ILC process sample: Whizard vs Madgraph

Chun Du

2013.10.30

Directory

All 4-fermion back grounds

Type	ID	LL (n)	LR (n+1)	RL (n + 3)	RR (n+2)	non-pol	Final states
sw_l	6585-88	40	3335	29.1	40	861	$\nu_e e \nu_l$ (l:μ,τ)
sw_sl	6563-66	119.7	10000	85.6	119.3	2581.2	ν_eeUD
sze_l	6555-58	1009.6	1084.1	1019.5	1008.4	1030.4	eell(l:μ,τ) $ee\nu_l\nu_l$
sze_sl	6559-62	259.8	459.1	316.5	259.0	323.6	eeUU, DD
szeorsw_l	6567-70	27.7	922.1	21.6	27.6	249.8	$ee\nu_e\nu_e$
sznu_l	6589(LR)-90		192.8	39.3		58.0	$\nu_e\nu_e$ll, (l:μ,τ)
sznu_sl	6571-72		456.8	130.8		146.9	$\nu_e\nu_e$UU, DD
ww_h	6551-52		14874.3	136.4		3752.7	
ww_l	6581-82		1564.2	14.7		394.7	$\nu_\mu\mu\nu_\tau\tau$
ww_sl	6577-78		18781.0	172.7		4738.4	UDν_ll (l:μ,τ)
zz_h	6573-74		1402.1	605.0		501.8	
zz_l	6579-80		158.0	99.5		64.4	2l2l (l:μ,τ) $2l'2\nu_l$,
zz_sl	6575-76		1422.1	713.5		533.9	
zzorww_h	6553-54		12383.3	224.8		3152.0	
zzorww_l	6721-22		1636.0	54.0		422.5	2l2ν_l (l:μ,τ)

- 4f_WW_hadronic:

- ww_h0cuxx: $e^- e^+ \to W^- W^+ \to c(d,s,b)u(d,s,b)$
  ww_h0uubd: $e^- e^+ \to W^- W^+ \to ubud$
  ww_h0uusd: $e^- e^+ \to W^- W^+ \to usud$
  ww_h0ccbs: $e^- e^+ \to W^- W^+ \to cbcs$
  ww_h0ccds: $e^- e^+ \to W^- W^+ \to cdcs$

- ID: 6551-52, $\sqrt{s} = 250$ GeV.

Table: cross section(fb) with polarizations

ww_h	LL	LR	RL	RR	non-pol
ww_h0cuxx		13529.4	124.0		3413.4
ww_h0uubd		0.2	2×10^{-3}		0.05
ww_h0uusd		662.8	6.1		167.2
ww_h0ccbs		22.8	0.2		5.8
ww_h0ccds		659.1	6.1		166.3
Madgraph+pythia	0	7072	71.7	0	1785.9

Matrix for $e^- e^+ \to csud$.

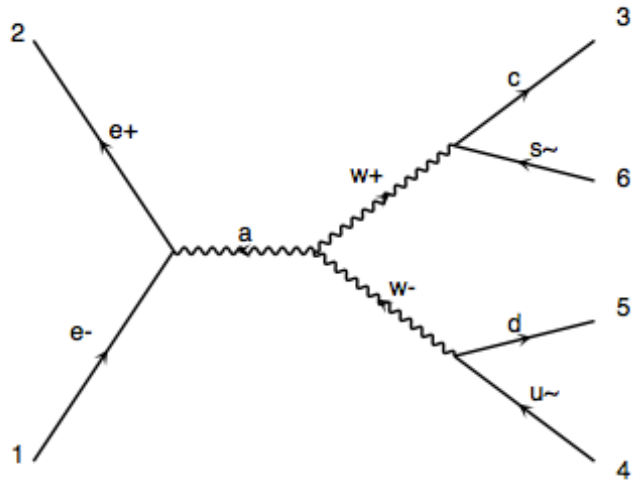


diagram 1 QCD=0, QED=4

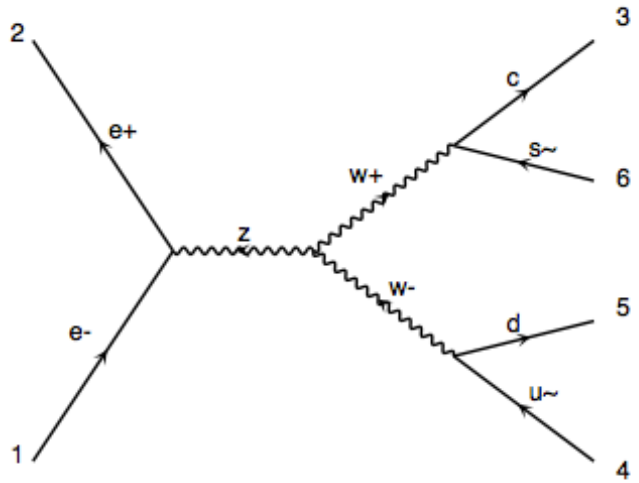


diagram 2 QCD=0, QED=4

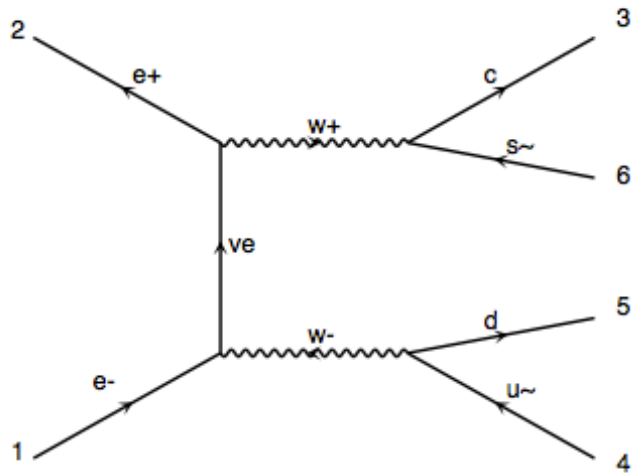


diagram 3 QCD=0, QED=4

- 4f_WW_leotonic: $e^- e^+ \to W^- W^+ \to \nu_\mu \mu \nu_\tau \tau$
- ID: 6581-82, $\sqrt{s} = 250$ GeV.

Table: cross section(fb) with polarizations

ww_l	LL	LR	RL	RR	non-pol
Whizard+pythia		1564.2	14.7		394.7
Madgraph+pythia	0	1476	13.1	0	372.3

Matrix for $e^- e^+ \to \bar{\nu}_\mu \mu^- \nu_\tau \tau^+$.

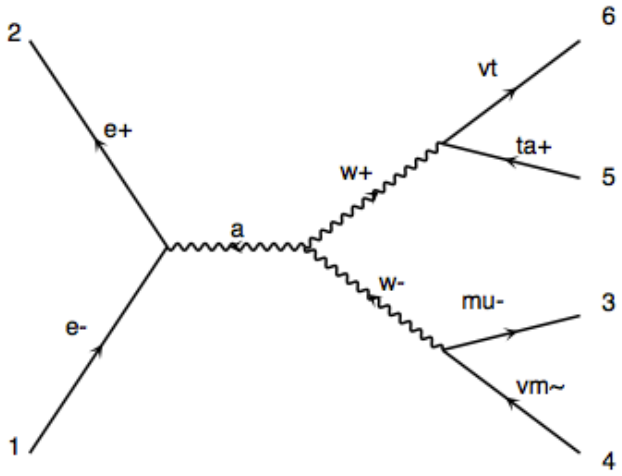


diagram 1 QCD=0, QED=4

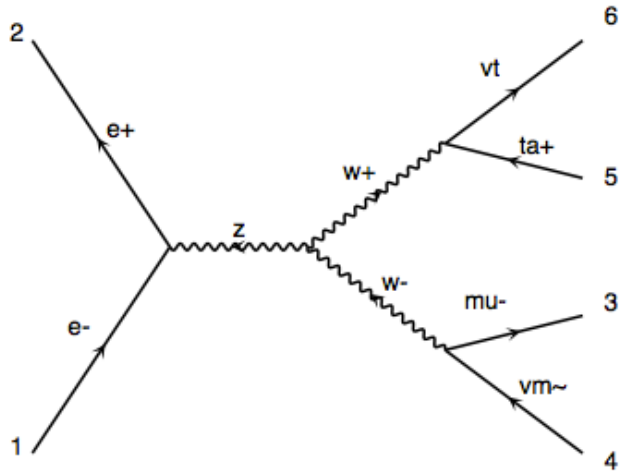


diagram 2 QCD=0, QED=4

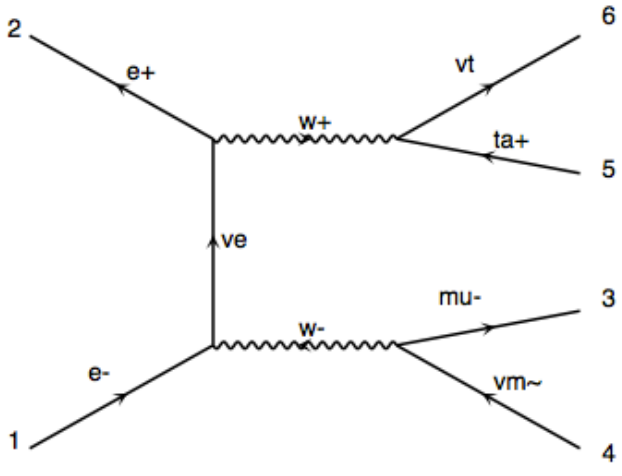


diagram 3 QCD=0, QED=4

Matrix for $e^- e^+ \to \nu_\mu \mu^+ \bar{\nu}_\tau \tau^-$.

