

we explicitly show the expressions of scalar integrals  $\{\tilde{I}_p\}_{p=1}^{198}$  and their reduction coefficients  $\{C_{1,p}\}_{p=1}^{198}$ . For convenience the constant factor  $i g_{49} g_{10}^2 g_{11}^3$  is factorized out in the results. And the scalar integral can be written

as

$$I_p \equiv \int \mathbb{D}^2 q \frac{\mathcal{N}_p}{\mathcal{D}_1 \mathcal{D}_2 \mathcal{D}_3 \mathcal{D}_4 \mathcal{D}_5 \mathcal{D}_6 \mathcal{D}_7}. \quad (1)$$

Then we have

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|   |   |
|---|---|
| $\mathcal{N}_1 = 1,$  | $\mathcal{N}_2 = (k_1 \cdot q_2),$                                  |
| $\mathcal{N}_3 = (k_2 \cdot q_2),$                                  | $\mathcal{N}_4 = (k_3 \cdot q_2),$                                  |
| $\mathcal{N}_5 = (k_1 \cdot q_1),$                                  | $\mathcal{N}_6 = (k_2 \cdot q_1),$                                  |
| $\mathcal{N}_7 = (k_3 \cdot q_1),$                                  | $\mathcal{N}_8 = (q_2 \cdot q_2),$                                  |
| $\mathcal{N}_9 = (k_1 \cdot q_2)^2,$                                | $\mathcal{N}_{10} = (k_1 \cdot q_2)(k_2 \cdot q_2),$                |
| $\mathcal{N}_{11} = (k_2 \cdot q_2)^2,$                             | $\mathcal{N}_{12} = (k_1 \cdot q_2)(k_3 \cdot q_2),$                |
| $\mathcal{N}_{13} = (k_2 \cdot q_2)(k_3 \cdot q_2),$                | $\mathcal{N}_{14} = (k_3 \cdot q_2)^2,$                             |
| $\mathcal{N}_{15} = (q_1 \cdot q_2),$                               | $\mathcal{N}_{16} = (k_1 \cdot q_1)(k_1 \cdot q_2),$                |
| $\mathcal{N}_{17} = (k_1 \cdot q_2)(k_2 \cdot q_1),$                | $\mathcal{N}_{18} = (k_1 \cdot q_2)(k_3 \cdot q_1),$                |
| $\mathcal{N}_{19} = (k_1 \cdot q_1)(k_2 \cdot q_2),$                | $\mathcal{N}_{20} = (k_2 \cdot q_1)(k_2 \cdot q_2),$                |
| $\mathcal{N}_{21} = (k_2 \cdot q_2)(k_3 \cdot q_1),$                | $\mathcal{N}_{22} = (k_1 \cdot q_1)(k_3 \cdot q_2),$                |
| $\mathcal{N}_{23} = (k_2 \cdot q_1)(k_3 \cdot q_2),$                | $\mathcal{N}_{24} = (k_3 \cdot q_1)(k_3 \cdot q_2),$                |
| $\mathcal{N}_{25} = (q_1 \cdot q_1),$                               | $\mathcal{N}_{26} = (k_1 \cdot q_1)^2,$                             |
| $\mathcal{N}_{27} = (k_1 \cdot q_1)(k_2 \cdot q_1),$                | $\mathcal{N}_{28} = (k_2 \cdot q_1)^2,$                             |
| $\mathcal{N}_{29} = (k_1 \cdot q_1)(k_3 \cdot q_1),$                | $\mathcal{N}_{30} = (k_2 \cdot q_1)(k_3 \cdot q_1),$                |
| $\mathcal{N}_{31} = (k_3 \cdot q_1)^2,$                             | $\mathcal{N}_{32} = (k_1 \cdot q_2)(q_1 \cdot q_2),$                |
| $\mathcal{N}_{33} = (k_2 \cdot q_2)(q_1 \cdot q_2),$                | $\mathcal{N}_{34} = (k_3 \cdot q_2)(q_1 \cdot q_2),$                |
| $\mathcal{N}_{35} = (k_1 \cdot q_1)(q_2 \cdot q_2),$                | $\mathcal{N}_{36} = (k_2 \cdot q_1)(q_2 \cdot q_2),$                |
| $\mathcal{N}_{37} = (k_3 \cdot q_1)(q_2 \cdot q_2),$                | $\mathcal{N}_{38} = (k_1 \cdot q_1)(k_1 \cdot q_2)^2,$              |
| $\mathcal{N}_{39} = (k_1 \cdot q_1)(k_1 \cdot q_2)(k_2 \cdot q_2),$ | $\mathcal{N}_{40} = (k_1 \cdot q_1)(k_2 \cdot q_2)^2,$              |
| $\mathcal{N}_{41} = (k_1 \cdot q_1)(k_1 \cdot q_2)(k_3 \cdot q_2),$ | $\mathcal{N}_{42} = (k_1 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_2),$ |
| $\mathcal{N}_{43} = (k_1 \cdot q_1)(k_3 \cdot q_2)^2,$              | $\mathcal{N}_{44} = (k_1 \cdot q_2)^2(k_2 \cdot q_1),$              |
| $\mathcal{N}_{45} = (k_1 \cdot q_2)(k_2 \cdot q_1)(k_2 \cdot q_2),$ | $\mathcal{N}_{46} = (k_2 \cdot q_1)(k_2 \cdot q_2)^2,$              |
| $\mathcal{N}_{47} = (k_1 \cdot q_2)(k_2 \cdot q_1)(k_3 \cdot q_2),$ | $\mathcal{N}_{48} = (k_2 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_2),$ |
| $\mathcal{N}_{49} = (k_2 \cdot q_1)(k_3 \cdot q_2)^2,$              | $\mathcal{N}_{50} = (k_1 \cdot q_2)^2(k_3 \cdot q_1),$              |
| $\mathcal{N}_{51} = (k_1 \cdot q_2)(k_2 \cdot q_2)(k_3 \cdot q_1),$ | $\mathcal{N}_{52} = (k_2 \cdot q_2)^2(k_3 \cdot q_1),$              |
| $\mathcal{N}_{53} = (k_1 \cdot q_2)(k_3 \cdot q_1)(k_3 \cdot q_2),$ | $\mathcal{N}_{54} = (k_2 \cdot q_2)(k_3 \cdot q_1)(k_3 \cdot q_2),$ |
| $\mathcal{N}_{55} = (k_1 \cdot q_1)(q_1 \cdot q_2),$                | $\mathcal{N}_{56} = (k_2 \cdot q_1)(q_1 \cdot q_2),$                |
| $\mathcal{N}_{57} = (k_3 \cdot q_1)(q_1 \cdot q_2),$                | $\mathcal{N}_{58} = (k_1 \cdot q_2)(q_1 \cdot q_1),$                |
| $\mathcal{N}_{59} = (k_2 \cdot q_2)(q_1 \cdot q_1),$                | $\mathcal{N}_{60} = (k_3 \cdot q_2)(q_1 \cdot q_1),$                |
| $\mathcal{N}_{61} = (k_1 \cdot q_1)^2(k_1 \cdot q_2),$              | $\mathcal{N}_{62} = (k_1 \cdot q_1)(k_1 \cdot q_2)(k_2 \cdot q_1),$ |
| $\mathcal{N}_{63} = (k_1 \cdot q_2)(k_2 \cdot q_1)^2,$              | $\mathcal{N}_{64} = (k_1 \cdot q_1)(k_1 \cdot q_2)(k_3 \cdot q_1),$ |
| $\mathcal{N}_{65} = (k_1 \cdot q_2)(k_2 \cdot q_1)(k_3 \cdot q_1),$ | $\mathcal{N}_{66} = (k_1 \cdot q_2)(k_3 \cdot q_1)^2,$              |
| $\mathcal{N}_{67} = (k_1 \cdot q_1)^2(k_2 \cdot q_2),$              | $\mathcal{N}_{68} = (k_1 \cdot q_1)(k_2 \cdot q_1)(k_2 \cdot q_2),$ |
| $\mathcal{N}_{69} = (k_2 \cdot q_1)^2(k_2 \cdot q_2),$              | $\mathcal{N}_{70} = (k_1 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_1),$ |
| $\mathcal{N}_{71} = (k_2 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_1),$ | $\mathcal{N}_{72} = (k_2 \cdot q_2)(k_3 \cdot q_1)^2,$              |
| $\mathcal{N}_{73} = (k_1 \cdot q_1)^2(k_3 \cdot q_2),$              | $\mathcal{N}_{74} = (k_1 \cdot q_1)(k_2 \cdot q_1)(k_3 \cdot q_2),$ |

