Supersymmetry at the Terascale Group Overview

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“Helmholtz-Hochschul-Nachwuchsgruppe“ at DESY
in Co-operation with the Hamburg University (5 years)

Group activities

Participation in Reference Analyses (with one and two leptons)

- Dirk Krücker

Participation in SUSY CAF team (prompt physics validation):

- Hannes Schettler
- https://twiki.cern.ch/twiki/bin/view/CMS/SusyPVT

First look into 900 GeV data:

- Isabell (& Dirk)

Important steps

Data analysis contains:

- Jet calibration (will mainly *use* given calibration in PAT)
- Missing energy
  - first step: try to understand missing energy in first data
  - currently no manpower to contribute to MET issues, just follow up work presented in MET meetings
- Leptons
  - muons seem to be looked at by everybody in the SUSY group ☛ we'll have a closer look at electrons

Co-operation with the Hamburg University

Investigation of different methods of data driven background determination

Code validation by comparison to reference analyses

Ntupler (Dirk)

CMS root files (even PAT) are not intuitive:

- participating in the development of a common ntuple framework for analysis and as tool for the SUSY Prompt Validation and Physics
- Simple, flat ntuple for fast testing, analysing
- Fast start for new students (summer students, diploma students,...)

1st Approach for Ntupler (Dirk)

Configurable analysis in cooperation with UCSB, Bristol and Imperial College

- Config. Ana.: TWIKI WorkBookConfigurableAnalysis#n_n_Configurable_Analysis
- The ConfigurableAnalysis allows to perform the simple task of selecting events, monitor control distribution during selection.
- The usage is quite simple and the user should not have to write any code
- Analysis selection defined by configuration file not much coding

☛ Large number of already produced root files

SUSY analysis for SS dileptons (Dirk)

All numbers for 100 pb^{-1} and LM0

	20GeV Muons			20GeV Electrons			
	all	noMET	neither Jet&MET	all	noMET	neither Jet&MET	
UCSB	3.492	6.623	-	1.385	2.529		
KIT	3.256	-	-	-	-		
Cornell	-	-	-	1.465	2.551	<----------	+
DESY v2	3.673	6.724	10.283	1.356	2.486	3.842	|
DESY v5 SC5	3.690	6.621	10.094	1.465	2.551	4.613	<-+

Cuts reference analysis: RA5 SS
- 3 jets > 50 GeV
- MET > 100
- 2 muons/electrons

- Differences due to different code versions and statistics
- Identical results where samples and code versions agree

2nd Approach (Dirk)

- Unfortunately the SUSY CAF team decided for a different approach
  - Existing code for 1st approach not for latest CMSSW version
  - Better support for needed adaptation e.g Trigger
- Ntupler developed in Aachen, Niklas Mohr et al.
- Work started to switch to this frame work
- Hannes has started to define control histograms using this ntupler

900 GeV – coming soon...

Will look at simple distributions:

- Charged particle multiplicities
- Eta/phi distributions
- Muons
- Dimuon mass (certainly limited in statistics, e.g. 10 J/Ψ for $1nb^{-1}$)
- MET variables

BACKUP

SUSY Analyses

Jets + E_T^{miss} + 2 (same-sign) muons/electrons

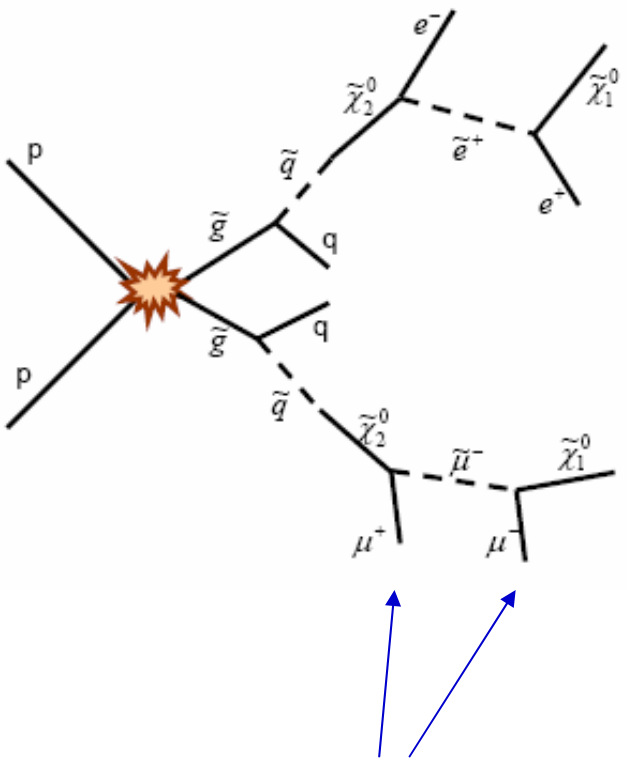
- Trigger quite simple (for muons)
- Small QCD background: mainly ttbar events, W+jets, charge reconstruction misidentification (e)

Jets + E_T^{miss} + 1 muon/electron

- Relative clean signature due to lepton
- Trigger quite simple (for muons)
- Background: ttbar events, W+jets, QCD multijet events

Jets + E_T^{miss} + 2 (odd-sign) muons/electrons

- Characteristic invariant mass distribution of the two muons



RA 5 SS Cuts

- Mu type GlobalMuonPromptTight
- p_T ≥ 20 GeV
- abs(eta) ≤ 2.1
- Rel. Isolation < 0.1
- abs(d_0) Tracker fit, beam corr. < 0.2 cm

- # valid hits in tracker fit ≥ 11
- HCal E < 6
- ECal E < 4