

DESY CMS

Physics Program

Work in Progress

PRC closed session
October 2010





Physics Program



■ QCD / Forward Physics

- Multiparton Interactions / UE
- QCD at small x
- Forward energy flow (Preliminary for ICHEP)
- Hadron-level corrections

■ Higgs

- MSSM Higgs Searches: $H(A) \rightarrow \tau\tau \rightarrow \mu\mu$ (advanced), $H(A) \rightarrow bb$ (starting)
- $Z \rightarrow \tau\tau \rightarrow \mu\mu$ study as a commissioning phase of the MSSM Higgs analysis $H(A) \rightarrow \tau\tau \rightarrow \mu\mu$
- B-tagging calibration with top pair production events (input for MSSM $H(A) \rightarrow bb$ analysis)
- Investigation of strange resonance production in pp collisions (spin-off of tracking performance studies, preliminary for ICHEP)

■ Susy

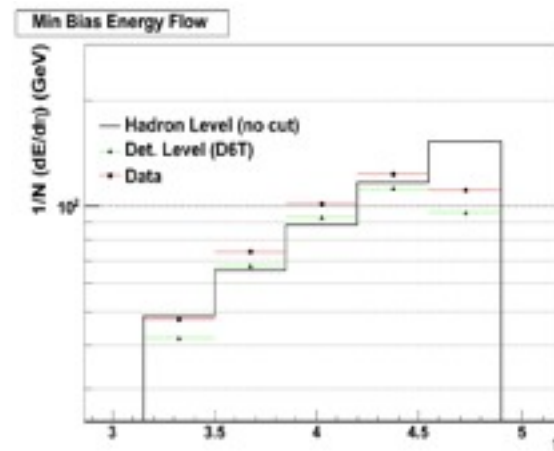
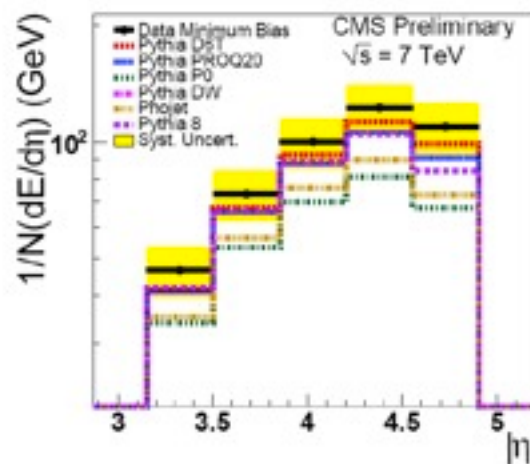
- Single lepton analyses with μ (advanced) and e (starting), contributing to cross checks of reference analysis in preparation of publication
- Two lepton analysis with μ and e (same sign and opposite sign)

■ Top Quarks

- Cross section measurement in the di-lepton channels $t\bar{t} \rightarrow 2W2b \rightarrow \mu\mu 2b$ and $\mu e 2b$ (advanced)
- bbZ production (with EWK, starting)
- Top quark mass determination (starting)

Forward energy flow

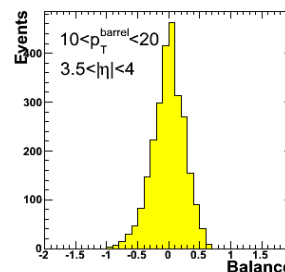
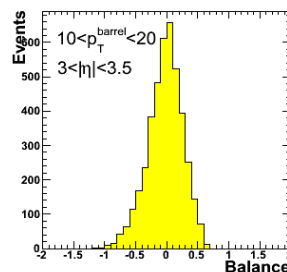
- measurement of energy flow (ICHEP preliminary)
- now study hadron level corrections, tune MC to better description of this newly measured kinematic regime



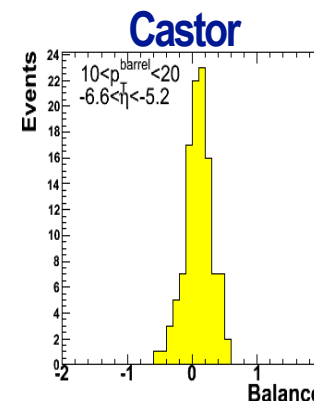
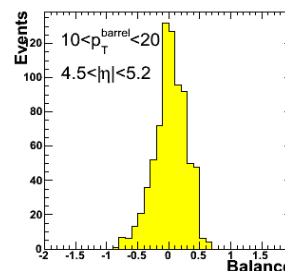
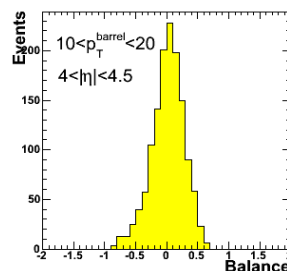
HF