$$\begin{aligned}
\mathcal{N}_{75} &= (k_2 \cdot q_1)^2 (k_3 \cdot q_2), \\
\mathcal{N}_{77} &= (k_2 \cdot q_1)(k_3 \cdot q_1)(k_3 \cdot q_2), \\
\mathcal{N}_{79} &= (k_1 \cdot q_1)^2 (k_3 \cdot q_1), \\
\mathcal{N}_{81} &= (k_2 \cdot q_1)^2 (k_3 \cdot q_1), \\
\mathcal{N}_{83} &= (k_2 \cdot q_1)(k_3 \cdot q_1)^2, \\
\mathcal{N}_{85} &= (k_1 \cdot q_1)(q_1 \cdot q_1), \\
\mathcal{N}_{87} &= (k_3 \cdot q_1)(q_1 \cdot q_1), \\
\mathcal{N}_{89} &= (k_2 \cdot q_2)^2 (q_1 \cdot q_2), \\
\mathcal{N}_{91} &= (k_1 \cdot q_1)(k_1 \cdot q_2)(k_2 \cdot q_2)^2, \\
\mathcal{N}_{93} &= (k_1 \cdot q_1)(k_2 \cdot q_2)^2 (k_3 \cdot q_2), \\
\mathcal{N}_{95} &= (k_1 \cdot q_2)^2 (k_2 \cdot q_1)(k_2 \cdot q_2), \\
\mathcal{N}_{97} &= (k_1 \cdot q_2)(k_2 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_2), \\
\mathcal{N}_{99} &= (k_1 \cdot q_2)(k_2 \cdot q_2)^2 (k_3 \cdot q_1), \\
\mathcal{N}_{101} &= (q_1 \cdot q_1)(q_2 \cdot q_2), \\
\mathcal{N}_{103} &= (k_1 \cdot q_1)(k_1 \cdot q_2)(q_1 \cdot q_2), \\
\mathcal{N}_{105} &= (k_1 \cdot q_2)(k_3 \cdot q_1)(q_1 \cdot q_2), \\
\mathcal{N}_{107} &= (k_1 \cdot q_2)^2 (k_2 \cdot q_1)^2, \\
\mathcal{N}_{109} &= (k_1 \cdot q_2)^2 (q_1 \cdot q_1), \\
\mathcal{N}_{111} &= (k_2 \cdot q_1)(k_2 \cdot q_2)(q_1 \cdot q_2), \\
\mathcal{N}_{113} &= (k_1 \cdot q_1)^2 (k_1 \cdot q_2)(k_2 \cdot q_2), \\
\mathcal{N}_{115} &= (k_1 \cdot q_2)(k_2 \cdot q_1)^2 (k_2 \cdot q_2), \\
\mathcal{N}_{117} &= (k_1 \cdot q_2)(k_2 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_1), \\
\mathcal{N}_{119} &= (k_1 \cdot q_2)(k_2 \cdot q_2)(q_1 \cdot q_1), \\
\mathcal{N}_{121} &= (k_1 \cdot q_1)(k_2 \cdot q_1)(k_2 \cdot q_2)^2, \\
\mathcal{N}_{123} &= (k_2 \cdot q_2)^2 (q_1 \cdot q_1), \\
\mathcal{N}_{125} &= (k_2 \cdot q_1)(k_3 \cdot q_2)(q_1 \cdot q_2), \\
\mathcal{N}_{127} &= (k_1 \cdot q_1)(k_1 \cdot q_2)(k_2 \cdot q_1)(k_3 \cdot q_2), \\
\mathcal{N}_{129} &= (k_1 \cdot q_2)(k_2 \cdot q_1)(k_3 \cdot q_1)(k_3 \cdot q_2), \\
\mathcal{N}_{131} &= (k_1 \cdot q_1)^2 (k_2 \cdot q_2)(k_3 \cdot q_2), \\
\mathcal{N}_{133} &= (k_1 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_1)(k_3 \cdot q_2), \\
\mathcal{N}_{135} &= (k_1 \cdot q_1)(k_2 \cdot q_1)(k_3 \cdot q_2)^2, \\
\mathcal{N}_{137} &= (k_1 \cdot q_1)^2 (q_2 \cdot q_2), \\
\mathcal{N}_{139} &= (k_2 \cdot q_1)^2 (q_2 \cdot q_2), \\
\mathcal{N}_{141} &= (k_2 \cdot q_1)(k_3 \cdot q_1)(q_2 \cdot q_2), \\
\mathcal{N}_{143} &= (k_1 \cdot q_1)(k_3 \cdot q_1)(q_1 \cdot q_2), \\
\mathcal{N}_{145} &= (k_3 \cdot q_1)^2 (q_1 \cdot q_2), \\
\mathcal{N}_{147} &= (k_1 \cdot q_2)(k_2 \cdot q_1)^2 (k_3 \cdot q_1), \\
\mathcal{N}_{149} &= (k_1 \cdot q_1)(k_1 \cdot q_2)(q_1 \cdot q_1), \\
\mathcal{N}_{151} &= (k_1 \cdot q_2)(k_3 \cdot q_1)(q_1 \cdot q_1), \\
\mathcal{N}_{153} &= (k_1 \cdot q_1)(k_2 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_1), \\
\mathcal{N}_{155} &= (k_1 \cdot q_1)(k_2 \cdot q_2)(q_1 \cdot q_1), \\
\mathcal{N}_{157} &= (k_2 \cdot q_2)(k_3 \cdot q_1)(q_1 \cdot q_1), \\
\mathcal{N}_{159} &= (k_1 \cdot q_1)(k_3 \cdot q_2)(q_1 \cdot q_1), \\
\mathcal{N}_{76} &= (k_1 \cdot q_1)(k_3 \cdot q_1)(k_3 \cdot q_2), \\
\mathcal{N}_{78} &= (k_3 \cdot q_1)^2 (k_3 \cdot q_2), \\
\mathcal{N}_{80} &= (k_1 \cdot q_1)(k_2 \cdot q_1)(k_3 \cdot q_1), \\
\mathcal{N}_{82} &= (k_1 \cdot q_1)(k_3 \cdot q_1)^2, \\
\mathcal{N}_{84} &= (k_3 \cdot q_1)^3, \\
\mathcal{N}_{86} &= (k_2 \cdot q_1)(q_1 \cdot q_1), \\
\mathcal{N}_{88} &= (k_1 \cdot q_2)(k_2 \cdot q_2)(q_1 \cdot q_2), \\
\mathcal{N}_{90} &= (k_2 \cdot q_2)(k_3 \cdot q_2)(q_1 \cdot q_2), \\
\mathcal{N}_{92} &= (k_1 \cdot q_1)(k_2 \cdot q_2)^3, \\
\mathcal{N}_{94} &= (k_1 \cdot q_1)(k_2 \cdot q_2)(q_2 \cdot q_2), \\
\mathcal{N}_{96} &= (k_1 \cdot q_2)(k_2 \cdot q_1)(k_2 \cdot q_2)^2, \\
\mathcal{N}_{98} &= (k_2 \cdot q_1)(k_2 \cdot q_2)(q_2 \cdot q_2), \\
\mathcal{N}_{100} &= (k_2 \cdot q_2)(k_3 \cdot q_1)(q_2 \cdot q_2), \\
\mathcal{N}_{102} &= (q_1 \cdot q_2)^2, \\
\mathcal{N}_{104} &= (k_1 \cdot q_2)(k_2 \cdot q_1)(q_1 \cdot q_2), \\
\mathcal{N}_{106} &= (k_1 \cdot q_1)(k_1 \cdot q_2)^2 (k_2 \cdot q_1), \\
\mathcal{N}_{108} &= (k_1 \cdot q_2)^2 (k_2 \cdot q_1)(k_3 \cdot q_1), \\
\mathcal{N}_{110} &= (k_1 \cdot q_1)(k_2 \cdot q_2)(q_1 \cdot q_2), \\
\mathcal{N}_{112} &= (k_2 \cdot q_2)(k_3 \cdot q_1)(q_1 \cdot q_2), \\
\mathcal{N}_{114} &= (k_1 \cdot q_1)(k_1 \cdot q_2)(k_2 \cdot q_1)(k_2 \cdot q_2), \\
\mathcal{N}_{116} &= (k_1 \cdot q_1)(k_1 \cdot q_2)(k_2 \cdot q_2)(k_3 \cdot q_1), \\
\mathcal{N}_{118} &= (k_1 \cdot q_2)(k_2 \cdot q_2)(k_3 \cdot q_1)^2, \\
\mathcal{N}_{120} &= (k_1 \cdot q_1)^2 (k_2 \cdot q_2)^2, \\
\mathcal{N}_{122} &= (k_1 \cdot q_1)(k_2 \cdot q_2)^2 (k_3 \cdot q_1), \\
\mathcal{N}_{124} &= (k_1 \cdot q_1)(k_3 \cdot q_2)(q_1 \cdot q_2), \\
\mathcal{N}_{126} &= (k_3 \cdot q_1)(k_3 \cdot q_2)(q_1 \cdot q_2), \\
\mathcal{N}_{128} &= (k_1 \cdot q_2)(k_2 \cdot q_1)^2 (k_3 \cdot q_2), \\
\mathcal{N}_{130} &= (k_1 \cdot q_2)(k_3 \cdot q_2)(q_1 \cdot q_1), \\
\mathcal{N}_{132} &= (k_1 \cdot q_1)(k_2 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_2), \\
\mathcal{N}_{134} &= (k_2 \cdot q_2)(k_3 \cdot q_2)(q_1 \cdot q_1), \\
\mathcal{N}_{136} &= (k_3 \cdot q_2)^2 (q_1 \cdot q_1), \\
\mathcal{N}_{138} &= (k_1 \cdot q_1)(k_2 \cdot q_1)(q_2 \cdot q_2), \\
\mathcal{N}_{140} &= (k_1 \cdot q_1)(k_3 \cdot q_1)(q_2 \cdot q_2), \\
\mathcal{N}_{142} &= (k_3 \cdot q_1)^2 (q_2 \cdot q_2), \\
\mathcal{N}_{144} &= (k_2 \cdot q_1)(k_3 \cdot q_1)(q_1 \cdot q_2), \\
\mathcal{N}_{146} &= (k_1 \cdot q_1)(k_1 \cdot q_2)(k_2 \cdot q_1)(k_3 \cdot q_1), \\
\mathcal{N}_{148} &= (k_1 \cdot q_2)(k_2 \cdot q_1)(k_3 \cdot q_1)^2, \\
\mathcal{N}_{150} &= (k_1 \cdot q_2)(k_2 \cdot q_1)(q_1 \cdot q_1), \\
\mathcal{N}_{152} &= (k_1 \cdot q_1)^2 (k_2 \cdot q_2)(k_3 \cdot q_1), \\
\mathcal{N}_{154} &= (k_1 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_1)^2, \\
\mathcal{N}_{156} &= (k_2 \cdot q_1)(k_2 \cdot q_2)(q_1 \cdot q_1), \\
\mathcal{N}_{158} &= (k_1 \cdot q_1)(k_2 \cdot q_1)(k_3 \cdot q_1)(k_3 \cdot q_2), \\
\mathcal{N}_{160} &= (k_2 \cdot q_1)(k_3 \cdot q_2)(q_1 \cdot q_1),
\end{aligned}$$

