\beta \left( c_{2\beta} + 2 c_W^2 \right) + c_\alpha c_\beta \left( 1 + 2 c_W^2 s_\beta^2 - 2 c_\beta^2 s_W^2 \right) \right)$$

$$C_{58}(H^0, G^-, G^+) = -\frac{i e c_{2\beta} M_W}{2 c_W^2 s_W} (c_\alpha c_\beta - s_\alpha s_\beta)$$

$$C_{59}(H^0, H^-, G^+) = \frac{i e M_W}{2 c_W^2 s_W} \left( c_{2\beta} c_W^2 s_{\alpha+\beta} + c_{\alpha+\beta} s_{2\beta} s_W^2 \right)$$

$$C_{60}(H^0, G^-, H^+) = \frac{i e M_W}{2 c_W^2 s_W} \left( c_{2\beta} c_W^2 s_{\alpha+\beta} + c_{\alpha+\beta} s_{2\beta} s_W^2 \right)$$

$$C_{61}(A^0, H^-, G^+) = -\frac{e M_W}{2 s_W}$$

$$C_{62}(A^0, G^-, H^+) = \frac{e M_W}{2 s_W}$$

**[SSS] Higgs – 2 Sleptons**

$$C_{214}(A^0, \tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2, \dagger}) = -\frac{e \delta_{j1,j2} m_{e_{j1}}}{2 c_\beta M_W s_W} \left( U_{s1,2}^{\tilde{e},j1*} U_{s2,1}^{\tilde{e},j1} \left( c_\beta \mu + A_{j1,j1}^{e*} s_\beta \right) - U_{s1,1}^{\tilde{e},j1*} U_{s2,2}^{\tilde{e},j1} \left( c_\beta \mu^* + A_{j1,j1}^e s_\beta \right) \right)$$

$$C_{215}(G^0, \tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2, \dagger}) = -\frac{e \delta_{j1,j2} m_{e_{j1}}}{2 c_\beta M_W s_W} \left( U_{s1,1}^{\tilde{e},j1*} U_{s2,2}^{\tilde{e},j1} \left( A_{j1,j1}^e c_\beta - \mu^* s_\beta \right) - U_{s1,2}^{\tilde{e},j1*} U_{s2,1}^{\tilde{e},j1} \left( A_{j1,j1}^{e*} c_\beta - \mu s_\beta \right) \right)$$

$$C_{220}(h^0, \tilde{\nu}_{j1}, \tilde{\nu}_{j2}^\dagger) = \frac{i e \delta_{j1,j2} M_Z s_{\alpha+\beta}}{2 c_W s_W}$$

$$C_{221}(H^0, \tilde{\nu}_{j1}, \tilde{\nu}_{j2}^\dagger) = -\frac{i e c_{\alpha+\beta} \delta_{j1,j2} M_Z}{2 c_W s_W}$$

$$C_{222}(h^0, \tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}) = \frac{i e \delta_{j1,j2}}{2 c_\beta c_W M_W s_W} \left\{ U_{s1,1}^{\tilde{e},j1*} \left( c_W m_{e_1} U_{s2,2}^{\tilde{e},j1} \left( c_\alpha \mu^* + A_{j1,j1}^e s_\alpha \right) + U_{s2,1}^{\tilde{e},j1} \left( 2 c_W m_{e_1}^2 s_\alpha + c_\beta M_W M_Z s_{\alpha+\beta} (1 - 2 c_W^2) \right) \right) + \right. \\ \left. U_{s1,2}^{\tilde{e},j1*} \left( 2 c_W m_{e_1}^2 s_\alpha U_{s2,2}^{\tilde{e},j1} - 2 c_\beta M_W M_Z s_{\alpha+\beta} s_W^2 U_{s2,2}^{\tilde{e},j1} + c_W m_{e_1} U_{s2,1}^{\tilde{e},j1} \left( c_\alpha \mu + A_{j1,j1}^{e*} s_\alpha \right) \right) \right\}$$

$$C_{223}(H^0, \tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}) = -\frac{i e \delta_{j1,j2}}{2 c_\beta c_W M_W s_W} \left\{ U_{s1,1}^{\tilde{e},j1*} \left( c_W m_{e_1} U_{s2,2}^{\tilde{e},j1} \left( A_{j1,j1}^e c_\alpha - \mu^* s_\alpha \right) + U_{s2,1}^{\tilde{e},j1} \left( 2 c_\alpha c_W m_{e_1}^2 + c_{\alpha+\beta} c_\beta M_W M_Z (1 - 2 c_W^2) \right) \right) + \right. \\ \left. U_{s1,2}^{\tilde{e},j1*} \left( 2 c_\alpha c_W m_{e_1}^2 U_{s2,2}^{\tilde{e},j1} - 2 c_{\alpha+\beta} c_\beta M_W M_Z s_W^2 U_{s2,2}^{\tilde{e},j1} + c_W m_{e_1} U_{s2,1}^{\tilde{e},j1} \left( A_{j1,j1}^{e*} c_\alpha - \mu s_\alpha \right) \right) \right\}$$

$$C_{230}(H^+, \tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger) = \frac{i e \delta_{j1,j2}}{\sqrt{2} c_\beta M_W s_W} \left( s_\beta U_{s2,1}^{\tilde{e},j1*} \left( m_{e_1}^2 - 2 c_\beta^2 M_W^2 \right) + m_{e_1} U_{s2,2}^{\tilde{e},j1*} \left( c_\beta \mu + A_{j1,j1}^{e*} s_\beta \right) \right)$$

$$C_{231}(H^-, \tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}) = \frac{i e \delta_{j1,j2}}{\sqrt{2} c_\beta M_W s_W} \left( s_\beta U_{s2,1}^{\tilde{e},j1} \left( m_{e_1}^2 - 2 c_\beta^2 M_W^2 \right) + m_{e_1} U_{s2,2}^{\tilde{e},j1} \left( c_\beta \mu^* + A_{j1,j1}^e s_\beta \right) \right)$$

$$C_{234}(G^+, \tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger) = -\frac{i e \delta_{j1,j2}}{\sqrt{2} c_\beta M_W s_W} \left( m_{e_1} U_{s2,2}^{\tilde{e},j1*} \left( A_{j1,j1}^{e*} c_\beta - \mu s_\beta \right) + c_\beta U_{s2,1}^{\tilde{e},j1*} \left( m_{e_1}^2 - c_{2\beta} M_W^2 \right) \right)$$

$$C_{235}(G^-, \tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}) = -\frac{i e \delta_{j1,j2}}{\sqrt{2} c_\beta M_W s_W} \left( m_{e_1} U_{s2,2}^{\tilde{e},j1} \left( A_{j1,j1}^e c_\beta - \mu^* s_\beta \right) + c_\beta U_{s2,1}^{\tilde{e},j1} \left( m_{e_1}^2 - c_{2\beta} M_W^2 \right) \right)$$

## [SSS] Higgs – 2 Squarks

$$C_{216}(A^0, \tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}) = \frac{e \delta_{j1,j2} m_{u_1}}{2 M_W s_\beta s_W} \left( U_{s1,1}^{\tilde{u},j1*} U_{s2,2}^{\tilde{u},j1} \left( A_{j1,j1}^u c_\beta + \mu^* s_\beta \right) - U_{s1,2}^{\tilde{u},j1*} U_{s2,1}^{\tilde{u},j1} \left( A_{j1,j1}^{u*} c_\beta + \mu s_\beta \right) \right)$$

$$C_{217}(G^0, \tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}) = \frac{e \delta_{j1,j2} m_{u_1}}{2 M_W s_\beta s_W} \left( U_{s1,2}^{\tilde{u},j1*} U_{s2,1}^{\tilde{u},j1} \left( c_\beta \mu - A_{j1,j1}^{u*} s_\beta \right) - U_{s1,1}^{\tilde{u},j1*} U_{s2,2}^{\tilde{u},j1} \left( c_\beta \mu^* - A_{j1,j1}^u s_\beta \right) \right)$$

$$C_{218}(A^0, \tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = -\frac{e \delta_{j1,j2} m_{d_1}}{2 c_\beta M_W s_W} \left( U_{s1,2}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1} \left( c_\beta \mu + A_{j1,j1}^{d*} s_\beta \right) - U_{s1,1}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j1} \left( c_\beta \mu^* + A_{j1,j1}^d s_\beta \right) \right)$$

$$C_{219}(G^0, \tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = -\frac{e \delta_{j1,j2} m_{d_1}}{2 c_\beta M_W s_W} \left( U_{s1,1}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j1} \left( A_{j1,j1}^d c_\beta - \mu^* s_\beta \right) - U_{s1,2}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1} \left( A_{j1,j1}^{d*} c_\beta - \mu s_\beta \right) \right)$$



$$C_{224}(h^0, \tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}) = -\frac{i e \delta_{j1,j2}}{6 c_W M_W s_\beta s_W} \left\{ U_{s1,1}^{\tilde{u},j1*} \left( 3 c_W m_{u_{j1}} U_{s2,2}^{\tilde{u},j1} \left( A_{j1,j1}^u c_\alpha + \mu^* s_\alpha \right) + U_{s2,1}^{\tilde{u},j1} \left( 6 c_\alpha c_W m_{u_{j1}}^2 + M_W M_Z s_{\alpha+\beta} s_\beta (1 - 4 c_W^2) \right) \right) + \right. \\ \left. U_{s1,2}^{\tilde{u},j1*} \left( 6 c_\alpha c_W m_{u_{j1}}^2 U_{s2,2}^{\tilde{u},j1} - 4 M_W M_Z s_{\alpha+\beta} s_\beta s_W^2 U_{s2,2}^{\tilde{u},j1} + 3 c_W m_{u_{j1}} U_{s2,1}^{\tilde{u},j1} \left( A_{j1,j1}^{u*} c_\alpha + \mu s_\alpha \right) \right) \right\}$$

$$C_{225}(H^0, \tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}) = \frac{i e \delta_{j1,j2}}{6 c_W M_W s_\beta s_W} \left\{ U_{s1,1}^{\tilde{u},j1*} \left( 3 c_W m_{u_{j1}} U_{s2,2}^{\tilde{u},j1} \left( c_\alpha \mu^* - A_{j1,j1}^u s_\alpha \right) - U_{s2,1}^{\tilde{u},j1} \left( 6 c_W m_{u_{j1}}^2 s_\alpha - c_{\alpha+\beta} M_W M_Z s_\beta (1 - 4 c_W^2) \right) \right) - \right. \\ \left. U_{s1,2}^{\tilde{u},j1*} \left( 6 c_W m_{u_{j1}}^2 s_\alpha U_{s2,2}^{\tilde{u},j1} + 4 c_{\alpha+\beta} M_W M_Z s_\beta s_W^2 U_{s2,2}^{\tilde{u},j1} - 3 c_W m_{u_{j1}} U_{s2,1}^{\tilde{u},j1} \left( c_\alpha \mu - A_{j1,j1}^{u*} s_\alpha \right) \right) \right\}$$

$$C_{226}(h^0, \tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = \frac{i e \delta_{j1,j2}}{6 c_\beta c_W M_W s_W} \left\{ U_{s1,1}^{\tilde{d},j1*} \left( 3 c_W m_{d_{j1}} U_{s2,2}^{\tilde{d},j1} \left( c_\alpha \mu^* + A_{j1,j1}^d s_\alpha \right) + U_{s2,1}^{\tilde{d},j1} \left( 6 c_W m_{d_{j1}}^2 s_\alpha - c_\beta M_W M_Z s_{\alpha+\beta} (1 + 2 c_W^2) \right) \right) + \right. \\ \left. U_{s1,2}^{\tilde{d},j1*} \left( 6 c_W m_{d_{j1}}^2 s_\alpha U_{s2,2}^{\tilde{d},j1} - 2 c_\beta M_W M_Z s_{\alpha+\beta} s_W^2 U_{s2,2}^{\tilde{d},j1} + 3 c_W m_{d_{j1}} U_{s2,1}^{\tilde{d},j1} \left( c_\alpha \mu + A_{j1,j1}^{d*} s_\alpha \right) \right) \right\}$$

$$C_{227}(H^0, \tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = -\frac{i e \delta_{j1,j2}}{6 c_\beta c_W M_W s_W} \left\{ U_{s1,1}^{\tilde{d},j1*} \left( 3 c_W m_{d_{j1}} U_{s2,2}^{\tilde{d},j1} \left( A_{j1,j1}^d c_\alpha - \mu^* s_\alpha \right) + U_{s2,1}^{\tilde{d},j1} \left( 6 c_\alpha c_W m_{d_{j1}}^2 - c_{\alpha+\beta} c_\beta M_W M_Z (1 + 2 c_W^2) \right) \right) + \right. \\ \left. U_{s1,2}^{\tilde{d},j1*} \left( 6 c_\alpha c_W m_{d_{j1}}^2 U_{s2,2}^{\tilde{d},j1} - 2 c_{\alpha+\beta} c_\beta M_W M_Z s_W^2 U_{s2,2}^{\tilde{d},j1} + 3 c_W m_{d_{j1}} U_{s2,1}^{\tilde{d},j1} \left( A_{j1,j1}^{d*} c_\alpha - \mu s_\alpha \right) \right) \right\}$$

$$C_{228}(H^+, \tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}) = \frac{\sqrt{2} i e \text{CKM}_{j1,j2}}{M_W s_{2\beta} s_W} \left\{ m_{d_{j2}} U_{s2,2}^{\tilde{d},j2*} \left( m_{u_{j1}} U_{s1,2}^{\tilde{u},j1} + s_\beta U_{s1,1}^{\tilde{u},j1} \left( c_\beta \mu + A_{j2,j2}^{d*} s_\beta \right) \right) + \right. \\ \left. U_{s2,1}^{\tilde{d},j2*} \left( c_\beta m_{u_{j1}} U_{s1,2}^{\tilde{u},j1} \left( A_{j1,j1}^u c_\beta + \mu^* s_\beta \right) - U_{s1,1}^{\tilde{u},j1} \left( \frac{M_W^2 s_{2\beta}^2}{2} - c_\beta^2 m_{u_{j1}}^2 - m_{d_{j2}}^2 s_\beta^2 \right) \right) \right\}$$