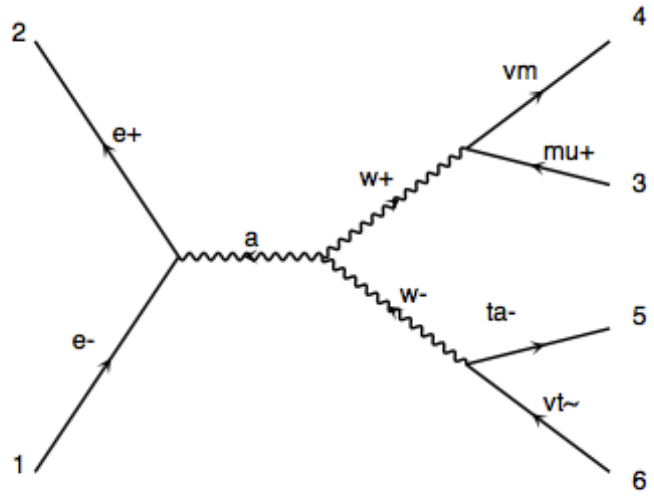


diagram 1 QCD=0, QED=4

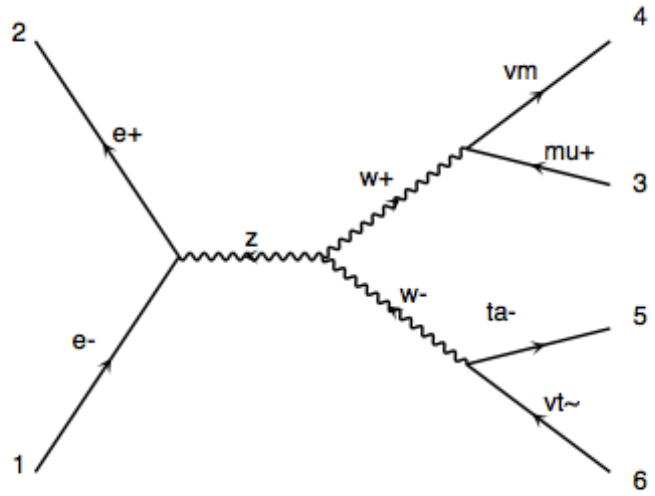


diagram 2 QCD=0, QED=4

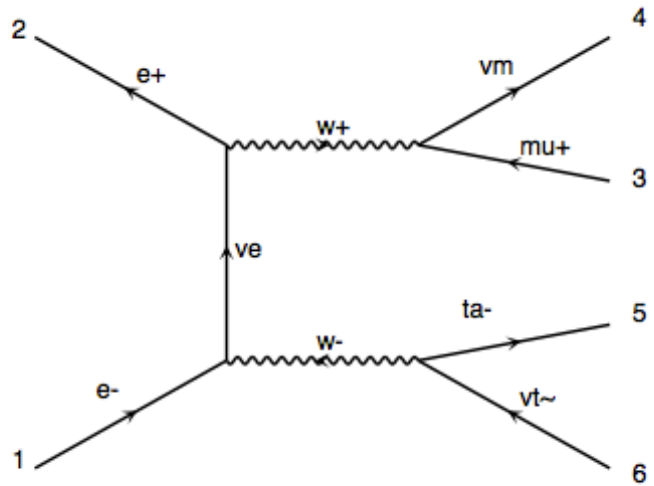


diagram 3 QCD=0, QED=4

- 4f_WW_semileptonic:
- ww_sl0tauq: $e^- e^+ \to W^- W^+ \to (u, c)(d, s, b)\tau(\nu_e, \nu_\mu, \nu_\tau)$
  ww_sl0muq: $e^- e^+ \to W^- W^+ \to (u, c)(d, s, b)\mu(\nu_e, \nu_\mu, \nu_\tau)$
- ID: 6577-78, $\sqrt{s} = 250$ GeV.

Table: cross section(fb) with polarizations

ww_sl	LL	LR	RL	RR	non-pol
ww_sl0tauq		9388.1	86.4		2368.6
Madgraph+pythia	0	6464	61.6	0	1631.4
ww_sl0muq		9392.8	86.3		2369.8
Madgraph+pythia	0	6455	61.9	0	1629.2

Matrix for $e^- e^+ \to u\bar{d}\tau^-\bar{\nu}_\tau$.

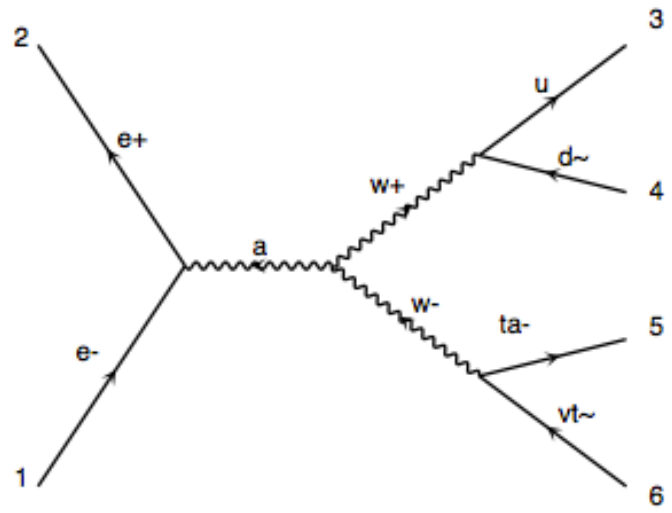


diagram 1 QCD=0, QED=4

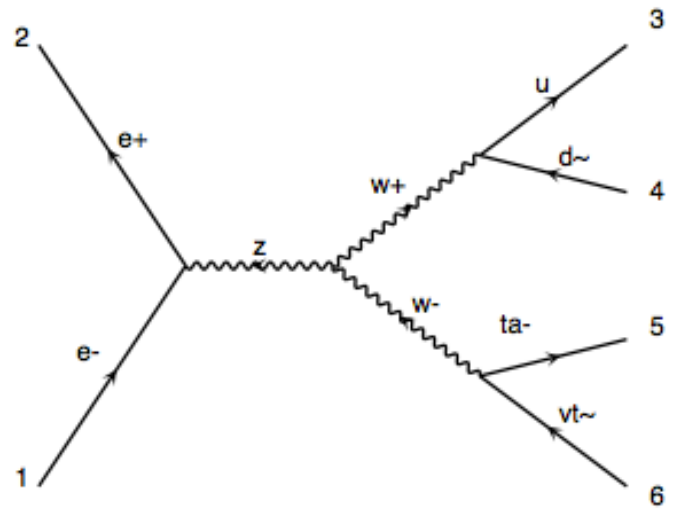
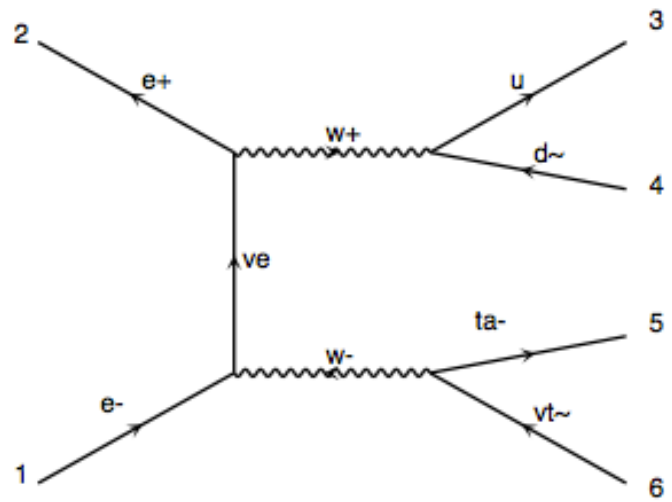


diagram 2 QCD=0, QED=4



Matrix for $e^- e^+ \to \bar{u} d \tau^+ \nu_\tau$.