$$\begin{aligned}
\mathcal{N}_{161} &= (k_3 \cdot q_1)(k_3 \cdot q_2)(q_1 \cdot q_1), & \mathcal{N}_{162} &= (q_1 \cdot q_1)(q_1 \cdot q_2), \\
\mathcal{N}_{163} &= (k_1 \cdot q_2)(q_1 \cdot q_2)^2, & \mathcal{N}_{164} &= (k_2 \cdot q_2)(q_1 \cdot q_2)^2, \\
\mathcal{N}_{165} &= (k_3 \cdot q_2)(q_1 \cdot q_2)^2, & \mathcal{N}_{166} &= (k_1 \cdot q_1)(k_1 \cdot q_2)(k_2 \cdot q_2)(q_1 \cdot q_2), \\
\mathcal{N}_{167} &= (k_1 \cdot q_1)(k_2 \cdot q_2)^2(q_1 \cdot q_2), & \mathcal{N}_{168} &= (k_1 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_2)(q_1 \cdot q_2), \\
\mathcal{N}_{169} &= (k_1 \cdot q_1)(q_1 \cdot q_2)(q_2 \cdot q_2), & \mathcal{N}_{170} &= (k_1 \cdot q_1)^2(k_2 \cdot q_2)(q_2 \cdot q_2), \\
\mathcal{N}_{171} &= (k_1 \cdot q_2)^2(k_2 \cdot q_1)(q_1 \cdot q_2), & \mathcal{N}_{172} &= (k_1 \cdot q_2)(k_2 \cdot q_1)(k_2 \cdot q_2)(q_1 \cdot q_2), \\
\mathcal{N}_{173} &= (k_1 \cdot q_2)(k_2 \cdot q_1)(k_3 \cdot q_2)(q_1 \cdot q_2), & \mathcal{N}_{174} &= (k_2 \cdot q_1)(q_1 \cdot q_2)(q_2 \cdot q_2), \\
\mathcal{N}_{175} &= (k_1 \cdot q_1)(k_1 \cdot q_2)(k_2 \cdot q_1)(q_2 \cdot q_2), & \mathcal{N}_{176} &= (k_1 \cdot q_1)(k_2 \cdot q_1)(k_2 \cdot q_2)(q_2 \cdot q_2), \\
\mathcal{N}_{177} &= (k_1 \cdot q_1)(k_2 \cdot q_1)(k_3 \cdot q_2)(q_2 \cdot q_2), & \mathcal{N}_{178} &= (k_1 \cdot q_2)(k_2 \cdot q_1)^2(q_2 \cdot q_2), \\
\mathcal{N}_{179} &= (k_1 \cdot q_2)(k_2 \cdot q_2)(k_3 \cdot q_1)(q_1 \cdot q_2), & \mathcal{N}_{180} &= (k_3 \cdot q_1)(q_1 \cdot q_2)(q_2 \cdot q_2), \\
\mathcal{N}_{181} &= (k_1 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_1)(q_2 \cdot q_2), & \mathcal{N}_{182} &= (k_1 \cdot q_2)(k_2 \cdot q_1)(k_3 \cdot q_1)(q_2 \cdot q_2), \\
\mathcal{N}_{183} &= (k_1 \cdot q_2)(q_1 \cdot q_1)(q_2 \cdot q_2), & \mathcal{N}_{184} &= (k_2 \cdot q_2)(q_1 \cdot q_1)(q_2 \cdot q_2), \\
\mathcal{N}_{185} &= (k_3 \cdot q_2)(q_1 \cdot q_1)(q_2 \cdot q_2), & \mathcal{N}_{186} &= (k_1 \cdot q_2)(q_1 \cdot q_1)(q_1 \cdot q_2), \\
\mathcal{N}_{187} &= (k_1 \cdot q_2)^2(k_2 \cdot q_1)(q_1 \cdot q_1), & \mathcal{N}_{188} &= (k_2 \cdot q_2)(q_1 \cdot q_1)(q_1 \cdot q_2), \\
\mathcal{N}_{189} &= (k_1 \cdot q_1)(k_1 \cdot q_2)(k_2 \cdot q_2)(q_1 \cdot q_1), & \mathcal{N}_{190} &= (k_1 \cdot q_2)(k_2 \cdot q_1)(k_2 \cdot q_2)(q_1 \cdot q_1), \\
\mathcal{N}_{191} &= (k_1 \cdot q_2)(k_2 \cdot q_2)(k_3 \cdot q_1)(q_1 \cdot q_1), & \mathcal{N}_{192} &= (k_1 \cdot q_1)(k_2 \cdot q_2)^2(q_1 \cdot q_1), \\
\mathcal{N}_{193} &= (k_3 \cdot q_2)(q_1 \cdot q_1)(q_1 \cdot q_2), & \mathcal{N}_{194} &= (k_1 \cdot q_2)(k_2 \cdot q_1)(k_3 \cdot q_2)(q_1 \cdot q_1), \\
\mathcal{N}_{195} &= (k_1 \cdot q_1)(k_2 \cdot q_2)(k_3 \cdot q_2)(q_1 \cdot q_1), & \mathcal{N}_{196} &= (k_1 \cdot q_1)(q_1 \cdot q_1)(q_2 \cdot q_2), \\
\mathcal{N}_{197} &= (k_2 \cdot q_1)(q_1 \cdot q_1)(q_2 \cdot q_2), & \mathcal{N}_{198} &= (k_3 \cdot q_1)(q_1 \cdot q_1)(q_2 \cdot q_2).
\end{aligned} \tag{2}$$

By using the in-house packages SERRA.JL, the reduction coefficients can be obtained and shown in the following

$$\begin{aligned}
C_{1,1} &= 2s_1 m_t (m_t^2 - m_W^2 + 2s_1 - 2s_2), \\
C_{1,2} &= \frac{2m_t s_1 (m_t^2 - s_1 - s_2) (m_t^2 - m_W^2 + 2s_1 - 2s_2)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)}, \\
C_{1,3} &= -\frac{2m_t s_1 (m_W^2 - s_2) (m_t^2 - m_W^2 + 2s_1 - 2s_2)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)}, \\
C_{1,4} &= -\frac{2m_t s_1 (2m_W^2 m_t^2 - s_1 m_t^2 - 2s_2 m_t^2 - 2s_1^2 + 2s_2^2 + m_W^2 s_1 - 2m_W^2 s_2 + 4s_1 s_2)}{(m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2)}, \\
C_{1,5} &= \frac{m_t}{(m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2)} \{ -m_t^6 + (3 - 4\epsilon) m_W^2 m_t^4 + 2s_1 m_t^4 + 2(\epsilon + 3) s_2 m_t^4 \\
&\quad - 2m_W^4 m_t^2 - s_1^2 m_t^2 + (-4\epsilon - 7) s_2^2 m_t^2 + 13m_W^2 s_1 m_t^2 + (8\epsilon - 6) m_W^2 s_2 m_t^2 - 2(\epsilon + 9) s_1 s_2 m_t^2 \\
&\quad + 2(\epsilon + 1) s_2^3 + (3 - 4\epsilon) m_W^2 s_2^2 + 2(\epsilon + 7) s_1 s_2^2 + 2m_W^4 s_2 + 12s_1^2 s_2 - 15m_W^2 s_1 s_2 \}, \\
C_{1,6} &= \frac{m_t}{(m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2)} \{ -3m_W^2 m_t^4 + 3s_2 m_t^4 + m_W^4 m_t^2 + (-2\epsilon - 7) s_2^2 m_t^2 - 9m_W^2 s_1 m_t^2 \\
&\quad + 2(\epsilon + 3) m_W^2 s_2 m_t^2 + 5s_1 s_2 m_t^2 + 2(\epsilon + 2) s_2^3 + (-2\epsilon - 3) m_W^2 s_2^2 + 4s_1 s_2^2 - m_W^4 s_2 \\
&\quad - 8s_1^2 s_2 + 8m_W^2 s_1 s_2 \}, \\
C_{1,7} &= \frac{m_t (-s_1 m_t^4 + s_1^2 m_t^2 - 5m_W^2 s_1 m_t^2 + (13 - 2\epsilon) s_1 s_2 m_t^2 + 2(\epsilon - 6) s_1 s_2^2 - 4s_1^2 s_2 + 5m_W^2 s_1 s_2)}{(m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2)},
\end{aligned}$$

$$C_{1,8} = -8s_1m_t(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4),$$

$$C_{1,9} = -s_1C_{1,38} = -2s_1C_{1,109} = \frac{8s_1m_t(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)(-m_t^2 + s_1 + s_2)^2}{s_1(m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2))},$$

$$C_{1,10} = -2s_1C_{1,119} = \frac{16s_1m_t(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)(m_t^2(m_W^2 - s_2) + (s_1 - s_2)m_W^2 + s_2(s_1 + s_2))}{s_1(m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2))},$$

$$C_{1,11} = -2s_1C_{1,123} = \frac{8s_1m_t(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)(m_W^2 - s_2)^2}{s_1(m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2))},$$

$$C_{1,12} = \frac{4s_1m_t(3 + 8\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4)(m_t^2 - s_1 - s_2)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,13} = -\frac{4s_1m_t(3 + 8\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4)(m_W^2 - s_2)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,14} = s_1C_{1,43} = \frac{-s_1C_{1,49}}{2} = \frac{4s_1^2m_t(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,15} = 2m_t((3 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)m_t^2 + 4(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)m_W^2 + 4(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4)s_1 + (-7 - 10\epsilon - 20\epsilon^2 - 40\epsilon^3 - 80\epsilon^4)s_2),$$

$$C_{1,16} = -\frac{2m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))}\{2(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)m_t^6 + 4(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)m_W^2m_t^4 + 8(\epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)s_1m_t^4 - 2(5 + 7\epsilon + 14\epsilon^2 + 28\epsilon^3 + 56\epsilon^4)s_2m_t^4 - 2(3 + 11\epsilon + 22\epsilon^2 + 44\epsilon^3 + 88\epsilon^4)s_1^2m_t^2 + 2(7 + 11\epsilon + 22\epsilon^2 + 44\epsilon^3 + 88\epsilon^4)s_2^2m_t^2 + (-7 - 16\epsilon - 32\epsilon^2 - 64\epsilon^3 - 128\epsilon^4)m_W^2s_1m_t^2 - 8(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)m_W^2s_2m_t^2 + 9s_1s_2m_t^2 + 4(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4)s_1^3 - 2(3 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4)s_2^3 + (3 + 8\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4)m_W^2s_1^2 + 4(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)m_W^2s_2^2 + (-9 - 8\epsilon - 16\epsilon^2 - 32\epsilon^3 - 64\epsilon^4)s_1s_2^2 + (1 + 14\epsilon + 28\epsilon^2 + 56\epsilon^3 + 112\epsilon^4)s_1^2s_2 + (7 + 16\epsilon + 32\epsilon^2 + 64\epsilon^3 + 128\epsilon^4)m_W^2s_1s_2\},$$

$$C_{1,17} = -\frac{4m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))}\{(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)m_W^2m_t^4 + s_1m_t^4 + (-1 - \epsilon - 2\epsilon^2 - 4\epsilon^3 - 8\epsilon^4)s_2m_t^4 + (2 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)m_W^4m_t^2 + s_1^2m_t^2 + (4 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4)s_2^2m_t^2 + (3 + 8\epsilon + 14\epsilon^2 + 28\epsilon^3 + 56\epsilon^4)m_W^2s_1m_t^2 - 2(3 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4)m_W^2s_2m_t^2 - 2(2 + 3\epsilon + 5\epsilon^2 + 10\epsilon^3 + 20\epsilon^4)s_1s_2m_t^2 - 2s_1^3 + (-3 - 5\epsilon - 10\epsilon^2 - 20\epsilon^3 - 40\epsilon^4)s_2^3 + (-1 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4)m_W^2s_1^2 + (5 + 9\epsilon + 18\epsilon^2 + 36\epsilon^3 + 72\epsilon^4)m_W^2s_2^2 + (1 + 2\epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)s_1s_2^2 + (2 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)m_W^4s_1 - 2(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)m_W^4s_2 + 6(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)s_1^2s_2 + (-3 - 8\epsilon - 14\epsilon^2 - 28\epsilon^3 - 56\epsilon^4)m_W^2s_1s_2\},$$

