



Top Trigger Studies

Marcello Barisonzi

Overview

- ◆ Status of CSC T5 Note
- ◆ DESY contributions to T5
- ◆ Non-physics
- ◆ Conclusions

Status of CSC T5 Note

- ◆ The 1st draft of the CSC Note on Top Trigger (T5) was due on 26/10
- ◆ Deadline met without too many problems
- ◆ Two referees will be appointed soon, probably during Physics & Trigger Week
- ◆ Note to be in final state by end 2007, discussion at CERN next Monday to plan ahead
- ◆ First draft available on CVS (tag = “CSCTrigger-00-01-00”):
<http://atlas-sw.cern.ch/cgi-bin/viewcvs-atlas.cgi/groups/Top/CSCTrigger/>

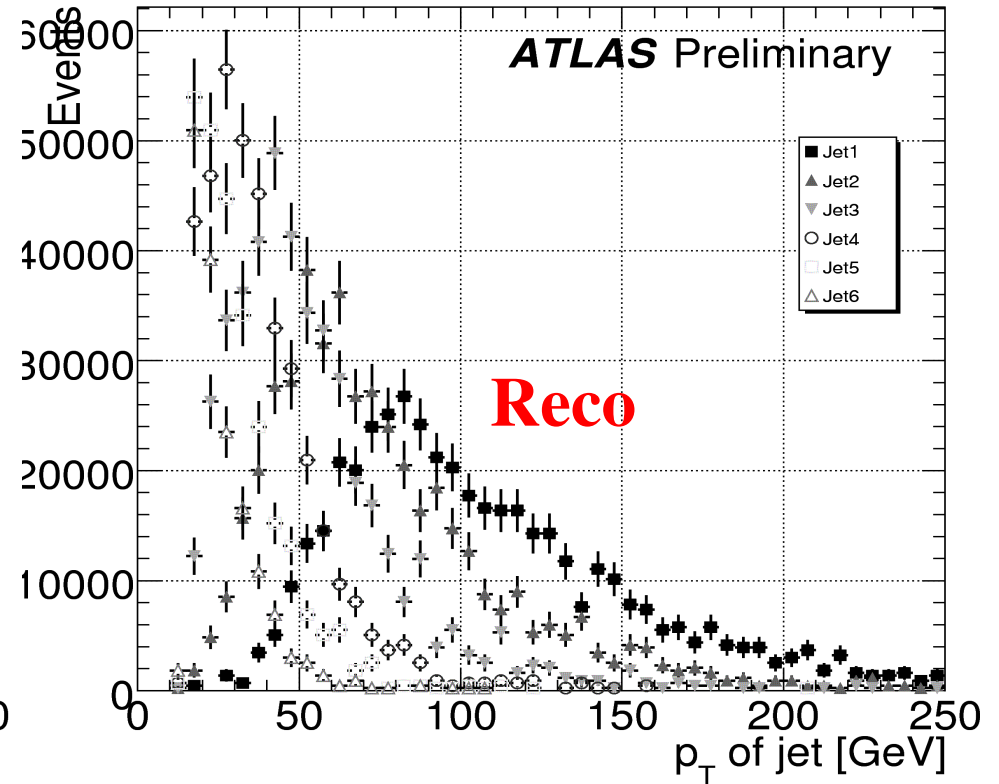
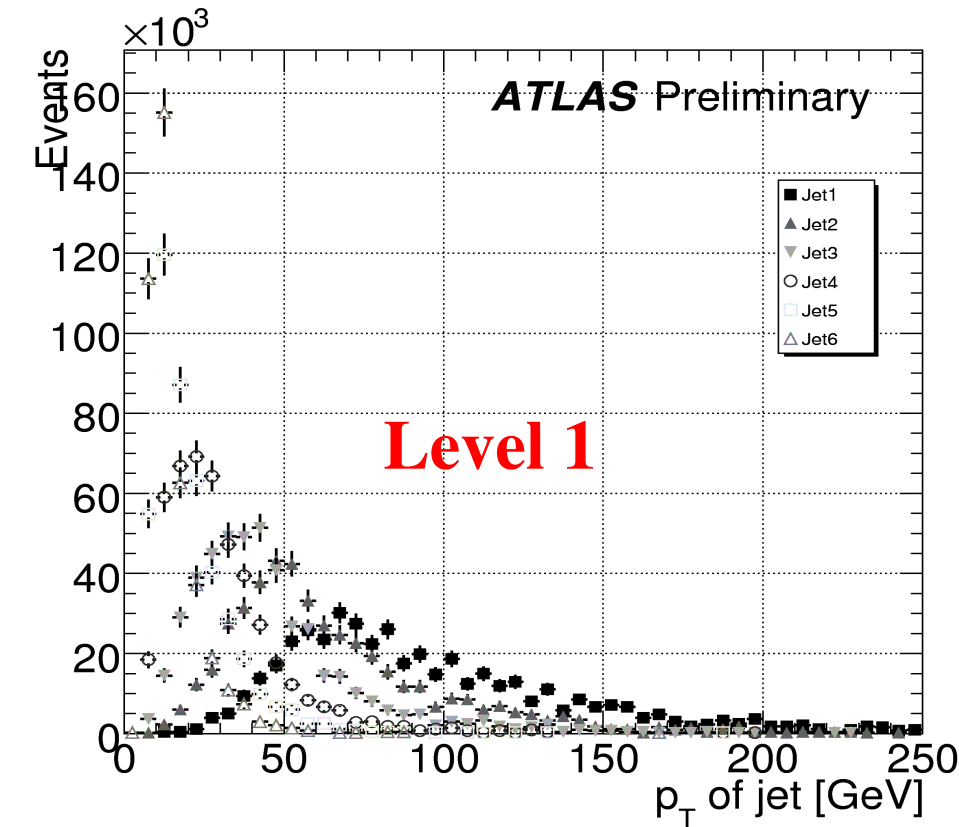
DESY Contributions to T5