$$C_{229}(H^-, \tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = \frac{\sqrt{2} i e \text{CKM}_{j1,j2}^*}{M_W s_{2\beta} s_W} \left\{ m_{u_{j1}} U_{s1,2}^{\tilde{u},j1*} \left( m_{d_{j2}} U_{s2,2}^{\tilde{d},j2} + c_\beta U_{s2,1}^{\tilde{d},j2} \left( A_{j1,j1}^{u*} c_\beta + \mu s_\beta \right) \right) + \right. \\ \left. U_{s1,1}^{\tilde{u},j1*} \left( m_{d_{j2}} s_\beta U_{s2,2}^{\tilde{d},j2} \left( c_\beta \mu^* + A_{j2,j2}^d s_\beta \right) - U_{s2,1}^{\tilde{d},j2} \left( \frac{M_W^2 s_{2\beta}^2}{2} - c_\beta^2 m_{u_{j1}}^2 - m_{d_{j2}}^2 s_\beta^2 \right) \right) \right\}$$

$$C_{232}(G^+, \tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}) = -\frac{\sqrt{2} i e \text{CKM}_{j1,j2}}{M_W s_{2\beta} s_W} \left\{ m_{d_{j2}} s_\beta U_{s1,1}^{\tilde{u},j1} U_{s2,2}^{\tilde{d},j2*} \left( A_{j2,j2}^{d*} c_\beta - \mu s_\beta \right) + \right. \\ \left. c_\beta U_{s2,1}^{\tilde{d},j2*} \left( m_{u_{j1}} U_{s1,2}^{\tilde{u},j1} \left( c_\beta \mu^* - A_{j1,j1}^u s_\beta \right) + s_\beta U_{s1,1}^{\tilde{u},j1} \left( m_{d_{j2}}^2 - m_{u_{j1}}^2 - c_{2\beta} M_W^2 \right) \right) \right\}$$

$$C_{233}(G^-, \tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = -\frac{\sqrt{2} i e \text{CKM}_{j1,j2}^*}{M_W s_{2\beta} s_W} \left\{ c_\beta m_{u_{j1}} U_{s1,2}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2} \left( c_\beta \mu - A_{j1,j1}^{u*} s_\beta \right) + \right. \\ \left. s_\beta U_{s1,1}^{\tilde{u},j1*} \left( m_{d_{j2}} U_{s2,2}^{\tilde{d},j2} \left( A_{j2,j2}^d c_\beta - \mu^* s_\beta \right) + c_\beta U_{s2,1}^{\tilde{d},j2} \left( m_{d_{j2}}^2 - m_{u_{j1}}^2 - c_{2\beta} M_W^2 \right) \right) \right\}$$

**[SSSS] 2 Higgs – 2 Sleptons**

$$C(h^0, h^0, \tilde{\nu}_{j2}, \tilde{\nu}_{j1}^\dagger) = \frac{Alfa \pi i c_{2\alpha} \delta_{j1,j2}}{c_W^2 s_W^2} \quad 280$$

$$C(h^0, h^0, \tilde{e}_{j2}^{s2}, \tilde{e}_{j1}^{s1,\dagger}) = -\frac{Alfa \pi i \delta_{j1,j2}}{c_\beta^2 c_W^2 M_W^2 s_W^2} \left( 2 U_{s1,2}^{\tilde{e},j1} U_{s2,2}^{\tilde{e},j1*} \left( SA2 c_W^2 m_{e_1}^2 + c_{2\alpha} c_\beta^2 M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{e},j1} U_{s2,1}^{\tilde{e},j1*} \left( 2 SA2 c_W^2 m_{e_1}^2 - c_{2\alpha} c_\beta^2 M_W^2 \left( 1 - 2 c_W^2 \right) \right) \right) \quad 281$$

$$C(H^0, H^0, \tilde{\nu}_{j2}, \tilde{\nu}_{j1}^\dagger) = -\frac{Alfa \pi i c_{2\alpha} \delta_{j1,j2}}{c_W^2 s_W^2} \quad 284$$

$$C(H^0, H^0, \tilde{e}_{j2}^{s2}, \tilde{e}_{j1}^{s1,\dagger}) = -\frac{Alfa \pi i \delta_{j1,j2}}{c_\beta^2 c_W^2 M_W^2 s_W^2} \left( 2 U_{s1,2}^{\tilde{e},j1} U_{s2,2}^{\tilde{e},j1*} \left( CA2 c_W^2 m_{e_1}^2 - c_{2\alpha} c_\beta^2 M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{e},j1} U_{s2,1}^{\tilde{e},j1*} \left( 2 CA2 c_W^2 m_{e_1}^2 + c_{2\alpha} c_\beta^2 M_W^2 \left( 1 - 2 c_W^2 \right) \right) \right) \quad 285$$

$$C(A^0, A^0, \tilde{\nu}_{j2}, \tilde{\nu}_{j1}^\dagger) = \frac{Alfa \pi i c_{2\beta} \delta_{j1,j2}}{c_W^2 s_W^2} \quad 288$$

$$C(G^0, G^0, \tilde{\nu}_{j2}, \tilde{\nu}_{j1}^\dagger) = -\frac{Alfa \pi i c_{2\beta} \delta_{j1,j2}}{c_W^2 s_W^2} \quad 289$$

$$C(A^0, G^0, \tilde{\nu}_{j2}, \tilde{\nu}_{j1}^\dagger) = \frac{Alfa \pi i \delta_{j1,j2} s_{2\beta}}{c_W^2 s_W^2} \quad 290$$

$$C(A^0, A^0, \tilde{e}_{j2}^{s2}, \tilde{e}_{j1}^{s1,\dagger}) = -\frac{Alfa \pi i \delta_{j1,j2}}{c_\beta^2 c_W^2 M_W^2 s_W^2} \left( 2 U_{s1,2}^{\tilde{e},j1} U_{s2,2}^{\tilde{e},j1*} \left( c_W^2 m_{e_1}^2 s_\beta^2 + c_{2\beta} c_\beta^2 M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{e},j1} U_{s2,1}^{\tilde{e},j1*} \left( 2 c_W^2 m_{e_1}^2 s_\beta^2 - c_{2\beta} c_\beta^2 M_W^2 \left( 1 - 2 c_W^2 \right) \right) \right) \quad 291$$

$$C(G^0, G^0, \tilde{e}_{j2}^{s2}, \tilde{e}_{j1}^{s1,\dagger}) = -\frac{Alfa \pi i \delta_{j1,j2}}{c_W^2 M_W^2 s_W^2} \left( 2 U_{s1,2}^{\tilde{e},j1} U_{s2,2}^{\tilde{e},j1*} \left( c_W^2 m_{e_1}^2 - c_{2\beta} M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{e},j1} U_{s2,1}^{\tilde{e},j1*} \left( 2 c_W^2 m_{e_1}^2 + c_{2\beta} M_W^2 \left( 1 - 2 c_W^2 \right) \right) \right) \quad 292$$

$$C(A^0, G^0, \tilde{e}_{j2}^{s2}, \tilde{e}_{j1}^{s1,\dagger}) = \frac{Alfa \pi i \delta_{j1,j2} s_{2\beta}}{c_\beta^2 c_W^2 M_W^2 s_W^2} \left( U_{s1,2}^{\tilde{e},j1} U_{s2,2}^{\tilde{e},j1*} \left( c_W^2 m_{e_1}^2 - 2 c_\beta^2 M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{e},j1} U_{s2,1}^{\tilde{e},j1*} \left( c_W^2 m_{e_1}^2 + c_\beta^2 M_W^2 \left( 1 - 2 c_W^2 \right) \right) \right) \quad 293$$

$$C(h^0, H^0, \tilde{\nu}_{j2}, \tilde{\nu}_{j1}^\dagger) = \frac{Alfa \pi i \delta_{j1,j2} s_{2\alpha}}{c_W^2 s_W^2} \quad 300$$

$$C_{301}(h^0, H^0, \tilde{e}_{j2}^{s2}, \tilde{e}_{j1}^{s1,\dagger}) = \frac{Alfa \pi i \delta_{j1,j2} s_{2\alpha}}{c_\beta^2 c_W^2 M_W^2 s_W^2} \left( U_{s1,2}^{\tilde{e},j1} U_{s2,2}^{\tilde{e},j1*} \left( c_W^2 m_{e_1}^2 - 2 c_\beta^2 M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{e},j1} U_{s2,1}^{\tilde{e},j1*} \left( c_W^2 m_{e_1}^2 + c_\beta^2 M_W^2 \left( 1 - 2 c_W^2 \right) \right) \right)$$

$$C_{316}(h^0, H^-, \tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}) = -\frac{\sqrt{2} Alfa \pi i \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1}}{c_\beta^2 M_W^2 s_W^2} \left( c_{\alpha+\beta} c_\beta^2 M_W^2 + m_{e_1}^2 s_\alpha s_\beta \right)$$

$$C_{317}(h^0, G^-, \tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}) = \frac{\sqrt{2} Alfa \pi i \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1}}{c_\beta^2 M_W^2 s_W^2} \left( c_\beta m_{e_1}^2 s_\alpha - c_\beta^2 M_W^2 s_{\alpha+\beta} \right)$$

$$C_{318}(h^0, H^+, \tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger) = -\frac{\sqrt{2} Alfa \pi i \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1*}}{c_\beta^2 M_W^2 s_W^2} \left( c_{\alpha+\beta} c_\beta^2 M_W^2 + m_{e_1}^2 s_\alpha s_\beta \right)$$

$$C_{319}(h^0, G^+, \tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger) = \frac{\sqrt{2} Alfa \pi i \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1*}}{c_\beta^2 M_W^2 s_W^2} \left( c_\beta m_{e_1}^2 s_\alpha - c_\beta^2 M_W^2 s_{\alpha+\beta} \right)$$

$$C_{320}(A^0, H^-, \tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}) = \frac{\sqrt{2} Alfa \pi \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1}}{c_\beta^2 M_W^2 s_W^2} \left( c_{2\beta} c_\beta^2 M_W^2 + m_{e_1}^2 s_\beta^2 \right)$$

$$C_{321}(G^0, G^-, \tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}) = \frac{\sqrt{2} Alfa \pi \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1}}{M_W^2 s_W^2} \left( m_{e_1}^2 - c_{2\beta} M_W^2 \right)$$

$$C_{322}(A^0, G^-, \tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}) = -\frac{Alfa \pi \delta_{j1,j2} s_{2\beta} U_{s2,1}^{\tilde{e},j1}}{\sqrt{2} c_\beta^2 M_W^2 s_W^2} \left( m_{e_1}^2 - 2 c_\beta^2 M_W^2 \right)$$

$$C_{323}(G^0, H^-, \tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}) = -\frac{Alfa \pi \delta_{j1,j2} s_{2\beta} U_{s2,1}^{\tilde{e},j1}}{\sqrt{2} c_\beta^2 M_W^2 s_W^2} \left( m_{e_1}^2 - 2 c_\beta^2 M_W^2 \right)$$

$$C_{324}(A^0, H^+, \tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger) = -\frac{\sqrt{2} Alfa \pi \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1*}}{c_\beta^2 M_W^2 s_W^2} \left( c_{2\beta} c_\beta^2 M_W^2 + m_{e_1}^2 s_\beta^2 \right)$$

$$C_{325}(G^0, G^+, \tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger) = -\frac{\sqrt{2} Alfa \pi \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1*}}{M_W^2 s_W^2} \left( m_{e_1}^2 - c_{2\beta} M_W^2 \right)$$

$$C_{326}(A^0, G^+, \tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger) = \frac{Alfa \pi \delta_{j1,j2} s_{2\beta} U_{s2,1}^{\tilde{e},j1*}}{\sqrt{2} c_\beta^2 M_W^2 s_W^2} \left( m_{e_1}^2 - 2 c_\beta^2 M_W^2 \right)$$

$$C_{327}(G^0, H^+, \tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger) = \frac{Alfa \pi \delta_{j1,j2} s_{2\beta} U_{s2,1}^{\tilde{e},j1*}}{\sqrt{2} c_\beta^2 M_W^2 s_W^2} \left( m_{e_1}^2 - 2 c_\beta^2 M_W^2 \right)$$

$$C_{332}(H^0, H^-, \tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}) = -\frac{\sqrt{2} Alfa \pi i \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1}}{c_\beta^2 M_W^2 s_W^2} \left( c_\beta^2 M_W^2 s_{\alpha+\beta} - c_\alpha m_{e_1}^2 s_\beta \right)$$

$$C_{333}(H^0, G^-, \tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}) = -\frac{\sqrt{2} Alfa \pi i \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1}}{c_\beta^2 M_W^2 s_W^2} \left( c_\alpha c_\beta m_{e_1}^2 - c_{\alpha+\beta} c_\beta^2 M_W^2 \right)$$

$$C_{334}(H^0, H^+, \tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger) = -\frac{\sqrt{2} Alfa \pi i \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1*}}{c_\beta^2 M_W^2 s_W^2} \left( c_\beta^2 M_W^2 s_{\alpha+\beta} - c_\alpha m_{e_1}^2 s_\beta \right)$$

$$C_{335}(H^0, G^+, \tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger) = -\frac{\sqrt{2} Alfa \pi i \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1*}}{c_\beta^2 M_W^2 s_W^2} \left( c_\alpha c_\beta m_{e_1}^2 - c_{\alpha+\beta} c_\beta^2 M_W^2 \right)$$

$$C_{336}(H^-, H^+, \tilde{\nu}_{j1}, \tilde{\nu}_{j2}^\dagger) = -\frac{Alfa \pi i \delta_{j1,j2}}{c_\beta^2 c_W^2 M_W^2 s_W^2} \left( 2 c_W^2 m_{e_1}^2 s_\beta^2 - c_{2\beta} c_\beta^2 M_W^2 (1 - 2 c_W^2) \right)$$

$$C_{337}(G^-, G^+, \tilde{\nu}_{j1}, \tilde{\nu}_{j2}^\dagger) = -\frac{Alfa \pi i \delta_{j1,j2}}{c_W^2 M_W^2 s_W^2} \left( 2 c_W^2 m_{e_1}^2 + c_{2\beta} M_W^2 (1 - 2 c_W^2) \right)$$

$$C_{338}(H^-, G^+, \tilde{\nu}_{j1}, \tilde{\nu}_{j2}^\dagger) = -\frac{Alfa \pi i \delta_{j1,j2} s_{2\beta}}{s_W^2} \left( 2 - \frac{m_{e_1}^2}{c_\beta^2 M_W^2} - \frac{1}{c_W^2} \right)$$

