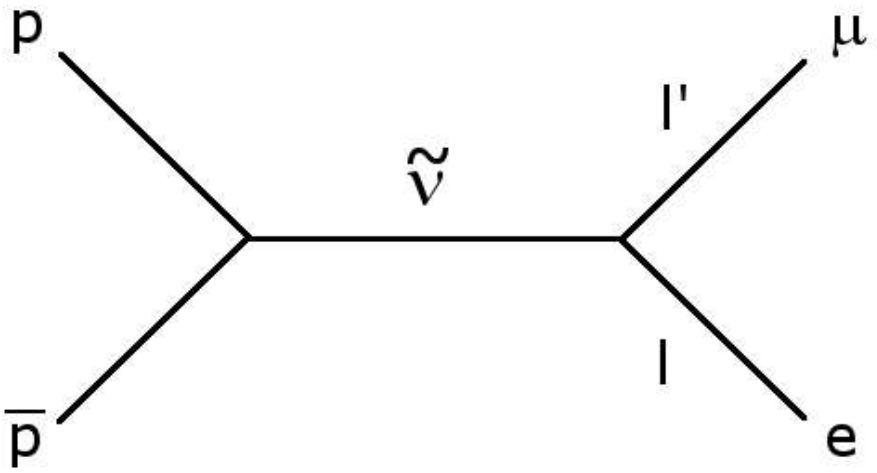
Update on RPV Sneutrino Decay

Kristian Hahn, Peter Wittich, Nigel Lockyer
University of Pennsylvania

11.16.04

Reminder



- Process specifics
  - RPV production & decay
  - Final State: High P_T muon & electron
- H_0 substituted for sneutrino in Pythia
- Main BG's: DY$\rightarrow\tau\tau$,WW,top,fakes

Event Selection

- Require >= 1 each “standard” electron, muon
  - Electrons: CEM
  - Muons: CMUP, CMU, CMP, CMX
- No missing E_T or jet requirements
- Vertex $\Delta Z < 5cm$
- Opposite Charge

