Minutes of the working meeting 2014/08/12

Chairman: Adam
His secretary: Eric

Analysis strategy
(talks postponed during the last meeting)

- **Analysis strategy for single top [Jeremy]**
  https://indico.in2p3.fr/getFile.py/access?contribId=1&resId=0&materialId=slides&confId=10360

  - Processes are sorted by number of leptons and number of jets in the final state.

  - Some processes could be ignored:
    - 0 lepton processes for obvious reason (trigger, large QCD bkg)
      Benjamin's question: what is the MET threshold in trigger @ 13TeV?
      We don't know. Threshold larger than the one used in 8 TeV: 150-200 GeV

    - Low cross-section values. Except for 5 leptons because SM bkg is rare.

  - Jeremy's proposal of list of channels to study is available on the next slide.

Comments:

- *Adam: can we handle H→gamma gamma? Specfic background, depending on Delphes realism → "Try and see".*
- *Eric: tZ with invisible Z needs Z→NuNu background. Some samples will be generated (exclusive prod up to 3 extra jets for the moment).*
- *Jeremy: processes involving gamma will be difficult because generating gamma+jet takes a lot of time.*
- *Adam suggests we should split this sample list in 3 main tasks.*

njet →nlept ↓	0	2	4	6
0		tZ->b+ 2nu (0.1pb) QCD, Zjets		QCD,tt
1	tH(bb)->3b+nu (0.1pb) t->b+nu (0.1pb) tZ->b+3nu (0.01pb) Single top (4pb), tt (160 pb)	tZ->b+nu (0.1pb) Single top (4pb), tt (160 pb)	tH(WW)->b+nu (0.1pb) tH(ZZ)->b+nu (0.1pb) Single top (4pb), tt (160 pb)	
2		tZ->b (0.01pb) tH(WW)->os(ss)+b+nu (0.01pb) tt(32pb),ttV(0.25pb)	**Interesting S/B ?**	
3	tZ->b+nu (0.1pb) tH(WW)->b+3nu (0.01pb) VVjets(6pb), ttV(0.013pb)			
4		VVjets(0.012pb) ttV(10-4)		
5	tH(ZZ)->b+			

- For gqt anomalous couplings :
  - pp->t->l+jets.

- For tZq anomalous couplings:
  - pp->tZ->3leptons,
  - pp->tZ->2leptons,
  - pp->tZ->2neutrinos,

- For tHq anomalous couplings:
  - pp->tH(WW)->same sign dilepton,
  - pp->tH(bb)->l+jets,
  - pp->tH(ZZ)->4l+1b+2j,
  - pp->tH($\gamma\gamma$)->1l+1b+nu,

- For tγq anomalous couplings:
  - pp->tγ->1l+1b+nu,
  - pp->tγ->2j+1b, (issue with QCD background)

- ## **Analysis strategy for ttbar [Kevin]**

  - Processes are sorted by number of leptons, number of photons and number of b-jets in the final state.

  - Some of these processes are already investigated in the CMS framework @ 8 TeV, and results are propagated @ 13 TeV.
    In these studies, anomalous coupling value = current limit.
    We know which process could be promising, which process could be ignored.

Comments:

- *Jeremy: overlap is possible between tt and single top signal. Some extra cut are maybe needed to avoid it. Ex: cut on bb invariant mass for H→bb*
- *Jeremy: we need to keep in mind that more than one coupling could be activated. In this case, how could we disentangle the different contributions? → try to find signatures specific to one kind of coupling.*
- *Jeremy: if we have several couplings values which satisfy several analyses, the limits to these coupling values will satisfy a system of equations. We need to think about it.*
- *Mis-identification of the lepton sign should be implemented in DelphesMA5tune [To do Eric]*
- *Lorenzo: why tZq is negligible with respect to thq for Z,h→b. Suspicious. Please have a second look.*
- *Eric: does the slide 9 suggest to not do an exhaustive study of anomalous coupling in ttbar? → Other processes must be covered. But the list of possible analyses will be shorter than the one devoted to the single top.*

Event categories
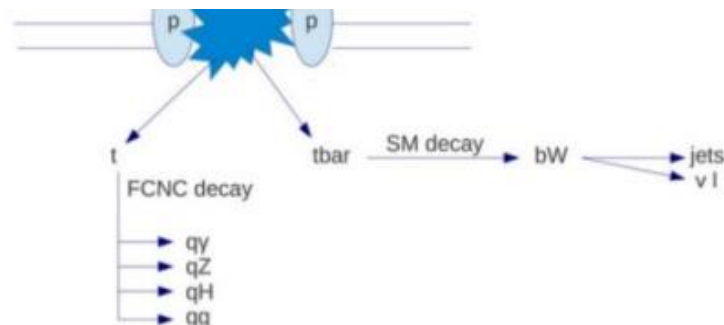
SM top decay	2 γ	γ	3 b-tag
leptonic	t→cH(γ γ)	t→cγ	t→cH(bb)
hadronic	t→cH(γ γ)	t→cγ	t→cH(bb)

SM top decay	0 l	1 l	2 l		3 l	≥4 l
			same sign	opp. sign		
leptonic		t→cH($V_h V_h$) t→cH($T_h T_h$) t→cZ_h t→cg t→cH($W_l W_h$)	t→cH($W_l W_h$) t→cH($T_l T_h$)		t→cH($W_l W_l$) t→cH($Z_l Z_h$) t→cZ_l	t→cH($V_l V_l$)
hadronic	t→cH t→cZ t→cg			t→cH($W_l W_l$) t→cH($Z_l Z_h$) t→cZ_l		t→cH($V_l V_l$)

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- **Jeremy's proposal for next meeting**

    - Take time to digest these information.

    - It is important to come back with suggestion, feedback or advices.
      To be sure that everybody agree with the relevance of these channels.

    - Volunteers for tacking one are several analyses are welcome.

Production

- **Production status @ IIHE**

  - Trouble with tth gridpacks. They are still running.
  - Signal (BSM tt) is ongoing.
    Adam's comment: be careful with MadSpin. Make sure MadSpin computes properly the BR of the BSM top decay.
  - Z$\rightarrow$LL10-50: 4 jets still running. Adam wil have a look on this problem.

- **Production status @ IPHC**

  - Very bad news: gridpacks and files have been deleted by mistake
  - (Re)Generation ongoing.
  - New samples requested by Jeremy (TZ dileptonic&monoleptonic, ZToNuNu) put in the to-do list.
  - New scripts for facilitating the life of analyzer @ Strasbourg. Need of the new hard disk is urgent.
  - *Jeremy: we have the new hard disk and IT people have just to implement it.*
  - *Eric's comment for Jeremy: he was very happy by the validation work of WToLNu. Could Jeremy share his script/files for validating the other exclusive production ?*

- **Computation of cross sections**

    - Computation of LO and NLO cross sections for WToLNu and ZToLL
    - 3 generators to compare: MG5_aMC@NLO, FEWZ and MCFM.

    - Consistent results for WToLNu and ZToLL with no cut on Mll

    - Problems appear if cut on Mll
        - No agreement between MG5_aMC@NLO and FEWZ/MCFM
        - LO cross section computed by FEWZ and MCFM totally off.

How to fix the problem? No clue. Lorenzo is a little bit discouraged.
Asking for help to authors seems the only option.
For the moment, if we need to take a value → choose the MG5_aMC@NLO one.

Eric's request: NLO cross section for ZToNuNu
→ Lorenzo will try to get a number although FEWZ is not designed for it.