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SUSY-Meeting May 26th, 2009

Motivation

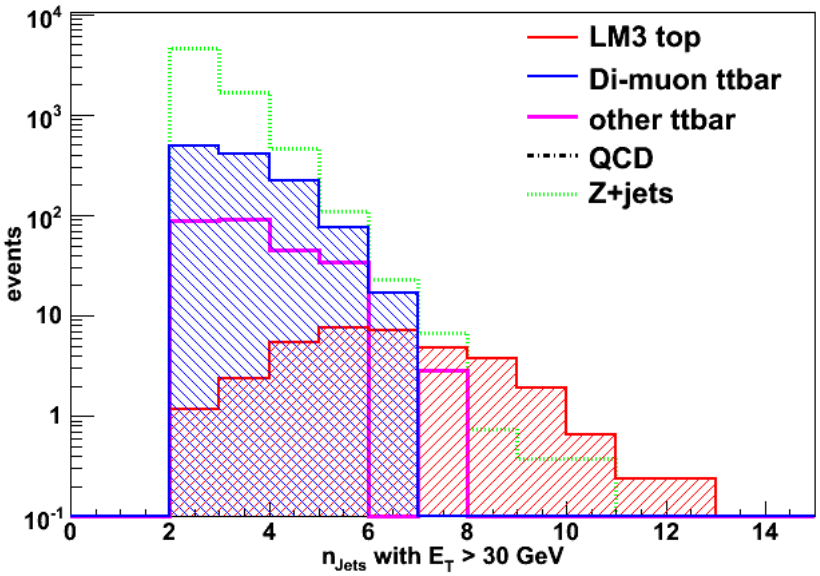
- 'General aim': Model independent Search for new physics in $t\bar{t}$-final-states at CMS

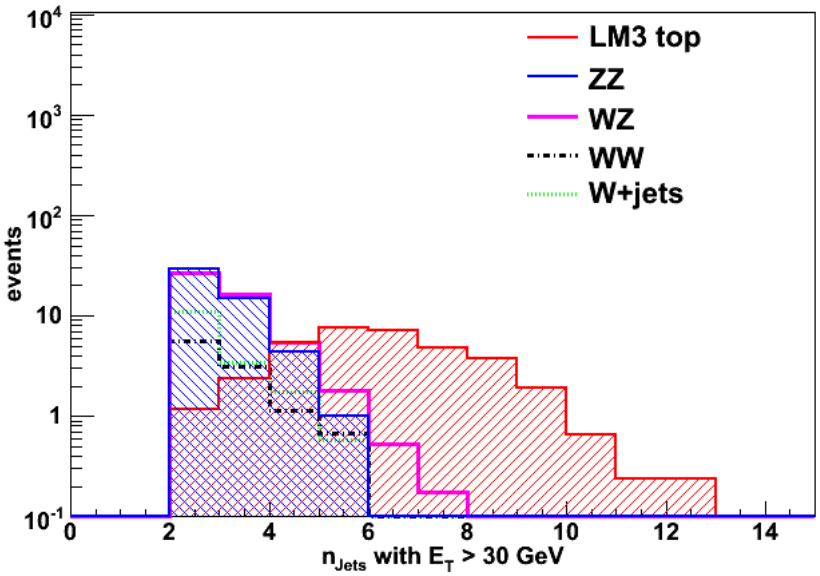
- Perform 'the' standard selection for $t\bar{t}$ in the semi-leptonic μ- and full-leptonic $\mu\mu$-channel
- Search for deviations due to new physics in the distributions of
  - Missing E_T
  - Jet multiplicities
  - ...
  - ... ?

