# $\overline{t}t$ + jet production at NLO QCD

| | contribution | processes | correction | subroutine (EvalCS...) |
|---|---|---|---|---|
| A | $d\sigma_{\bar{t}tj}^{\mathrm{LO}}\, d\mathcal{B}_{\bar{t}}^{\mathrm{LO}} d\mathcal{B}_t^{\mathrm{LO}}$ | 3,4,5,6 | 0 | _1L_ttbggg, _1L_ttbqqbg |
| B | $d\sigma_{\bar{t}t}^{\mathrm{LO}}\, d\mathcal{B}_{\bar{t}j}^{\mathrm{LO}} d\mathcal{B}_t^{\mathrm{LO}}$ $+d\sigma_{\bar{t}t}^{\mathrm{LO}}\, d\mathcal{B}_{\bar{t}}^{\mathrm{LO}} d\mathcal{B}_{tj}^{\mathrm{LO}}$ | 33,34 (nJetRad=1-4) | 0 | _DKJ_1L_ttbgg, _DKJ_1L_ttbqqb |
| C | $d\sigma_{\bar{t}tj}^{\mathrm{virt}}\, d\mathcal{B}_{\bar{t}}^{\mathrm{LO}} d\mathcal{B}_t^{\mathrm{LO}}$ | 3,4,5,6 | 1 | _1L_ttbggg, _1L_ttbqqbg |
| D | $d\sigma_{\bar{t}tjj}^{\mathrm{real}}\, d\mathcal{B}_{\bar{t}}^{\mathrm{LO}} d\mathcal{B}_t^{\mathrm{LO}}$ | 9-19 | 2,3 | _Real_ttbgggg, _Real_ttbqqbgg _Real_ttbqqbqqb, _1L_ttbggg, _1L_ttbqqbg |
| E | $d\sigma_{\bar{t}t}^{\mathrm{virt}}\, d\mathcal{B}_{\bar{t}j}^{\mathrm{LO}} d\mathcal{B}_t^{\mathrm{LO}}$ $+d\sigma_{\bar{t}t}^{\mathrm{virt}}\, d\mathcal{B}_{\bar{t}}^{\mathrm{LO}} d\mathcal{B}_{tj}^{\mathrm{LO}}$ | 33,34 (nJetRad=1-4) | 1 | _DKJ_1L_ttbgg, _DKJ_1L_ttbqqb |
| F | $d\sigma_{\bar{t}tj}^{\mathrm{real}}\, d\mathcal{B}_{\bar{t}j}^{\mathrm{real}} d\mathcal{B}_t^{\mathrm{LO}}$ $+d\sigma_{\bar{t}tj}^{\mathrm{real}}\, d\mathcal{B}_{\bar{t}}^{\mathrm{LO}} d\mathcal{B}_{tj}^{\mathrm{real}}$ | 35-38 (nJetRad=1-4) | 2,3 | _DKJ_Real_ttbggg, _DKJ_Real_ttbqqbg, _DKJ_1L_ttbgg, _DKJ_1L_ttbqqb |
| G | $d\sigma_{\bar{t}tj}^{\mathrm{LO}}\, d\mathcal{B}_{\bar{t}}^{\mathrm{virt}} d\mathcal{B}_t^{\mathrm{LO}}$ $+d\sigma_{\bar{t}tj}^{\mathrm{LO}}\, d\mathcal{B}_{\bar{t}}^{\mathrm{LO}} d\mathcal{B}_t^{\mathrm{virt}}$ | 3,4,5,6 | 4 | _1LDK_ttbggg, _1LDK_ttbqqbg |
| H | $d\sigma_{\bar{t}t}^{\mathrm{LO}}\, d\mathcal{B}_{\bar{t}j}^{\mathrm{virt}} d\mathcal{B}_t^{\mathrm{LO}}$ $+d\sigma_{\bar{t}t}^{\mathrm{LO}}\, d\mathcal{B}_{\bar{t}}^{\mathrm{LO}} d\mathcal{B}_{tj}^{\mathrm{virt}}$ $+d\sigma_{\bar{t}t}^{\mathrm{LO}}\, d\mathcal{B}_{\bar{t}j}^{\mathrm{LO}} d\mathcal{B}_t^{\mathrm{virt}}$ $+d\sigma_{\bar{t}t}^{\mathrm{LO}}\, d\mathcal{B}_{\bar{t}}^{\mathrm{virt}} d\mathcal{B}_{tj}^{\mathrm{LO}}$ | 33,34 (nJetRad=1-16) | 4 | _1LDKJ_ttb |
| I | $d\sigma_{\bar{t}t}^{\mathrm{LO}}\, d\mathcal{B}_{\bar{t}jj}^{\mathrm{real}} d\mathcal{B}_t^{\mathrm{LO}}$ $+d\sigma_{\bar{t}t}^{\mathrm{LO}}\, d\mathcal{B}_{\bar{t}}^{\mathrm{LO}} d\mathcal{B}_{tjj}^{\mathrm{real}}$ $+d\sigma_{\bar{t}t}^{\mathrm{LO}}\, d\mathcal{B}_{\bar{t}j}^{\mathrm{real}} d\mathcal{B}_{tj}^{\mathrm{real}}$ | 33,34 (nJetRad=1-20) | 5 | _REDKJ_ttb |

