FCNC channel: pp → t →lνb

Caroline

(01/04/15)

Selection

Selection:

- = 1 lepton pT>30 GeV (no other lepton pT>20),
- 1 or 2 jets : first one with pT(j1)>30 GeV, other jets with pT>20 GeV, all with $|\eta|<2.4$
- MET>30 & $M_T(W)>50$ GeV from ATLAS paper, used for multijet suppression.
- b-tagging : Medium criteria for j1.
  - Modification of the AnalysisHelper class to return the efficiency of b-tagging per jet -> used as a weight to avoid lack of statistics in my case for DY. I also code the proba of a jets to have 0, 1, 2 or at least 3 b-tagged jets in the events. But in that case, difficult to use the “b” jet information (pT, DeltaR with other jet or lepton, etc). I can commit my code if you need it.

CutFlow Table

New k factor for signal

Cut	Sum Bg	Signal gct	Signal gut	T+jets	TT+jets	W+jets	ZToLL
$nosel$	4290299434 ± 5799150	749982 ± 264	667187 ± 236	27237610 ± 16998	36605248 ± 7677	1613848064 ± 568471	2612608512 ± 5771190
$= 1lep$	1365879080 ± 436451	243085 ± 150	173582 ± 121	3380814 ± 5455	13094378 ± 4557	1212020864 ± 252487	137383024 ± 355934
$>= 1jet$	369796558 ± 289401	204443 ± 138	133453 ± 106	3100341 ± 5171	12951785 ± 4538	292226656 ± 95468	61517776 ± 273114
$pt(j1) > 30$	258595014 ± 264773	188193 ± 132	121321 ± 101	2951626 ± 5023	12821832 ± 4520	192003856 ± 66047	50817700 ± 256314
$MET > 30$	134868083 ± 132497	134166 ± 111	86849 ± 85	2216143 ± 4331	10452940 ± 4054	112844192 ± 50369	9354808 ± 122406
$M_T > 50$	108863544 ± 100794	108146 ± 100	68167 ± 76	1703800 ± 3842	7531914 ± 3412	94473056 ± 47005	5154774 ± 89015
b_1L	24194919 ± 22543	68813 ± 69	38935 ± 50	1029120 ± 2768	4179366 ± 2165	18066938 ± 10086	919494 ± 19853
b_1M	7777716 ± 13228	55473 ± 59	30879 ± 42	826610 ± 2371	3283684 ± 1846	3447627 ± 3128	219796 ± 12497
$(test b_1T)$	3691340 ± 8707	38002 ± 41	21359 ± 30	569303 ± 1658	2229962 ± 1285	794635 ± 1015	97439 ± 8390
$= 1/2j, b_1M$	5210432 ± 11114	51150 ± 57	28628 ± 41	639292 ± 2143	1152822 ± 999	3242427 ± 3071	175891 ± 10416
$= 1jbM$	3174467 ± 7933	37312 ± 49	21238 ± 35	334833 ± 1576	315820 ± 497	2422634 ± 2725	101179 ± 7265
$= 1/2jbM, 0a$	5082828 ± 10894	50691 ± 57	28363 ± 40	625003 ± 2126	1083224 ± 975	3208169 ± 3055	166431 ± 10192

Above the line : normal cutFlow
Below the line : test, cut on top of b1M

Size of the error from DY : reduced (because of btag weight and not cut)

Significance: S/sqrt(S+B)

Cut	Signal gct	Signal gut
$nosel$	11.449	10.185
$= 1lep$	6.577	4.696
$>= 1jet$	10.628	6.939
$pt(j1) > 30$	11.699	7.543
$MET > 30$	11.547	7.476
$M_T > 50$	10.360	6.531
b_1L	13.970	7.909
b_1M	19.820	11.050
$(testb_1T)$	19.678	11.085
$= 1/2j, b_1M$	22.299	12.507
$= 1jbM$	20.820	11.881
$= 1/2jbM, 0a$	22.373	12.545

Best cut:
=1,2 j
Jet1 = b M
0 γ

Contamination from other signals

	b_1M	$(testb_1T)$	$=1/2j, b_1M$	$=1jbM$	$=1/2jbM, 0a$
Signal gct	55473 ± 59	38002 ± 41	51150 ± 57	37312 ± 49	50691 ± 57
Signal gut	30879 ± 42	21359 ± 30	28628 ± 41	21238 ± 35	28363 ± 40
Signal t+H K_{hct}	664 ± 1	450 ± 0	251 ± 0	76 ± 0	241 ± 0
Signal t+H K_{hut}	1203 ± 2	817 ± 1	602 ± 1	245 ± 1	580 ± 1
Signal t+a K_{act}	9298 ± 9	5681 ± 6	6762 ± 8	2983 ± 6	862 ± 3
Signal t+a K_{aut}	1562 ± 5	1081 ± 3	1296 ± 4	775 ± 3	270 ± 2
Signal t+a/inv K_{gct}	618 ± 2	431 ± 2	582 ± 2	435 ± 2	494 ± 2
Signal t+a/inv K_{gut}	429 ± 2	299 ± 1	401 ± 2	299 ± 2	354 ± 2
Signal t+inv K_{zct}	68 ± 0	47 ± 0	60 ± 0	40 ± 0	59 ± 0
Signal t+inv K_{zut}	679 ± 2	471 ± 1	602 ± 2	403 ± 2	591 ± 2
Signal t+inv Z_{zct}	34 ± 0	24 ± 0	31 ± 0	22 ± 0	31 ± 0
Signal t+inv Z_{zut}	212 ± 1	147 ± 0	193 ± 1	134 ± 1	190 ± 1

Translation for the signal names

```
Insert("tGamma-Kappa-act", "Signal t+a $K_{act}$");
Insert("TTtoLGamma-Kappa-act", "Signal t+a $K_{act}$");

Insert("tGamma-Kappa-aut", "Signal t+a $K_{aut}$");
Insert("TTtoLGamma-Kappa-aut", "Signal t+a $K_{aut}$");

Insert("tGamma-Kappa-gct", "Signal t+a/inv $K_{gct}$");
Insert("tZ-monolep-met-Kappa-gct", "Signal t+a/inv $K_{gct}$");
Insert("tHToZZ-Kappa-gct", "Signal t+a/inv $K_{gut}$");
Insert("tGamma-Kappa-gut", "Signal t+a/inv $K_{gut}$");
Insert("tZ-monolep-met-Kappa-gut", "Signal t+a/inv $K_{gut}$");
Insert("tHToZZ-Kappa-gut", "Signal t+a/inv $K_{gut}$");

Insert("tZ-monolep-met-Kappa-zct", "Signal t+inv $K_{zct}$");
Insert("tZ-monolep-met-Kappa-zut", "Signal t+inv $K_{zut}$");

Insert("tZ-monolep-met-Zeta-zct", "Signal t+inv $Z_{zct}$");
Insert("tZ-monolep-met-Zeta-zut", "Signal t+inv $Z_{zut}$");

Insert("tHToZZ-Kappa-hct", "Signal t+H $K_{hct}$");
Insert("TTtoLHtoZZ-Kappa-hct", "Signal t+H $K_{hct}$");
Insert("tHToZZ-Kappa-hut", "Signal t+H $K_{hut}$");
Insert("TTtoLHtoZZ-Kappa-hut", "Signal t+H $K_{hut}$");
```

Next steps

Play with MVA
Compute contours
Start writing the template for the analysis