$$C_{339}(G^-, H^+, \tilde{\nu}_{j1}, \tilde{\nu}_{j2}^\dagger) = -\frac{Alfa \pi i \delta_{j1,j2} s_{2\beta}}{s_W^2} \left( 2 - \frac{m_{e_1}^2}{c_\beta^2 M_W^2} - \frac{1}{c_W^2} \right)$$

$$C_{340}(H^-, H^+, \tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}) = \frac{Alfa \pi i \delta_{j1,j2}}{c_W^2 s_W^2} \left( c_{2\beta} U_{s1,1}^{\tilde{e},j1*} U_{s2,1}^{\tilde{e},j1} - \frac{2 U_{s1,2}^{\tilde{e},j1*} U_{s2,2}^{\tilde{e},j1}}{c_\beta^2 M_W^2} \left( c_W^2 m_{e_1}^2 s_\beta^2 + c_{2\beta} c_\beta^2 M_W^2 s_W^2 \right) \right)$$

$$C_{341}(G^-, G^+, \tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2, \dagger}) = -\frac{\text{Alfa } \pi i \delta_{j1,j2}}{c_W^2 M_W^2 s_W^2} \left( c_{2\beta} M_W^2 U_{s1,1}^{\tilde{e},j1*} U_{s2,1}^{\tilde{e},j1} + 2 U_{s1,2}^{\tilde{e},j1*} U_{s2,2}^{\tilde{e},j1} \left( c_W^2 m_{e_1}^2 - c_{2\beta} M_W^2 s_W^2 \right) \right)$$

$$C_{342}(H^-, G^+, \tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2, \dagger}) = \frac{\text{Alfa } \pi i \delta_{j1,j2}}{c_W^2 s_W^2} \left( s_{2\beta} U_{s1,1}^{\tilde{e},j1*} U_{s2,1}^{\tilde{e},j1} + \frac{s_{2\beta} U_{s1,2}^{\tilde{e},j1*} U_{s2,2}^{\tilde{e},j1}}{c_\beta^2 M_W^2} \left( c_W^2 m_{e_1}^2 - 2 c_\beta^2 M_W^2 s_W^2 \right) \right)$$

$$C_{343}(G^-, H^+, \tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2, \dagger}) = \frac{\text{Alfa } \pi i \delta_{j1,j2}}{c_W^2 s_W^2} \left( s_{2\beta} U_{s1,1}^{\tilde{e},j1*} U_{s2,1}^{\tilde{e},j1} + \frac{s_{2\beta} U_{s1,2}^{\tilde{e},j1*} U_{s2,2}^{\tilde{e},j1}}{c_\beta^2 M_W^2} \left( c_W^2 m_{e_1}^2 - 2 c_\beta^2 M_W^2 s_W^2 \right) \right)$$

## [SSSS] 2 Higgs – 2 Squarks

$$C_{282}(h^0, h^0, \tilde{u}_{j2}^{s2}, \tilde{u}_{j1}^{s1, \dagger}) = -\frac{\text{Alfa } \pi i \delta_{j1,j2}}{3 c_W^2 M_W^2 s_\beta^2 s_W^2} \left( 2 U_{s1,2}^{\tilde{u},j1} U_{s2,2}^{\tilde{u},j1*} \left( 3 \text{CA2 } c_W^2 m_{u_1}^2 - 2 c_{2\alpha} M_W^2 s_\beta^2 s_W^2 \right) + U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{u},j1*} \left( 6 \text{CA2 } c_W^2 m_{u_1}^2 + c_{2\alpha} M_W^2 s_\beta^2 \left( 1 - 4 c_W^2 \right) \right) \right)$$

$$C_{283}(h^0, h^0, \tilde{d}_{j2}^{s2}, \tilde{d}_{j1}^{s1, \dagger}) = -\frac{\text{Alfa } \pi i \delta_{j1,j2}}{3 c_\beta^2 c_W^2 M_W^2 s_W^2} \left( 2 U_{s1,2}^{\tilde{d},j1} U_{s2,2}^{\tilde{d},j1*} \left( 3 \text{SA2 } c_W^2 m_{d_1}^2 + c_{2\alpha} c_\beta^2 M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{d},j1} U_{s2,1}^{\tilde{d},j1*} \left( 6 \text{SA2 } c_W^2 m_{d_1}^2 + c_{2\alpha} c_\beta^2 M_W^2 \left( 1 + 2 c_W^2 \right) \right) \right)$$

$$C_{286}(H^0, H^0, \tilde{u}_{j2}^{s2}, \tilde{u}_{j1}^{s1, \dagger}) = -\frac{\text{Alfa } \pi i \delta_{j1,j2}}{3 c_W^2 M_W^2 s_\beta^2 s_W^2} \left( 2 U_{s1,2}^{\tilde{u},j1} U_{s2,2}^{\tilde{u},j1*} \left( 3 \text{SA2 } c_W^2 m_{u_1}^2 + 2 c_{2\alpha} M_W^2 s_\beta^2 s_W^2 \right) + U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{u},j1*} \left( 6 \text{SA2 } c_W^2 m_{u_1}^2 - c_{2\alpha} M_W^2 s_\beta^2 \left( 1 - 4 c_W^2 \right) \right) \right)$$

$$C_{287}(H^0, H^0, \tilde{d}_{j2}^{s2}, \tilde{d}_{j1}^{s1, \dagger}) = -\frac{\text{Alfa } \pi i \delta_{j1,j2}}{3 c_\beta^2 c_W^2 M_W^2 s_W^2} \left( 2 U_{s1,2}^{\tilde{d},j1} U_{s2,2}^{\tilde{d},j1*} \left( 3 \text{CA2 } c_W^2 m_{d_1}^2 - c_{2\alpha} c_\beta^2 M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{d},j1} U_{s2,1}^{\tilde{d},j1*} \left( 6 \text{CA2 } c_W^2 m_{d_1}^2 - c_{2\alpha} c_\beta^2 M_W^2 \left( 1 + 2 c_W^2 \right) \right) \right)$$

$$C_{294}(A^0, A^0, \tilde{u}_{j2}^{s2}, \tilde{u}_{j1}^{s1, \dagger}) = -\frac{\text{Alfa } \pi i \delta_{j1,j2}}{3 c_W^2 M_W^2 s_\beta^2 s_W^2} \left( 2 U_{s1,2}^{\tilde{u},j1} U_{s2,2}^{\tilde{u},j1*} \left( 3 c_\beta^2 c_W^2 m_{u_1}^2 - 2 c_{2\beta} M_W^2 s_\beta^2 s_W^2 \right) + U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{u},j1*} \left( 6 c_\beta^2 c_W^2 m_{u_1}^2 + c_{2\beta} M_W^2 s_\beta^2 \left( 1 - 4 c_W^2 \right) \right) \right)$$

$$C_{295}(G^0, G^0, \tilde{u}_{j2}^{s2}, \tilde{u}_{j1}^{s1, \dagger}) = -\frac{\text{Alfa } \pi i \delta_{j1,j2}}{3 c_W^2 M_W^2 s_W^2} \left( 2 U_{s1,2}^{\tilde{u},j1} U_{s2,2}^{\tilde{u},j1*} \left( 3 c_W^2 m_{u_1}^2 + 2 c_{2\beta} M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{u},j1*} \left( 6 c_W^2 m_{u_1}^2 - c_{2\beta} M_W^2 \left( 1 - 4 c_W^2 \right) \right) \right)$$

$$C_{296}(A^0, G^0, \tilde{u}_{j2}^{s2}, \tilde{u}_{j1}^{s1, \dagger}) = -\frac{2 \text{Alfa } \pi i c_\beta \delta_{j1,j2}}{3 c_W^2 M_W^2 s_\beta^2 s_W^2} \left( U_{s1,2}^{\tilde{u},j1} U_{s2,2}^{\tilde{u},j1*} \left( 3 c_W^2 m_{u_1}^2 - 4 M_W^2 s_\beta^2 s_W^2 \right) + U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{u},j1*} \left( 3 c_W^2 m_{u_1}^2 + M_W^2 s_\beta^2 \left( 1 - 4 c_W^2 \right) \right) \right)$$

$$C_{297}(A^0, A^0, \tilde{d}_{j2}^{s2}, \tilde{d}_{j1}^{s1, \dagger}) = -\frac{\text{Alfa } \pi i \delta_{j1,j2}}{3 c_\beta^2 c_W^2 M_W^2 s_W^2} \left( 2 U_{s1,2}^{\tilde{d},j1} U_{s2,2}^{\tilde{d},j1*} \left( 3 c_W^2 m_{d_1}^2 s_\beta^2 + c_{2\beta} c_\beta^2 M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{d},j1} U_{s2,1}^{\tilde{d},j1*} \left( 6 c_W^2 m_{d_1}^2 s_\beta^2 + c_{2\beta} c_\beta^2 M_W^2 \left( 1 + 2 c_W^2 \right) \right) \right)$$

$$C_{298}(G^0, G^0, \tilde{d}_{j2}^{s2}, \tilde{d}_{j1}^{s1,\dagger}) = -\frac{\text{Alfa } \pi i \delta_{j1,j2}}{3 c_W^2 M_W^2 s_W^2} \left( 2 U_{s1,2}^{\tilde{d},j1} U_{s2,2}^{\tilde{d},j1*} \left( 3 c_W^2 m_{d_{j1}}^2 - c_{2\beta} M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{d},j1} U_{s2,1}^{\tilde{d},j1*} \left( 6 c_W^2 m_{d_{j1}}^2 - c_{2\beta} M_W^2 (1 + 2 c_W^2) \right) \right)$$

$$C_{299}(A^0, G^0, \tilde{d}_{j2}^{s2}, \tilde{d}_{j1}^{s1,\dagger}) = \frac{\text{Alfa } \pi i \delta_{j1,j2} s_{2\beta}}{3 c_\beta^2 c_W^2 M_W^2 s_W^2} \left( U_{s1,2}^{\tilde{d},j1} U_{s2,2}^{\tilde{d},j1*} \left( 3 c_W^2 m_{d_{j1}}^2 - 2 c_\beta^2 M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{d},j1} U_{s2,1}^{\tilde{d},j1*} \left( 3 c_W^2 m_{d_{j1}}^2 - c_\beta^2 M_W^2 (1 + 2 c_W^2) \right) \right)$$

$$C_{302}(h^0, H^0, \tilde{u}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}) = -\frac{\text{Alfa } \pi i \delta_{j1,j2} s_{2\alpha}}{3 c_W^2 M_W^2 s_\beta^2 s_W^2} \left( U_{s1,2}^{\tilde{u},j1} U_{s2,2}^{\tilde{u},j1*} \left( 3 c_W^2 m_{u_{j1}}^2 - 4 M_W^2 s_\beta^2 s_W^2 \right) + U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{u},j1*} \left( 3 c_W^2 m_{u_{j1}}^2 + M_W^2 s_\beta^2 (1 - 4 c_W^2) \right) \right)$$

$$C_{303}(h^0, H^0, \tilde{d}_{j2}^{s2}, \tilde{d}_{j1}^{s1,\dagger}) = \frac{\text{Alfa } \pi i \delta_{j1,j2} s_{2\alpha}}{3 c_\beta^2 c_W^2 M_W^2 s_W^2} \left( U_{s1,2}^{\tilde{d},j1} U_{s2,2}^{\tilde{d},j1*} \left( 3 c_W^2 m_{d_{j1}}^2 - 2 c_\beta^2 M_W^2 s_W^2 \right) + U_{s1,1}^{\tilde{d},j1} U_{s2,1}^{\tilde{d},j1*} \left( 3 c_W^2 m_{d_{j1}}^2 - c_\beta^2 M_W^2 (1 + 2 c_W^2) \right) \right)$$

$$C_{304}(h^0, H^-, \tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = \frac{4 \sqrt{2} \text{Alfa } \pi i \text{CKM}_{j1,j2}^*}{M_W^2 s_{2\beta}^2 s_W^2} \left( \frac{m_{d_{j2}} m_{u_{j1}} s_{2\beta} s_{\beta-\alpha} U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{d},j2}}{2} + U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2} \left( c_\alpha c_\beta^3 m_{u_{j1}}^2 - s_\beta^2 (c_{\alpha+\beta} c_\beta^2 M_W^2 + m_{d_{j2}}^2 s_\alpha s_\beta) \right) \right)$$

$$C_{305}(h^0, G^-, \tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = -\frac{\sqrt{2} \text{Alfa } \pi i \text{CKM}_{j1,j2}^*}{c_\beta^2 M_W^2 s_\beta s_W^2} \left( c_\beta c_{\beta-\alpha} m_{d_{j2}} m_{u_{j1}} U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{d},j2} - U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2} \left( \frac{m_{d_{j2}}^2 s_{2\beta} s_\alpha}{2} + c_\alpha c_\beta^2 m_{u_{j1}}^2 - c_\beta^2 M_W^2 s_{\alpha+\beta} s_\beta \right) \right)$$

$$C_{306}(h^0, H^+, \tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}) = \frac{4 \sqrt{2} \text{Alfa } \pi i \text{CKM}_{j1,j2}}{M_W^2 s_{2\beta}^2 s_W^2} \left( \frac{m_{d_{j2}} m_{u_{j1}} s_{2\beta} s_{\beta-\alpha} U_{s1,2}^{\tilde{u},j1} U_{s2,2}^{\tilde{d},j2*}}{2} + U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{d},j2*} \left( c_\alpha c_\beta^3 m_{u_{j1}}^2 - s_\beta^2 (c_{\alpha+\beta} c_\beta^2 M_W^2 + m_{d_{j2}}^2 s_\alpha s_\beta) \right) \right)$$

$$C_{307}(h^0, G^+, \tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}) = -\frac{\sqrt{2} \text{Alfa } \pi i \text{CKM}_{j1,j2}}{c_\beta^2 M_W^2 s_\beta s_W^2} \left( c_\beta c_{\beta-\alpha} m_{d_{j2}} m_{u_{j1}} U_{s1,2}^{\tilde{u},j1} U_{s2,2}^{\tilde{d},j2*} - U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{d},j2*} \left( \frac{m_{d_{j2}}^2 s_{2\beta} s_\alpha}{2} + c_\alpha c_\beta^2 m_{u_{j1}}^2 - c_\beta^2 M_W^2 s_{\alpha+\beta} s_\beta \right) \right)$$