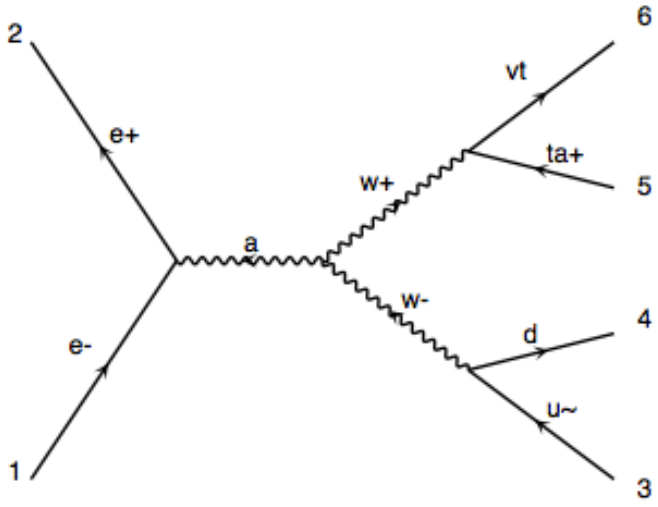


diagram 1 QCD=0, QED=4

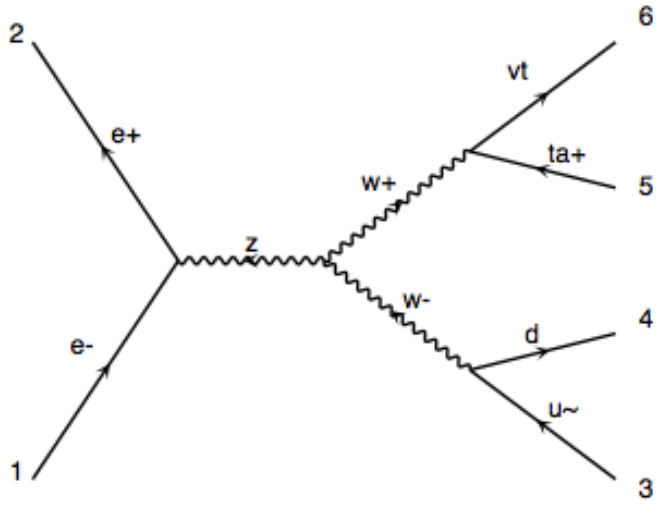


diagram 2 QCD=0, QED=4

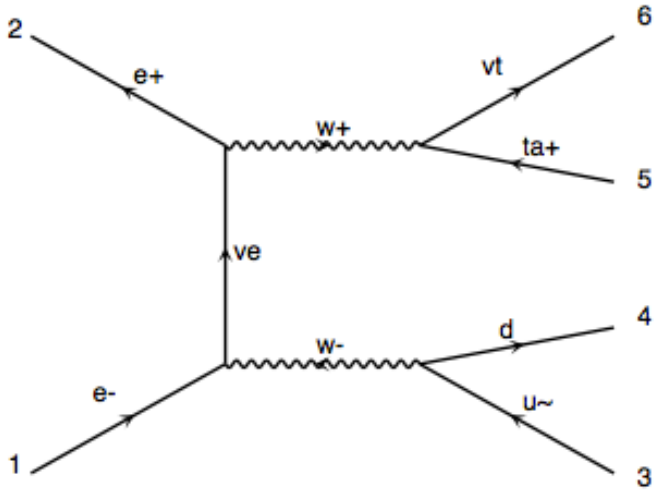


diagram 3 QCD=0, QED=4

Matrix for $e^- e^+ \to u\bar{d}\mu^-\bar{\nu}_\mu$.

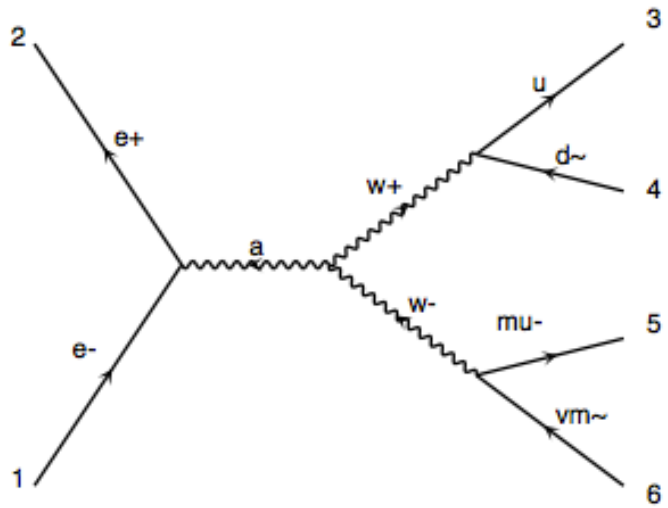


diagram 1 QCD=0, QED=4

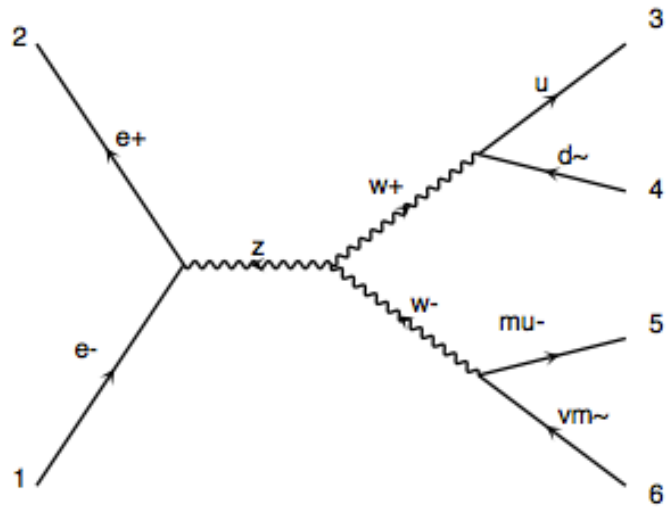
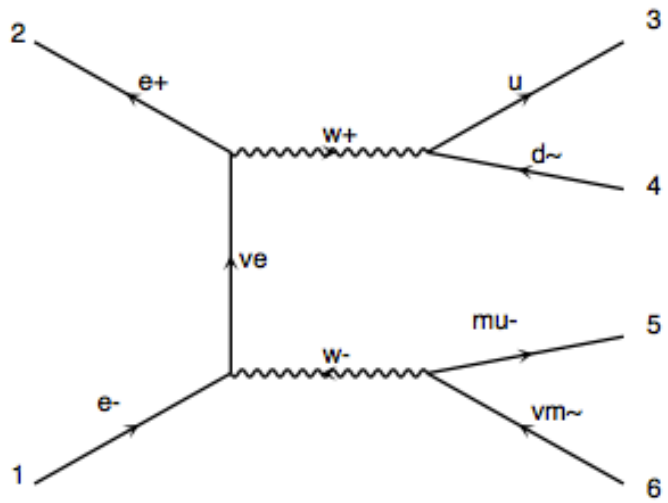


diagram 2 QCD=0, QED=4



Matrix for $e^- e^+ \to \bar{u} d \mu^+ \nu_\mu$.

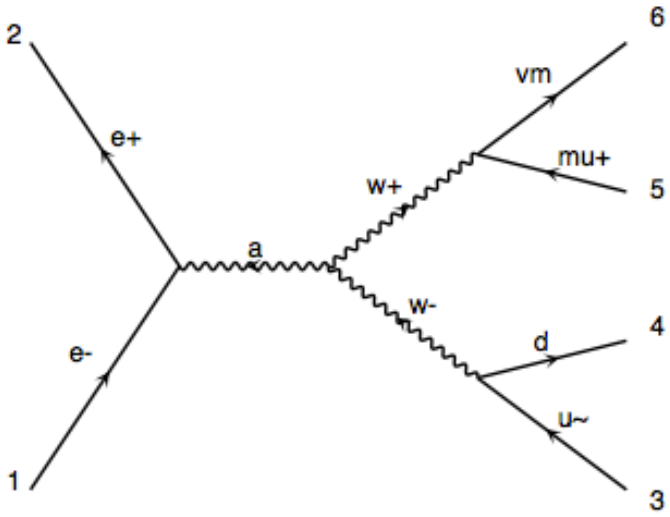


diagram 1 QCD=0, QED=4

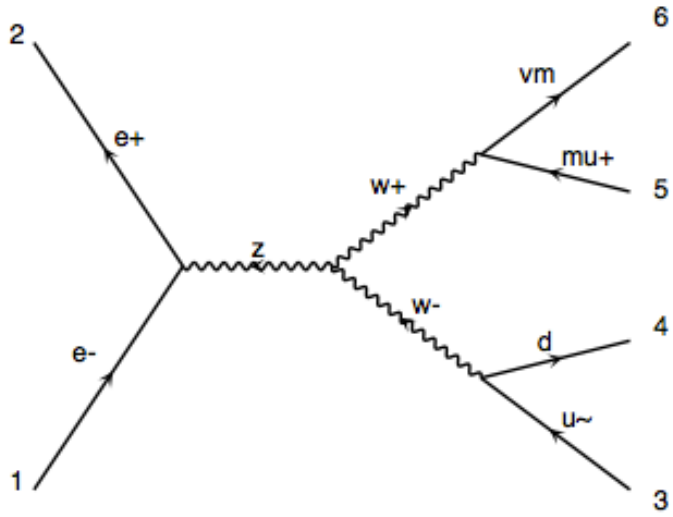
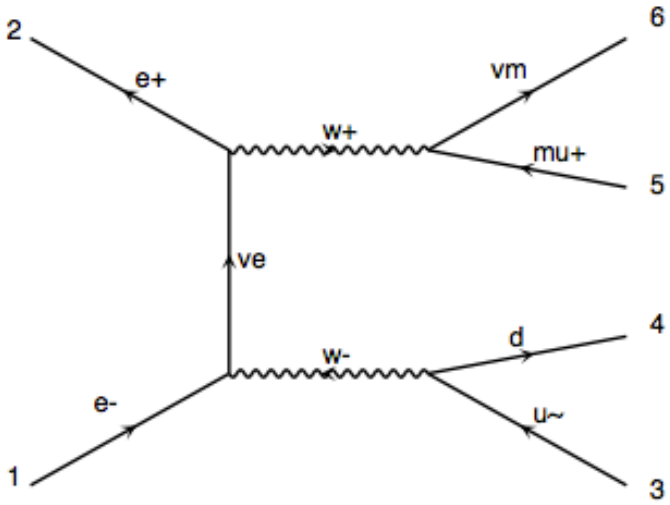


diagram 2 QCD=0, QED=4



- 4f_ZZ_hadronic:

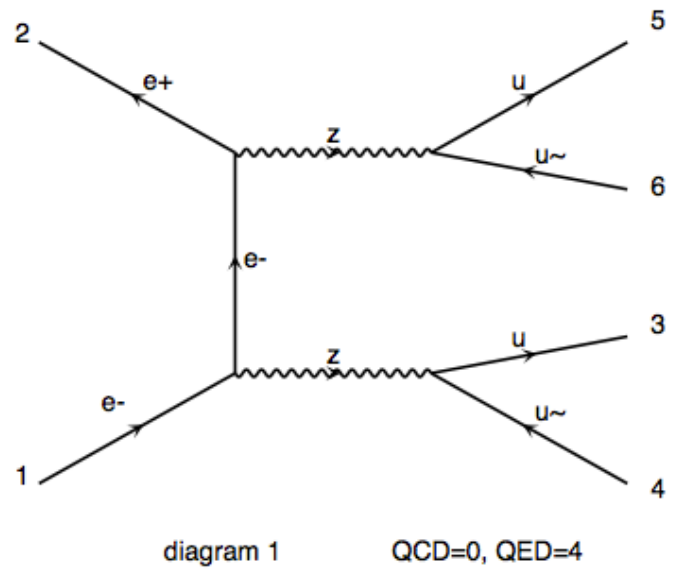
- zz_h0utut: $e^- e^+ \to ZZ \to (u, c)(u, c)(u, c)(u, c)$
  zz_h0dtdt: $e^- e^+ \to ZZ \to (d, s, b)(d, s, b)(d, s, b)(d, s, b)$
  zz_h0uu_notd: $e^- e^+ \to ZZ \to uu(s, b)(s, b)$
  zz_h0cc_nots: $e^- e^+ \to ZZ \to cc(d, b)(d, b)$

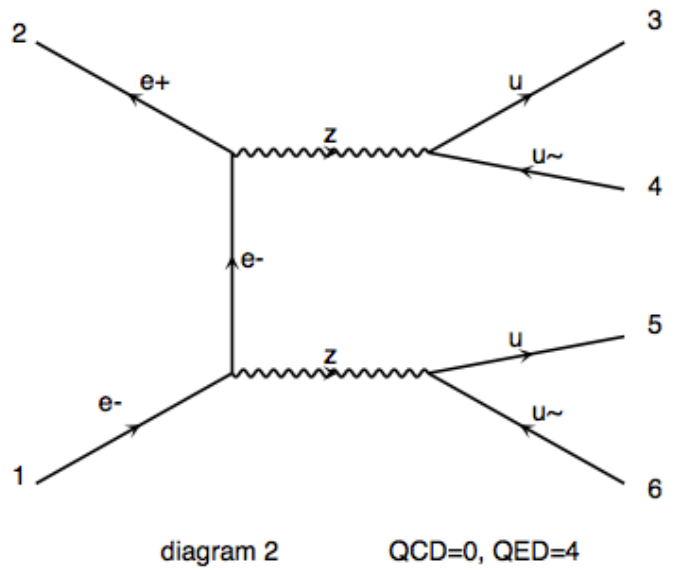
- ID: 6573-74, $\sqrt{s} = 250$ GeV.

Table: cross section(fb) with polarizations

zz_h	LL	LR	RL	RR	non-pol
zz_h0utut		225.2	107.0		83.1
Madgraph+pythia	0	100.6	41.3	0	35.5
zz_h0dtdt		634.8	270.9		226.4
Madgraph+pythia	0	450.9	185.1	0	159.0
zz_h0uu_notd		270.2	113.8		96.0
Madgraph+pythia	0	149	61.4	0	52.6
zz_h0cc_nots		271.8	113.3		96.3
Madgraph+pythia	0	149	61.4	0	52.6

Matrix for $e^- e^+ \to u\ \bar{u}\ u\ \bar{u}(c\ \bar{c}\ c\ \bar{c})$.





Matrix for $e^- e^+ \to u\ \bar{u}\ c\ \bar{c}$.

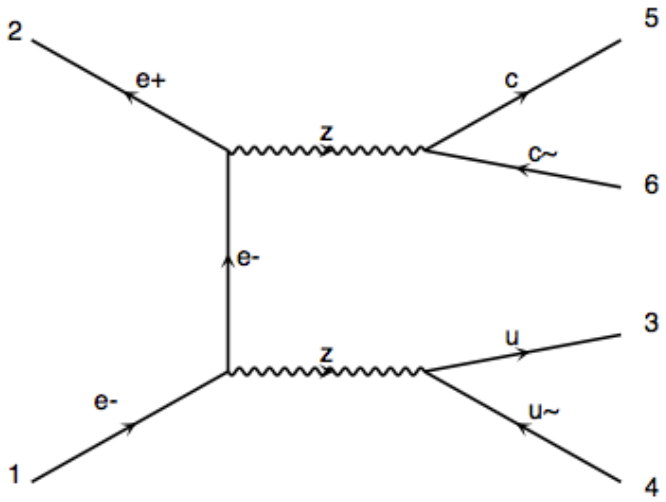


diagram 1 QCD=0, QED=4

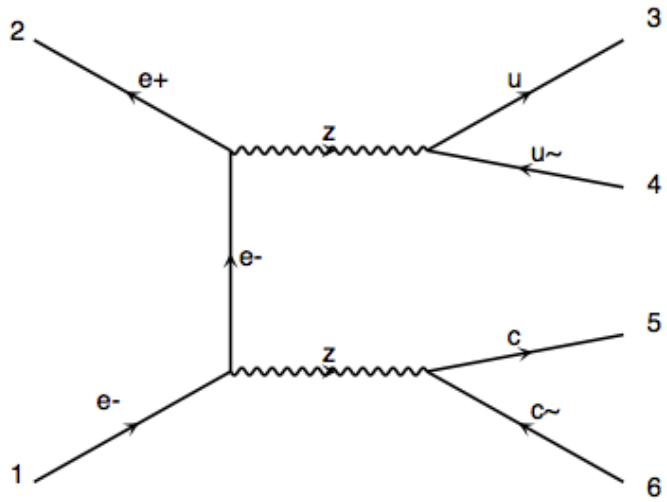
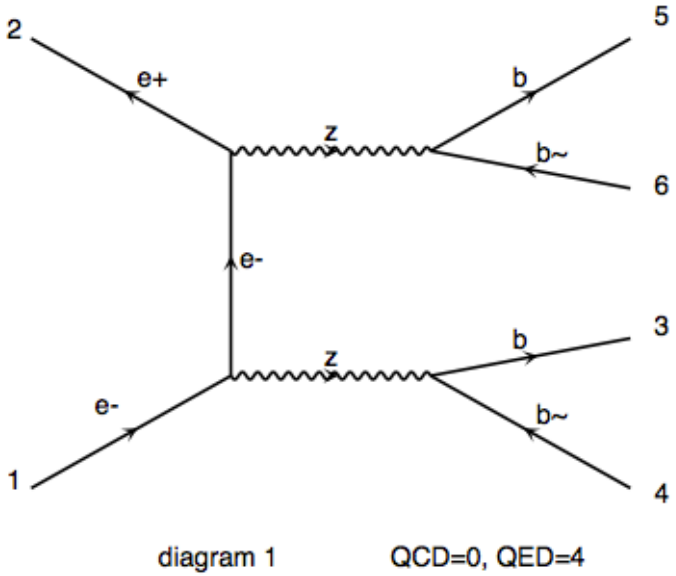
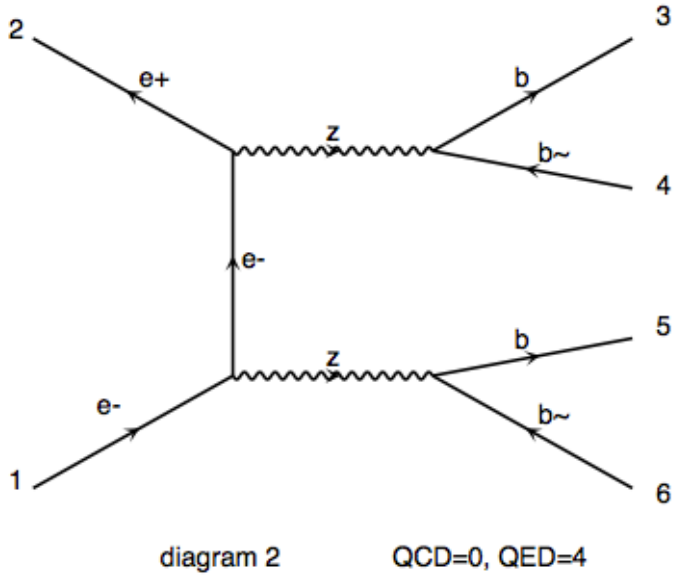