- ◆ We contribute to 4 sections:
 - ◆ 2.3 Jet Triggers in ttbar Events
(MB, SM, LW) + D. Berge
 - ◆ 2.4 MissEt and SumEt Triggers in ttbar Events
(MB, OK, CL) + J. Thomas
 - ◆ 3 Monitor Trigger for Top Events
(SM) + D. Berge & J. Thomas
 - ◆ 4.1 Determining the electron trigger efficiency from data and its application to top events
(J. Haller, S. Mättig) + S. Head (not in this presentation)

Jet Triggers in $t\bar{t}$ bar events

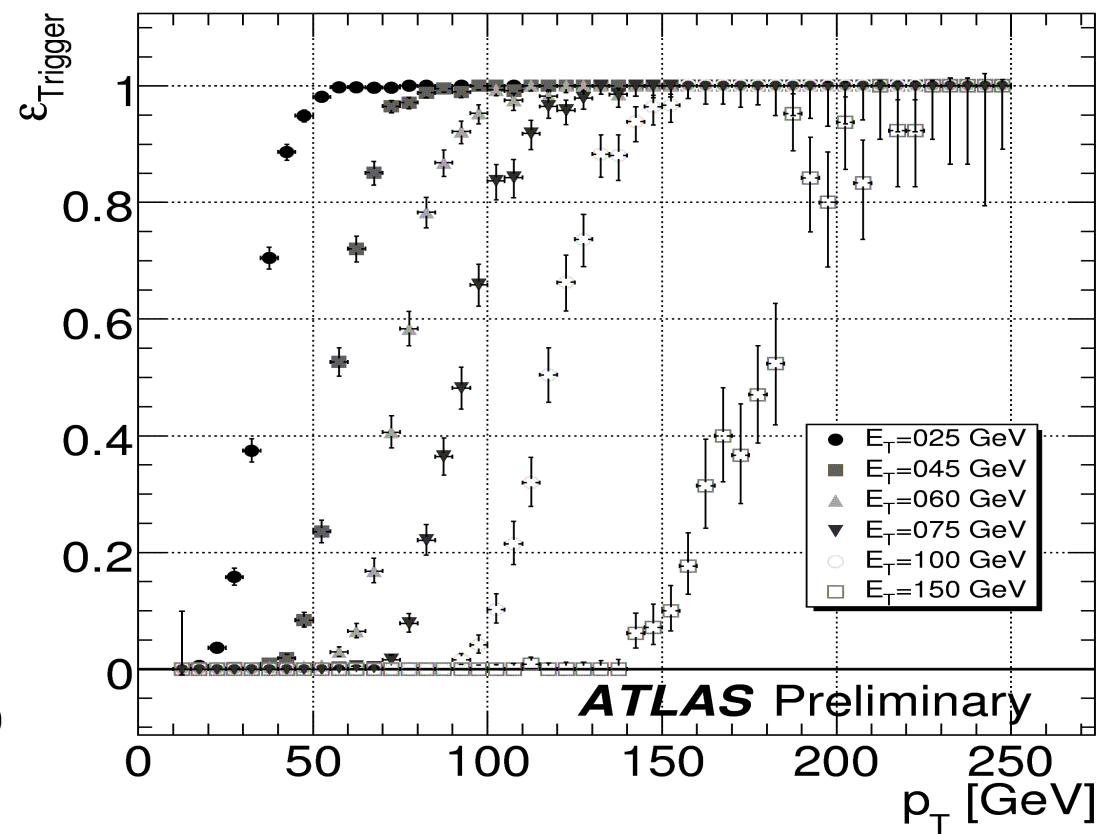
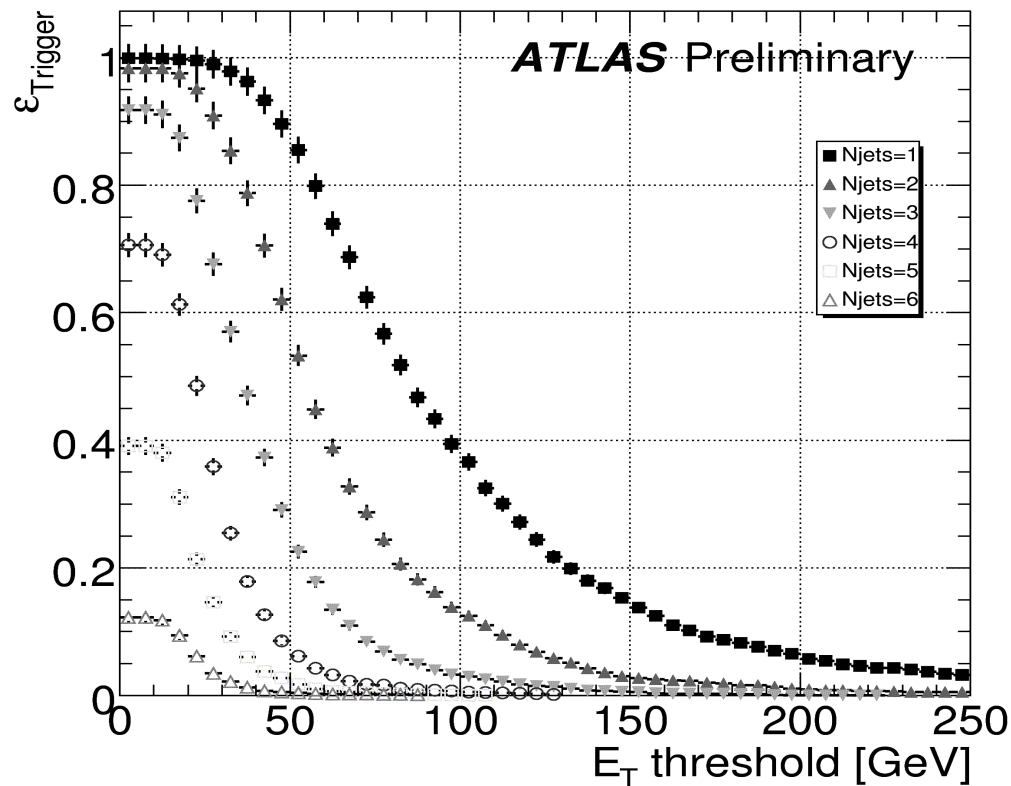
- ◆ Goals: to evaluate single-jet and multi-jet trigger efficiencies and to optimize trigger thresholds for semi-leptonic and all-hadrons $t\bar{t}$ bar decay channels
- ◆ For $t\bar{t}$ bar in the semi-leptonic channel, the trigger is “obvious” (isolated leptons, 3/4 jets, missEt) while for all-hadrons is difficult (large QCD background). See Liv's talk.