Di-Muon-$t\bar{t}$-decay

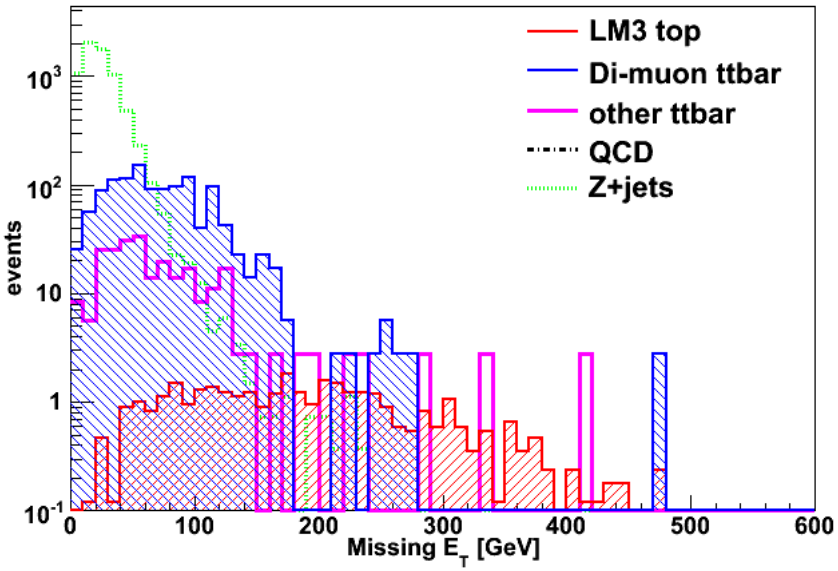
- Samples:
  - SUSY LM3 (with at least one top-quark in the event)
  - Di-muon-$t\bar{t}$
  - Other $t\bar{t}$-background
  - QCD
  - Z+Jets
  - W+jets
  - WW
  - WZ
  - ZZ
- Preselection cuts:
  - $|$ eta(muon) $| < 2.5$ (2 leading muons)
  - pt(muon) > 15GeV (2 leading muons)

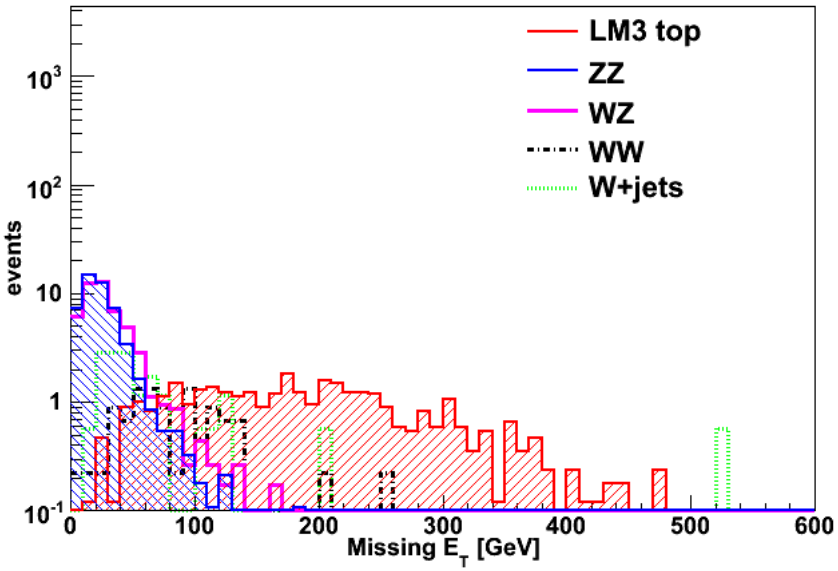
- Selection cuts:
  - $|\ \text{eta(muon1)}\ | < 2.1$
  - $|\ \text{eta(muon2)}\ | < 2.1$
  - $\text{pt(muon1)} > 20$ GeV
  - $\text{pt(muon2)} > 20$ GeV
  - $|\ \text{eta(jet1)}\ | < 2.4$
  - $|\ \text{eta(jet2)}\ | < 2.4$
  - $\text{pt(jet1)} > 40$ GeV
  - $\text{pt(jet2)} > 40$ GeV
  - $(\sum_{tracker} \text{pt} + \sum_{ecal.} \text{pt} + \sum_{hcal.} \text{pt}) \ / \ \text{pt(muon1)} < 0.1$
  - $(\sum_{tracker} \text{pt} + \sum_{ecal.} \text{pt} + \sum_{hcal.} \text{pt}) \ / \ \text{pt(muon2)} < 0.1$