$$C_{308}(A^0, H^-, \tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = \frac{4 \sqrt{2} \text{Alfa } \pi \text{CKM}_{j1,j2}^* U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2}}{M_W^2 s_{2\beta}^2 s_W^2} \left( \frac{c_{2\beta} M_W^2 s_{2\beta}^2}{4} - c_\beta^4 m_{u_{j1}}^2 + m_{d_{j2}}^2 s_\beta^4 \right)$$

$$C_{309}(G^0, G^-, \tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = \frac{\sqrt{2} \text{Alfa } \pi \text{CKM}_{j1,j2}^* U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2}}{M_W^2 s_W^2} \left( m_{d_{j2}}^2 - m_{u_{j1}}^2 - c_{2\beta} M_W^2 \right)$$

$$C_{310}(A^0, G^-, \tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = -\frac{\sqrt{2} \text{Alfa } \pi \text{CKM}_{j1,j2}^*}{c_\beta M_W^2 s_\beta s_W^2} \left( m_{d_{j2}} m_{u_{j1}} U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{d},j2} + U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2} \left( c_\beta^2 m_{u_{j1}}^2 + s_\beta^2 (m_{d_{j2}}^2 - 2 c_\beta^2 M_W^2) \right) \right)$$

$$C_{311}(G^0, H^-, \tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = \frac{\sqrt{2} \text{Alfa} \pi \text{CKM}_{j1,j2}^*}{c_\beta M_W^2 s_\beta s_W^2} \left( m_{d_{j2}} m_{u_{j1}} U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{d},j2} - U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2} \left( c_\beta^2 m_{u_{j1}}^2 + s_\beta^2 \left( m_{d_{j2}}^2 - 2 c_\beta^2 M_W^2 \right) \right) \right)$$

$$C_{312}(A^0, H^+, \tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}) = -\frac{4 \sqrt{2} \text{Alfa} \pi \text{CKM}_{j1,j2} U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{d},j2*}}{M_W^2 s_{2\beta}^2 s_W^2} \left( \frac{c_{2\beta} M_W^2 s_{2\beta}^2}{4} - c_\beta^4 m_{u_{j1}}^2 + m_{d_{j2}}^2 s_\beta^4 \right)$$

$$C_{313}(G^0, G^+, \tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}) = -\frac{\sqrt{2} \text{Alfa} \pi \text{CKM}_{j1,j2} U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{d},j2*}}{M_W^2 s_W^2} \left( m_{d_{j2}}^2 - m_{u_{j1}}^2 - c_{2\beta} M_W^2 \right)$$

$$C_{314}(A^0, G^+, \tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}) = \frac{\sqrt{2} \text{Alfa} \pi \text{CKM}_{j1,j2}}{c_\beta M_W^2 s_\beta s_W^2} \left( m_{d_{j2}} m_{u_{j1}} U_{s1,2}^{\tilde{u},j1} U_{s2,2}^{\tilde{d},j2*} + U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{d},j2*} \left( c_\beta^2 m_{u_{j1}}^2 + s_\beta^2 \left( m_{d_{j2}}^2 - 2 c_\beta^2 M_W^2 \right) \right) \right)$$

$$C_{315}(G^0, H^+, \tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}) = -\frac{\sqrt{2} \text{Alfa} \pi \text{CKM}_{j1,j2}}{c_\beta M_W^2 s_\beta s_W^2} \left( m_{d_{j2}} m_{u_{j1}} U_{s1,2}^{\tilde{u},j1} U_{s2,2}^{\tilde{d},j2*} - U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{d},j2*} \left( c_\beta^2 m_{u_{j1}}^2 + s_\beta^2 \left( m_{d_{j2}}^2 - 2 c_\beta^2 M_W^2 \right) \right) \right)$$

$$C_{328}(H^0, H^-, \tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = \frac{4 \sqrt{2} \text{Alfa} \pi i \text{CKM}_{j1,j2}^*}{M_W^2 s_{2\beta}^2 s_W^2} \left( \frac{c_{\beta-\alpha} m_{d_{j2}} m_{u_{j1}} s_{2\beta} U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{d},j2}}{2} - U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2} \left( \frac{M_W^2 s_{2\beta}^2 s_{\alpha+\beta}}{4} - c_\beta^3 m_{u_{j1}}^2 s_\alpha - c_\alpha m_{d_{j2}}^2 s_\beta^3 \right) \right)$$

$$C_{329}(H^0, G^-, \tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = \frac{\sqrt{2} \text{Alfa} \pi i \text{CKM}_{j1,j2}^*}{c_\beta^2 M_W^2 s_\beta s_W^2} \left( c_\beta m_{d_{j2}} m_{u_{j1}} s_{\beta-\alpha} U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{d},j2} - U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2} \left( \frac{c_\alpha m_{d_{j2}}^2 s_{2\beta}}{2} - c_\beta^2 m_{u_{j1}}^2 s_\alpha - c_{\alpha+\beta} c_\beta^2 M_W^2 s_\beta \right) \right)$$

$$C_{330}(H^0, H^+, \tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}) = \frac{4 \sqrt{2} \text{Alfa} \pi i \text{CKM}_{j1,j2}}{M_W^2 s_{2\beta}^2 s_W^2} \left( \frac{c_{\beta-\alpha} m_{d_{j2}} m_{u_{j1}} s_{2\beta} U_{s1,2}^{\tilde{u},j1} U_{s2,2}^{\tilde{d},j2*}}{2} - U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{d},j2*} \left( \frac{M_W^2 s_{2\beta}^2 s_{\alpha+\beta}}{4} - c_\beta^3 m_{u_{j1}}^2 s_\alpha - c_\alpha m_{d_{j2}}^2 s_\beta^3 \right) \right)$$

$$C_{331}(H^0, G^+, \tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}) = \frac{\sqrt{2} \text{Alfa} \pi i \text{CKM}_{j1,j2}}{c_\beta^2 M_W^2 s_\beta s_W^2} \left( c_\beta m_{d_{j2}} m_{u_{j1}} s_{\beta-\alpha} U_{s1,2}^{\tilde{u},j1} U_{s2,2}^{\tilde{d},j2*} - U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{d},j2*} \left( \frac{c_\alpha m_{d_{j2}}^2 s_{2\beta}}{2} - c_\beta^2 m_{u_{j1}}^2 s_\alpha - c_{\alpha+\beta} c_\beta^2 M_W^2 s_\beta \right) \right)$$

$$C_{344}(H^-, H^+, \tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}) = -\frac{\text{Alfa} \pi i}{3 c_W^2 M_W^2 s_W^2} \left\{ \frac{U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{u},j2}}{c_\beta^2} \left( c_{2\beta} c_\beta^2 \delta_{j1,j2} M_W^2 (1 + 2 c_W^2) + 6 c_W^2 s_\beta^2 \left( m_{d_1}^2 \text{CKM}_{j1,1}^* \text{CKM}_{j2,1} + m_{d_2}^2 \text{CKM}_{j1,2}^* \text{CKM}_{j2,2} + m_{d_3}^2 \text{CKM}_{j1,3}^* \text{CKM}_{j2,3} \right) \right) + \frac{2 \delta_{j1,j2} U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{u},j2}}{s_\beta^2} \left( 3 c_\beta^2 c_W^2 m_{u_{j1}}^2 - 2 c_{2\beta} M_W^2 s_\beta^2 s_W^2 \right) \right\}$$

$$C_{345}(G^-, G^+, \tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}) = \frac{Alfa \pi i}{3 c_W^2 M_W^2 s_W^2} \left\{ \frac{U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{u},j2}}{2 \delta_{j1,j2} U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{u},j2}} \left( c_{2\beta} \delta_{j1,j2} M_W^2 (1 + 2 c_W^2) - 6 c_W^2 \left( m_{d_1}^2 \text{CKM}_{j1,1}^* \text{CKM}_{j2,1} + m_{d_2}^2 \text{CKM}_{j1,2}^* \text{CKM}_{j2,2} + m_{d_3}^2 \text{CKM}_{j1,3}^* \text{CKM}_{j2,3} \right) \right) - \right\}$$

$$C_{346}(H^-, G^+, \tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}) = -\frac{2 Alfa \pi i}{3 c_\beta c_W^2 M_W^2 s_\beta s_W^2} \left\{ \frac{s_\beta^2 U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{u},j2}}{c_\beta^2 \delta_{j1,j2} U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{u},j2}} \left( c_\beta^2 \delta_{j1,j2} M_W^2 (1 + 2 c_W^2) - 3 c_W^2 \left( m_{d_1}^2 \text{CKM}_{j1,1}^* \text{CKM}_{j2,1} + m_{d_2}^2 \text{CKM}_{j1,2}^* \text{CKM}_{j2,2} + m_{d_3}^2 \text{CKM}_{j1,3}^* \text{CKM}_{j2,3} \right) \right) + \right\}$$

$$C_{347}(G^-, H^+, \tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}) = -\frac{2 Alfa \pi i}{3 c_\beta c_W^2 M_W^2 s_\beta s_W^2} \left\{ \frac{s_\beta^2 U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{u},j2}}{c_\beta^2 \delta_{j1,j2} U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{u},j2}} \left( c_\beta^2 \delta_{j1,j2} M_W^2 (1 + 2 c_W^2) - 3 c_W^2 \left( m_{d_1}^2 \text{CKM}_{j1,1}^* \text{CKM}_{j2,1} + m_{d_2}^2 \text{CKM}_{j1,2}^* \text{CKM}_{j2,2} + m_{d_3}^2 \text{CKM}_{j1,3}^* \text{CKM}_{j2,3} \right) \right) + \right\}$$

$$C_{348}(H^-, H^+, \tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = -\frac{Alfa \pi i}{3 c_W^2 M_W^2 s_W^2} \left\{ \frac{U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j2}}{s_\beta^2} \left( c_{2\beta} \delta_{j1,j2} M_W^2 s_\beta^2 (1 - 4 c_W^2) + 6 c_\beta^2 c_W^2 \left( m_{u_1}^2 \text{CKM}_{1,j1} \text{CKM}_{1,j2}^* + m_{u_2}^2 \text{CKM}_{2,j1} \text{CKM}_{2,j2}^* + m_{u_3}^2 \text{CKM}_{3,j1} \text{CKM}_{3,j2}^* \right) \right) + \right\}$$

$$C_{349}(G^-, G^+, \tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = \frac{Alfa \pi i}{3 c_W^2 M_W^2 s_W^2} \left\{ \frac{U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j2}}{2 \delta_{j1,j2} U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j2}} \left( c_{2\beta} \delta_{j1,j2} M_W^2 (1 - 4 c_W^2) - 6 c_W^2 \left( m_{u_1}^2 \text{CKM}_{1,j1} \text{CKM}_{1,j2}^* + m_{u_2}^2 \text{CKM}_{2,j1} \text{CKM}_{2,j2}^* + m_{u_3}^2 \text{CKM}_{3,j1} \text{CKM}_{3,j2}^* \right) \right) - \right\}$$

$$C_{350}(H^-, G^+, \tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = -\frac{2 Alfa \pi i}{3 c_\beta c_W^2 M_W^2 s_\beta s_W^2} \left\{ \frac{c_\beta^2 U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j2}}{\delta_{j1,j2} s_\beta^2 U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j2}} \left( \delta_{j1,j2} M_W^2 s_\beta^2 (1 - 4 c_W^2) + 3 c_W^2 \left( m_{u_1}^2 \text{CKM}_{1,j1} \text{CKM}_{1,j2}^* + m_{u_2}^2 \text{CKM}_{2,j1} \text{CKM}_{2,j2}^* + m_{u_3}^2 \text{CKM}_{3,j1} \text{CKM}_{3,j2}^* \right) \right) - \right\}$$

$$C_{351}(G^-, H^+, \tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}) = -\frac{2 Alfa \pi i}{3 c_\beta c_W^2 M_W^2 s_\beta s_W^2} \left\{ \frac{c_\beta^2 U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j2}}{\delta_{j1,j2} s_\beta^2 U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j2}} \left( \delta_{j1,j2} M_W^2 s_\beta^2 (1 - 4 c_W^2) + 3 c_W^2 \left( m_{u_1}^2 \text{CKM}_{1,j1} \text{CKM}_{1,j2}^* + m_{u_2}^2 \text{CKM}_{2,j1} \text{CKM}_{2,j2}^* + m_{u_3}^2 \text{CKM}_{3,j1} \text{CKM}_{3,j2}^* \right) \right) - \right\}$$