$$\begin{aligned}
C_{1,18} = & -\frac{4m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ (2 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) m_t^4 \\
& + (2 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) m_W^2 m_t^2 + (2 + 4\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) s_1 m_t^2 \\
& - 6(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) s_2 m_t^2 - 6\epsilon(8\epsilon^3 + 4\epsilon^2 + 2\epsilon + 1) s_1^2 \\
& + (4 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) s_2^2 - 2(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^2 s_1 \\
& - 2(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^2 s_2 - 2\epsilon^2(4\epsilon^2 + 2\epsilon + 1) s_1 s_2 \},
\end{aligned}$$

$$\begin{aligned}
C_{1,19} = & -\frac{2m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{ 2(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) m_W^2 m_t^4 \\
& - s_1 m_t^4 - 2(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) s_2 m_t^4 + 4(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^4 m_t^2 \\
& + s_1^2 m_t^2 + 4(2 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) s_2^2 m_t^2 + (6 + 8\epsilon + 28\epsilon^2 + 56\epsilon^3 + 112\epsilon^4) m_W^2 s_1 m_t^2 \\
& - 4(3 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) m_W^2 s_2 m_t^2 + (3 - 6\epsilon - 20\epsilon^2 - 40\epsilon^3 - 80\epsilon^4) s_1 s_2 m_t^2 \\
& - 2(3 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) s_2^3 + 2(5 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) m_W^2 s_1^2 \\
& + 2(5 + 9\epsilon + 18\epsilon^2 + 36\epsilon^3 + 72\epsilon^4) m_W^2 s_2^2 + (-5 - 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) s_1 s_2^2 \\
& + (3 + 8\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4) m_W^4 s_1 - 4(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^4 s_2 \\
& + (-8 + 10\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) s_1^2 s_2 - 2(3 + 4\epsilon + 14\epsilon^2 + 28\epsilon^3 + 56\epsilon^4) m_W^2 s_1 s_2 \},
\end{aligned}$$

$$\begin{aligned}
C_{1,20} = & -\frac{2m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{ 4(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^6 \\
& + 2(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) m_t^2 m_W^4 + 4(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) s_1 m_W^4 \\
& - 2(7 + 13\epsilon + 26\epsilon^2 + 52\epsilon^3 + 104\epsilon^4) s_2 m_W^4 - 4s_1^2 m_W^2 + 4(4 + 7\epsilon + 14\epsilon^2 + 28\epsilon^3 + 56\epsilon^4) s_2^2 m_W^2 \\
& - m_t^2 s_1 m_W^2 - 4(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) m_t^2 s_2 m_W^2 - 2(4 + 11\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) s_1 s_2 m_W^2 \\
& - 2(3 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) s_2^3 + 2(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) m_t^2 s_2^2 \\
& + (4 + 10\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) s_1 s_2^2 + 4s_1^2 s_2 + m_t^2 s_1 s_2 \},
\end{aligned}$$

$$\begin{aligned}
C_{1,21} = & \frac{2m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ 4(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^4 \\
& + 2(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) m_t^2 m_W^2 + 6(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) s_1 m_W^2 \\
& - 2(5 + 9\epsilon + 18\epsilon^2 + 36\epsilon^3 + 72\epsilon^4) s_2 m_W^2 + (6 + 10\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4) s_2^2 \\
& + m_t^2 s_1 - 2(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) m_t^2 s_2 - 2(6 + 5\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) s_1 s_2 \},
\end{aligned}$$

$$\begin{aligned}
C_{1,22} = & -\frac{2m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ (-3 + 4\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_t^4 \\
& + (6 + 8\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4) m_W^2 m_t^2 + (-1 + 10\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4) s_1 m_t^2 \\
& - 8(2\epsilon + 3\epsilon^2 + 6\epsilon^3 + 12\epsilon^4) s_2 m_t^2 - 4(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) s_1^2 \\
& + (3 + 12\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4) s_2^2 + (-3 - 8\epsilon - 16\epsilon^2 - 32\epsilon^3 - 64\epsilon^4) m_W^2 s_1 \\
& - 2(3 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) m_W^2 s_2 - 2(-4 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) s_1 s_2 \},
\end{aligned}$$

$$\begin{aligned}
C_{1,23} = & \frac{2m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ 4(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^4 \\
& + (3 + 4\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_t^2 m_W^2 + (-2 + 12\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) s_1 m_W^2 \\
& + (-11 - 20\epsilon - 36\epsilon^2 - 72\epsilon^3 - 144\epsilon^4) s_2 m_W^2 - 4s_1^2 + (7 + 12\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4) s_2^2 \\
& - 2m_t^2 s_1 + (-3 - 4\epsilon - 4\epsilon^2 - 8\epsilon^3 - 16\epsilon^4) m_t^2 s_2 - 12(-1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) s_1 s_2 \},
\end{aligned}$$

$$C_{1,24} = -\frac{2m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{(-1 + 4\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) s_1 m_t^2 \\ + 12(\epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) s_1^2 + 4(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^2 s_1 \\ + (-3 - 12\epsilon - 20\epsilon^2 - 40\epsilon^3 - 80\epsilon^4) s_1 s_2\},$$

$$C_{1,25} = m_t((1 + 12\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) m_t^2 - 8(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) m_W^2 \\ + 20(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) s_1 + (13 + 8\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4) s_2),$$

$$C_{1,26} = -\frac{2m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{(2 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) m_t^6 \\ + (-5 - 16\epsilon - 32\epsilon^2 - 64\epsilon^3 - 128\epsilon^4) m_W^2 m_t^4 + 4(3 + 7\epsilon + 14\epsilon^2 + 28\epsilon^3 + 56\epsilon^4) s_1 m_t^4 \\ - 8\epsilon(8\epsilon^3 + 4\epsilon^2 + 2\epsilon + 1) s_2 m_t^4 - 2(15 + 37\epsilon + 74\epsilon^2 + 148\epsilon^3 + 296\epsilon^4) s_1^2 m_t^2 \\ - 2(3 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) s_2^2 m_t^2 + (2 + 28\epsilon + 64\epsilon^2 + 128\epsilon^3 + 256\epsilon^4) m_W^2 s_1 m_t^2 \\ + 2(5 + 16\epsilon + 32\epsilon^2 + 64\epsilon^3 + 128\epsilon^4) m_W^2 s_2 m_t^2 - 2(16 + 37\epsilon + 76\epsilon^2 + 152\epsilon^3 + 304\epsilon^4) s_1 s_2 m_t^2 \\ + 8(2 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) s_1^3 + 4(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) s_2^3 \\ + (-5 - 16\epsilon - 32\epsilon^2 - 64\epsilon^3 - 128\epsilon^4) m_W^2 s_1^2 + (-5 - 16\epsilon - 32\epsilon^2 - 64\epsilon^3 - 128\epsilon^4) m_W^2 s_2^2 \\ + (20 + 46\epsilon + 96\epsilon^2 + 192\epsilon^3 + 384\epsilon^4) s_1 s_2^2 + (32 + 82\epsilon + 168\epsilon^2 + 336\epsilon^3 + 672\epsilon^4) s_1^2 s_2 \\ - 2(1 + 14\epsilon + 32\epsilon^2 + 64\epsilon^3 + 128\epsilon^4) m_W^2 s_1 s_2\},$$

$$C_{1,27} = -\frac{4m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{(2 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) m_W^2 m_t^4 \\ - 2(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) s_2 m_t^4 + (-5 - 16\epsilon - 32\epsilon^2 - 64\epsilon^3 - 128\epsilon^4) m_W^4 m_t^2 \\ + 2(-1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) s_2^2 m_t^2 + 2(7 + 22\epsilon + 46\epsilon^2 + 92\epsilon^3 + 184\epsilon^4) m_W^2 s_1 m_t^2 \\ + 7(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^2 s_2 m_t^2 + (-12 - 33\epsilon - 68\epsilon^2 - 136\epsilon^3 - 272\epsilon^4) s_1 s_2 m_t^2 \\ + 4(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) s_2^3 + 8(2 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) m_W^2 s_1^2 \\ + (-9 - 20\epsilon - 40\epsilon^2 - 80\epsilon^3 - 160\epsilon^4) m_W^2 s_2^2 + 2(8 + 21\epsilon + 44\epsilon^2 + 88\epsilon^3 + 176\epsilon^4) s_1 s_2^2 \\ + (-5 - 16\epsilon - 32\epsilon^2 - 64\epsilon^3 - 128\epsilon^4) m_W^4 s_1 + (5 + 16\epsilon + 32\epsilon^2 + 64\epsilon^3 + 128\epsilon^4) m_W^4 s_2 \\ + (14 + 39\epsilon + 80\epsilon^2 + 160\epsilon^3 + 320\epsilon^4) s_1^2 s_2 + (-11 - 49\epsilon - 104\epsilon^2 - 208\epsilon^3 - 416\epsilon^4) m_W^2 s_1 s_2\},$$

$$C_{1,28} = \frac{2m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{(5 + 16\epsilon + 32\epsilon^2 + 64\epsilon^3 + 128\epsilon^4) m_W^6 \\ - 2(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) m_t^2 m_W^4 - 8(2 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) s_1 m_W^4 \\ - 2(7 + 18\epsilon + 36\epsilon^2 + 72\epsilon^3 + 144\epsilon^4) s_2 m_W^4 + (13 + 24\epsilon + 48\epsilon^2 + 96\epsilon^3 + 192\epsilon^4) s_2^2 m_W^2 \\ + 4(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) m_t^2 s_2 m_W^2 + (28 + 78\epsilon + 160\epsilon^2 + 320\epsilon^3 + 640\epsilon^4) s_1 s_2 m_W^2 \\ - 4(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) s_2^3 - 2(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) m_t^2 s_2^2 \\ - 2(6 + 19\epsilon + 40\epsilon^2 + 80\epsilon^3 + 160\epsilon^4) s_1 s_2^2\},$$

$$C_{1,29} = -\frac{4m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{(-2 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) m_t^4 \\ - 2(1 + 7\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4) m_W^2 m_t^2 + 2(9 + 17\epsilon + 34\epsilon^2 + 68\epsilon^3 + 136\epsilon^4) s_1 m_t^2 \\ + (7 - 3\epsilon - 4\epsilon^2 - 8\epsilon^3 - 16\epsilon^4) s_2 m_t^2 - 8(2 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) s_1^2 \\ + (-5 - 3\epsilon - 8\epsilon^2 - 16\epsilon^3 - 32\epsilon^4) s_2^2 + (5 + 16\epsilon + 32\epsilon^2 + 64\epsilon^3 + 128\epsilon^4) m_W^2 s_1 \\ + 2(1 + 7\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4) m_W^2 s_2 + (-23 - 44\epsilon - 88\epsilon^2 - 176\epsilon^3 - 352\epsilon^4) s_1 s_2\},$$

