Very preliminary start on the SLT $t\bar{t}$ cross-section analysis

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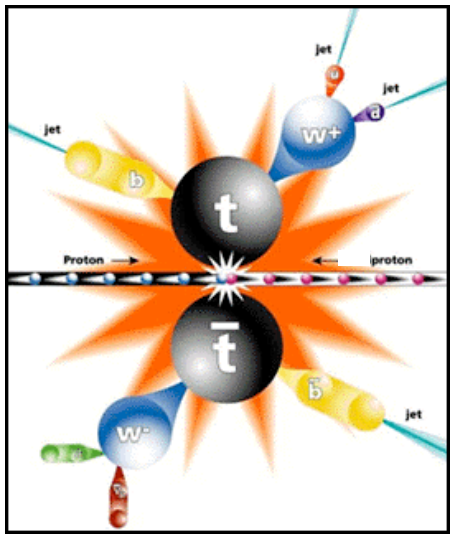
UK Top meeting September 17th 2008

Outline

- Motivation
- Selection
- A few more words on the soft muon



From R. Bailey (Top 2008)

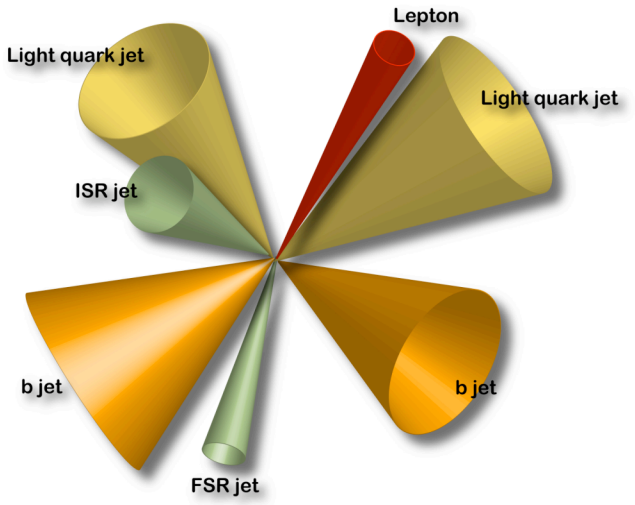
Month	Phase	Days physics	Efficiency factor	Peak luminosity	Delivered luminosity
Jan	Cooldown and Hardware Commissioning and Machine checkout				
Feb					
Mar					
Apr					
May					
June					
Jul					
Aug	Beam Commissioning Physics run				
Sep					
Oct					
Nov		40	0.1	$5\ 10^{31}$	20 pb^{-1}
Dec	Shutdown				
Jan					
Feb					
Mar	Machine checkout				
Apr	75ns Commissioning				
May	Physics run	150	0.2	10^{33}	2.5 fb^{-1}
June					
Jul					
Aug					
Sep					
Oct					
Nov					
Dec					

10 TeV

14 TeV

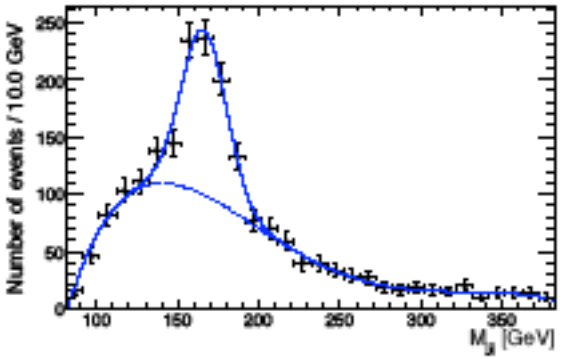
$t\bar{t}$ cross-section in L+J channel

- Realistically 2008-2009 will entirely be commissioning years
- Before we can claim new physics (including in the top sector), imperative to establish SM processes
  - Including Top signal
- Top requires a lot of understanding of the detector
  - Important to push for this to happen with the 10TeV run



$t\bar{t}$ Cross-section in L+J channel

- T6 CSC note
- Best selection:
  - 1 e or μ p_T>20 GeV
  - ME_T > 20 GeV
  - ≥ 4 jets p_T>20 GeV
  - ≥ 3 jets p_T>40 GeV
  - 1 of 3 $|m_{jj}-M_W|$ < 10 GeV



- W+jets:
  - Scale from Z+jets
  - For 100pb-1: 50% uncertainty
  - With 1fb-1: 20%
- QCD: smaller than W+jets…

Electron channel

Sample	default	W const.
$t\bar{t}$	2555	1262
hadronic $t\bar{t}$	11	4
W+jets	761	241
single top	183	67
$Z \to ll$ +jets	115	35
$W\,b\bar{b}$	44	15
$W\,c\bar{c}$	19	6
WW	7	4
WZ	4	1
ZZ	0.5	0.2
Signal	2555	1262
Background	1144	374
S/B	2.2	3.4

Source	Likelihood fit		Counting method (elec)	
	Electron	Muon	Default	W const.
Statistical	10.5	8.0	2.7	3.5
Lepton ID efficiency	1.0	1.0	1.0	1.0
Lepton trigger efficiency	1.0	1.0	1.0	1.0
50% more W+jets	1.0	0.6	14.7	9.5
20% more W+jets	0.3	0.3	5.9	3.8
Jet Energy Scale (5%)	2.3	0.9	13.3	9.7
PDFs	2.5	2.2	2.3	2.5
ISR/FSR	8.9	8.9	10.6	8.9
Shape of fit function	14.0	10.4	-	-

Likelihood method: $\Delta\sigma/\sigma = (7(\text{stat}) \pm 15(\text{syst}) \pm 3(\text{pdf}) \pm 5(\text{lumi}))\%$