## [SSSS] 2 Sleptons – 2 Squarks

$$C_{375}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, \tilde{e}_{j3}^{s3}, \tilde{e}_{j4}^{s4,\dagger}) = \frac{Alfa \pi i \delta_{j1,j2} \delta_{j3,j4}}{3 c_\beta^2 c_W^2 M_W^2 s_W^2} \left\{ U_{s3,1}^{\tilde{e},j3*} \left\{ \frac{c_\beta^2 M_W^2 U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1} U_{s4,1}^{\tilde{e},j3}}{2 U_{s1,2}^{\tilde{d},j1*} \left( c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{d},j1} U_{s4,1}^{\tilde{e},j3} - 3 c_W^2 m_{d_{j1}} m_{e_{j3}} U_{s2,1}^{\tilde{d},j1} U_{s4,2}^{\tilde{e},j3} \right)} \right\} - \right. \\ \left. 2 U_{s3,2}^{\tilde{e},j3*} \left( 2 c_\beta^2 M_W^2 s_W^2 U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j1} U_{s4,2}^{\tilde{e},j3} + U_{s1,1}^{\tilde{d},j1*} \left( 3 c_W^2 m_{d_{j1}} m_{e_{j3}} U_{s2,2}^{\tilde{d},j1} U_{s4,1}^{\tilde{e},j3} + c_\beta^2 M_W^2 s_W^2 U_{s2,1}^{\tilde{d},j1} U_{s4,2}^{\tilde{e},j3} \right) \right) \right\}$$



$$C_{376}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, \tilde{\nu}_{j3}, \tilde{\nu}_{j4}^\dagger) = \frac{Alfa \pi i \delta_{j1,j2} \delta_{j3,j4}}{3 c_W^2 s_W^2} \left( 2 s_W^2 U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j1} + U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1} (1 + 2 c_W^2) \right)$$

$$C_{378}(\tilde{d}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}, \tilde{\nu}_{j3}, \tilde{u}_{j4}^{s4,\dagger}) = -\frac{2 Alfa \pi i \delta_{j2,j3} CKM_{j4,j1} U_{s4,1}^{\tilde{u},j4}}{c_\beta^2 M_W^2 s_W^2} \left( c_\beta^2 M_W^2 U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{e},j2} + m_{d_{j1}} m_{e_{j2}} U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{e},j2} \right)$$

$$C_{379}(\tilde{e}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, \tilde{u}_{j3}^{s3}, \tilde{\nu}_{j4}^\dagger) = -\frac{2 Alfa \pi i \delta_{j1,j4} CKM_{j3,j2}^* U_{s3,1}^{\tilde{u},j3*}}{c_\beta^2 M_W^2 s_W^2} \left( c_\beta^2 M_W^2 U_{s1,1}^{\tilde{e},j1*} U_{s2,1}^{\tilde{d},j2} + m_{d_{j2}} m_{e_{j1}} U_{s1,2}^{\tilde{e},j1*} U_{s2,2}^{\tilde{d},j2} \right)$$

$$C_{382}(\tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}, \tilde{u}_{j3}^{s3}, \tilde{u}_{j4}^{s4,\dagger}) = -\frac{Alfa \pi i \delta_{j1,j2} \delta_{j3,j4}}{3 c_W^2 s_W^2} \left\{ \begin{aligned} & 2 s_W^2 U_{s1,2}^{\tilde{e},j1*} U_{s2,2}^{\tilde{e},j1} \left( U_{s3,1}^{\tilde{u},j3*} U_{s4,1}^{\tilde{u},j3} - 4 U_{s3,2}^{\tilde{u},j3*} U_{s4,2}^{\tilde{u},j3} \right) + \\ & U_{s1,1}^{\tilde{e},j1*} U_{s2,1}^{\tilde{e},j1} \left( 4 s_W^2 U_{s3,2}^{\tilde{u},j3*} U_{s4,2}^{\tilde{u},j3} - U_{s3,1}^{\tilde{u},j3*} U_{s4,1}^{\tilde{u},j3} (1 + 2 c_W^2) \right) \end{aligned} \right\}$$

$$C_{384}(\tilde{\nu}_{j1}, \tilde{\nu}_{j2}^\dagger, \tilde{u}_{j3}^{s3}, \tilde{u}_{j4}^{s4,\dagger}) = -\frac{Alfa \pi i \delta_{j1,j2} \delta_{j3,j4}}{3 c_W^2 s_W^2} \left( 4 s_W^2 U_{s3,2}^{\tilde{u},j3*} U_{s4,2}^{\tilde{u},j3} - U_{s3,1}^{\tilde{u},j3*} U_{s4,1}^{\tilde{u},j3} (1 - 4 c_W^2) \right)$$

### [SSSS] 4 Higgs

$$C_{91}(h^0, h^0, h^0, h^0) = -\frac{3 Alfa \pi i c_{2\alpha}^2}{c_W^2 s_W^2}$$

$$C_{92}(h^0, h^0, h^0, H^0) = -\frac{3 Alfa \pi i c_{2\alpha} s_{2\alpha}}{c_W^2 s_W^2}$$

$$C_{93}(h^0, h^0, H^0, H^0) = \frac{Alfa \pi i}{c_W^2 s_W^2} (1 - 3 s_{2\alpha}^2)$$

$$C_{94}(h^0, H^0, H^0, H^0) = \frac{3 Alfa \pi i c_{2\alpha} s_{2\alpha}}{c_W^2 s_W^2}$$

$$C_{95}(H^0, H^0, H^0, H^0) = -\frac{3 Alfa \pi i c_{2\alpha}^2}{c_W^2 s_W^2}$$

$$C_{96}(h^0, h^0, A^0, A^0) = -\frac{Alfa \pi i c_{2\alpha} c_{2\beta}}{c_W^2 s_W^2}$$

$$C_{97}(h^0, h^0, G^0, G^0) = \frac{Alfa \pi i c_{2\alpha} c_{2\beta}}{c_W^2 s_W^2}$$

$$C_{98}(h^0, h^0, A^0, G^0) = -\frac{Alfa \pi i c_{2\alpha} s_{2\beta}}{c_W^2 s_W^2}$$

$$C_{99}(h^0, H^0, A^0, A^0) = -\frac{Alfa \pi i c_{2\beta} s_{2\alpha}}{c_W^2 s_W^2}$$

$$C_{100}(h^0, H^0, G^0, G^0) = \frac{Alfa \pi i c_{2\beta} s_{2\alpha}}{c_W^2 s_W^2}$$

$$C_{101}(h^0, H^0, A^0, G^0) = -\frac{Alfa \pi i s_{2\alpha} s_{2\beta}}{c_W^2 s_W^2}$$

$$C_{102}(H^0, H^0, A^0, A^0) = \frac{Alfa \pi i c_{2\alpha} c_{2\beta}}{c_W^2 s_W^2}$$

$$C_{103}(H^0, H^0, G^0, G^0) = -\frac{Alfa \pi i c_{2\alpha} c_{2\beta}}{c_W^2 s_W^2}$$

$$C_{104}(H^0, H^0, A^0, G^0) = \frac{Alfa \pi i c_{2\alpha} s_{2\beta}}{c_W^2 s_W^2}$$

$$C_{105}(h^0, h^0, H^-, H^+) = -\frac{Alfa \pi i}{c_W^2 s_W^2} \left( c_W^2 - c_W^2 s_{2\alpha} s_{2\beta} + c_{2\alpha} c_{2\beta} s_W^2 \right)$$

$$C_{106}(h^0, h^0, G^-, G^+) = Alfa \pi i \left( \frac{c_{2\alpha} c_{2\beta}}{c_W^2} - \frac{1}{s_W^2} (1 + s_{2\alpha} s_{2\beta}) \right)$$

$$C_{107}(h^0, h^0, H^-, G^+) = -Alfa \pi i \left( \frac{c_{2\alpha} s_{2\beta}}{c_W^2} + \frac{c_{2\beta} s_{2\alpha}}{s_W^2} \right)$$

$$C_{108}(h^0, h^0, G^-, H^+) = -Alfa \pi i \left( \frac{c_{2\alpha} s_{2\beta}}{c_W^2} + \frac{c_{2\beta} s_{2\alpha}}{s_W^2} \right)$$

$$C_{109}(h^0, H^0, H^-, H^+) = -Alfa \pi i \left( \frac{c_{2\beta} s_{2\alpha}}{c_W^2} + \frac{c_{2\alpha} s_{2\beta}}{s_W^2} \right)$$

$$C_{110}(h^0, H^0, G^-, G^+) = Alfa \pi i \left( \frac{c_{2\beta} s_{2\alpha}}{c_W^2} + \frac{c_{2\alpha} s_{2\beta}}{s_W^2} \right)$$

$$C_{111}(h^0, H^0, H^-, G^+) = -Alfa \pi i \left( \frac{s_{2\alpha} s_{2\beta}}{c_W^2} - \frac{c_{2\alpha} c_{2\beta}}{s_W^2} \right)$$

$$C_{112}(h^0, H^0, G^-, H^+) = -Alfa \pi i \left( \frac{s_{2\alpha} s_{2\beta}}{c_W^2} - \frac{c_{2\alpha} c_{2\beta}}{s_W^2} \right)$$

$$C_{113}(H^0, H^0, H^-, H^+) = Alfa \pi i \left( \frac{c_{2\alpha} c_{2\beta}}{c_W^2} - \frac{1}{s_W^2} (1 + s_{2\alpha} s_{2\beta}) \right)$$

$$C_{114}(H^0, H^0, G^-, G^+) = -\frac{Alfa \pi i}{c_W^2 s_W^2} \left( c_W^2 - c_W^2 s_{2\alpha} s_{2\beta} + c_{2\alpha} c_{2\beta} s_W^2 \right)$$

$$C_{115}(H^0, H^0, H^-, G^+) = Alfa \pi i \left( \frac{c_{2\alpha} s_{2\beta}}{c_W^2} + \frac{c_{2\beta} s_{2\alpha}}{s_W^2} \right)$$

$$C_{116}(H^0, H^0, G^-, H^+) = Alfa \pi i \left( \frac{c_{2\alpha} s_{2\beta}}{c_W^2} + \frac{c_{2\beta} s_{2\alpha}}{s_W^2} \right)$$

$$C_{117}(h^0, A^0, H^-, G^+) = -\frac{Alfa \pi s_{\beta-\alpha}}{s_W^2}$$

$$C_{118}(h^0, A^0, G^-, H^+) = \frac{Alfa \pi s_{\beta-\alpha}}{s_W^2}$$

$$C_{119}(h^0, G^0, H^-, G^+) = \frac{Alfa \pi c_{\beta-\alpha}}{s_W^2}$$

$$C_{120}(h^0, G^0, G^-, H^+) = -\frac{Alfa \pi c_{\beta-\alpha}}{s_W^2}$$

$$C_{121}(H^0, A^0, H^-, G^+) = -\frac{Alfa \pi c_{\beta-\alpha}}{s_W^2}$$

$$C_{122}(H^0, A^0, G^-, H^+) = \frac{Alfa \pi c_{\beta-\alpha}}{s_W^2}$$

$$C_{123}(H^0, G^0, H^-, G^+) = -\frac{\text{Alfa} \pi s_{\beta-\alpha}}{s_W^2}$$

$$C_{124}(H^0, G^0, G^-, H^+) = \frac{\text{Alfa} \pi s_{\beta-\alpha}}{s_W^2}$$

$$C_{125}(A^0, A^0, A^0, A^0) = -\frac{3 \text{Alfa} \pi i}{c_W^2 s_W^2} \left( 1 + c_\beta^2 \left( c_{2\beta} s_{2\beta}^2 \left( 1 + s_\beta^4 \right) - 2 s_\beta^2 \left( 7 - 3 c_{2\beta}^2 c_\beta^4 - s_\beta^2 \left( 24 - s_\beta^2 \left( 45 - 2 s_\beta^2 \left( 21 - 8 s_\beta^2 \right) \right) \right) \right) \right) \right)$$

$$C_{126}(A^0, A^0, A^0, G^0) = -\frac{3 \text{Alfa} \pi i c_{2\beta} s_{2\beta}}{c_W^2 s_W^2}$$

$$C_{127}(A^0, A^0, G^0, G^0) = \frac{\text{Alfa} \pi i}{c_W^2 s_W^2} \left( 1 - 3 s_{2\beta}^2 \right)$$

$$C_{128}(A^0, G^0, G^0, G^0) = \frac{3 \text{Alfa} \pi i c_{2\beta} s_{2\beta}}{c_W^2 s_W^2}$$

$$C_{129}(G^0, G^0, G^0, G^0) = -\frac{3 \text{Alfa} \pi i}{c_W^2 s_W^2} \left( 1 + c_\beta^2 \left( c_{2\beta} s_{2\beta}^2 \left( 1 + s_\beta^4 \right) - 2 s_\beta^2 \left( 7 - 3 c_{2\beta}^2 c_\beta^4 - s_\beta^2 \left( 24 - s_\beta^2 \left( 45 - 2 s_\beta^2 \left( 21 - 8 s_\beta^2 \right) \right) \right) \right) \right) \right)$$

$$C_{130}(A^0, A^0, H^-, H^+) = -\frac{\text{Alfa} \pi i c_{2\beta}^2}{c_W^2 s_W^2}$$

$$C_{131}(A^0, A^0, H^-, G^+) = -\frac{\text{Alfa} \pi i c_{2\beta} s_{2\beta}}{c_W^2 s_W^2}$$

$$C_{132}(A^0, A^0, G^-, H^+) = -\frac{\text{Alfa} \pi i c_{2\beta} s_{2\beta}}{c_W^2 s_W^2}$$

$$C_{133}(A^0, A^0, G^-, G^+) = -\frac{\text{Alfa} \pi i}{c_W^2 s_W^2} \left( c_W^2 + s_{2\beta}^2 - s_W^2 \right)$$

$$C_{134}(A^0, G^0, H^-, H^+) = -\frac{\text{Alfa} \pi i c_{2\beta} s_{2\beta}}{c_W^2 s_W^2}$$

$$C_{135}(A^0, G^0, H^-, G^+) = \frac{\text{Alfa} \pi i}{c_W^2 s_W^2} \left( c_W^2 - s_{2\beta}^2 \right)$$

$$C_{136}(A^0, G^0, G^-, H^+) = \frac{Alfa \pi i}{c_W^2 s_W^2} (c_W^2 - s_{2\beta}^2)$$

$$C_{137}(A^0, G^0, G^-, G^+) = \frac{Alfa \pi i c_{2\beta} s_{2\beta}}{c_W^2 s_W^2}$$

$$C_{138}(G^0, G^0, H^-, H^+) = -\frac{Alfa \pi i}{c_W^2 s_W^2} (c_W^2 + s_{2\beta}^2 - s_W^2)$$

$$C_{139}(G^0, G^0, H^-, G^+) = \frac{Alfa \pi i c_{2\beta} s_{2\beta}}{c_W^2 s_W^2}$$

$$C_{140}(G^0, G^0, G^-, H^+) = \frac{Alfa \pi i c_{2\beta} s_{2\beta}}{c_W^2 s_W^2}$$

$$C_{141}(G^0, G^0, G^-, G^+) = -\frac{Alfa \pi i c_{2\beta}^2}{c_W^2 s_W^2}$$

$$C_{142}(H^-, H^-, H^+, H^+) = -\frac{2 Alfa \pi i}{c_W^2 s_W^2} (c_\beta - s_\beta)^2 (c_\beta + s_\beta)^2$$

$$C_{143}(H^-, H^-, H^+, G^+) = -\frac{2 Alfa \pi i s_{2\beta}}{c_W^2 s_W^2} (c_\beta - s_\beta) (c_\beta + s_\beta)$$

$$C_{144}(H^-, H^-, G^+, G^+) = -\frac{2 Alfa \pi i s_{2\beta}^2}{c_W^2 s_W^2}$$

$$C_{145}(H^-, G^-, H^+, H^+) = -\frac{2 Alfa \pi i s_{2\beta}}{c_W^2 s_W^2} (c_\beta - s_\beta) (c_\beta + s_\beta)$$

$$C_{146}(H^-, G^-, H^+, G^+) = \frac{Alfa \pi i}{c_W^2 s_W^2} (1 - 2 s_{2\beta}^2)$$

$$C_{147}(H^-, G^-, G^+, G^+) = \frac{2 Alfa \pi i s_{2\beta}}{c_W^2 s_W^2} (c_\beta - s_\beta) (c_\beta + s_\beta)$$

$$C_{148}(G^-, G^-, H^+, H^+) = -\frac{2 Alfa \pi i s_{2\beta}^2}{c_W^2 s_W^2}$$

$$C_{149}(G^-, G^-, H^+, G^+) = \frac{2 \text{Alfa } \pi \text{ i } s_{2\beta}}{c_W^2 s_W^2} (c_\beta - s_\beta) (c_\beta + s_\beta)$$

$$C_{150}(G^-, G^-, G^+, G^+) = -\frac{2 \text{Alfa } \pi \text{ i}}{c_W^2 s_W^2} (c_\beta - s_\beta)^2 (c_\beta + s_\beta)^2$$