Jet p_T Spectrum



- ◆ Spectrum of 6 highest p_T jets per event in semileptonic sample
- ◆ p_T is underestimated in L1 by a few tens of GeV
- ◆ From this spectrum we calculate efficiencies for multijet triggers

Jet Trigger Efficiencies and Turn-On



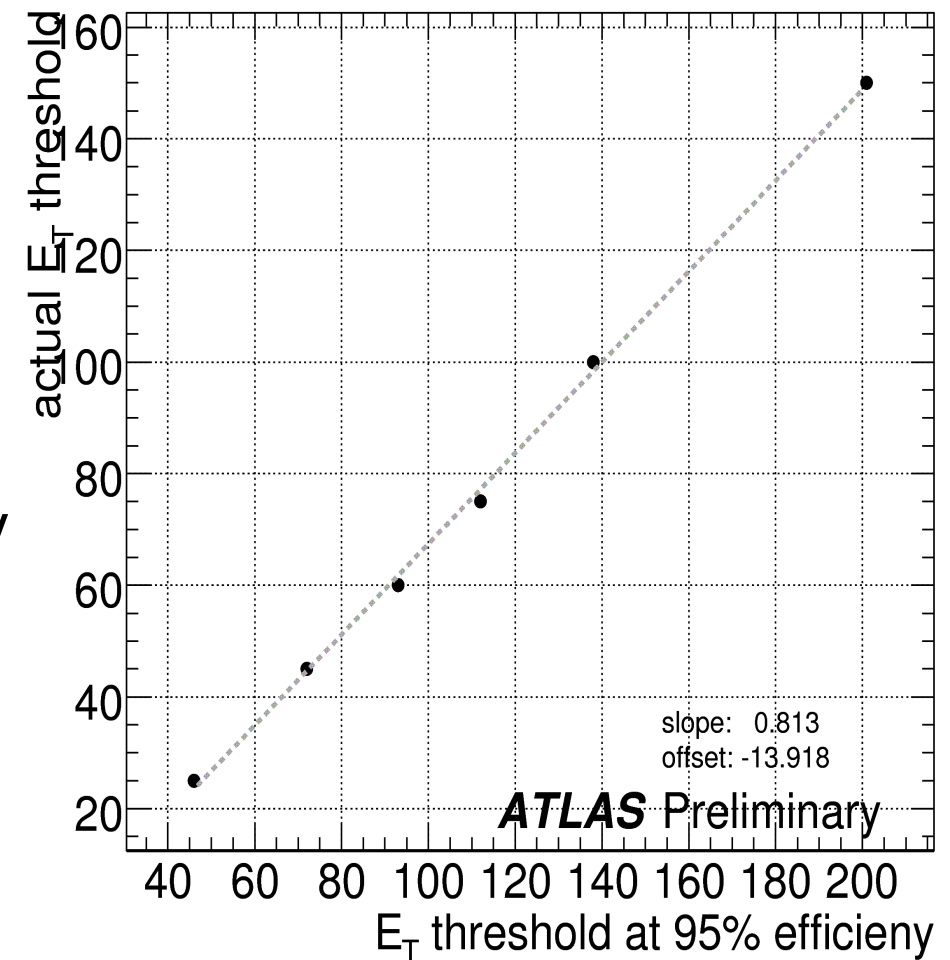
5200

5200

- ◆ Efficiency plot useful to optimize cuts (for example, what do we gain if we loosen the cuts on the 3rd and 4th jets?)

Jet Threshold Parametrization

- ◆ Turn-on curves for different pT thresholds fitted with Fermi-Dirac step function.
- ◆ Fit parameters used to evaluate cutoff point to obtain 95% efficiency at a desired threshold
- ◆ Useful for exploring “homemade” triggers (e.g. 10^{31} menu)



5200

SumEt and MissEt Triggers

- ◆ SumEt and MissEt trigger not unique to the top physics sector
- ◆ As a matter of fact, they can be triggered easily by many other channels!
- ◆ Their purpose here: study if they can be used to increase the acceptance for top physics samples, together with loosened cuts (e.g. isolated leptons with lower thresholds)
- ◆ Rate is very important -> Good background simulation necessary