$$C_{1,30} = \frac{4m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ (-5 - 16\epsilon - 32\epsilon^2 - 64\epsilon^3 - 128\epsilon^4) m_W^4 \\ + (2 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) m_t^2 m_W^2 + 8(2 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) s_1 m_W^2 \\ + (9 + 21\epsilon + 40\epsilon^2 + 80\epsilon^3 + 160\epsilon^4) s_2 m_W^2 + (-4 - 5\epsilon - 8\epsilon^2 - 16\epsilon^3 - 32\epsilon^4) s_2^2 \\ - 2(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) m_t^2 s_2 + (-10 - 39\epsilon - 80\epsilon^2 - 160\epsilon^3 - 320\epsilon^4) s_1 s_2 \},$$

$$C_{1,31} = -\frac{2m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ 6(-1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) s_1 m_t^2 \\ + 8(2 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) s_1^2 + (-5 - 16\epsilon - 32\epsilon^2 - 64\epsilon^3 - 128\epsilon^4) m_W^2 s_1 \\ + 2(6 + 3\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) s_1 s_2 \},$$

$$C_{1,32} = -\frac{4m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) m_t^4 \\ - 4(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^2 m_t^2 + (-7 - 17\epsilon - 34\epsilon^2 - 68\epsilon^3 - 136\epsilon^4) s_1 m_t^2 \\ + 2(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) s_2 m_t^2 + 2(3 + 7\epsilon + 14\epsilon^2 + 28\epsilon^3 + 56\epsilon^4) s_1^2 \\ + (-3 - 5\epsilon - 10\epsilon^2 - 20\epsilon^3 - 40\epsilon^4) s_2^2 + 4(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^2 s_2 \\ + (3 + 9\epsilon + 18\epsilon^2 + 36\epsilon^3 + 72\epsilon^4) s_1 s_2 \},$$

$$C_{1,33} = -\frac{4m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ (6 + 7\epsilon + 14\epsilon^2 + 28\epsilon^3 + 56\epsilon^4) m_W^2 m_t^2 \\ + (-6 - 7\epsilon - 14\epsilon^2 - 28\epsilon^3 - 56\epsilon^4) s_2 m_t^2 + (6 + 7\epsilon + 14\epsilon^2 + 28\epsilon^3 + 56\epsilon^4) s_2^2 \\ + 2(3 + 7\epsilon + 14\epsilon^2 + 28\epsilon^3 + 56\epsilon^4) m_W^2 s_1 + (-6 - 7\epsilon - 14\epsilon^2 - 28\epsilon^3 - 56\epsilon^4) m_W^2 s_2 \\ + (1 - 4\epsilon - 8\epsilon^2 - 16\epsilon^3 - 32\epsilon^4) s_1 s_2 \},$$

$$C_{1,34} = \frac{4m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ (-1 - 3\epsilon - 6\epsilon^2 - 12\epsilon^3 - 24\epsilon^4) s_1 m_t^2 \\ + 2(3 + 7\epsilon + 14\epsilon^2 + 28\epsilon^3 + 56\epsilon^4) s_1^2 + (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) s_1 s_2 \},$$

$$C_{1,35} = \frac{m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ (6 + 10\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) m_t^4 \\ - 8(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^2 m_t^2 + (-19 - 66\epsilon - 136\epsilon^2 - 272\epsilon^3 - 544\epsilon^4) s_1 m_t^2 \\ - 4(1 + \epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) s_2 m_t^2 + (13 + 56\epsilon + 112\epsilon^2 + 224\epsilon^3 + 448\epsilon^4) s_1^2 \\ - 2(1 + 3\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) s_2^2 + 8(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) m_W^2 s_2 \\ + (11 + 50\epsilon + 104\epsilon^2 + 208\epsilon^3 + 416\epsilon^4) s_1 s_2 \},$$

$$C_{1,36} = \frac{m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ 2(5 + 11\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4) m_W^2 m_t^2 \\ - 2(5 + 11\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4) s_2 m_t^2 + 2(5 + 11\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4) s_2^2 \\ + (13 + 56\epsilon + 112\epsilon^2 + 224\epsilon^3 + 448\epsilon^4) m_W^2 s_1 - 2(5 + 11\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4) m_W^2 s_2 \\ - 3(-1 + 8\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4) s_1 s_2 \},$$

$$C_{1,37} = -\frac{m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ -2(3 + 5\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) s_1 m_t^2 \\ + (13 + 56\epsilon + 112\epsilon^2 + 224\epsilon^3 + 448\epsilon^4) s_1^2 + (6 + 10\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) s_1 s_2 \},$$

$$C_{1,39} = \frac{8m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{2(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)m_t^4 \\ + (1 + 7\epsilon + 14\epsilon^2 + 28\epsilon^3 + 56\epsilon^4)s_1m_t^2 - 4(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)s_2m_t^2 \\ - 3(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4)s_1^2 + 2(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)s_2^2 \\ + (-1 - 7\epsilon - 14\epsilon^2 - 28\epsilon^3 - 56\epsilon^4)s_1s_2\},$$

$$C_{1,40} = \frac{8m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)m_W^4 \\ + 2(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)m_t^2m_W^2 + 2(4 + 9\epsilon + 19\epsilon^2 + 38\epsilon^3 + 76\epsilon^4)s_1m_W^2 \\ - 2(2 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4)s_2m_W^2 + (3 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)s_2^2 \\ - 2(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)m_t^2s_2 + (-3 - 8\epsilon - 18\epsilon^2 - 36\epsilon^3 - 72\epsilon^4)s_1s_2\},$$

$$C_{1,41} = \frac{4m_t(-m_t^2 + s_1 + s_2)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,42} = \frac{4m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{2(2 + 9\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4)m_t^2 \\ + (-3 - 8\epsilon - 16\epsilon^2 - 32\epsilon^3 - 64\epsilon^4)m_W^2 - 2(7 + 19\epsilon + 38\epsilon^2 + 76\epsilon^3 + 152\epsilon^4)s_1 \\ + (-1 - 10\epsilon - 16\epsilon^2 - 32\epsilon^3 - 64\epsilon^4)s_2\},$$

$$C_{1,44} = -\frac{8m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)m_t^4 \\ + (2 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)m_W^2m_t^2 + (3 + 9\epsilon + 18\epsilon^2 + 36\epsilon^3 + 72\epsilon^4)s_1m_t^2 \\ - 2(2 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4)s_2m_t^2 - 2(2 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4)s_1^2 \\ + (3 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4)s_2^2 + (2 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)m_W^2s_1 \\ - 2(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)m_W^2s_2 + (-1 - 5\epsilon - 10\epsilon^2 - 20\epsilon^3 - 40\epsilon^4)s_1s_2\},$$

$$C_{1,45} = -\frac{8m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{(2 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)m_W^4 \\ + 2(3 + 8\epsilon + 17\epsilon^2 + 34\epsilon^3 + 68\epsilon^4)s_1m_W^2 - 4(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)s_2m_W^2 \\ + (2 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)s_2^2 + (-5 - 10\epsilon - 22\epsilon^2 - 44\epsilon^3 - 88\epsilon^4)s_1s_2\},$$

$$C_{1,46} = C_{1,69} = \frac{-C_{1,81}}{2} = \frac{8m_t(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)(m_W^2 - s_2)^2}{s_1(m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2))},$$

$$C_{1,47} = -\frac{8m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{(2 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4)m_t^2 \\ - 2(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)m_W^2 + 3(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)s_1 \\ - (\epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)s_2\},$$

$$C_{1,48} = \frac{8m_t(1 + 2\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4)(m_W^2 - s_2)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$



$$C_{1,50} = \frac{16m_t(1+2\epsilon+4\epsilon^2+8\epsilon^3+16\epsilon^4)(-m_t^2+s_1+s_2)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)},$$

$$C_{1,51} = -\frac{8m_t}{(m_W^2-s_2)m_t^2+s_2(-m_W^2+s_1+s_2)}\{(-2+\epsilon+2\epsilon^2+4\epsilon^3+8\epsilon^4)m_t^2 \\ -2(1+2\epsilon+4\epsilon^2+8\epsilon^3+16\epsilon^4)m_W^2-2(4+11\epsilon+23\epsilon^2+46\epsilon^3+92\epsilon^4)s_1 \\ + (4+3\epsilon+6\epsilon^2+12\epsilon^3+24\epsilon^4)s_2\},$$

$$C_{1,52} = -\frac{8m_t(3+5\epsilon+10\epsilon^2+20\epsilon^3+40\epsilon^4)(m_W^2-s_2)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)},$$

$$C_{1,53} = -\frac{16s_1m_t(1+2\epsilon+4\epsilon^2+8\epsilon^3+16\epsilon^4)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)},$$

$$C_{1,54} = \frac{16s_1m_t(1+3\epsilon+5\epsilon^2+10\epsilon^3+20\epsilon^4)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)},$$

$$C_{1,55} = \frac{4m_t}{(m_W^2-s_2)m_t^2+s_2(-m_W^2+s_1+s_2)}\{(3+5\epsilon+10\epsilon^2+20\epsilon^3+40\epsilon^4)m_t^4 \\ + (5+16\epsilon+36\epsilon^2+72\epsilon^3+144\epsilon^4)m_W^2m_t^2-11(1+3\epsilon+6\epsilon^2+12\epsilon^3+24\epsilon^4)s_1m_t^2 \\ + (-9-18\epsilon-38\epsilon^2-76\epsilon^3-152\epsilon^4)s_2m_t^2+4(2+7\epsilon+14\epsilon^2+28\epsilon^3+56\epsilon^4)s_1^2 \\ + (6+13\epsilon+28\epsilon^2+56\epsilon^3+112\epsilon^4)s_2^2+(-5-14\epsilon-28\epsilon^2-56\epsilon^3-112\epsilon^4)m_W^2s_1 \\ + (-5-16\epsilon-36\epsilon^2-72\epsilon^3-144\epsilon^4)m_W^2s_2+(14+41\epsilon+84\epsilon^2+168\epsilon^3+336\epsilon^4)s_1s_2\},$$