## [SSSS] 4 Sleptons

$$C_{380}(\tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}, \tilde{e}_{j3}^{s3}, \tilde{e}_{j4}^{s4,\dagger}) = -\frac{\text{Alfa } \pi \text{ i}}{c_\beta^2 c_W^2 M_W^2 s_W^2} \left\{ \begin{aligned} & 2 U_{s1,2}^{\tilde{e},j1*} \left\{ \begin{aligned} & \delta_{j1,j2} \delta_{j3,j4} \left\{ \begin{aligned} & 2 c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{e},j1} U_{s3,2}^{\tilde{e},j3*} U_{s4,2}^{\tilde{e},j3} - \\ & U_{s3,1}^{\tilde{e},j3*} \left( c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{e},j1} U_{s4,1}^{\tilde{e},j3} - c_W^2 m_{e1} m_{e3} U_{s2,1}^{\tilde{e},j1} U_{s4,2}^{\tilde{e},j3} \right) \end{aligned} \right\} + \\ & 2 c_\beta^2 \delta_{j1,j4} \delta_{j2,j3} M_W^2 s_W^2 U_{s2,2}^{\tilde{e},j2} U_{s3,2}^{\tilde{e},j2*} U_{s4,2}^{\tilde{e},j1} + \\ & \delta_{j1,j4} \delta_{j2,j3} U_{s3,1}^{\tilde{e},j2*} \left( c_W^2 m_{e1} m_{e2} U_{s2,2}^{\tilde{e},j2} U_{s4,1}^{\tilde{e},j1} - c_\beta^2 M_W^2 s_W^2 U_{s2,1}^{\tilde{e},j2} U_{s4,2}^{\tilde{e},j1} \right) \end{aligned} \right\} + \\ & U_{s1,1}^{\tilde{e},j1*} \left\{ \begin{aligned} & c_\beta^2 \delta_{j1,j4} \delta_{j2,j3} M_W^2 U_{s2,1}^{\tilde{e},j2} U_{s3,1}^{\tilde{e},j2*} U_{s4,1}^{\tilde{e},j1} - \\ & 2 \delta_{j1,j4} \delta_{j2,j3} U_{s3,2}^{\tilde{e},j2*} \left( c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{e},j2} U_{s4,1}^{\tilde{e},j1} - c_W^2 m_{e1} m_{e2} U_{s2,1}^{\tilde{e},j2} U_{s4,2}^{\tilde{e},j1} \right) + \\ & \delta_{j1,j2} \delta_{j3,j4} \left( c_\beta^2 M_W^2 U_{s2,1}^{\tilde{e},j1} U_{s3,1}^{\tilde{e},j3*} U_{s4,1}^{\tilde{e},j3} + 2 U_{s3,2}^{\tilde{e},j3*} \left( c_W^2 m_{e1} m_{e3} U_{s2,2}^{\tilde{e},j1} U_{s4,1}^{\tilde{e},j3} - c_\beta^2 M_W^2 s_W^2 U_{s2,1}^{\tilde{e},j1} U_{s4,2}^{\tilde{e},j3} \right) \right) \end{aligned} \right\} \end{aligned} \right\}$$

$$C_{381}(\tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}, \tilde{\nu}_{j3}, \tilde{\nu}_{j4}^\dagger) = \frac{\text{Alfa } \pi \text{ i}}{s_W^2} \left\{ \begin{aligned} & \frac{\delta_{j1,j2} \delta_{j3,j4}}{c_W^2} \left( 2 s_W^2 U_{s1,2}^{\tilde{e},j1*} U_{s2,2}^{\tilde{e},j1} - U_{s1,1}^{\tilde{e},j1*} U_{s2,1}^{\tilde{e},j1} (1 - 2 c_W^2) \right) - \\ & \frac{2 \delta_{j1,j4} \delta_{j2,j3}}{c_\beta^2 M_W^2} \left( c_\beta^2 M_W^2 U_{s1,1}^{\tilde{e},j1*} U_{s2,1}^{\tilde{e},j2} + m_{e1} m_{e2} U_{s1,2}^{\tilde{e},j1*} U_{s2,2}^{\tilde{e},j2} \right) \end{aligned} \right\}$$

$$C_{383}(\tilde{\nu}_{j1}, \tilde{\nu}_{j2}^\dagger, \tilde{\nu}_{j3}, \tilde{\nu}_{j4}^\dagger) = -\frac{\text{Alfa } \pi \text{ i}}{c_W^2 s_W^2} (\delta_{j1,j4} \delta_{j2,j3} + \delta_{j1,j2} \delta_{j3,j4})$$

[SSSS] 4 Squarks

$$\begin{aligned}
C_{374}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, \tilde{d}_{j3}^{s3}, \tilde{d}_{j4}^{s4,\dagger}) &= -\frac{i}{36} \left\{ \delta_{j1,j4} \delta_{j2,j3} \left\{ \frac{4 \text{Alfa} \pi}{c_\beta^2 c_W^2 M_W^2 s_W^2} \left\{ U_{s1,1}^{\tilde{d},j1*} \left\{ c_\beta^2 M_W^2 U_{s2,1}^{\tilde{d},j2} U_{s3,1}^{\tilde{d},j2*} U_{s4,1}^{\tilde{d},j1} (1 + 8 c_W^2) + \right. \right. \right. \\
&\quad \left. \left. \left. 2 U_{s3,2}^{\tilde{d},j2*} \left( c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{d},j2} U_{s4,1}^{\tilde{d},j1} + 9 c_W^2 m_{d_{j1}} m_{d_{j2}} U_{s2,1}^{\tilde{d},j2} U_{s4,2}^{\tilde{d},j1} \right) \right\} + \right. \right. \\
&\quad \left. \left. 2 U_{s1,2}^{\tilde{d},j1*} \left\{ 2 c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{d},j2} U_{s3,2}^{\tilde{d},j2*} U_{s4,2}^{\tilde{d},j1} + \right. \right. \right. \\
&\quad \left. \left. \left. U_{s3,1}^{\tilde{d},j2*} \left( 9 c_W^2 m_{d_{j1}} m_{d_{j2}} U_{s2,2}^{\tilde{d},j2} U_{s4,1}^{\tilde{d},j1} + c_\beta^2 M_W^2 s_W^2 U_{s2,1}^{\tilde{d},j2} U_{s4,2}^{\tilde{d},j1} \right) \right\} \right\} + \right. \\
&\quad \left. 144 \text{Alfas} \pi T_{o2,o3}^x T_{o4,o1}^x \left( U_{s2,1}^{\tilde{d},j2} U_{s3,1}^{\tilde{d},j2*} - U_{s2,2}^{\tilde{d},j2} U_{s3,2}^{\tilde{d},j2*} \right) \left( U_{s1,1}^{\tilde{d},j1*} U_{s4,1}^{\tilde{d},j1} - U_{s1,2}^{\tilde{d},j1*} U_{s4,2}^{\tilde{d},j1} \right) \right\} + \\
&\quad \delta_{j1,j2} \delta_{j3,j4} \left\{ \frac{4 \text{Alfa} \pi}{c_\beta^2 c_W^2 M_W^2 s_W^2} \left\{ U_{s1,1}^{\tilde{d},j1*} \left\{ c_\beta^2 M_W^2 U_{s2,1}^{\tilde{d},j1} U_{s3,1}^{\tilde{d},j3*} U_{s4,1}^{\tilde{d},j3} (1 + 8 c_W^2) + \right. \right. \right. \\
&\quad \left. \left. \left. 2 U_{s3,2}^{\tilde{d},j3*} \left( 9 c_W^2 m_{d_{j1}} m_{d_{j3}} U_{s2,2}^{\tilde{d},j1} U_{s4,1}^{\tilde{d},j3} + c_\beta^2 M_W^2 s_W^2 U_{s2,1}^{\tilde{d},j1} U_{s4,2}^{\tilde{d},j3} \right) \right\} + \right. \right. \\
&\quad \left. \left. 2 U_{s1,2}^{\tilde{d},j1*} \left\{ 2 c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{d},j1} U_{s3,2}^{\tilde{d},j3*} U_{s4,2}^{\tilde{d},j3} + \right. \right. \right. \\
&\quad \left. \left. \left. U_{s3,1}^{\tilde{d},j3*} \left( c_\beta^2 M_W^2 s_W^2 U_{s2,2}^{\tilde{d},j1} U_{s4,1}^{\tilde{d},j3} + 9 c_W^2 m_{d_{j1}} m_{d_{j3}} U_{s2,1}^{\tilde{d},j1} U_{s4,2}^{\tilde{d},j3} \right) \right\} \right\} + \right. \\
&\quad \left. 144 \text{Alfas} \pi T_{o2,o1}^x T_{o4,o3}^x \left( U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1} - U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j1} \right) \left( U_{s3,1}^{\tilde{d},j3*} U_{s4,1}^{\tilde{d},j3} - U_{s3,2}^{\tilde{d},j3*} U_{s4,2}^{\tilde{d},j3} \right) \right\} \right\} + \\
C_{377}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, \tilde{u}_{j3}^{s3}, \tilde{u}_{j4}^{s4,\dagger}) &= \delta_{j1,j2} \delta_{j3,j4} \left\{ \frac{\text{Alfa} \pi i}{9 c_W^2 s_W^2} \left\{ 4 s_W^2 U_{s3,2}^{\tilde{u},j3*} U_{s4,2}^{\tilde{u},j3} \left( U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1} + 2 U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j1} \right) - \right. \right. \\
&\quad \left. \left. U_{s3,1}^{\tilde{u},j3*} U_{s4,1}^{\tilde{u},j3} \left( 2 s_W^2 U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j1} + U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1} (1 - 10 c_W^2) \right) \right\} - \right. \\
&\quad \left. 4 \text{Alfas} \pi i T_{o2,o1}^x T_{o4,o3}^x \left( U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1} - U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j1} \right) \left( U_{s3,1}^{\tilde{u},j3*} U_{s4,1}^{\tilde{u},j3} - U_{s3,2}^{\tilde{u},j3*} U_{s4,2}^{\tilde{u},j3} \right) \right\} - \\
&\quad \frac{8 \text{Alfa} \pi i \text{CKM}_{j3,j2}^* \text{CKM}_{j4,j1}}{M_W^2 s_{2\beta}^2 s_W^2} \left\{ c_\beta^2 m_{u_{j3}} m_{u_{j4}} U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j2} U_{s3,2}^{\tilde{u},j3*} U_{s4,2}^{\tilde{u},j4} + \right. \\
&\quad \left. s_\beta^2 U_{s3,1}^{\tilde{u},j3*} U_{s4,1}^{\tilde{u},j4} \left( c_\beta^2 M_W^2 U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j2} + m_{d_{j1}} m_{d_{j2}} U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j2} \right) \right\}
\end{aligned}$$

$$C(\tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}, \tilde{u}_{j3}^{s3}, \tilde{u}_{j4}^{s4,\dagger}) = -\frac{i}{36} \left\{ \begin{array}{l} \delta_{j1,j4} \delta_{j2,j3} \left\{ \begin{array}{l} \frac{4 \text{ Alfa } \pi}{c_W^2 M_W^2 s_\beta^2 s_W^2} \left\{ \begin{array}{l} U_{s1,1}^{\tilde{u},j1*} \left\{ \begin{array}{l} M_W^2 s_\beta^2 U_{s2,1}^{\tilde{u},j2} U_{s3,1}^{\tilde{u},j2*} U_{s4,1}^{\tilde{u},j1} (1 + 8 c_W^2) - \\ 2 U_{s3,2}^{\tilde{u},j2*} \left( 2 M_W^2 s_\beta^2 s_W^2 U_{s2,2}^{\tilde{u},j2} U_{s4,1}^{\tilde{u},j1} - 9 c_W^2 m_{u_{j1}} m_{u_{j2}} U_{s2,1}^{\tilde{u},j2} U_{s4,2}^{\tilde{u},j1} \right) \end{array} \right\} + \\ 2 U_{s1,2}^{\tilde{u},j1*} \left\{ \begin{array}{l} 8 M_W^2 s_\beta^2 s_W^2 U_{s2,2}^{\tilde{u},j2} U_{s3,2}^{\tilde{u},j2*} U_{s4,2}^{\tilde{u},j1} + \\ U_{s3,1}^{\tilde{u},j2*} \left( 9 c_W^2 m_{u_{j1}} m_{u_{j2}} U_{s2,2}^{\tilde{u},j2} U_{s4,1}^{\tilde{u},j1} - 2 M_W^2 s_\beta^2 s_W^2 U_{s2,1}^{\tilde{u},j2} U_{s4,2}^{\tilde{u},j1} \right) \end{array} \right\} \end{array} \right\} + \\ 144 \text{ Alfa } \pi T_{o2,o3}^x T_{o4,o1}^x \left( U_{s2,1}^{\tilde{u},j2} U_{s3,1}^{\tilde{u},j2*} - U_{s2,2}^{\tilde{u},j2} U_{s3,2}^{\tilde{u},j2*} \right) \left( U_{s1,1}^{\tilde{u},j1*} U_{s4,1}^{\tilde{u},j1} - U_{s1,2}^{\tilde{u},j1*} U_{s4,2}^{\tilde{u},j1} \right) \\ \delta_{j1,j2} \delta_{j3,j4} \left\{ \begin{array}{l} \frac{4 \text{ Alfa } \pi}{c_W^2 M_W^2 s_\beta^2 s_W^2} \left\{ \begin{array}{l} U_{s1,1}^{\tilde{u},j1*} \left\{ \begin{array}{l} M_W^2 s_\beta^2 U_{s2,1}^{\tilde{u},j1} U_{s3,1}^{\tilde{u},j3*} U_{s4,1}^{\tilde{u},j3} (1 + 8 c_W^2) + \\ 2 U_{s3,2}^{\tilde{u},j3*} \left( 9 c_W^2 m_{u_{j1}} m_{u_{j3}} U_{s2,2}^{\tilde{u},j1} U_{s4,1}^{\tilde{u},j3} - 2 M_W^2 s_\beta^2 s_W^2 U_{s2,1}^{\tilde{u},j1} U_{s4,2}^{\tilde{u},j3} \right) \end{array} \right\} + \\ 2 U_{s1,2}^{\tilde{u},j1*} \left\{ \begin{array}{l} 8 M_W^2 s_\beta^2 s_W^2 U_{s2,2}^{\tilde{u},j1} U_{s3,2}^{\tilde{u},j3*} U_{s4,2}^{\tilde{u},j3} - \\ U_{s3,1}^{\tilde{u},j3*} \left( 2 M_W^2 s_\beta^2 s_W^2 U_{s2,2}^{\tilde{u},j1} U_{s4,1}^{\tilde{u},j3} - 9 c_W^2 m_{u_{j1}} m_{u_{j3}} U_{s2,1}^{\tilde{u},j1} U_{s4,2}^{\tilde{u},j3} \right) \end{array} \right\} \end{array} \right\} + \\ 144 \text{ Alfa } \pi T_{o2,o1}^x T_{o4,o3}^x \left( U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{u},j1} - U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{u},j1} \right) \left( U_{s3,1}^{\tilde{u},j3*} U_{s4,1}^{\tilde{u},j3} - U_{s3,2}^{\tilde{u},j3*} U_{s4,2}^{\tilde{u},j3} \right) \end{array} \right\} + \end{array} \right\} \end{array} \right\}$$