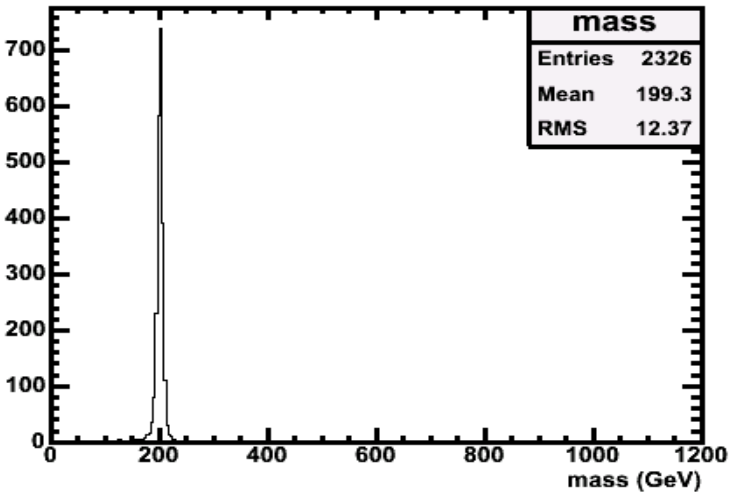
Standard EWK/top Cuts

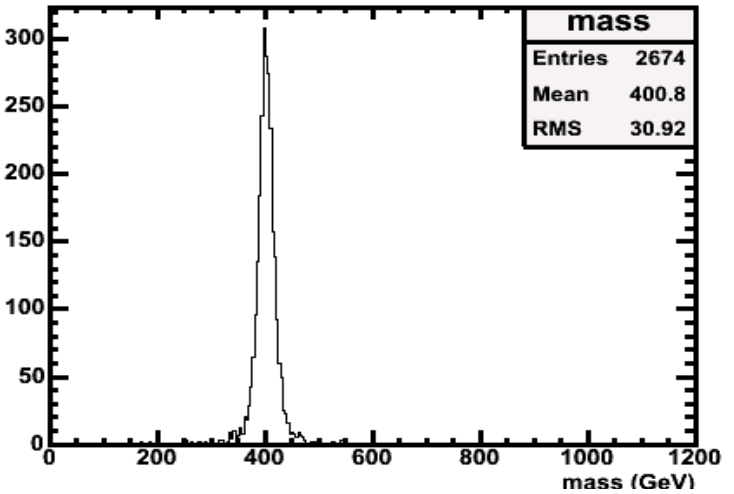
- electrons
  - **E_T >= 20 (25)**
  - **Axial Hits >= 3**
  - **Stereo Hits >= 3**
  - **P_T >= 10 (13)**
  - **Had/EM <= 0.055-(0.0045*E)**
  - **E/P <= 4 || P_T >= 50**
  - **Z_0 <= 60**
  - **ΔZ <= 5**
  - **-3.0 <= Q*ΔX <= 1.5**
  - **Lshr <= 0.2**
  - **Strip χ^2 <= 10**
- muons
  - **P_T >= 20**
  - **Had <= max(6,6+0.0280*P-100)**
  - **EM <= max(2,2+0.0115*P-100)**
  - **Z_0 <= 60**
  - **Axial Hits >= 3**
  - **Stereo Hits >= 3**
  - **abs(D_0) <= .20,TrkSiHits==0 || abs(D_0) <= .02, TrkSiHits!=0 (no Si reqs.)**

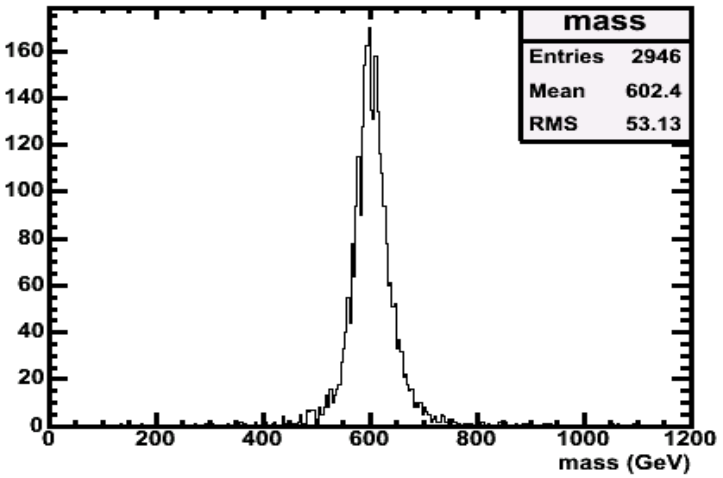
Since Last Time ...

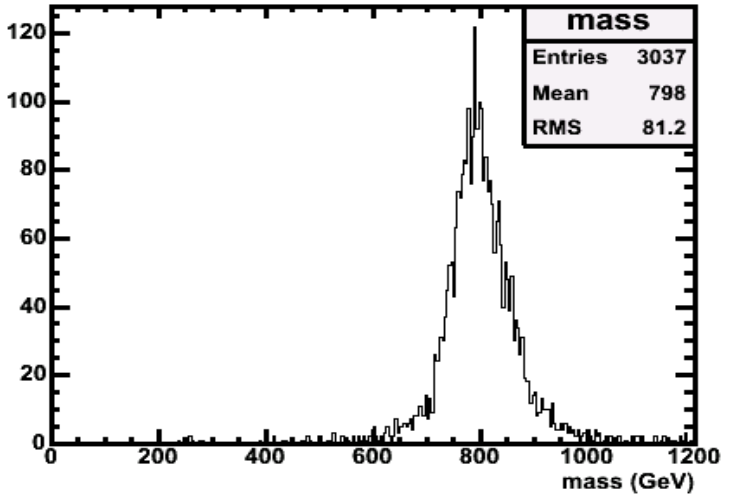
- Moved to 5.3.3
  - Generation/production (earlier version: 4.9.1hpt3)
  - TopNtuple (earlier version: 4.11.2)
  - All MC's regenerated
    - Changing random seeds resolved decreasing signal acc.
- Remaining BG's
  - Didn't consider WZ & ZZ earlier, now have acceptances
  - Haven't yet accounted for fakes ...
- Control Regions
  - $Z \rightarrow ee$ is on the right track
  - Still working on $Z \rightarrow \mu\mu$