$$C_{1,56} = \frac{4m_t}{(m_W^2-s_2)m_t^2+s_2(-m_W^2+s_1+s_2)}\{(-5-14\epsilon-28\epsilon^2-56\epsilon^3-112\epsilon^4)m_W^4 \\ + (2+9\epsilon+18\epsilon^2+36\epsilon^3+72\epsilon^4)m_t^2m_W^2+4(2+7\epsilon+14\epsilon^2+28\epsilon^3+56\epsilon^4)s_1m_W^2 \\ + (6+11\epsilon+20\epsilon^2+40\epsilon^3+80\epsilon^4)s_2m_W^2+(-1+3\epsilon+8\epsilon^2+16\epsilon^3+32\epsilon^4)s_2^2 \\ + (-2-9\epsilon-18\epsilon^2-36\epsilon^3-72\epsilon^4)m_t^2s_2+(-3-14\epsilon-28\epsilon^2-56\epsilon^3-112\epsilon^4)s_1s_2\},$$

$$C_{1,57} = -\frac{4m_t}{(m_W^2-s_2)m_t^2+s_2(-m_W^2+s_1+s_2)}\{(1+6\epsilon+12\epsilon^2+24\epsilon^3+48\epsilon^4)m_W^2m_t^2 \\ + (-3-5\epsilon-10\epsilon^2-20\epsilon^3-40\epsilon^4)s_1m_t^2+(-1-6\epsilon-12\epsilon^2-24\epsilon^3-48\epsilon^4)s_2m_t^2 \\ + 4(2+7\epsilon+14\epsilon^2+28\epsilon^3+56\epsilon^4)s_1^2+(1+6\epsilon+12\epsilon^2+24\epsilon^3+48\epsilon^4)s_2^2 \\ + (-5-14\epsilon-28\epsilon^2-56\epsilon^3-112\epsilon^4)m_W^2s_1+(-1-6\epsilon-12\epsilon^2-24\epsilon^3-48\epsilon^4)m_W^2s_2 \\ + (7+17\epsilon+32\epsilon^2+64\epsilon^3+128\epsilon^4)s_1s_2\},$$

$$C_{1,58} = \frac{m_t}{(s_2-m_W^2)m_t^2+(m_W^2-s_1-s_2)s_2}\{5(3+4\epsilon+8\epsilon^2+16\epsilon^3+32\epsilon^4)m_t^4 \\ + 4(5+14\epsilon+28\epsilon^2+56\epsilon^3+112\epsilon^4)m_W^2m_t^2-3(17+44\epsilon+88\epsilon^2+176\epsilon^3+352\epsilon^4)s_1m_t^2 \\ - 4(11+15\epsilon+30\epsilon^2+60\epsilon^3+120\epsilon^4)s_2m_t^2+4(9+28\epsilon+56\epsilon^2+112\epsilon^3+224\epsilon^4)s_1^2 \\ + (29+40\epsilon+80\epsilon^2+160\epsilon^3+320\epsilon^4)s_2^2-4(5+14\epsilon+28\epsilon^2+56\epsilon^3+112\epsilon^4)m_W^2s_1 \\ - 4(5+14\epsilon+28\epsilon^2+56\epsilon^3+112\epsilon^4)m_W^2s_2+(65+152\epsilon+304\epsilon^2+608\epsilon^3+1216\epsilon^4)s_1s_2\},$$

$$C_{1,59} = \frac{m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{4(5 + 14\epsilon + 28\epsilon^2 + 56\epsilon^3 + 112\epsilon^4)m_W^4 \\ + (-17 - 44\epsilon - 88\epsilon^2 - 176\epsilon^3 - 352\epsilon^4)m_t^2m_W^2 - 4(9 + 28\epsilon + 56\epsilon^2 + 112\epsilon^3 + 224\epsilon^4)s_1m_W^2 \\ + (-17 - 32\epsilon - 64\epsilon^2 - 128\epsilon^3 - 256\epsilon^4)s_2m_W^2 - 3(1 + 8\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4)s_2^2 \\ + (17 + 44\epsilon + 88\epsilon^2 + 176\epsilon^3 + 352\epsilon^4)m_t^2s_2 + 4(1 + 12\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4)s_1s_2\},$$

$$C_{1,60} = \frac{m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{16m_W^2m_t^2 - 5(3 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)s_1m_t^2 \\ - 16s_2m_t^2 + 4(9 + 28\epsilon + 56\epsilon^2 + 112\epsilon^3 + 224\epsilon^4)s_1^2 + 16s_2^2 - 4(5 + 14\epsilon + 28\epsilon^2 + 56\epsilon^3 + 112\epsilon^4)m_W^2s_1 \\ - 16m_W^2s_2 + 5(9 + 8\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4)s_1s_2\},$$

$$C_{1,61} = -\frac{4m_t(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)(-m_t^2 + s_1 + s_2)^2}{s_1(m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2))},$$

$$C_{1,62} = -\frac{4m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{4\epsilon(8\epsilon^3 + 4\epsilon^2 + 2\epsilon + 1)m_t^4 \\ - 2(5 + 12\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4)m_W^2m_t^2 + 2(9 + 19\epsilon + 38\epsilon^2 + 76\epsilon^3 + 152\epsilon^4)s_1m_t^2 \\ + (5 - 2\epsilon - 4\epsilon^2 - 8\epsilon^3 - 16\epsilon^4)s_2m_t^2 - 6(3 + 7\epsilon + 14\epsilon^2 + 28\epsilon^3 + 56\epsilon^4)s_1^2 \\ + (-5 - 2\epsilon - 4\epsilon^2 - 8\epsilon^3 - 16\epsilon^4)s_2^2 + (6 + 30\epsilon + 64\epsilon^2 + 128\epsilon^3 + 256\epsilon^4)m_W^2s_1 \\ + 2(5 + 12\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4)m_W^2s_2 + (-19 - 42\epsilon - 88\epsilon^2 - 176\epsilon^3 - 352\epsilon^4)s_1s_2\},$$

$$C_{1,63} = -\frac{4m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{(-11 - 28\epsilon - 56\epsilon^2 - 112\epsilon^3 - 224\epsilon^4)m_W^4 \\ + 4\epsilon(8\epsilon^3 + 4\epsilon^2 + 2\epsilon + 1)m_t^2m_W^2 + 4(6 + 17\epsilon + 35\epsilon^2 + 70\epsilon^3 + 140\epsilon^4)s_1m_W^2 \\ + 17(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)s_2m_W^2 - 6(1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)s_2^2 \\ - 4\epsilon(8\epsilon^3 + 4\epsilon^2 + 2\epsilon + 1)m_t^2s_2 - 2(7 + 20\epsilon + 42\epsilon^2 + 84\epsilon^3 + 168\epsilon^4)s_1s_2\},$$

$$C_{1,64} = \frac{8m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4)m_t^4 \\ + (-3 - 8\epsilon - 16\epsilon^2 - 32\epsilon^3 - 64\epsilon^4)s_1m_t^2 - 2(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4)s_2m_t^2 \\ + 2(2\epsilon + 5\epsilon^2 + 10\epsilon^3 + 20\epsilon^4)s_1^2 + (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4)s_2^2 \\ + (3 + 8\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4)s_1s_2\},$$

$$C_{1,65} = \frac{4m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{(2 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4)m_W^2m_t^2 \\ - 6(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)s_1m_t^2 - 2(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4)s_2m_t^2 \\ + 4(5 + 17\epsilon + 35\epsilon^2 + 70\epsilon^3 + 140\epsilon^4)s_1^2 + (2 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4)s_2^2 \\ + (-11 - 24\epsilon - 44\epsilon^2 - 88\epsilon^3 - 176\epsilon^4)m_W^2s_1 - 2(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4)m_W^2s_2 \\ + 2(7 + 21\epsilon + 40\epsilon^2 + 80\epsilon^3 + 160\epsilon^4)s_1s_2\},$$

$$C_{1,66} = -\frac{8m_t(-3(\epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)m_t^2 + 2s_1(\epsilon + 3\epsilon^2 + 6\epsilon^3 + 12\epsilon^4) + 3s_2(\epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4))}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,67} = \frac{4m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{(2 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4)m_t^4$$

$$\begin{aligned}
& -4(3+8\epsilon+16\epsilon^2+32\epsilon^3+64\epsilon^4)m_W^2m_t^2+2(7+17\epsilon+34\epsilon^2+68\epsilon^3+136\epsilon^4)s_1m_t^2 \\
& + (3+2\epsilon+4\epsilon^2+8\epsilon^3+16\epsilon^4)s_2m_t^2-8(2+5\epsilon+10\epsilon^2+20\epsilon^3+40\epsilon^4)s_1^2 \\
& + (-5-8\epsilon-16\epsilon^2-32\epsilon^3-64\epsilon^4)s_2^2+(4+22\epsilon+48\epsilon^2+96\epsilon^3+192\epsilon^4)m_W^2s_1 \\
& + 4(3+8\epsilon+16\epsilon^2+32\epsilon^3+64\epsilon^4)m_W^2s_2+(-17-46\epsilon-96\epsilon^2-192\epsilon^3-384\epsilon^4)s_1s_2\},
\end{aligned}$$

$$\begin{aligned}
C_{1,68} = & \frac{4m_t}{s_1((m_W^2-s_2)m_t^2+s_2(-m_W^2+s_1+s_2))}\{-4(3+8\epsilon+16\epsilon^2+32\epsilon^3+64\epsilon^4)m_W^4 \\
& + 4(1+2\epsilon+4\epsilon^2+8\epsilon^3+16\epsilon^4)m_t^2m_W^2+4(7+18\epsilon+37\epsilon^2+74\epsilon^3+148\epsilon^4)s_1m_W^2 \\
& + (15+38\epsilon+76\epsilon^2+152\epsilon^3+304\epsilon^4)s_2m_W^2-3(1+2\epsilon+4\epsilon^2+8\epsilon^3+16\epsilon^4)s_2^2 \\
& - 4(1+2\epsilon+4\epsilon^2+8\epsilon^3+16\epsilon^4)m_t^2s_2-2(5+18\epsilon+38\epsilon^2+76\epsilon^3+152\epsilon^4)s_1s_2\},
\end{aligned}$$

$$\begin{aligned}
C_{1,70} = & \frac{4m_t}{s_1((m_W^2-s_2)m_t^2+s_2(-m_W^2+s_1+s_2))}\{(2+6\epsilon+12\epsilon^2+24\epsilon^3+48\epsilon^4)m_W^2m_t^2 \\
& + (2+22\epsilon+44\epsilon^2+88\epsilon^3+176\epsilon^4)s_1m_t^2-2(1+3\epsilon+6\epsilon^2+12\epsilon^3+24\epsilon^4)s_2m_t^2 \\
& + 8(2+3\epsilon+6\epsilon^2+12\epsilon^3+24\epsilon^4)s_1^2+(2+6\epsilon+12\epsilon^2+24\epsilon^3+48\epsilon^4)s_2^2 \\
& + (-3-16\epsilon-36\epsilon^2-72\epsilon^3-144\epsilon^4)m_W^2s_1-2(1+3\epsilon+6\epsilon^2+12\epsilon^3+24\epsilon^4)m_W^2s_2 \\
& - 2(-1+6\epsilon+10\epsilon^2+20\epsilon^3+40\epsilon^4)s_1s_2\},
\end{aligned}$$