"real" means that the jet is allowed to become unresolved

| processes | |
|---|---|
| 3 | $qg \to \bar{t}t\, q$ |
| 4 | $\bar{q}g \to \bar{t}t\, \bar{q}$ |
| 5 | $gg \to \bar{t}t\, g$ |
| 6 | $\bar{q}q \to \bar{t}t\, g$ |
| 9 | $gg \to \bar{t}t\, g\, g$ |
| 10 | $\bar{q}q \to \bar{t}t\, g\, g$ |
| 11 | $gg \to \bar{t}t\, q\bar{q}$ |
| 12 | $qg \to \bar{t}t\, q\, g$ |
| 13 | $\bar{q}g \to \bar{t}t\, \bar{q}\, g$ |
| 14 | $\bar{q}q \to \bar{t}t\, (\bar{q}q + \bar{q}'q')$ |
| 15 | $q\bar{q}' \to \bar{t}t\, q\bar{q}'$ |
| 16 | $qq' \to \bar{t}t\, qq'$ |
| 17 | $\bar{q}\bar{q}' \to \bar{t}t\, \bar{q}\bar{q}'$ |
| 18 | $qq \to \bar{t}t\, qq$ |
| 19 | $\bar{q}\bar{q} \to \bar{t}t\, \bar{q}\bar{q}$ |
| 33 | $gg \to \bar{t}t\, g_{\mathrm{DK}}$ |
| 34 | $\bar{q}q \to \bar{t}t\, g_{\mathrm{DK}}$ |
| 35 | $qg \to \bar{t}t\, q\, g_{\mathrm{DK}}$ |
| 36 | $\bar{q}g \to \bar{t}t\, \bar{q}\, g_{\mathrm{DK}}$ |
| 37 | $gg \to \bar{t}t\, g\, g_{\mathrm{DK}}$ |
| 38 | $\bar{q}q \to \bar{t}t\, g\, g_{\mathrm{DK}}$ |

1  $\bar{t}$  ⬜A

2   ✓

3   ⬜A

4   ✓

5  $\bar{t}$ $t$

6 

7 

8 

↑
2↗
not well
checked

9  ↔ .  ⬜A

10  ↔ .

11  ↔ .  ⬜A

12  ↔ .

13  ↔ .

14  ↔ .

15  ↔ .

16.  ↔ .

R

1

2

3

4

5

6

7

8 $\longleftrightarrow$ .

9 $\longleftrightarrow$ .

10 $\longleftrightarrow$ .