Signal MC Dimass







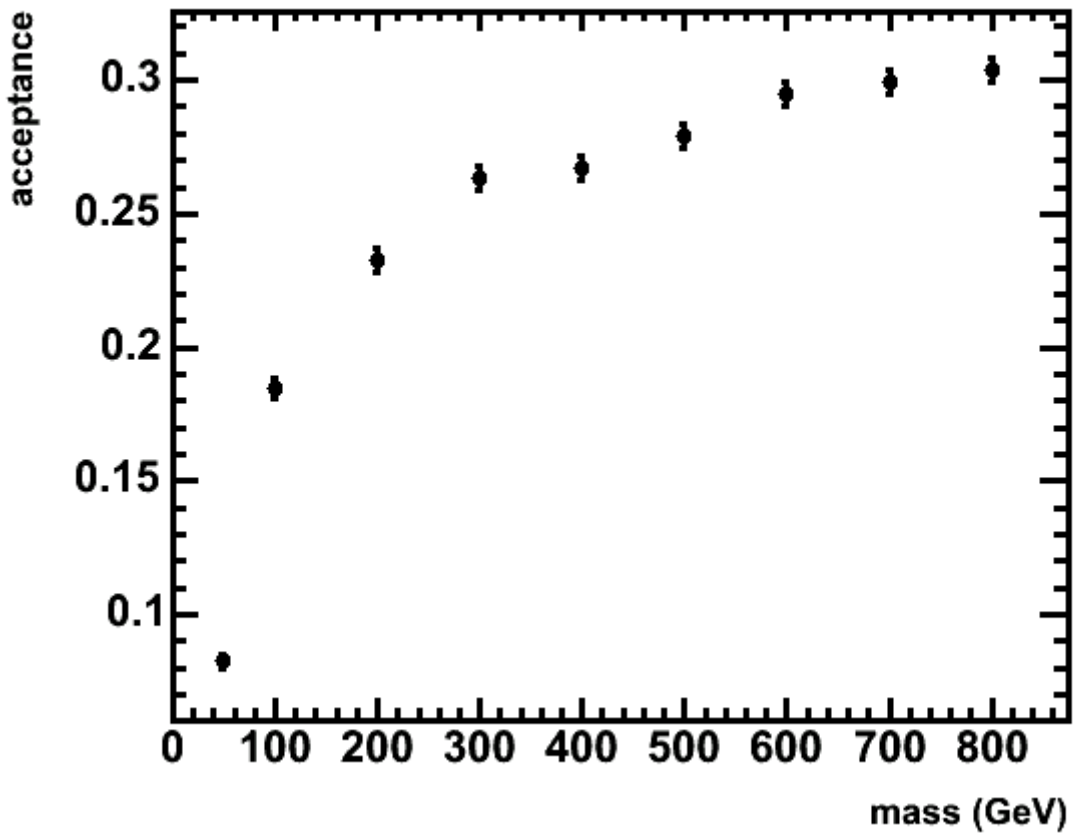


- Generate at 50,100-800Gev (10K events each)
- Force H to decay to eμ, ignoring spin correlations
- Mass distrib. broadens due to degrading resolution at highpt

Signal MC Acceptance

Mass (GeV)	v-4.11.2 (%)	v-5.3.3 (%)
50	8.3	08.6 ±0.28
100	18.7	18.5 ±0.39
200	22.2	23.4 ±0.42
300	26.3	26.2 ±0.44
400	28.7	26.7 ±0.44
500	29.1	27.9 ±0.45
600	27.9	29.5 ±0.46
700	32	30.1 ±0.46
800	31.5	30.5 ±0.46