Sample List

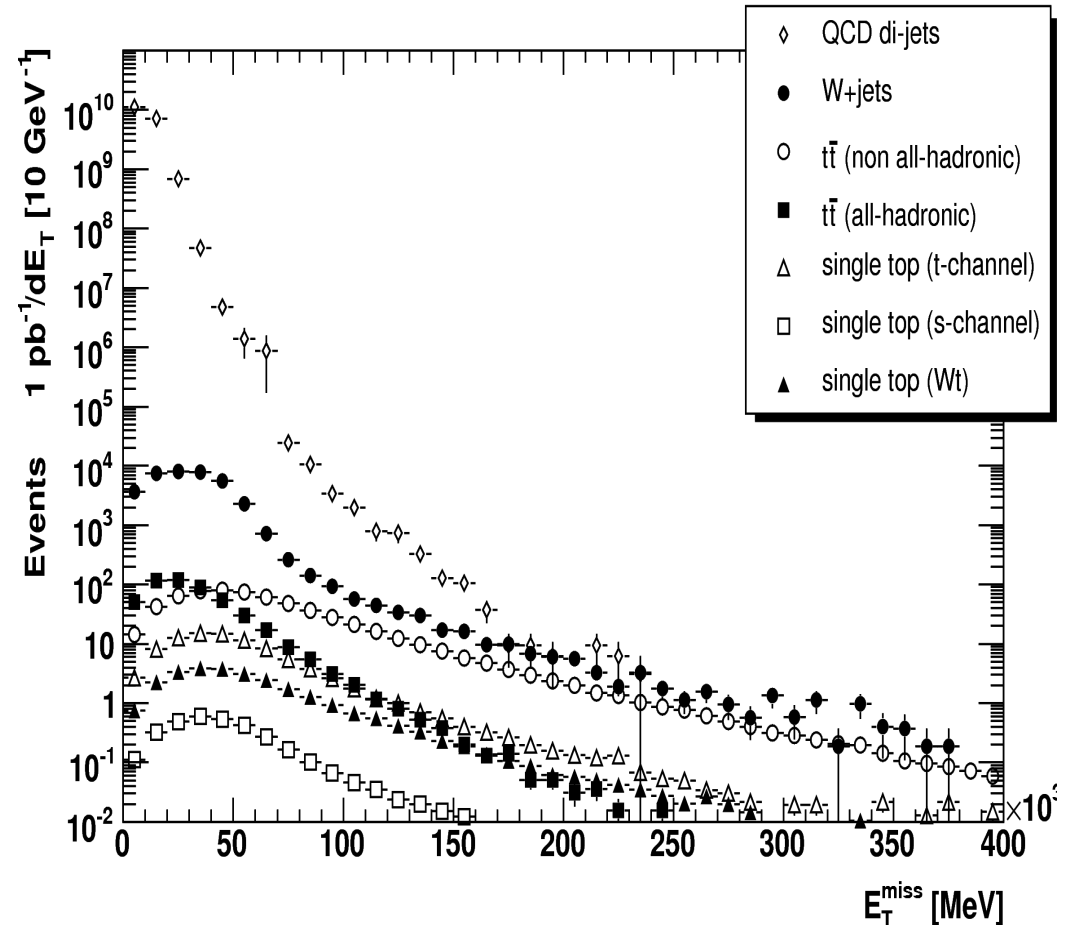
- Missing Et ans SumEt are “worst quality triggers”
- Study of background necessary for fake rates
- However, cross sections vary over several order of magnitudes
- Large scaling factors involved

Table 7: List of TopView Ntuples used in the $\cancel{E}_T$ and ΣE_T trigger studies. Due to computing power constraints and the stochastic nature of the GRID network, the data samples used in this analysis have been generated and reconstructed with varying degrees of success. Therefore, in order to obtain meaningful and realistic $\cancel{E}_T$ and ΣE_T spectra, all the data samples have been rescaled to 1 pb^{-1} .

Ntuple ID	Description	σ (pb)	Int. Lumi (pb^{-1})	Scaling factor
5200	Fully leptonic and semileptonic $t\bar{t}$	461	928	1.07×10^{-3}
5204	Fully hadronic $t\bar{t}$	369	195	5.13×10^{-3}
5500	Single top associated Wt production, semi-leptonic decay	26.7	1811	0.55×10^{-3}
5501	Single top s-channel	3.3	14636	68.3×10^{-6}
5502	Single top t-channel	81.3	468	2.14×10^{-3}
5009	J0 QCD Dijet, 8-17 GeV	17.6×10^9	1.42×10^{-6}	704000
5010	J1 QCD Dijet, 17-35 GeV	1.38×10^9	16.3×10^{-6}	61333
5011	J2 QCD Dijet, 35-70 GeV	93.3×10^6	34.83×10^{-6}	28708
5012	J3 QCD Dijet, 70-140 GeV	5.88×10^6	4.25×10^{-3}	235.2
5013	J4 QCD Dijet, 140-280 GeV	308×10^3	81.2×10^{-3}	12.32
5014	J5 QCD Dijet, 280-560 GeV	12.5×10^3	0.32	3.125
6210	W+0 jets, leptonic W decay	24.61×10^3	0.29	3.39
6211	W+1 jet, leptonic W decay	6.87×10^3	1.42	0.704
6212	W+2 jets, leptonic W decay	2.63×10^3	4.75	0.210
6213	W+3 jets, leptonic W decay	2.295×10^3	5.34	0.187