$$C_{1,71} = \frac{8m_t(1+3\epsilon+6\epsilon^2+12\epsilon^3+24\epsilon^4)(m_W^2-s_2)(m_W^2-3s_1-s_2)}{s_1(m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2))},$$

$$\begin{aligned}
C_{1,72} = & -\frac{8m_t}{(m_W^2-s_2)m_t^2+s_2(-m_W^2+s_1+s_2)}\{(1+3\epsilon+6\epsilon^2+12\epsilon^3+24\epsilon^4)m_W^2 \\
& - 8(\epsilon+2\epsilon^2+4\epsilon^3+8\epsilon^4)s_1+(-1-3\epsilon-6\epsilon^2-12\epsilon^3-24\epsilon^4)s_2\},
\end{aligned}$$

$$\begin{aligned}
C_{1,73} = & -\frac{4m_t}{s_1((m_W^2-s_2)m_t^2+s_2(-m_W^2+s_1+s_2))}\{3m_t^4+(-7+2\epsilon+8\epsilon^2+16\epsilon^3+32\epsilon^4)s_1m_t^2 \\
& - 6s_2m_t^2-4\epsilon(8\epsilon^3+4\epsilon^2+2\epsilon+1)s_1^2+3s_2^2+(7-2\epsilon-8\epsilon^2-16\epsilon^3-32\epsilon^4)s_1s_2\},
\end{aligned}$$

$$\begin{aligned}
C_{1,74} = & -\frac{4m_t}{s_1((m_W^2-s_2)m_t^2+s_2(-m_W^2+s_1+s_2))}\{6m_W^2m_t^2-4(2+2\epsilon+3\epsilon^2+6\epsilon^3+12\epsilon^4)s_1m_t^2 \\
& - 6s_2m_t^2+(40+98\epsilon+196\epsilon^2+392\epsilon^3+784\epsilon^4)s_1^2+6s_2^2+(-13-58\epsilon-120\epsilon^2-240\epsilon^3-480\epsilon^4)m_W^2s_1 \\
& - 6m_W^2s_2+(23+30\epsilon+60\epsilon^2+120\epsilon^3+240\epsilon^4)s_1s_2\},
\end{aligned}$$

$$\begin{aligned}
C_{1,75} = & -\frac{4m_t}{s_1((m_W^2-s_2)m_t^2+s_2(-m_W^2+s_1+s_2))}\{3m_W^4-2(1+6\epsilon+14\epsilon^2+28\epsilon^3+56\epsilon^4)s_1m_W^2 \\
& - 6s_2m_W^2+3s_2^2+2(1+6\epsilon+14\epsilon^2+28\epsilon^3+56\epsilon^4)s_1s_2\},
\end{aligned}$$

$$\begin{aligned}
C_{1,76} = & \frac{8m_t}{(m_W^2-s_2)m_t^2+s_2(-m_W^2+s_1+s_2)}\{(-1+2\epsilon+6\epsilon^2+12\epsilon^3+24\epsilon^4)m_t^2 \\
& + (1-4\epsilon-10\epsilon^2-20\epsilon^3-40\epsilon^4)s_1+(1-2\epsilon-6\epsilon^2-12\epsilon^3-24\epsilon^4)s_2\},
\end{aligned}$$

$$\begin{aligned}
C_{1,77} = & \frac{8m_t}{(s_2-m_W^2)m_t^2+(m_W^2-s_1-s_2)s_2}\{2(-1+\epsilon+3\epsilon^2+6\epsilon^3+12\epsilon^4)m_W^2 \\
& + (-1+6\epsilon+14\epsilon^2+28\epsilon^3+56\epsilon^4)s_1-2(-1+\epsilon+3\epsilon^2+6\epsilon^3+12\epsilon^4)s_2\},
\end{aligned}$$

$$C_{1,78} = \frac{4s_1 m_t (-1 + 4\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,79} = -\frac{16m_t (1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) (-m_t^2 + s_1 + s_2)^2}{s_1 (m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2))},$$

$$C_{1,80} = -\frac{32m_t (1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) (m_t^2 (m_W^2 - s_2) + (s_1 - s_2) m_W^2 + s_2 (s_1 + s_2))}{s_1 (m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2))},$$

$$C_{1,82} = 4C_{1,88} = 2C_{1,143} = -4C_{1,163} = -\frac{32m_t (1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) (m_t^2 - s_1 - s_2)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,83} = 4C_{1,89} = 2C_{1,144} = -4C_{1,164} = \frac{32m_t (1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) (m_W^2 - s_2)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,84} = 2C_{1,90} = C_{1,145} = -2C_{1,165} = -\frac{16s_1 m_t (1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,85} = -\frac{2m_t (\epsilon + 2) (m_t^2 (2m_W^2 - s_2) + s_2 (-2m_W^2 + s_1 + s_2))}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,86} = \frac{2s_2 m_t (\epsilon + 2) (m_W^2 - s_2)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,87} = \frac{2m_t}{(m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2)} \{ (11 + 8\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4) m_W^2 m_t^2 \\ + (-11 - 8\epsilon - 16\epsilon^2 - 32\epsilon^3 - 64\epsilon^4) s_2 m_t^2 + (11 + 8\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4) s_2^2 \\ + (-11 - 8\epsilon - 16\epsilon^2 - 32\epsilon^3 - 64\epsilon^4) m_W^2 s_2 + (9 + 7\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4) s_1 s_2 \},$$

$$C_{1,91} = -C_{1,95} = C_{1,108} = \frac{C_{1,146}}{2} = \frac{-C_{1,152}}{2} = -C_{1,166} = C_{1,171} \\ = \frac{16m_t (1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) (-m_t^2 + s_1 + s_2)}{s_1 (m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2))},$$

$$C_{1,92} = -C_{1,96} = -C_{1,122} = \frac{C_{1,147}}{2} = \frac{-C_{1,153}}{2} = -C_{1,167} = C_{1,172} \\ = -\frac{16m_t (1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) (m_W^2 - s_2)}{s_1 (m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2))},$$

$$C_{1,93} = C_{1,97} = \frac{-C_{1,99}}{2} = \frac{C_{1,118}}{2} = \frac{C_{1,148}}{2} = \frac{C_{1,154}}{2} = \frac{-C_{1,158}}{4} = -C_{1,168} = -C_{1,173} = \frac{C_{1,179}}{2} \\ = \frac{16m_t (1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,94} = \frac{2m_t (3 + 6\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) (m_t^2 - s_1 - s_2)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,98} = -\frac{2m_t (3 + 6\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) (m_W^2 - s_2)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,100} = \frac{2s_1 m_t (3 + 6\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,101} = 2m_t (7 + 10\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4),$$

$$C_{1,102} = -4m_t (1 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4),$$

$$C_{1,103} = -\frac{8m_t (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) (m_t^2 - s_2) (-m_t^2 + s_1 + s_2)}{s_1 (m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2))},$$

$$C_{1,104} = \frac{8m_t}{s_1 ((m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2))} \{ (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) m_W^2 m_t^2 \\ + (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) s_1 m_t^2 + (-1 - 3\epsilon - 6\epsilon^2 - 12\epsilon^3 - 24\epsilon^4) s_2 m_t^2 \\ + (-1 - 3\epsilon - 6\epsilon^2 - 12\epsilon^3 - 24\epsilon^4) s_1^2 + (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) s_2^2 \\ + 2 (\epsilon + 3\epsilon^2 + 6\epsilon^3 + 12\epsilon^4) m_W^2 s_1 + (-1 - 3\epsilon - 6\epsilon^2 - 12\epsilon^3 - 24\epsilon^4) m_W^2 s_2 + \epsilon s_1 s_2 \},$$

$$C_{1,105} = \frac{8m_t}{(m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2)} \{ (1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) m_t^2 \\ + (-1 - 3\epsilon - 8\epsilon^2 - 16\epsilon^3 - 32\epsilon^4) s_1 + (-1 - 4\epsilon - 8\epsilon^2 - 16\epsilon^3 - 32\epsilon^4) s_2 \},$$

$$C_{1,106} = C_{1,107} = -C_{1,113} = -2C_{1,187} = 2C_{1,189} = \frac{16m_t (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) (-m_t^2 + s_1 + s_2)}{s_1 (m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2))},$$

$$C_{1,110} = \frac{8m_t}{s_1 ((m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2))} \{ (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) m_W^2 m_t^2 \\ + (-1 - 3\epsilon - 6\epsilon^2 - 12\epsilon^3 - 24\epsilon^4) s_2 m_t^2 + (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) s_2^2 + (\epsilon + 1) m_W^2 s_1 \\ + (-1 - 3\epsilon - 6\epsilon^2 - 12\epsilon^3 - 24\epsilon^4) m_W^2 s_2 + (2 + 5\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) s_1 s_2 \},$$

$$C_{1,111} = -\frac{8m_t (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) (m_W^2 - s_2) (-m_W^2 + s_1 + s_2)}{s_1 (m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2))},$$

$$C_{1,112} = -\frac{16m_t (1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4) (m_W^2 - s_2)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,114} = \frac{16m_t (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) (m_t^2 - m_W^2 - s_1)}{s_1 (m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2))},$$

$$C_{1,115} = -C_{1,120} = -C_{1,121} = -2C_{1,190} = 2C_{1,192} = -\frac{16m_t (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) (m_W^2 - s_2)}{s_1 (m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2))},$$

$$C_{1,116} = \frac{16m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{ (1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) m_t^2 \\ + (1 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) s_1 + (-1 - \epsilon - 2\epsilon^2 - 4\epsilon^3 - 8\epsilon^4) s_2 \},$$

$$C_{1,117} = - \frac{16m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{ (1 + \epsilon + 2\epsilon^2 + 4\epsilon^3 + 8\epsilon^4) m_W^2 \\ - 2(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) s_1 + (-1 - \epsilon - 2\epsilon^2 - 4\epsilon^3 - 8\epsilon^4) s_2 \},$$

$$C_{1,123} = - \frac{4m_t(1 + 2\epsilon + 4\epsilon^2 + 8\epsilon^3 + 16\epsilon^4)(m_W^2 - s_2)^2}{s_1(m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2))},$$

$$C_{1,124} = - \frac{8m_t}{(s_2 - m_W^2)m_t^2 + (m_W^2 - s_1 - s_2)s_2} \{ (3 + 8\epsilon + 18\epsilon^2 + 36\epsilon^3 + 72\epsilon^4) m_t^2 \\ - 2(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) s_1 + (-3 - 8\epsilon - 18\epsilon^2 - 36\epsilon^3 - 72\epsilon^4) s_2 \},$$