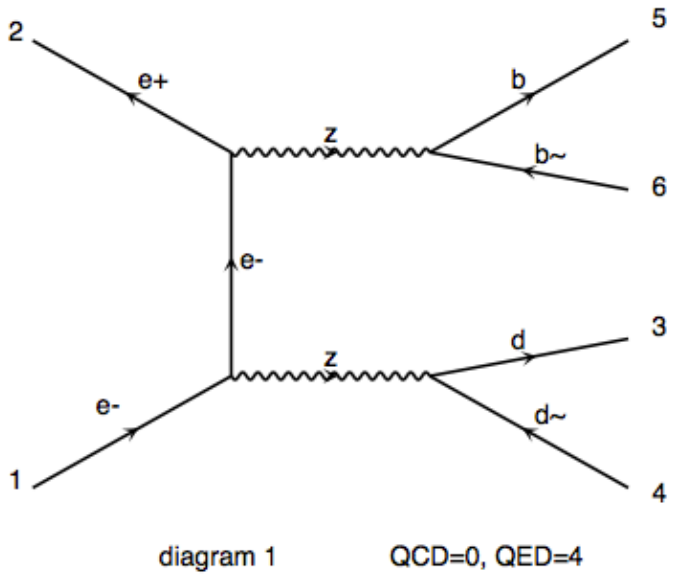
diagram 2 QCD=0, QED=4

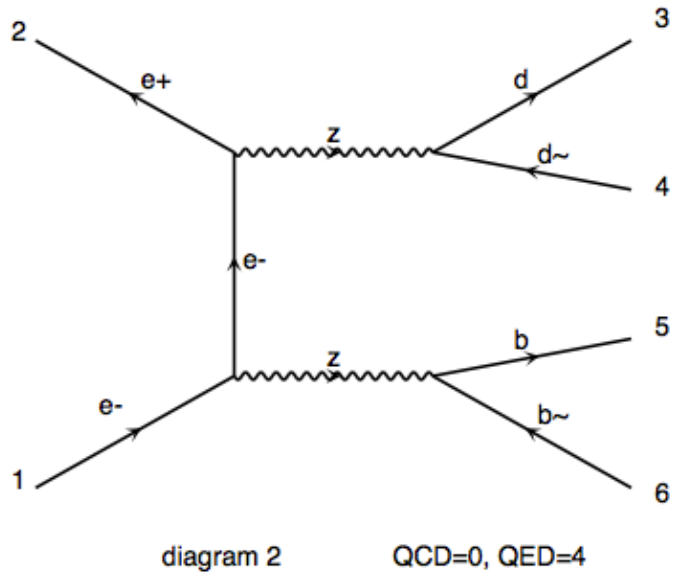
Matrix for $e^- e^+ \to b\ \bar{b}\ b\ \bar{b}$.



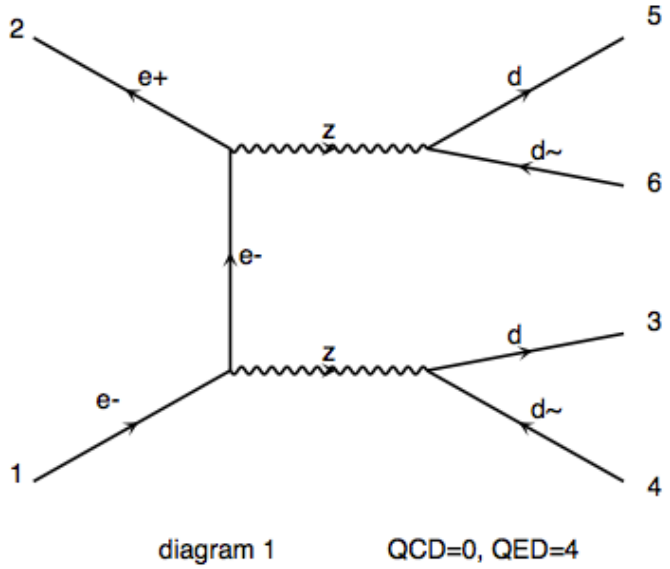


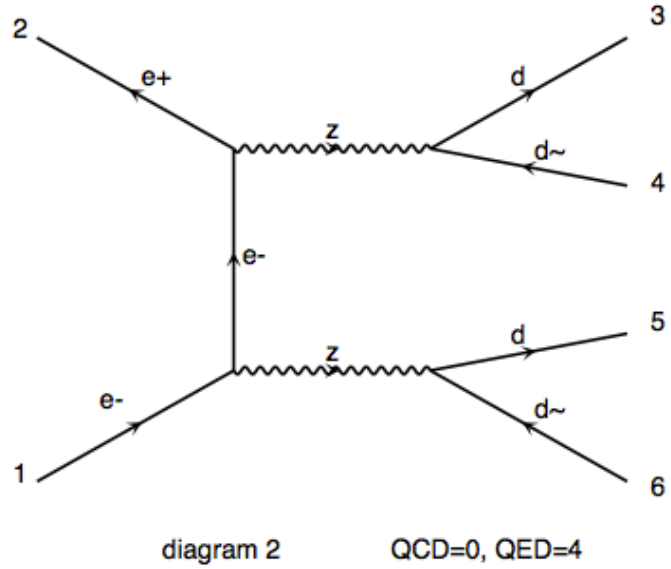
Matrix for $e^- e^+ \to d\ \bar{d}\ b\ \bar{b}(s\ \bar{s}\ b\ \bar{b})$.





Matrix for $e^- e^+ \to d\ \bar{d}\ d\ \bar{d}(s\ \bar{s}\ s\ \bar{s})$.





Matrix for $e^- e^+ \to d\ \bar{d}\ s\ \bar{s}$.

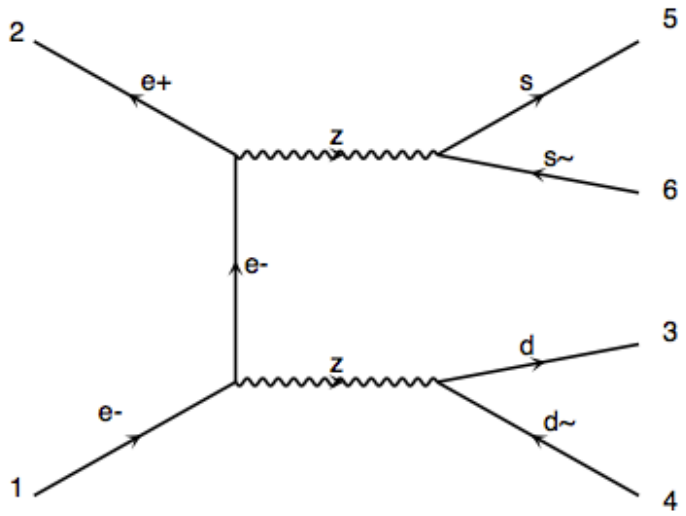


diagram 1 QCD=0, QED=4

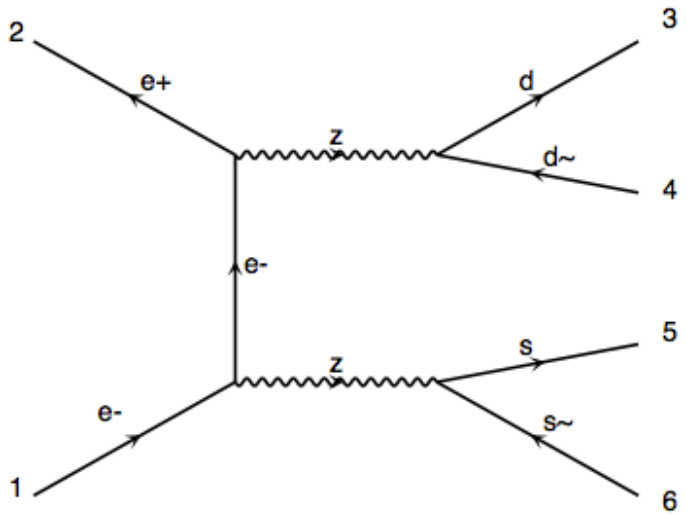


diagram 2 QCD=0, QED=4

Matrix for $e^- e^+ \to u\ \bar{u}\ b\ \bar{b}$.