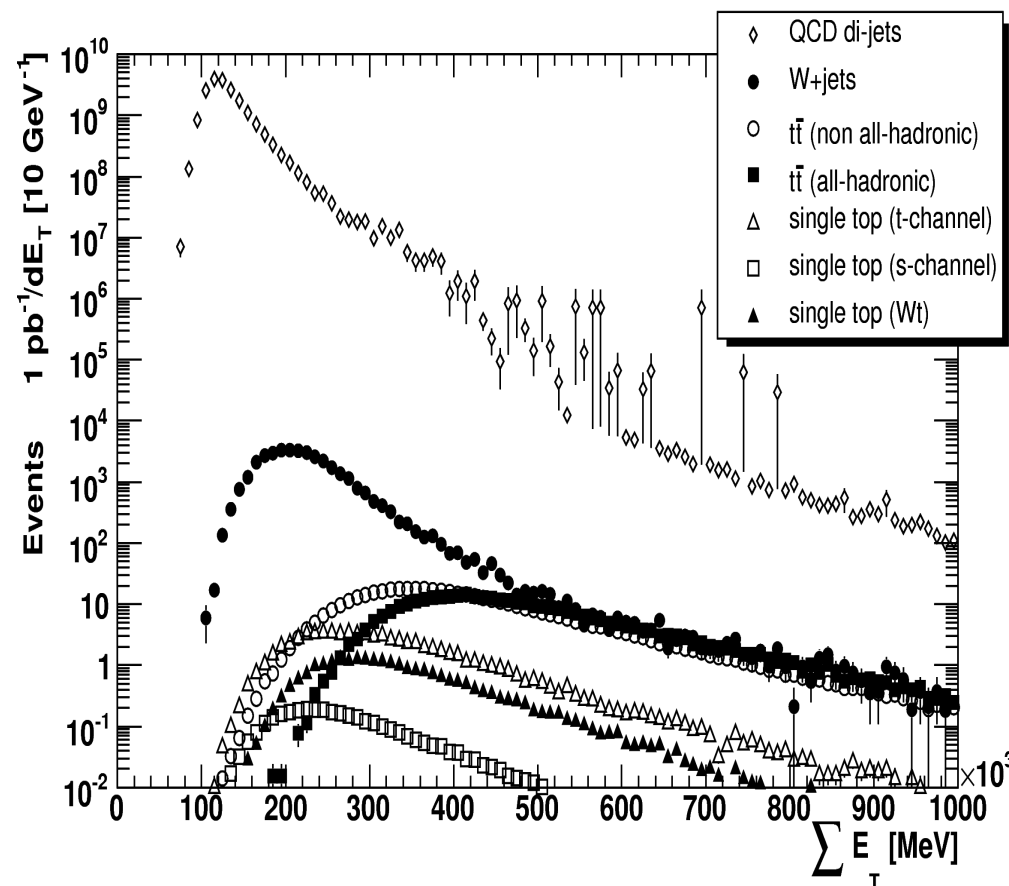
Missing Et Spectra

- ◆ Missing Et can be faked by fluctuations in the energy deposition, even QCD di-jets can produce large missEt!
- ◆ Use of this trigger probably only in conjunction with isolated lepton trigger.



Sum Et Spectra

- QCD di-jet dominates completely
- All SumEt triggers are prescaled, except L1_TE650
- Nothing much we can do with it!



Conclusions

- ♦ Lots of info learned from jet triggers, now it's time for an educated guess
- ♦ SumEt Trigger seems to be useless for Top
- ♦ To be done:
 - ♦ W+jet samples probably will be redone, benefit for background studies
 - ♦ Early trigger studies
 - ♦ Wrap-up of CSC Note
 - ♦ Proposal of top menu