$$C_{1,125} = \frac{8m_t}{(s_2 - m_W^2)m_t^2 + (m_W^2 - s_1 - s_2)s_2} \{ (2 + 8\epsilon + 18\epsilon^2 + 36\epsilon^3 + 72\epsilon^4) m_W^2 \\ + (-1 - 3\epsilon - 6\epsilon^2 - 12\epsilon^3 - 24\epsilon^4) s_1 - 2(1 + 4\epsilon + 9\epsilon^2 + 18\epsilon^3 + 36\epsilon^4) s_2 \},$$

$$C_{1,126} = \frac{8s_1m_t(3 + 9\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,127} = \frac{8m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{ 3(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) m_t^2 \\ + (-5 - 18\epsilon - 36\epsilon^2 - 72\epsilon^3 - 144\epsilon^4) s_1 - 3(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) s_2 \},$$

$$C_{1,128} = \frac{8m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{ 3(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) m_W^2 \\ - 2(1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4) s_1 - 3(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) s_2 \},$$

$$C_{1,129} = C_{1,133} = - \frac{8m_t(5 + 14\epsilon + 28\epsilon^2 + 56\epsilon^3 + 112\epsilon^4)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,130} = - \frac{16m_t(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)(m_t^2 - s_1 - s_2)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,131} = - \frac{8m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{ 3(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) m_t^2 \\ + (-1 - 6\epsilon - 12\epsilon^2 - 24\epsilon^3 - 48\epsilon^4) s_1 - 3(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) s_2 \},$$

$$C_{1,132} = - \frac{8m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{ 3(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) m_W^2 \\ + (2 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) s_1 - 3(1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) s_2 \},$$

$$C_{1,134} = \frac{16m_t (1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4) (m_W^2 - s_2)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,135} = \frac{48m_t (1 + 4\epsilon + 8\epsilon^2 + 16\epsilon^3 + 32\epsilon^4)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,136} = -\frac{4s_1 m_t (3 + 14\epsilon + 28\epsilon^2 + 56\epsilon^3 + 112\epsilon^4)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,137} = -\frac{2m_t}{s_1 ((m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2))} \{ (5 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) m_t^4 \\ - 2(\epsilon + 4) s_1 m_t^2 - 2(5 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) s_2 m_t^2 + (3 - 4\epsilon - 12\epsilon^2 - 24\epsilon^3 - 48\epsilon^4) s_1^2 \\ + (5 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) s_2^2 + 2(\epsilon + 4) s_1 s_2 \},$$

$$C_{1,138} = -\frac{4m_t}{s_1 ((m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2))} \{ (5 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) m_W^2 m_t^2 \\ + (1 + 5\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) s_1 m_t^2 + (-5 - 6\epsilon - 12\epsilon^2 - 24\epsilon^3 - 48\epsilon^4) s_2 m_t^2 \\ + (-1 - 5\epsilon - 12\epsilon^2 - 24\epsilon^3 - 48\epsilon^4) s_1^2 + (5 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) s_2^2 + (\epsilon + 4) m_W^2 s_1 \\ + (-5 - 6\epsilon - 12\epsilon^2 - 24\epsilon^3 - 48\epsilon^4) m_W^2 s_2 + (5 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) s_1 s_2 \},$$

$$C_{1,139} = -\frac{2m_t}{s_1 ((m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2))} \{ (5 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) m_W^4 \\ - 2(1 + 5\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) s_1 m_W^2 - 2(5 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) s_2 m_W^2 \\ + (5 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) s_2^2 + (2 + 10\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) s_1 s_2 \},$$

$$C_{1,140} = \frac{4m_t}{(s_2 - m_W^2) m_t^2 + (m_W^2 - s_1 - s_2) s_2} \{ (6 + 9\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4) m_t^2 \\ + (-5 - 4\epsilon - 4\epsilon^2 - 8\epsilon^3 - 16\epsilon^4) s_1 + (-6 - 9\epsilon - 16\epsilon^2 - 32\epsilon^3 - 64\epsilon^4) s_2 \},$$

$$C_{1,141} = \frac{4m_t}{(m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2)} \{ (6 + 9\epsilon + 16\epsilon^2 + 32\epsilon^3 + 64\epsilon^4) m_W^2 \\ + (-1 - 5\epsilon - 12\epsilon^2 - 24\epsilon^3 - 48\epsilon^4) s_1 + (-6 - 9\epsilon - 16\epsilon^2 - 32\epsilon^3 - 64\epsilon^4) s_2 \},$$

$$C_{1,142} = -\frac{2s_1 m_t (7 + 12\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4)}{m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2)},$$

$$C_{1,149} = \frac{2m_t (5 + 12\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) (-m_t^2 + s_1 + s_2)^2}{s_1 (m_t^2 (m_W^2 - s_2) + s_2 (-m_W^2 + s_1 + s_2))},$$

$$C_{1,150} = \frac{2m_t}{s_1 ((m_W^2 - s_2) m_t^2 + s_2 (-m_W^2 + s_1 + s_2))} \{ (5 + 12\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) m_W^2 m_t^2 \\ + (-5 - 12\epsilon - 24\epsilon^2 - 48\epsilon^3 - 96\epsilon^4) s_2 m_t^2 + (5 + 12\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) s_2^2 \\ + (-1 + 10\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) m_W^2 s_1 + (-5 - 12\epsilon - 24\epsilon^2 - 48\epsilon^3 - 96\epsilon^4) m_W^2 s_2 \\ + (9 + 14\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) s_1 s_2 \},$$

$$C_{1,151} = \frac{4m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ (7 + 10\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4) m_t^2 \\ + (-5 - 9\epsilon - 20\epsilon^2 - 40\epsilon^3 - 80\epsilon^4) s_1 + (-7 - 10\epsilon - 20\epsilon^2 - 40\epsilon^3 - 80\epsilon^4) s_2 \},$$

$$C_{1,155} = \frac{2m_t}{s_1((m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2))} \{ (5 + 12\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) m_W^2 m_t^2 \\ + (-5 - 12\epsilon - 24\epsilon^2 - 48\epsilon^3 - 96\epsilon^4) s_2 m_t^2 + (5 + 12\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) s_2^2 \\ + (11 + 14\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) m_W^2 s_1 + (-5 - 12\epsilon - 24\epsilon^2 - 48\epsilon^3 - 96\epsilon^4) m_W^2 s_2 \\ + (1 + 10\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) s_1 s_2 \},$$

$$C_{1,156} = \frac{2m_t (5 + 12\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) (m_W^2 - s_2)^2}{s_1(m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2))},$$

$$C_{1,157} = -\frac{8m_t (4 + 5\epsilon + 10\epsilon^2 + 20\epsilon^3 + 40\epsilon^4) (m_W^2 - s_2)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,159} = \frac{2m_t}{(m_W^2 - s_2)m_t^2 + s_2(-m_W^2 + s_1 + s_2)} \{ (3 + 10\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) m_t^2 \\ + (-7 - 12\epsilon - 24\epsilon^2 - 48\epsilon^3 - 96\epsilon^4) s_1 + (-3 - 10\epsilon - 24\epsilon^2 - 48\epsilon^3 - 96\epsilon^4) s_2 \},$$

$$C_{1,160} = -\frac{2m_t (1 + 10\epsilon + 24\epsilon^2 + 48\epsilon^3 + 96\epsilon^4) (m_W^2 - s_2)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,161} = \frac{4s_1 m_t (6 + 9\epsilon + 20\epsilon^2 + 40\epsilon^3 + 80\epsilon^4)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,162} = -8m_t (1 + 3\epsilon + 6\epsilon^2 + 12\epsilon^3 + 24\epsilon^4),$$

$$C_{1,169} = \frac{4m_t (8\epsilon^4 + 4\epsilon^3 + 2\epsilon^2 - 1) (m_t^2 - s_1 - s_2)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,170} = -C_{1,175} = \frac{4m_t (1 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) (-m_t^2 + s_1 + s_2)}{s_1(m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2))},$$

$$C_{1,174} = -\frac{4m_t (8\epsilon^4 + 4\epsilon^3 + 2\epsilon^2 - 1) (m_W^2 - s_2)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,176} = -C_{1,178} = -\frac{4m_t (1 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4) (m_W^2 - s_2)}{s_1(m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2))},$$

$$C_{1,177} = -2C_{1,181} = -2C_{1,182} = \frac{8m_t (1 + 6\epsilon + 12\epsilon^2 + 24\epsilon^3 + 48\epsilon^4)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$

$$C_{1,180} = \frac{4s_1 m_t (8\epsilon^4 + 4\epsilon^3 + 2\epsilon^2 - 1)}{m_t^2(m_W^2 - s_2) + s_2(-m_W^2 + s_1 + s_2)},$$



$$\begin{aligned}
C_{1,183} &= -\frac{2m_t(1+6\epsilon+12\epsilon^2+24\epsilon^3+48\epsilon^4)(m_t^2-s_1-s_2)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)}, \\
C_{1,184} &= \frac{2m_t(1+6\epsilon+12\epsilon^2+24\epsilon^3+48\epsilon^4)(m_W^2-s_2)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)}, \\
C_{1,185} &= -\frac{2s_1m_t(1+6\epsilon+12\epsilon^2+24\epsilon^3+48\epsilon^4)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)}, \\
C_{1,186} &= -\frac{4m_t(1+3\epsilon+6\epsilon^2+12\epsilon^3+24\epsilon^4)(m_t^2-s_1-s_2)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)}, \\
C_{1,188} &= \frac{4m_t(1+3\epsilon+6\epsilon^2+12\epsilon^3+24\epsilon^4)(m_W^2-s_2)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)}, \\
C_{1,191} &= -2C_{1,194} = -2C_{1,195} = -\frac{16m_t(1+3\epsilon+6\epsilon^2+12\epsilon^3+24\epsilon^4)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)}, \\
C_{1,193} &= -\frac{4s_1m_t(1+3\epsilon+6\epsilon^2+12\epsilon^3+24\epsilon^4)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)}, \\
C_{1,196} &= \frac{2m_t(1+5\epsilon+12\epsilon^2+24\epsilon^3+48\epsilon^4)(m_t^2-s_1-s_2)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)}, \\
C_{1,197} &= -\frac{2m_t(1+5\epsilon+12\epsilon^2+24\epsilon^3+48\epsilon^4)(m_W^2-s_2)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)}, \\
C_{1,198} &= \frac{2s_1m_t(1+5\epsilon+12\epsilon^2+24\epsilon^3+48\epsilon^4)}{m_t^2(m_W^2-s_2)+s_2(-m_W^2+s_1+s_2)}. \tag{3}
\end{aligned}$$


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