## [SSV] 2 Higgs – Gauge Boson

$$C_1(G^-, G^+, \gamma) = i e$$

$$C_2(G^-, G^+, Z) = -\frac{i e}{2 c_W s_W} (1 - 2 c_W^2)$$

$$C_3(G^0, G^-, W^+) = \frac{e}{2 s_W}$$

$$C_4(G^0, G^+, W^-) = \frac{e}{2 s_W}$$

$$C_{65}(h^0, A^0, Z) = \frac{e c_{\beta-\alpha}}{2 c_W s_W}$$

$$C_{66}(h^0, G^0, Z) = \frac{e s_{\beta-\alpha}}{2 c_W s_W}$$



$$_{67} C(H^0, A^0, Z) = -\frac{e s_{\beta-\alpha}}{2 c_W s_W}$$

$$_{68} C(H^0, G^0, Z) = \frac{e c_{\beta-\alpha}}{2 c_W s_W}$$

$$_{69} C(H^-, H^+, \gamma) = i e$$

$$_{70} C(H^-, H^+, Z) = -\frac{i e}{2 c_W s_W} (1 - 2 c_W^2)$$

$$_{71} C(h^0, H^-, W^+) = -\frac{i e c_{\beta-\alpha}}{2 s_W}$$

$$_{72} C(h^0, G^-, W^+) = -\frac{i e s_{\beta-\alpha}}{2 s_W}$$

$$_{73} C(H^0, H^-, W^+) = \frac{i e s_{\beta-\alpha}}{2 s_W}$$

$$_{74} C(H^0, G^-, W^+) = -\frac{i e c_{\beta-\alpha}}{2 s_W}$$

$$_{75} C(h^0, H^+, W^-) = \frac{i e c_{\beta-\alpha}}{2 s_W}$$

$$_{76} C(h^0, G^+, W^-) = \frac{i e s_{\beta-\alpha}}{2 s_W}$$

$$_{77} C(H^0, H^+, W^-) = -\frac{i e s_{\beta-\alpha}}{2 s_W}$$

$$_{78} C(H^0, G^+, W^-) = \frac{i e c_{\beta-\alpha}}{2 s_W}$$

$$_{79} C(A^0, H^-, W^+) = \frac{e}{2 s_W}$$

$$_{80} C(A^0, H^+, W^-) = \frac{e}{2 s_W}$$

## [SSV] 2 Sleptons – Gauge Boson

$$C_{236}(\tilde{\nu}_{j1}, \tilde{\nu}_{j2}^\dagger, Z) = -\frac{i e \delta_{j1,j2}}{2 c_W s_W}$$

$$C_{237}(\tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}, \gamma) = i e \delta_{j1,j2} \delta_{s1,s2}$$

$$C_{238}(\tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}, Z) = -\frac{i e \delta_{j1,j2}}{2 c_W s_W} \left( 2 s_W^2 U_{s1,2}^{\tilde{e},j1*} U_{s2,2}^{\tilde{e},j1} + U_{s1,1}^{\tilde{e},j1*} U_{s2,1}^{\tilde{e},j1} (1 - 2 c_W^2) \right)$$

$$C_{245}(\tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}, W^-) = -\frac{i e \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1}}{\sqrt{2} s_W}$$

$$C_{246}(\tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger, W^+) = -\frac{i e \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1*}}{\sqrt{2} s_W}$$

## [SSV] 2 Squarks – Gauge Boson

$$C_{239}(\tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}, \gamma) = -\frac{2 i e \delta_{j1,j2} \delta_{s1,s2}}{3}$$

$$C_{240}(\tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}, Z) = \frac{i e \delta_{j1,j2}}{6 c_W s_W} \left( 4 s_W^2 U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{u},j1} + U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{u},j1} (1 - 4 c_W^2) \right)$$

$$C_{241}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, \gamma) = \frac{i e \delta_{j1,j2} \delta_{s1,s2}}{3}$$

$$C_{242}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, Z) = -\frac{i e \delta_{j1,j2}}{6 c_W s_W} \left( 2 s_W^2 U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j1} - U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1} (1 + 2 c_W^2) \right)$$

$$C_{243}(\tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, W^-) = -\frac{i e \text{CKM}_{j1,j2}^* U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2}}{\sqrt{2} s_W}$$

$$C_{244}(\tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}, W^+) = -\frac{i e \text{CKM}_{j1,j2} U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{d},j2*}}{\sqrt{2} s_W}$$

## [SSV] 2 Squarks – Gluon

$$C_{407}(\tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}, g) = -i g_s \delta_{j1,j2} \delta_{s1,s2} T_{o2,o1}^{g1}$$

$$C_{408}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, g) = -i g_s \delta_{j1,j2} \delta_{s1,s2} T_{o2,o1}^{g1}$$

## [SSVV] 2 Higgs – 2 Gauge Bosons

$$C_{31}(h^0, h^0, Z, Z) = \frac{2 \text{Alfa} \pi i}{c_W^2 s_W^2}$$

$$C_{32}(h^0, h^0, W^-, W^+) = \frac{2 \text{Alfa} \pi i}{s_W^2}$$

$$C_{33}(G^0, G^0, Z, Z) = \frac{2 \text{Alfa} \pi i}{c_W^2 s_W^2}$$

$$C_{34}(G^0, G^0, W^-, W^+) = \frac{2 \text{Alfa} \pi i}{s_W^2}$$

$$C_{35}(G^-, G^+, \gamma, \gamma) = 8 \text{Alfa} \pi i$$

$$C_{36}(G^-, G^+, \gamma, Z) = -\frac{4 \text{Alfa} \pi i}{c_W s_W} (1 - 2 c_W^2)$$

$$C_{37}(G^-, G^+, Z, Z) = \frac{2 \text{Alfa} \pi i}{c_W^2 s_W^2} (1 - 2 c_W^2)^2$$

$$C_{38}(G^-, G^+, W^-, W^+) = \frac{2 \text{Alfa } \pi i}{s_W^2}$$

$$C_{151}(h^0, H^-, \gamma, W^+) = \frac{2 \text{Alfa } \pi i c_{\beta-\alpha}}{s_W}$$

$$C_{152}(h^0, G^-, \gamma, W^+) = \frac{2 \text{Alfa } \pi i s_{\beta-\alpha}}{s_W}$$

$$C_{153}(h^0, H^-, Z, W^+) = -\frac{2 \text{Alfa } \pi i c_{\beta-\alpha}}{c_W}$$

$$C_{154}(h^0, G^-, Z, W^+) = -\frac{2 \text{Alfa } \pi i s_{\beta-\alpha}}{c_W}$$

$$C_{155}(h^0, H^+, \gamma, W^-) = \frac{2 \text{Alfa } \pi i c_{\beta-\alpha}}{s_W}$$

$$C_{156}(h^0, G^+, \gamma, W^-) = \frac{2 \text{Alfa } \pi i s_{\beta-\alpha}}{s_W}$$

$$C_{157}(h^0, H^+, Z, W^-) = -\frac{2 \text{Alfa } \pi i c_{\beta-\alpha}}{c_W}$$

$$C_{158}(h^0, G^+, Z, W^-) = -\frac{2 \text{Alfa } \pi i s_{\beta-\alpha}}{c_W}$$

$$C_{159}(H^0, H^0, Z, Z) = \frac{2 \text{Alfa } \pi i}{c_W^2 s_W^2}$$

$$C_{160}(H^0, H^0, W^-, W^+) = \frac{2 \text{Alfa } \pi i}{s_W^2}$$

$$C_{161}(H^0, H^-, \gamma, W^+) = -\frac{2 \text{Alfa } \pi i s_{\beta-\alpha}}{s_W}$$

$$C_{162}(H^0, G^-, \gamma, W^+) = \frac{2 \text{Alfa } \pi i c_{\beta-\alpha}}{s_W}$$

$$C_{163}(H^0, H^-, Z, W^+) = \frac{2 \text{Alfa } \pi i s_{\beta-\alpha}}{c_W}$$

$$C_{164}(H^0, G^-, Z, W^+) = -\frac{2 \text{Alfa } \pi i c_{\beta-\alpha}}{c_W}$$

$$C_{165}(H^0, H^+, \gamma, W^-) = -\frac{2 \text{Alfa } \pi i s_{\beta-\alpha}}{s_W}$$

$$C_{166}(H^0, G^+, \gamma, W^-) = \frac{2 \text{Alfa } \pi i c_{\beta-\alpha}}{s_W}$$

$$C_{167}(H^0, H^+, Z, W^-) = \frac{2 \text{Alfa } \pi i s_{\beta-\alpha}}{c_W}$$

$$C_{168}(H^0, G^+, Z, W^-) = -\frac{2 \text{Alfa } \pi i c_{\beta-\alpha}}{c_W}$$

$$C_{169}(A^0, A^0, Z, Z) = \frac{2 \text{Alfa } \pi i}{c_W^2 s_W^2}$$

$$C_{170}(A^0, A^0, W^-, W^+) = \frac{2 \text{Alfa } \pi i}{s_W^2}$$

$$C_{171}(A^0, H^-, \gamma, W^+) = -\frac{2 \text{Alfa } \pi}{s_W}$$

$$C_{172}(A^0, H^-, Z, W^+) = \frac{2 \text{Alfa } \pi}{c_W}$$

$$C_{173}(A^0, H^+, \gamma, W^-) = \frac{2 \text{Alfa } \pi}{s_W}$$

$$C_{174}(A^0, H^+, Z, W^-) = -\frac{2 \text{Alfa } \pi}{c_W}$$

$$C_{175}(G^0, G^-, \gamma, W^+) = -\frac{2 \text{Alfa } \pi}{s_W}$$

$$C_{176}(G^0, G^-, Z, W^+) = \frac{2 \text{Alfa } \pi}{c_W}$$

$$C_{177}(G^0, G^+, \gamma, W^-) = \frac{2 \text{Alfa } \pi}{s_W}$$

$$C_{178}(G^0, G^+, Z, W^-) = -\frac{2 \text{Alfa } \pi}{c_W}$$

$$C_{179}(H^-, H^+, \gamma, \gamma) = 8 \text{Alfa } \pi i$$

$$C_{180}(H^-, H^+, \gamma, Z) = -\frac{4 \text{Alfa } \pi i}{c_W s_W} (1 - 2 c_W^2)$$

$$C_{181}(H^-, H^+, Z, Z) = \frac{2 \text{Alfa } \pi i}{c_W^2 s_W^2} (1 - 2 c_W^2)^2$$

$$C_{182}(H^-, H^+, W^-, W^+) = \frac{2 \text{Alfa } \pi i}{s_W^2}$$

**[SSVV] 2 Sleptons – 2 Gauge Bosons**

$$C_{352}(\tilde{\nu}_{j1}, \tilde{\nu}_{j2}^\dagger, Z, Z) = \frac{2 \text{Alfa } \pi i \delta_{j1,j2}}{c_W^2 s_W^2}$$

$$C_{353}(\tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}, \gamma, \gamma) = 8 \text{Alfa } \pi i \delta_{j1,j2} \delta_{s1,s2}$$

$$C_{354}(\tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}, \gamma, Z) = -\frac{4 \text{Alfa } \pi i \delta_{j1,j2}}{c_W s_W} \left( 2 s_W^2 U_{s1,2}^{\tilde{e},j1*} U_{s2,2}^{\tilde{e},j1} + U_{s1,1}^{\tilde{e},j1*} U_{s2,1}^{\tilde{e},j1} (1 - 2 c_W^2) \right)$$

$$C_{355}(\tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}, Z, Z) = \frac{2 \text{Alfa } \pi i \delta_{j1,j2}}{c_W^2 s_W^2} \left( (1 - 2 c_W^2)^2 U_{s1,1}^{\tilde{e},j1*} U_{s2,1}^{\tilde{e},j1} + 4 s_W^4 U_{s1,2}^{\tilde{e},j1*} U_{s2,2}^{\tilde{e},j1} \right)$$

$$C_{364}(\tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}, \gamma, W^-) = -\frac{2 \sqrt{2} \text{Alfa } \pi i \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1}}{s_W}$$

$$C_{365}(\tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger, \gamma, W^+) = -\frac{2 \sqrt{2} \text{Alfa } \pi i \delta_{j1,j2} U_{s2,1}^{\tilde{e},j1*}}{s_W}$$

$$C_{368}(\tilde{\nu}_{j1}, \tilde{e}_{j2}^{s2,\dagger}, Z, W^-) = \frac{2\sqrt{2}\text{Alfa}\pi i\delta_{j1,j2}U_{s2,1}^{\tilde{e},j1}}{c_W}$$

$$C_{369}(\tilde{e}_{j2}^{s2}, \tilde{\nu}_{j1}^\dagger, Z, W^+) = \frac{2\sqrt{2}\text{Alfa}\pi i\delta_{j1,j2}U_{s2,1}^{\tilde{e},j1*}}{c_W}$$

$$C_{370}(\tilde{\nu}_{j1}, \tilde{\nu}_{j2}^\dagger, W^-, W^+) = \frac{2\text{Alfa}\pi i\delta_{j1,j2}}{s_W^2}$$

$$C_{371}(\tilde{e}_{j1}^{s1}, \tilde{e}_{j2}^{s2,\dagger}, W^-, W^+) = \frac{2\text{Alfa}\pi i\delta_{j1,j2}U_{s1,1}^{\tilde{e},j1*}U_{s2,1}^{\tilde{e},j1}}{s_W^2}$$