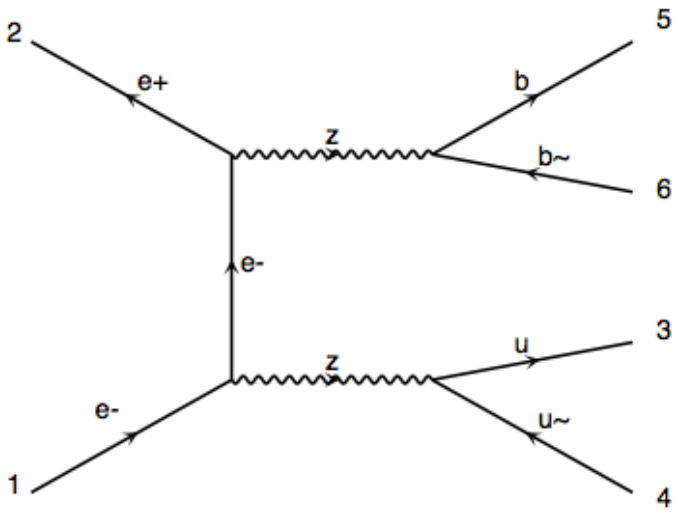


diagram 1 QCD=0, QED=4

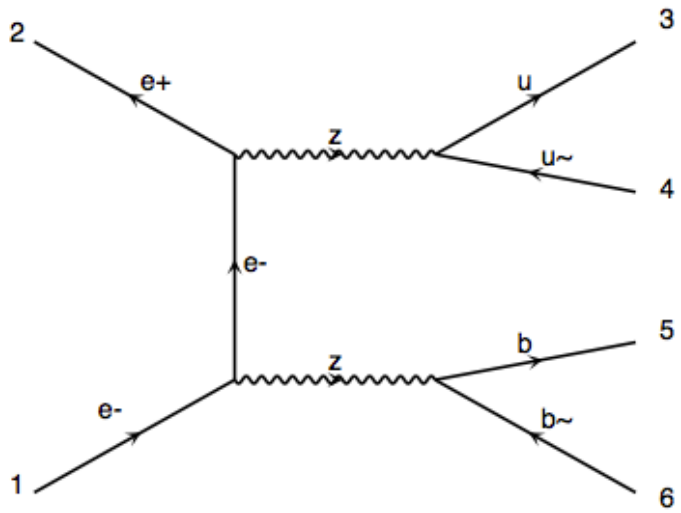
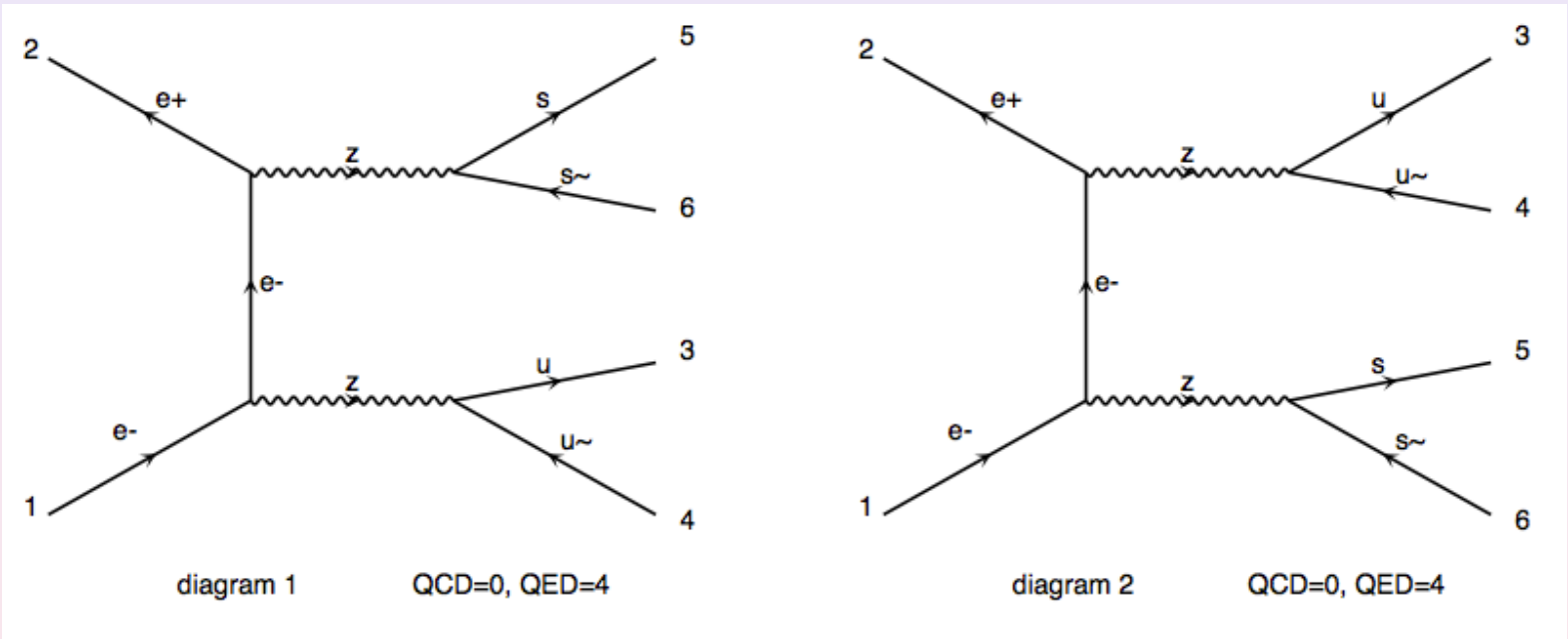
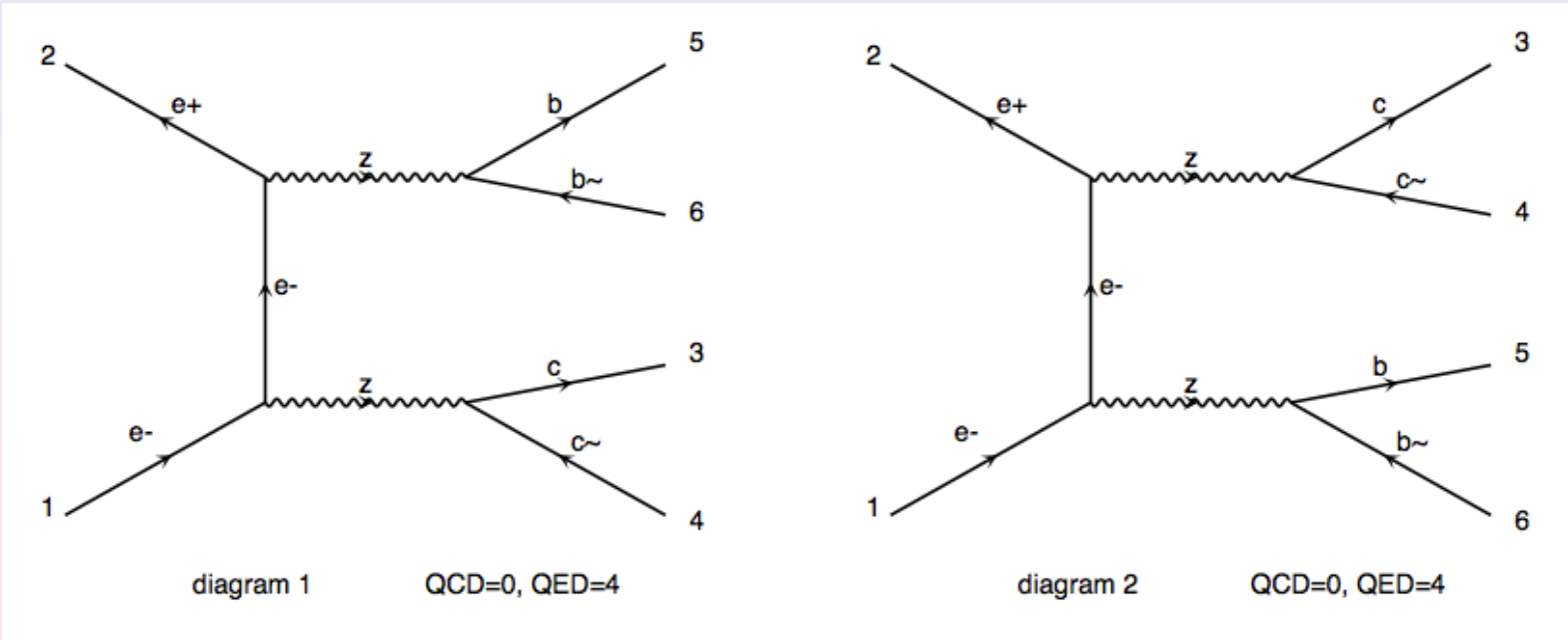


