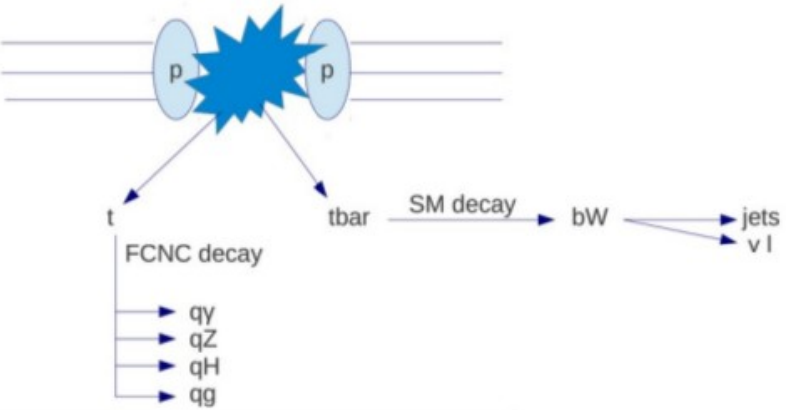
Small summary of BXL search channels for FCNC

Event categories



SM top decay	2 γ	γ	3 b-tag
leptonic	$t\to cH(\gamma\gamma)$	$t\to c\gamma$	$t\to cH(bb)$
hadronic	$t\to cH(\gamma\gamma)$	$t\to c\gamma$	$t\to cH(bb)$

SM top decay	0 *l*	1 *l*	2 *l*		3 *l*	≥4 *l*
			same sign	opp. sign		
leptonic		$t\to cH(V_hV_h)$ $t\to cH(\tau_h\tau_h)$ $t\to cZ_h$ $t\to cg$ $t\to cH(W_lW_h)$	$t\to cH(W_lW_h)$ $t\to cH(\tau_l\tau_h)$		$t\to cH(W_lW_l)$ $t\to cH(Z_lZ_h)$ $t\to cZ_l$	$t\to cH(V_lV_l)$
hadronic	$t\to cH$ $t\to cZ$ $t\to cg$			$t\to cH(W_lW_l)$ $t\to cH(Z_lZ_h)$ $t\to cZ_l$		$t\to cH(V_lV_l)$

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- Investigated categories:

  2x Photon → diphoton

  1x Lepton → 1L 3B

  2x Lepton → SS dilepton

  3x Lepton → 3L

  4 or 5x Lepton →4L5L

- Approach:

  1. Kinematic cuts to discriminate signal from background
  2. Calculate selection efficiencies for samples
  3. Propagate to 13 TeV
  4. Estimate S/√B

Diphoton (status on 19/02/2014)

Taejeong

SIGNAL: tcH(γγ) (967 evts)

BACKGROUND: ttbar+jets (3836), Z+jets (481 evts)

== 2 photons
>= 2 jets
>= 1 b-tagged jets (CSVT)
M(γγ) > 100 GeV

$S/\sqrt{B} = 13.17$ (8 TeV)

1L3B (status on 3/02/2014)

Kevin

SIGNAL: tcH(bb) (639 evts)

BACKGROUND: ttbar+jets (36 976 evts), W+jets (739 evts), tW (1074 evts)

== 1 lepton (e or μ)
>= 4 jets
>= 3 b-tagged jets (CSVM)

$S/\sqrt{B}$ = 3.29 (8 TeV) and 17.93 (14 TeV)

SS dilepton (status on 3/02/2014)

Shimaa

SIGNAL: tcH(WW) → blv clvqq (18 evts)

BACKGROUND: ttbar (semi/full lept) (189 evts), DY (15 evts), W(lv)+jets (22 evts)

== 2 SS leptons (e or μ)
>= 4 jets
>= 1 b-tagged jet (CSVM)
Zmass veto (DY)

S/√B = 1.21 (8 TeV) and 10.68 (13 TeV)

3L (status on 3/02/2014)

Isis

SIGNAL: tcH(WW) (64 evts) , tcH(ZZ) (18 evts)

tcZ (349 evts)

BACKGROUND: DY (3000), diboson, ttbar

== 3L (e or μ)

S/√B = 3 (8 TeV) and 12 (13 TeV)

Don't know if this is for tcH or tcZ... (or both?)

4L5L (status on 3/02/2014)

Isis

SIGNAL: tcH(ZZ) (1 evt)

BACKGROUND: ZZ(266 evts), SM H (11 evts)

>= 4L (e or μ)

S/√B = 0.10 (8 TeV) and 0.30 (13 TeV)

MVA

S/√B = 0.54 (8 TeV)

Conclusions

To be kept

Diphoton
1L3B
SS dilepton
3L

- Already good significance with simple cut-based selection
- Improvements still possible!
  - What about photon validation?
    - We contacted Taejeong and he is willing to work on this

To be dropped

4L5L

- No clear variable to make a cut
- No good significance