Signal MC Acceptance



Background Acceptance

Channel	v-4.11.2 (%)	v-5.3.3 (%)
DY	0.39	0.37 ±0.08
WW	3.12	2.92 ±0.08
Top	0.45	0.42 ±0.01
WZ	N/A	3.89 ±0.20
ZZ	N/A	4.37 ±0.32

Background Acceptance

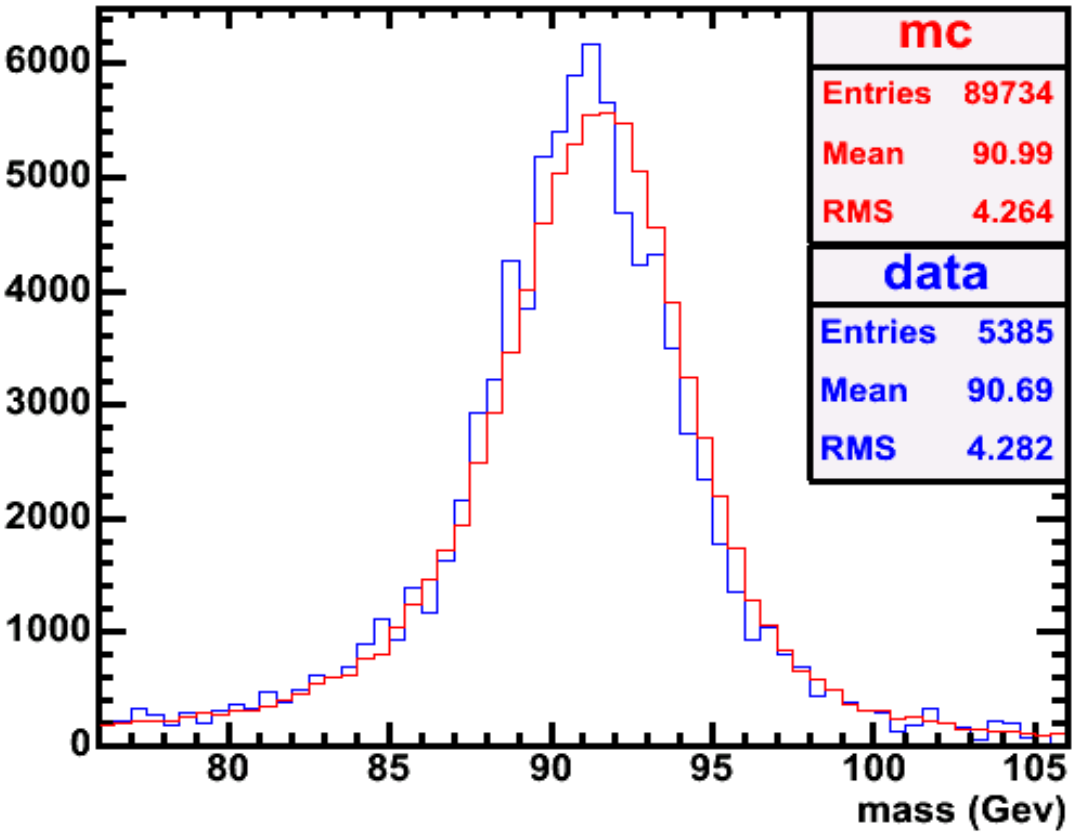
Channel	v-4.11.2 (%)	v-5.3.3 (%)
DY	0.39	0.37 ±0.08
WW	3.12	2.92 ±0.08
Top	0.45	0.42 ±0.01
WZ	N/A	3.89 ±0.20
ZZ	N/A	4.37 ±0.32