after preselection and selection cuts



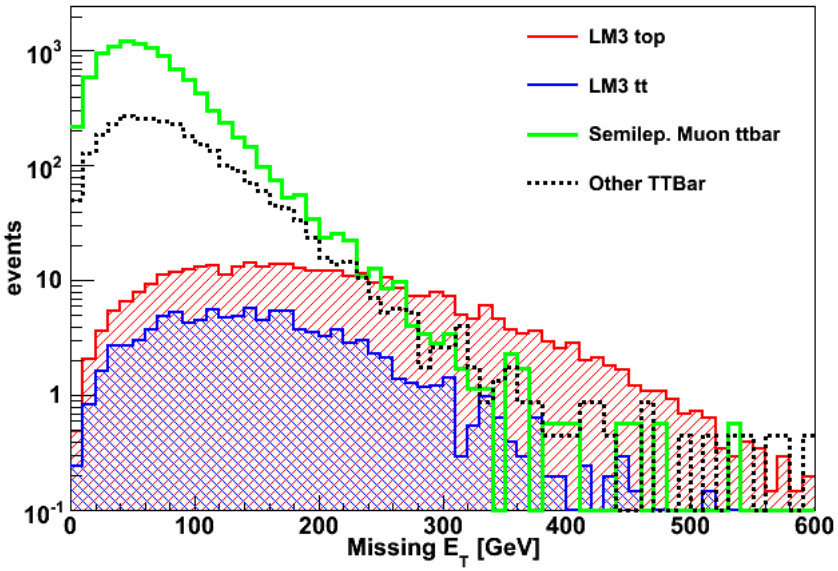


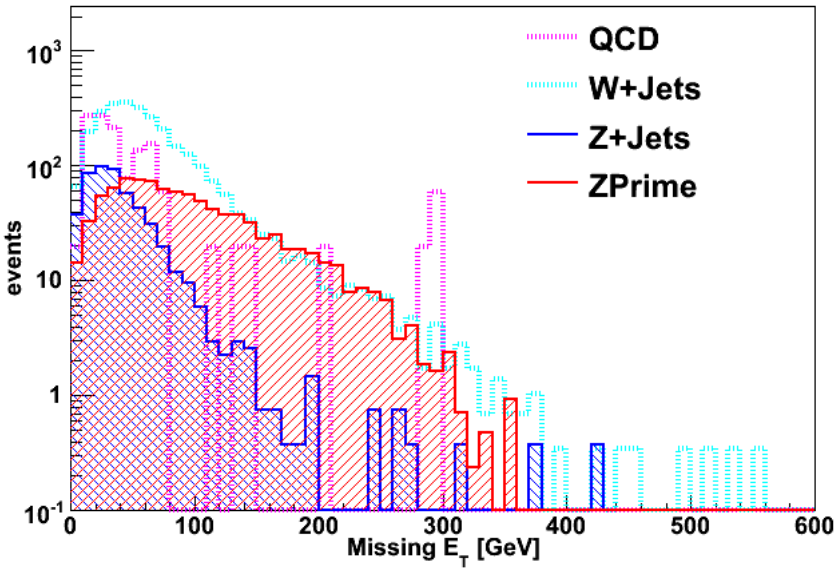
after preselection and selection cuts

Semi-Leptonic-Muon-$t\bar{t}$-decay

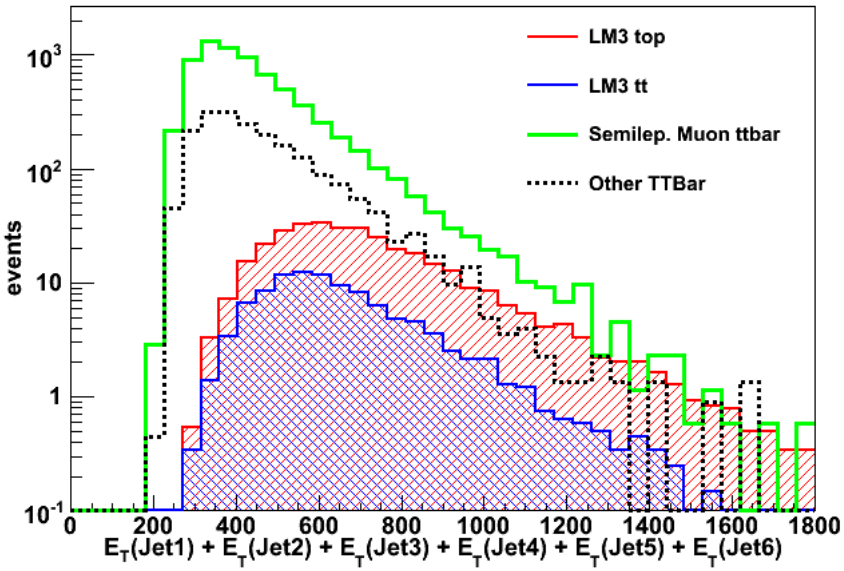
- Samples:
  - SUSY LM3 (with at least one top-quark in the event)
  - SUSY LM3 (with at least two top-quarks in the event)
  - SemiLepMuon-$t\bar{t}$
  - Other $t\bar{t}$-background
  - QCD
  - W+Jets
  - Z+jets
  - ZPrime (m = 750 GeV)
- Preselection cuts:
  - $|$ eta(muon) $|$ < 2.5 (leading muon)
  - pt(muon) > 20GeV (leading muon)
  - $|$ eta(jets) $|$ < 3.0 (4 leading jets)
  - pt(muon) > 5GeV (4 leading jets)