Counting method: $\Delta\sigma/\sigma = (3(\text{stat}) \pm 16(\text{syst}) \pm 3(\text{pdf}) \pm 5(\text{lumi}))\%$

Cross-section using Soft muon tag (in collaboration with QMUL)

- B-tagging: not as efficient as using silicon
  - But available from the beginning!
  - Nice orthogonal sample
  - Starting point of other analyses:
    - QMUL: Mass, RHUL: Charge
- Back of the envelopes numbers:
  - 20pb-1 at 10 TeV = 400pb (20pb-1) = 8000 tops
  - Equivalent to 1fb-1 at the Tevatron
  - Tevatron measurement with 2fb-1, scaling to 1fb-1: stat = 18% syst = 10% and lumi = 7%
    - Quite decent measurement!
  - 100pb-1 at 14TeV: equivalent to 10fb-1 at the Tevatron
  - Scaling we get: stat = 6%, syst = 10%
    - Comparable to the other commissioning analysis!

Event Selection not including SLT

	Kerim's Cut Flow	Our Cut Flow
L2_e25	29.39%	29.3%
EF_e25	23.53%	23.5%
1 Elec >20Gev	17.64%	21.7%
Et Miss > 20Gev	15.90%	20.2%
4 Jets >20Gev	8.38%	6.6%
3 Jets >40Gev	5.94%	3.1%

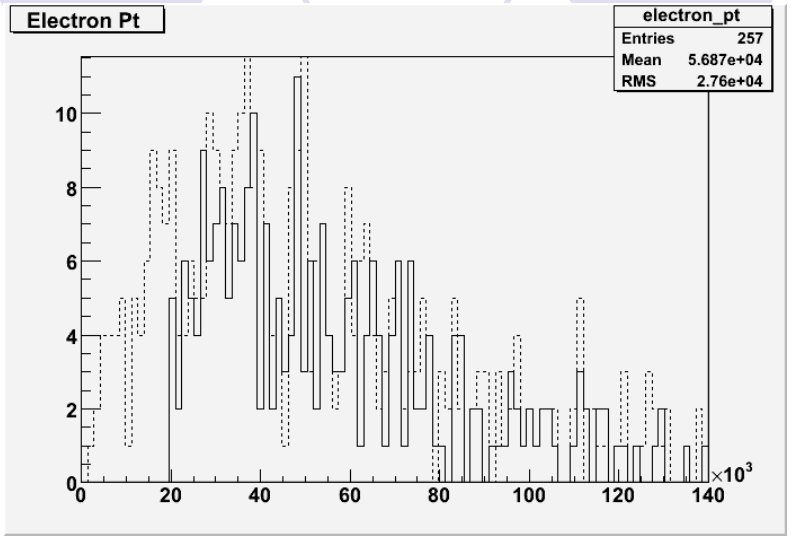
- Using v13 and 5200 sample

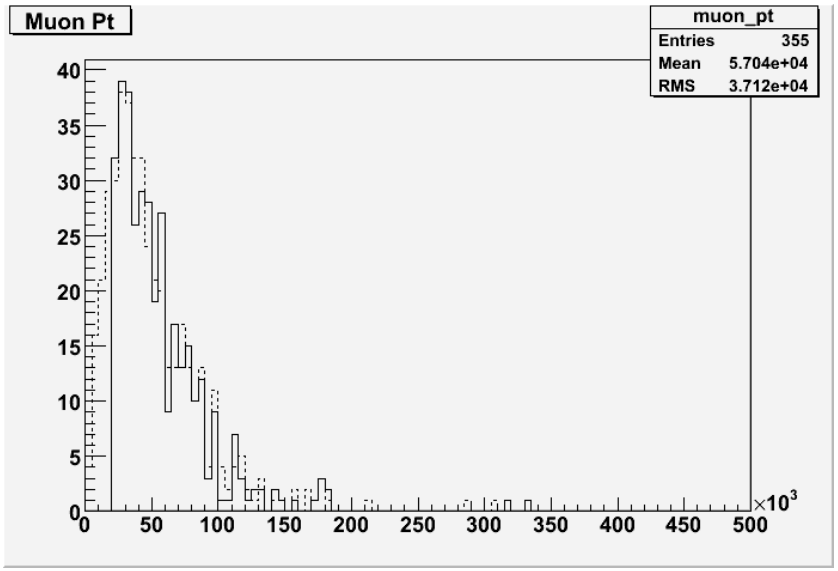
Electron definition

- Author = AuthorElectron || AuthorPhoton
  - AuthorElectron: standard egamma shower seeded reconstructins
  - AuthorSofte: softe (track based) reconstruction
  - AuthorPhoton: from conversion algorithm
- goodPID = egammaPID::ElectronMedium
  - Definition changes according to release!
  - 12 calorimeter requirements + 3 track requirements
- Eta cut: < 2.5 and not in crack region
- P_T> 20GeV/c
- Isolation E_T in cone with half opening angle of 0.2 (etcone20) < 6GeV

Out of 1000 events from 5200 sample

- Electrons:
  - Reco: 257
  - Truth from W: 381
    - With pt and eta cuts: 286 (90%)
- Muons:
  - Reco: 355
    - 30 from W->τ->μ
    - 5 from b
  - Truth from W: 433
    - With pt and eta cuts: 344 (93%)





About the soft muon…

- Very close to having an algorithm which finds all the truth muons coming from b jets
  - Then can get useful information like pt, eta spectrum, etc.

Conclusions

- Short term plans are:
  - get efficiencies using v13 and CSC samples
  - migrate code to v14 and run on FDR2 (BSc project)
  - run on new v14 10 TeV samples
- Medium term plans are:
  - Optimize soft muon selection
  - Background estimates!
  - Systematics
  - Run on data!!
- If you are interested in joining our group, we will have plenty of jobs to go around!
  - Contact us!