diagram 2 QCD=0, QED=4

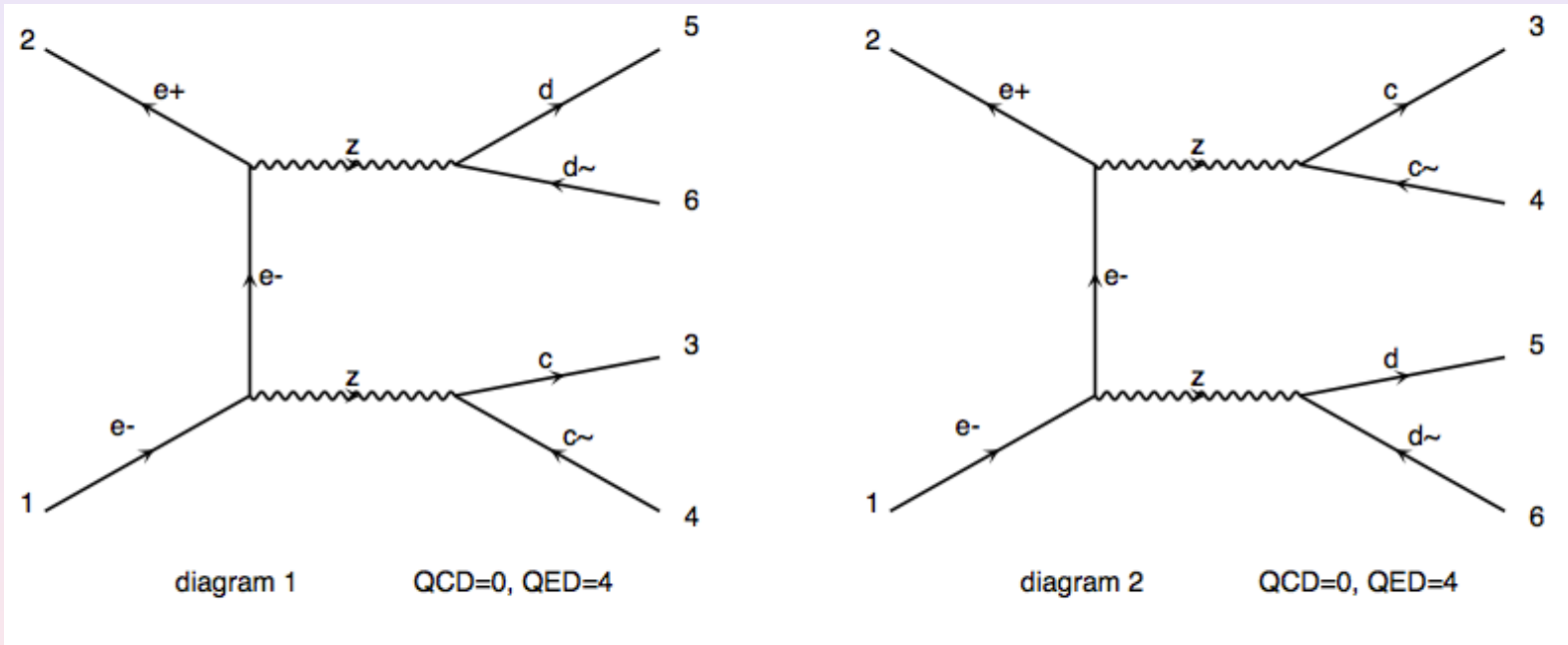
Matrix for $e^- e^+ \to u\ \bar{u}\ s\ \bar{s}$.



Matrix for $e^- e^+ \to c\ \bar{c}\ b\ \bar{b}$.



Matrix for $e^- e^+ \to c\ \bar{c}\ d\ \bar{d}$.



- 4f_ZZ_leptonic:

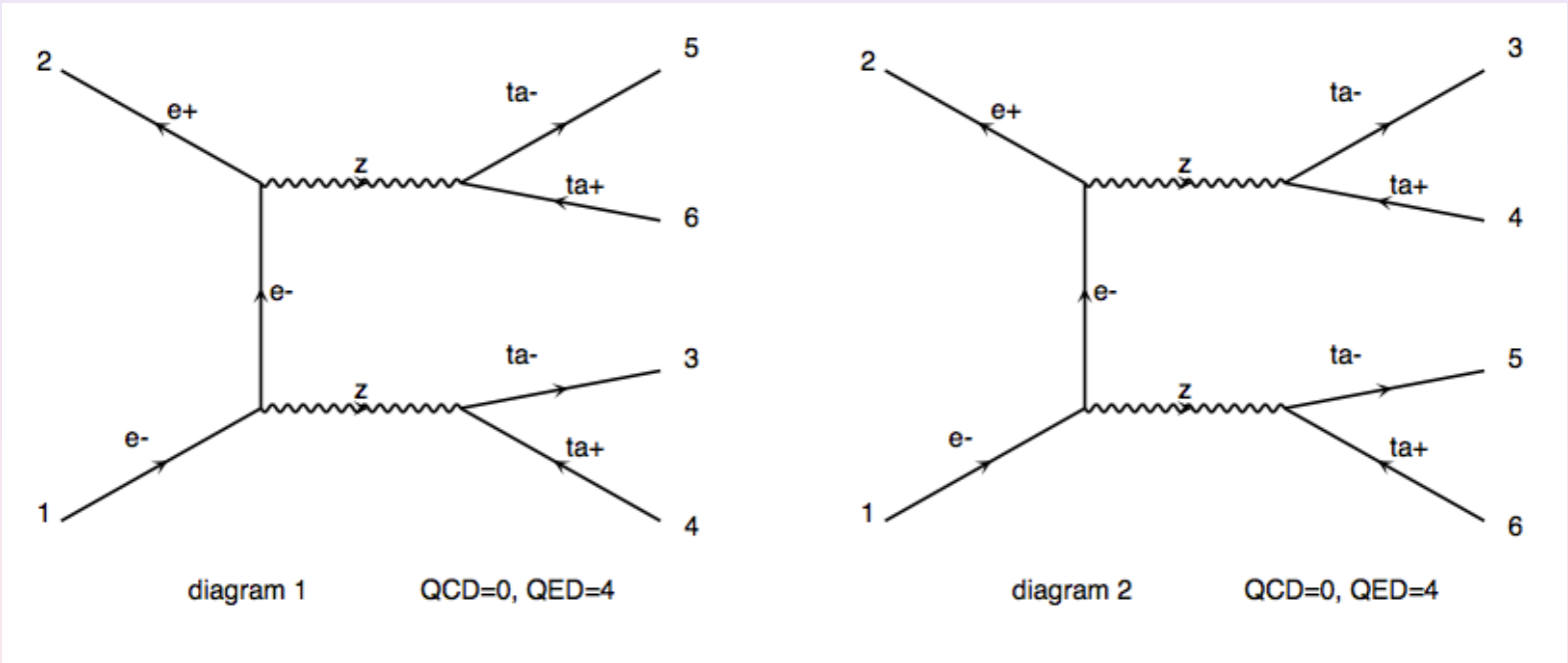
- zz_l04tau: $e^- e^+ \to ZZ \to \tau\tau\tau\tau$
  zz_l04mu: $e^- e^+ \to ZZ \to \mu\mu\mu\mu$
  zz_l0taumu: $e^- e^+ \to ZZ \to \tau\tau\mu\mu$
  zz_l0mumu: $e^- e^+ \to ZZ \to \nu_\tau\nu_\tau\mu\mu$
  zz_l0tautau: $e^- e^+ \to ZZ \to \nu_\mu\nu_\mu\tau\tau$

- ID: 6579-80, $\sqrt{s} = 250$ GeV.

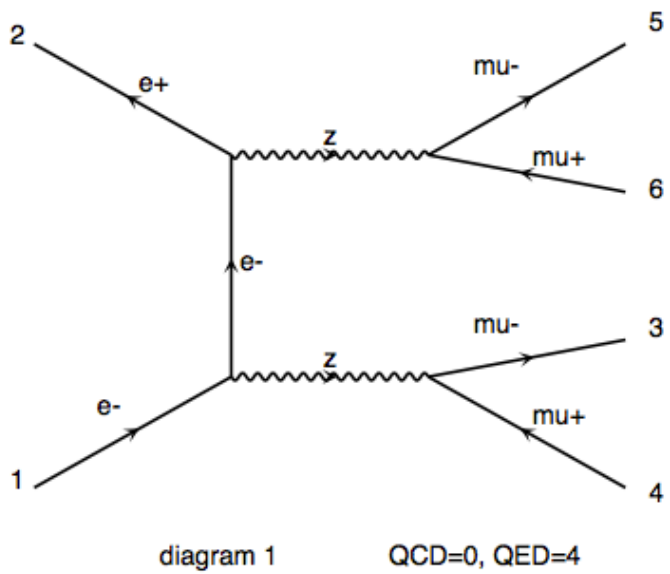
Table: cross section(fb) with polarizations

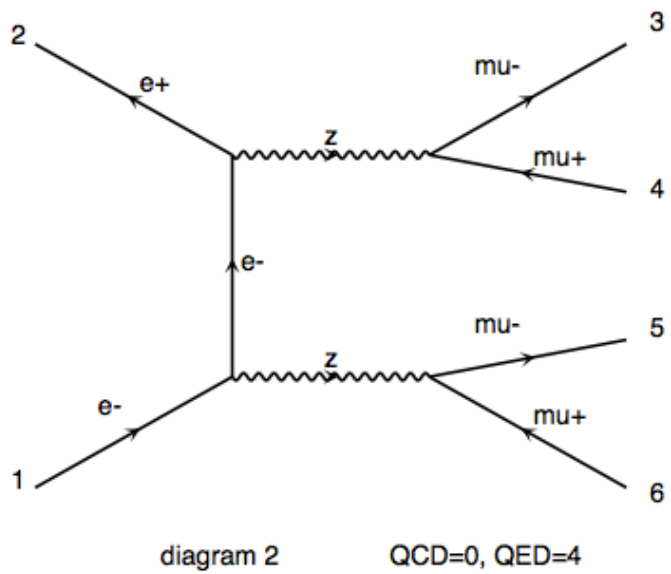
zz_l	LL	LR	RL	RR	non-pol
zz_l04tau		10.9	6.8		4.4
Madgraph+pythia	0	3.0	1.2	0	1.1
zz_l04mu		34.0	24.5		14.6
Madgraph+pythia	0	3.0	1.2	0	1.1
zz_l0taumu		42.1	28.8		17.7
Madgraph+pythia	0	6.0	2.4	0	2.1
zz_l0mumu		46.5	26.9		18.4
Madgraph+pythia	0	13.3	5.4	0	4.7
zz_l0tautau		24.5	12.6		9.3
Madgraph+pythia	0	13.2	5.4	0	4.7

Matrix for $e^- e^+ \to \tau^- \tau^+ \tau^- \tau^+$.