11/12      $9\bar{9}/b\bar{b}$
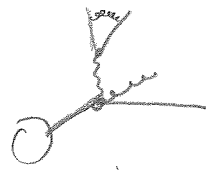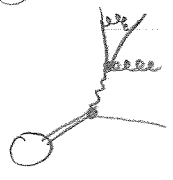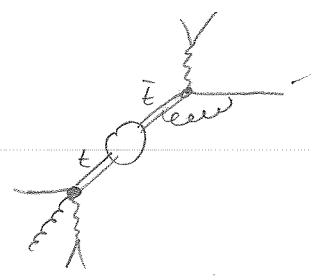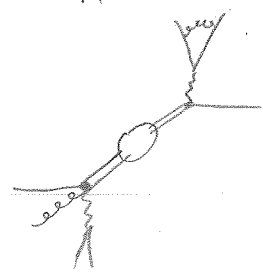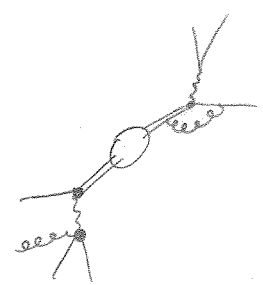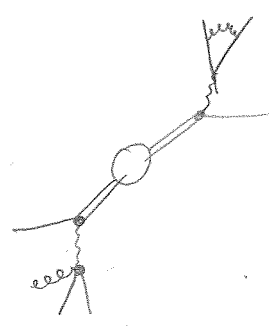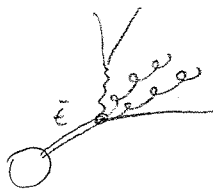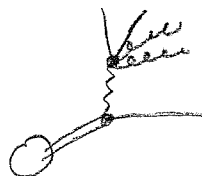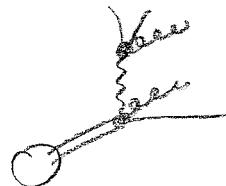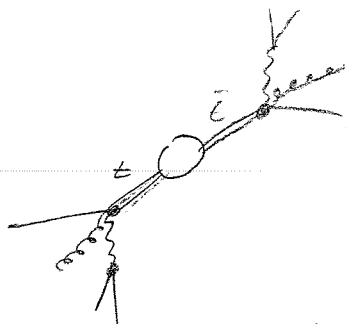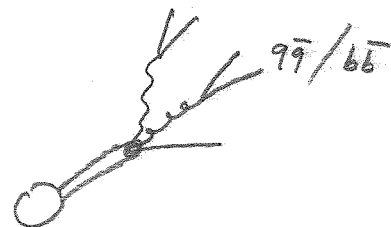
13/14  $\updownarrow$ .
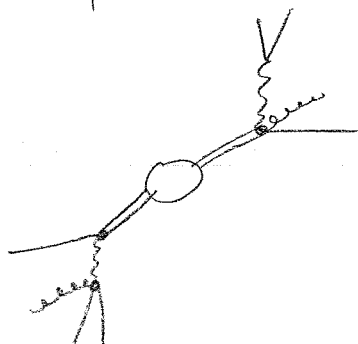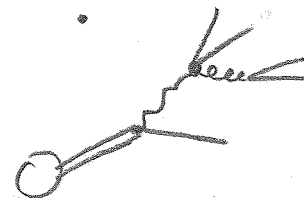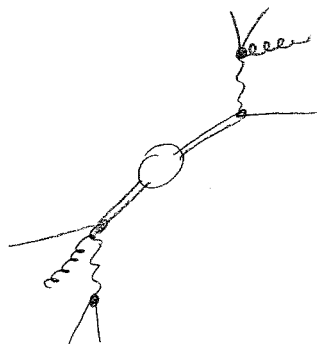
15/16/17

15: $ud(cc + ss + bb) + cs(uu/dd/bb)$

16: $ud\,uu + cs\,cc$

17: $ud\,dd + cs\,ss$

18/19/20  $\updownarrow$ .