- DY & Top : Pythia, ~1M events
- Diboson : ALPGEN, ~400K events

Control Regions

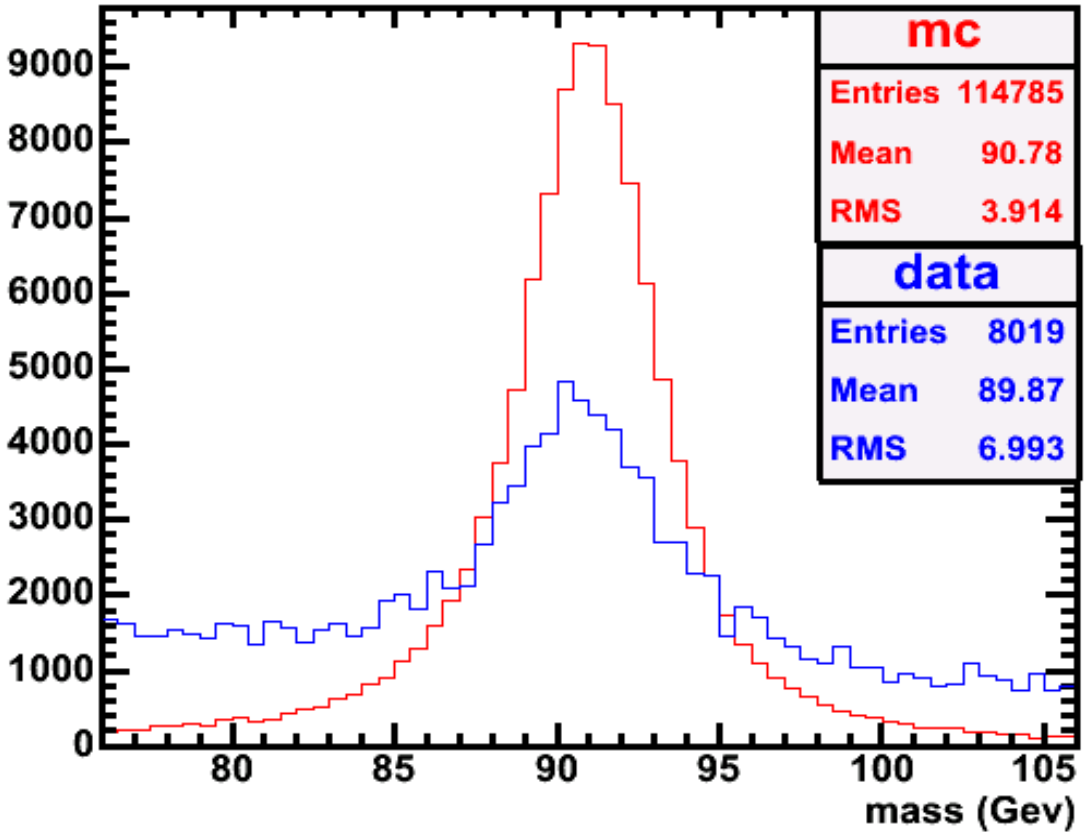
- Tests lepton ID, cut efficiencies, lumi estimates, etc.
- Selection
  - Apply the usual individual lepton cuts
  - Apply usual ΔZ<5cm & oppQ
  - Require either 2 e's or 2 μ's
  - 76< mass < 106
- Acceptance
  - Measure in DY Monte Carlo
  - Cut at 66< HEPG dimass <116 to remove continuum contribution
- Data
  - Apply DQM-v4 good run list to inclusive lepton dataset

Control Regions - Z→ee



- σ*BR : 225 ± 12 pb (vs. 252, haven't applied scale factors)
- MC: DY→ee, HEPG Zmass>30GeV
- Data: highpt inclusive electron (CEM18). 201pb

Control Regions - $Z \rightarrow \mu\mu$



- σ*BR : 380 pb , apparently something's wrong ...
- MC : DY$\rightarrow\mu\mu$, HEPG Zmass>30GeV
- Data: inclusive highpt muon, (CMUP18 or CMX18) 198pb
- BG due to CMU,CMP?

Near Term Goals

- Control Regions
  - Understand $Z \rightarrow \mu\mu$
    - Double check MC
  - Find other regions to test, away from our signal region
    - $DY \rightarrow \tau\tau \rightarrow e\mu$ @ low invariant mass
    - $WW \rightarrow$ ee or $\mu\mu$ @ high missing E_T
- Fakes
  - Measure fake rate in di-jet sample
  - Apply to lepton+jet sample
    - estimate expected # fakes
  - track or jet based ... haven't yet decided