## [SSVV] 2 Squarks – 2 Gauge Bosons

$$C_{356}(\tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}, \gamma, \gamma) = \frac{32\text{Alfa}\pi i\delta_{j1,j2}\delta_{s1,s2}}{9}$$

$$C_{357}(\tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}, \gamma, Z) = -\frac{8\text{Alfa}\pi i\delta_{j1,j2}}{9c_W s_W} \left( 4s_W^2 U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{u},j1} + U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{u},j1} (1 - 4c_W^2) \right)$$

$$C_{358}(\tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}, Z, Z) = \frac{2\text{Alfa}\pi i\delta_{j1,j2}}{9c_W^2 s_W^2} \left( (1 - 4c_W^2)^2 U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{u},j1} + 16s_W^4 U_{s1,2}^{\tilde{u},j1*} U_{s2,2}^{\tilde{u},j1} \right)$$

$$C_{359}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, \gamma, \gamma) = \frac{8\text{Alfa}\pi i\delta_{j1,j2}\delta_{s1,s2}}{9}$$

$$C_{360}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, \gamma, Z) = -\frac{4\text{Alfa}\pi i\delta_{j1,j2}}{9c_W s_W} \left( 2s_W^2 U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j1} - U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1} (1 + 2c_W^2) \right)$$

$$C_{361}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, Z, Z) = \frac{2\text{Alfa}\pi i\delta_{j1,j2}}{9c_W^2 s_W^2} \left( (1 + 2c_W^2)^2 U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1} + 4s_W^4 U_{s1,2}^{\tilde{d},j1*} U_{s2,2}^{\tilde{d},j1} \right)$$

$$C_{362}(\tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, \gamma, W^-) = \frac{2\sqrt{2}\text{Alfa}\pi i\text{CKM}_{j1,j2}^* U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2}}{3s_W}$$

$$C_{363}(\tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}, \gamma, W^+) = \frac{2\sqrt{2} \text{Alfa} \pi \text{i CKM}_{j1,j2} U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{d},j2*}}{3 s_W}$$

$$C_{366}(\tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, Z, W^-) = -\frac{2\sqrt{2} \text{Alfa} \pi \text{i CKM}_{j1,j2}^* U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2}}{3 c_W}$$

$$C_{367}(\tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}, Z, W^+) = -\frac{2\sqrt{2} \text{Alfa} \pi \text{i CKM}_{j1,j2} U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{d},j2*}}{3 c_W}$$

$$C_{372}(\tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}, W^-, W^+) = \frac{2 \text{Alfa} \pi \text{i} \delta_{j1,j2} U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{u},j1}}{s_W^2}$$

$$C_{373}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, W^-, W^+) = \frac{2 \text{Alfa} \pi \text{i} \delta_{j1,j2} U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1}}{s_W^2}$$

## [SSVV] 2 Squarks – 2 Gluons

$$C_{413}(\tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}, g, g) = 4 \text{Alfas} \pi \text{i} \delta_{j1,j2} \delta_{s1,s2} \left( (T^{g1} T^{g2})_{o2,o1} + (T^{g2} T^{g1})_{o2,o1} \right)$$

$$C_{414}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, g, g) = 4 \text{Alfas} \pi \text{i} \delta_{j1,j2} \delta_{s1,s2} \left( (T^{g1} T^{g2})_{o2,o1} + (T^{g2} T^{g1})_{o2,o1} \right)$$

## [SSVV] 2 Squarks – Gauge Boson – Gluon

$$C_{415}(\tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}, g, \gamma) = \frac{4 \text{i} e g_s \delta_{j1,j2} \delta_{s1,s2} T_{o2,o1}^{g1}}{3}$$

$$C_{416}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, g, \gamma) = -\frac{2 \text{i} e g_s \delta_{j1,j2} \delta_{s1,s2} T_{o2,o1}^{g1}}{3}$$



$$C_{417}(\tilde{u}_{j1}^{s1}, \tilde{u}_{j2}^{s2,\dagger}, g, Z) = -\frac{i e g_s \delta_{j1,j2} T_{o2,o1}^{g1}}{3 c_W s_W} \left( 4 \delta_{s1,s2} s_W^2 - 3 U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{u},j1} \right)$$

$$C_{418}(\tilde{d}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, g, Z) = \frac{i e g_s \delta_{j1,j2} T_{o2,o1}^{g1}}{3 c_W s_W} \left( 2 \delta_{s1,s2} s_W^2 - 3 U_{s1,1}^{\tilde{d},j1*} U_{s2,1}^{\tilde{d},j1} \right)$$

$$C_{419}(\tilde{u}_{j1}^{s1}, \tilde{d}_{j2}^{s2,\dagger}, g, W^-) = \frac{\sqrt{2} i e g_s \text{CKM}_{j1,j2}^* T_{o2,o1}^{g1} U_{s1,1}^{\tilde{u},j1*} U_{s2,1}^{\tilde{d},j2}}{s_W}$$

$$C_{420}(\tilde{d}_{j2}^{s2}, \tilde{u}_{j1}^{s1,\dagger}, g, W^+) = \frac{\sqrt{2} i e g_s \text{CKM}_{j1,j2} T_{o1,o2}^{g1} U_{s1,1}^{\tilde{u},j1} U_{s2,1}^{\tilde{d},j2*}}{s_W}$$

## [SUU] Higgs – 2 Ghosts

$$C_{11}(G^0, u_-, \bar{u}_-) = -\frac{e M_W \xi_W}{2 s_W}$$

$$C_{12}(G^0, u_+, \bar{u}_+) = \frac{e M_W \xi_W}{2 s_W}$$

$$C_{13}(G^-, u_\gamma, \bar{u}_-) = -i e M_W \xi_W$$

$$C_{14}(G^+, u_\gamma, \bar{u}_+) = -i e M_W \xi_W$$

$$C_{15}(G^-, u_Z, \bar{u}_-) = \frac{i e M_W \xi_W}{2 c_W s_W} \left( 1 - 2 c_W^2 \right)$$

$$C_{16}(G^+, u_Z, \bar{u}_+) = \frac{i e M_W \xi_W}{2 c_W s_W} \left( 1 - 2 c_W^2 \right)$$

$$C_{17}(G^-, u_+, \bar{u}_Z) = \frac{i e M_W \xi_Z}{2 c_W s_W}$$

$$C_{18}(G^+, u_-, \bar{u}_Z) = \frac{i e M_W \xi_Z}{2 c_W s_W}$$

$$C_{85}(h^0, u_Z, \bar{u}_Z) = -\frac{i e M_W s_{\beta-\alpha} \xi_Z}{2 c_W^2 s_W}$$

$$C_{86}(H^0, u_Z, \bar{u}_Z) = -\frac{i e c_{\beta-\alpha} M_W \xi_Z}{2 c_W^2 s_W}$$

$$C_{87}(h^0, u_-, \bar{u}_-) = -\frac{i e M_W s_{\beta-\alpha} \xi_W}{2 s_W}$$

$$C_{88}(H^0, u_-, \bar{u}_-) = -\frac{i e c_{\beta-\alpha} M_W \xi_W}{2 s_W}$$

$$C_{89}(h^0, u_+, \bar{u}_+) = -\frac{i e M_W s_{\beta-\alpha} \xi_W}{2 s_W}$$

$$C_{90}(H^0, u_+, \bar{u}_+) = -\frac{i e c_{\beta-\alpha} M_W \xi_W}{2 s_W}$$

**[SVV] Higgs – 2 Gauge Bosons**

$$C_5(G^-, \gamma, W^+) = i e M_W$$

$$C_6(G^+, \gamma, W^-) = i e M_W$$

$$C_7(G^-, Z, W^+) = -\frac{i e M_W s_W}{c_W}$$

$$C_8(G^+, Z, W^-) = -\frac{i e M_W s_W}{c_W}$$

$$C_{81}(h^0, Z, Z) = \frac{i e M_W s_{\beta-\alpha}}{c_W^2 s_W}$$

$$C_{82}(H^0, Z, Z) = \frac{\mathrm{i} e c_{\beta-\alpha} M_W}{c_W^2 s_W}$$

$$C_{83}(h^0, W^-, W^+) = \frac{\mathrm{i} e M_W s_{\beta-\alpha}}{s_W}$$

$$C_{84}(H^0, W^-, W^+) = \frac{\mathrm{i} e c_{\beta-\alpha} M_W}{s_W}$$

**[UUV] 2 Ghosts – Gauge Boson**

$$C_{19}(\bar{u}_-, u_-, \gamma) = \begin{bmatrix} -\mathrm{i} e \\ 0 \end{bmatrix}$$

$$C_{20}(\bar{u}_+, u_+, \gamma) = \begin{bmatrix} \mathrm{i} e \\ 0 \end{bmatrix}$$

$$C_{21}(\bar{u}_-, u_-, Z) = \begin{bmatrix} -\frac{\mathrm{i} e c_W}{s_W} \\ 0 \end{bmatrix}$$

$$C_{22}(\bar{u}_+, u_+, Z) = \begin{bmatrix} \frac{\mathrm{i} e c_W}{s_W} \\ 0 \end{bmatrix}$$

$$C_{23}(\bar{u}_-, u_\gamma, W^-) = \begin{bmatrix} \mathrm{i} e \\ 0 \end{bmatrix}$$

$$C_{24}(\bar{u}_+, u_\gamma, W^+) = \begin{bmatrix} -\mathrm{i} e \\ 0 \end{bmatrix}$$

$$C_{25}(\bar{u}_\gamma, u_+, W^-) = \begin{bmatrix} -ie \\ 0 \end{bmatrix}$$

$$C_{26}(\bar{u}_\gamma, u_-, W^+) = \begin{bmatrix} ie \\ 0 \end{bmatrix}$$

$$C_{27}(\bar{u}_-, u_Z, W^-) = \begin{bmatrix} \frac{ie c_W}{s_W} \\ 0 \end{bmatrix}$$

$$C_{28}(\bar{u}_+, u_Z, W^+) = \begin{bmatrix} -\frac{ie c_W}{s_W} \\ 0 \end{bmatrix}$$

$$C_{29}(\bar{u}_Z, u_+, W^-) = \begin{bmatrix} -\frac{ie c_W}{s_W} \\ 0 \end{bmatrix}$$

$$C_{30}(\bar{u}_Z, u_-, W^+) = \begin{bmatrix} \frac{ie c_W}{s_W} \\ 0 \end{bmatrix}$$

**[UUV] 2 Ghosts – Gluon**

$$C_{403}(\bar{u}_g, u_g, g) = \begin{bmatrix} g_s f^{g^1, g^2, g^3} \\ 0 \end{bmatrix}$$

[VVV] 3 Gauge Bosons

$$C(\gamma, W^+, W^-) = -ie$$

$$C(Z, W^+, W^-) = -\frac{ie c_W}{s_W}$$

[VVV] 3 Gluons

$$C(g, g, g) = g_s f^{g^1, g^2, g^3}$$

[VVVV] 4 Gauge Bosons

$$C(\gamma, \gamma, W^-, W^+) = \begin{bmatrix} -8 \text{Alfa} \pi i \\ 4 \text{Alfa} \pi i \\ 4 \text{Alfa} \pi i \end{bmatrix}$$

$$C(\gamma, Z, W^-, W^+) = \begin{bmatrix} -\frac{8 \text{Alfa} \pi i c_W}{s_W} \\ \frac{4 \text{Alfa} \pi i c_W}{s_W} \\ \frac{4 \text{Alfa} \pi i c_W}{s_W} \end{bmatrix}$$

$$C_{41}(Z, Z, W^-, W^+) = \begin{bmatrix} -\frac{8 \text{ Alfa } \pi \text{ i } c_W^2}{s_W^2} \\ \frac{4 \text{ Alfa } \pi \text{ i } c_W^2}{s_W^2} \\ \frac{4 \text{ Alfa } \pi \text{ i } c_W^2}{s_W^2} \end{bmatrix}$$

$$C_{42}(W^-, W^-, W^+, W^+) = \begin{bmatrix} \frac{8 \text{ Alfa } \pi \text{ i}}{s_W^2} \\ -\frac{4 \text{ Alfa } \pi \text{ i}}{s_W^2} \\ -\frac{4 \text{ Alfa } \pi \text{ i}}{s_W^2} \end{bmatrix}$$

[VVVV] **4 Gluons**

$$C_{401}(g, g, g, g) = \begin{bmatrix} -4 \text{ Alfas } \pi \text{ i} \left( f^{g^1, g^3, x} f^{x, g^2, g^4} - f^{g^1, g^4, x} f^{x, g^3, g^2} \right) \\ -4 \text{ Alfas } \pi \text{ i} \left( f^{g^1, g^2, x} f^{x, g^3, g^4} + f^{g^1, g^4, x} f^{x, g^3, g^2} \right) \\ 4 \text{ Alfas } \pi \text{ i} \left( f^{g^1, g^2, x} f^{x, g^3, g^4} + f^{g^1, g^3, x} f^{x, g^2, g^4} \right) \end{bmatrix}$$