Matrix for $e^- e^+ \to \mu^- \ \mu^+ \ \mu^- \ \mu^+$.





Matrix for $e^- e^+ \to \tau^- \tau^+ \mu^- \mu^+$.

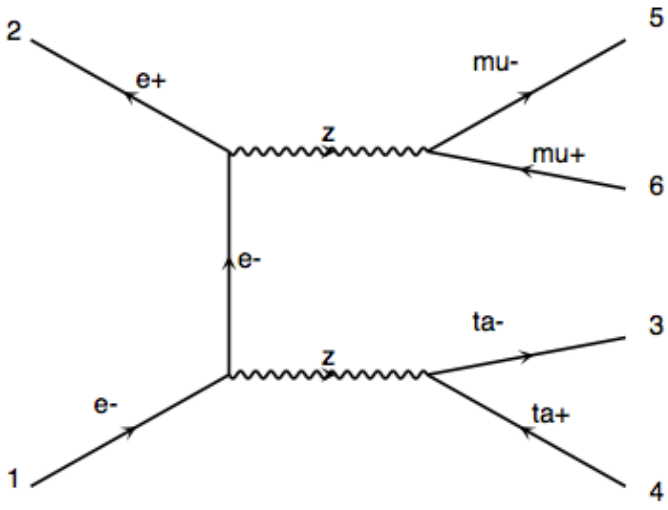


diagram 1 QCD=0, QED=4

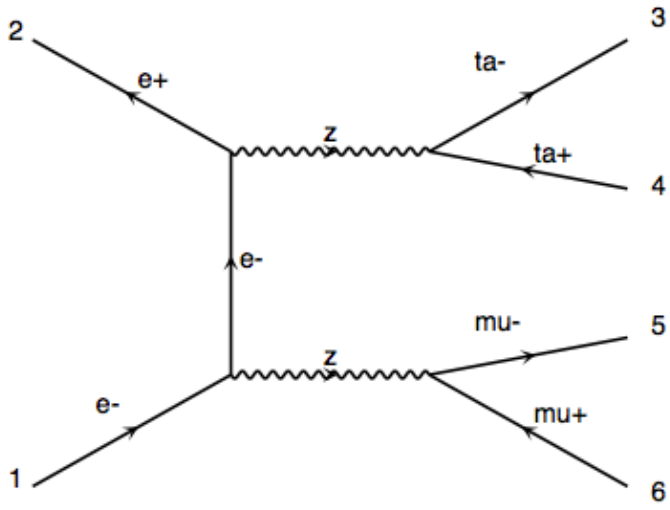


diagram 2 QCD=0, QED=4

Matrix for $e^- e^+ \to \nu_\tau \ \bar{\nu}_\tau \ \mu^- \ \mu^+$.

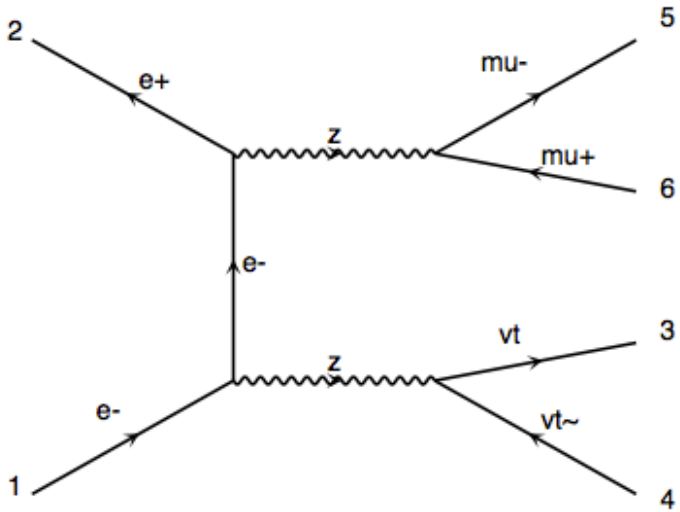


diagram 1 QCD=0, QED=4

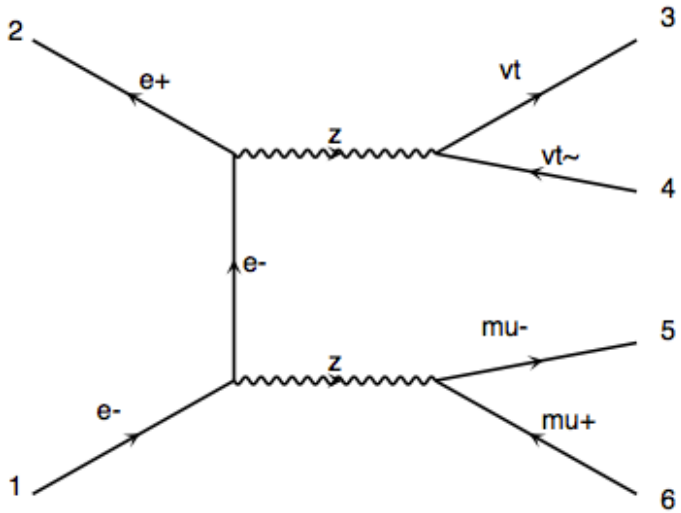


diagram 2 QCD=0, QED=4

Matrix for $e^- e^+ \to \nu_\mu \ \bar{\nu}_\mu \ \tau^- \ \tau^+$.

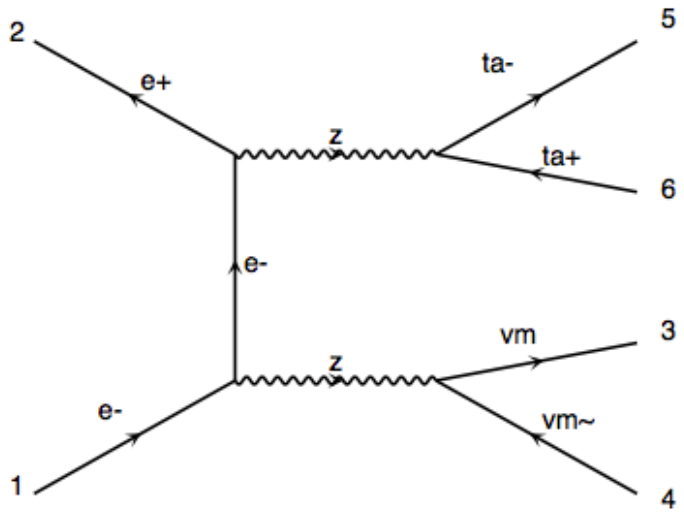


diagram 1 QCD=0, QED=4

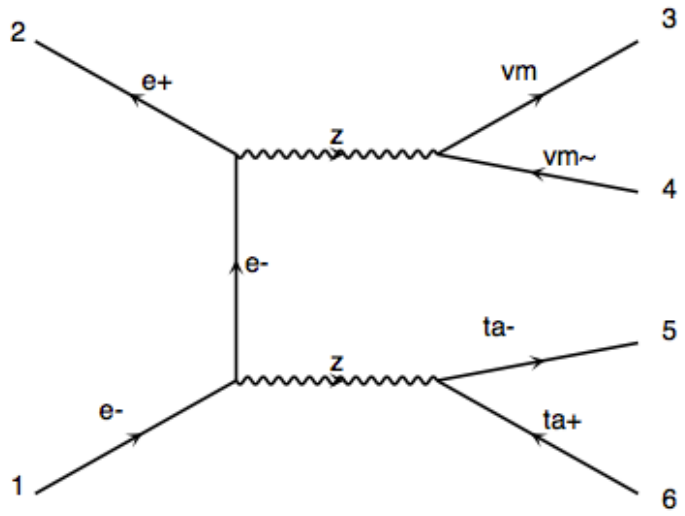


diagram 2 QCD=0, QED=4