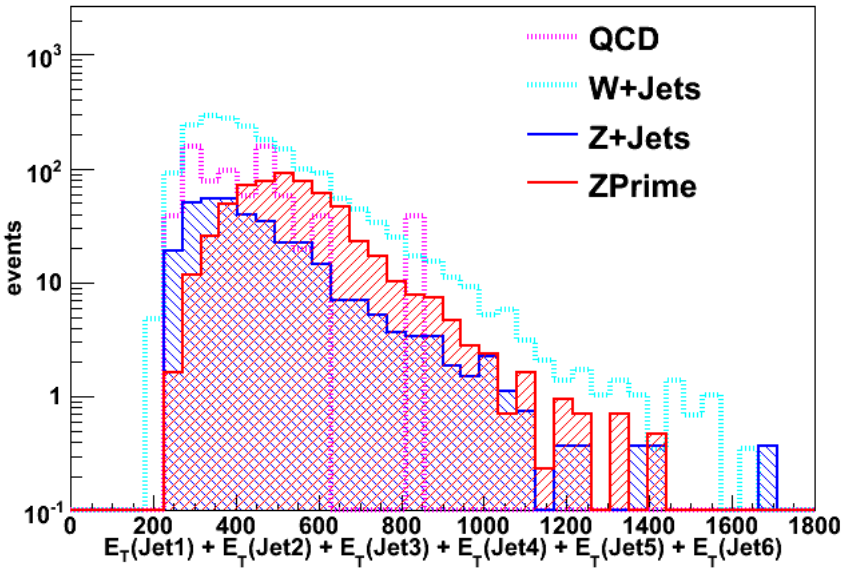
- Selection cuts:
  - $|$ eta(muon1) $|$ < 2.1
  - $|$ eta(jet) $|$ < 2.4 (4 leading jets)
  - pt(jet1) > 30 GeV
  - pt(jet2) > 30 GeV
  - pt(jet3) > 30 GeV
  - pt(jet4) > 30 GeV
  - $\left(\sum_{tracker} \text{pt} + \sum_{ecal.} \text{pt} + \sum_{hcal.} \text{pt} \right) / \text{pt(muon1)} < 0.1$





after preselection and selection cuts



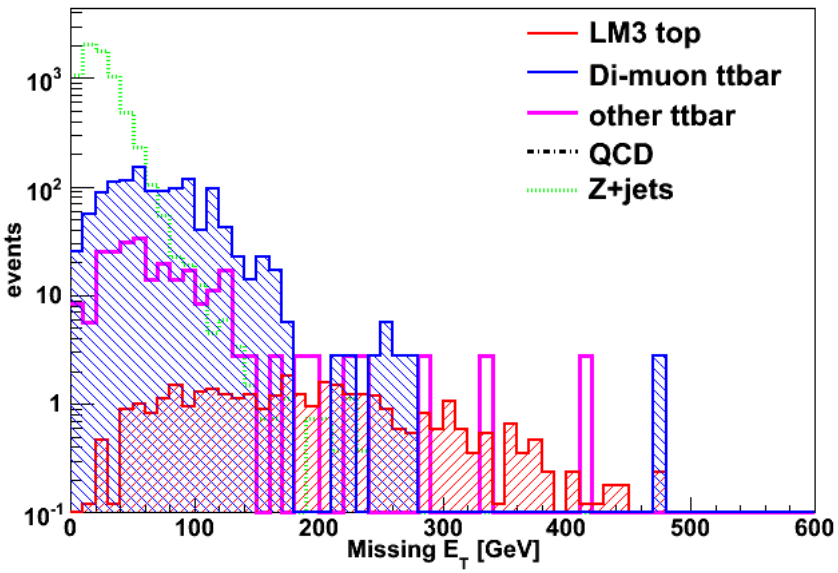


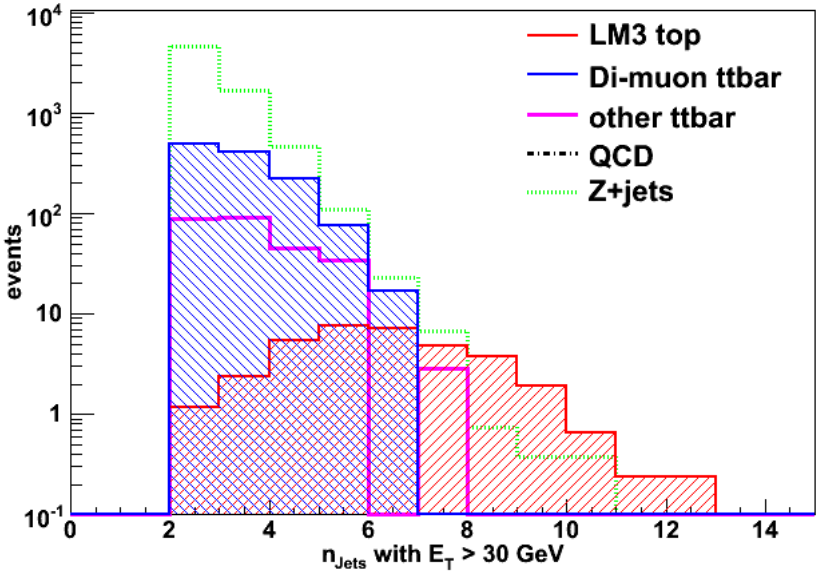
after preselection and selection cuts

Outlook

Plans for next weeks/ months:

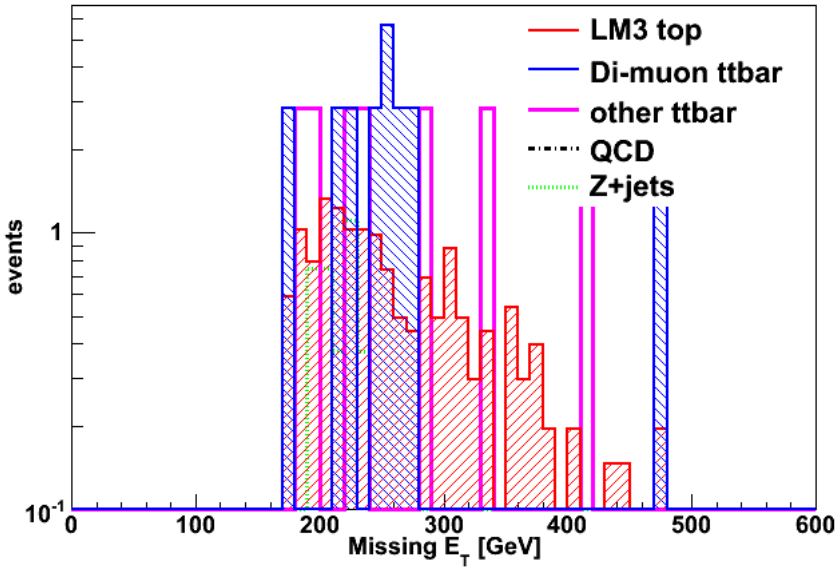
- Use b-tagging
- Cut on invariant di-muon mass
- Do reconstruction of the $t\bar{t}$-system and consider the distributions of
  - the invariant mass
  - Δ-ϕ between t and $\bar{t}$
  - ...
- Perform further cuts, i.e. on Missing E_T ???

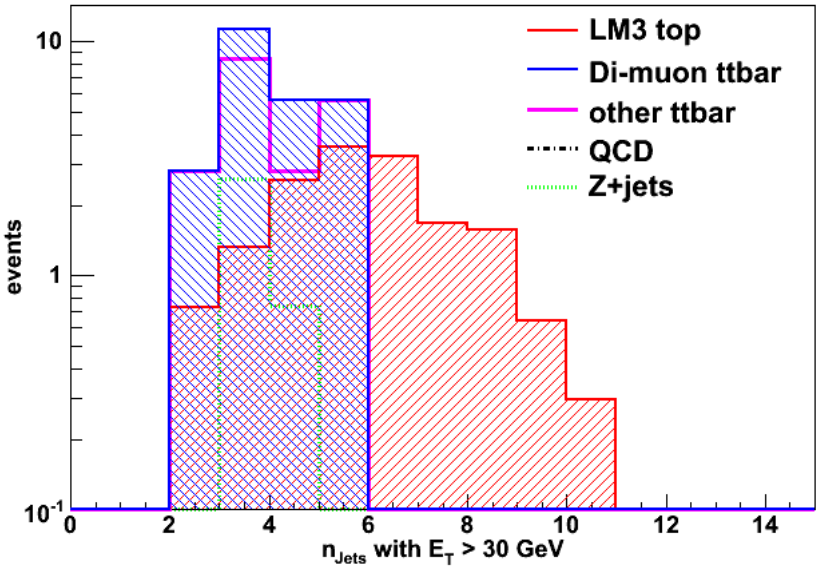




Next cut:

- Missing $E_T > 175$ GeV





Cut:

- Missing $E_T > 175$ GeV