Calibration of Castor

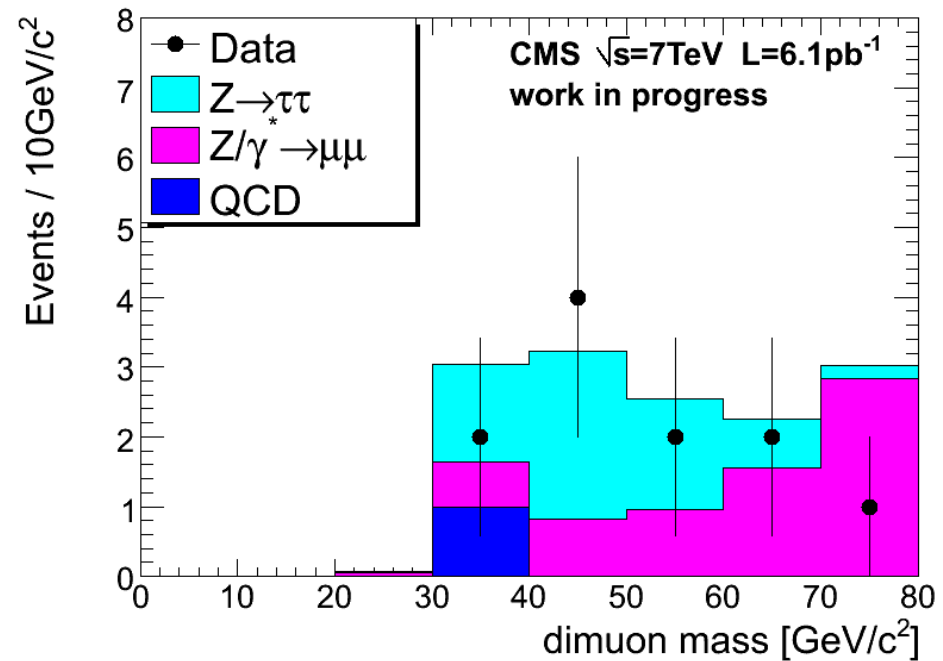
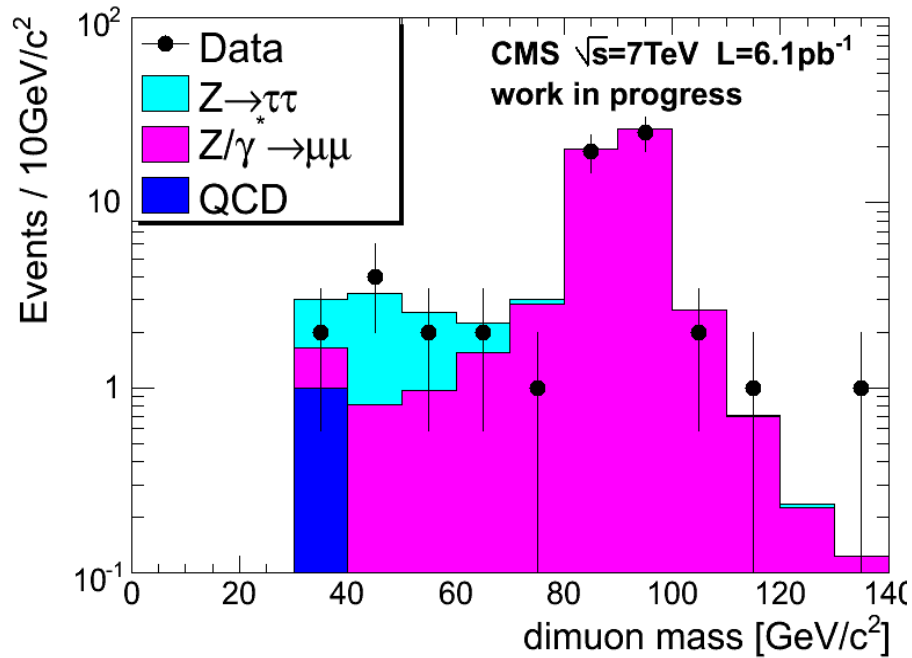
- use pt-balance to calibrate in phi segments
- in parallel intercalibration with halo muons



$10 < p_T^{\text{barrel}} < 20 \text{ GeV}$



Work in Progress (Higgs)



Process	# events	
	Full mass range	$M_{\mu\mu} < 70 \text{ GeV}/c^2$
Z → ττ	6.38	6.11
Z/γ* → μμ	55.5	4.02
QCD	1.00	1.00
Total MC	62.9	11.1
Data	59	10

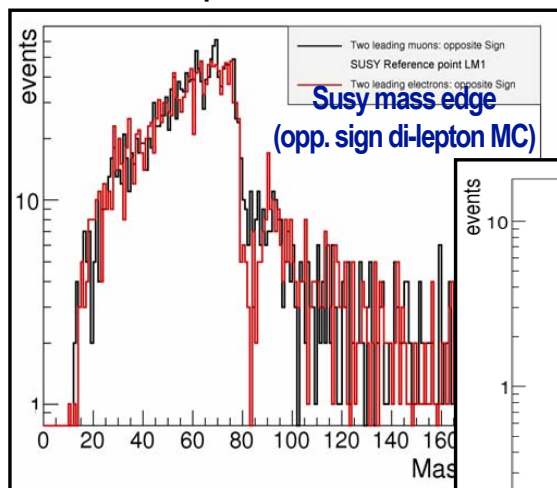
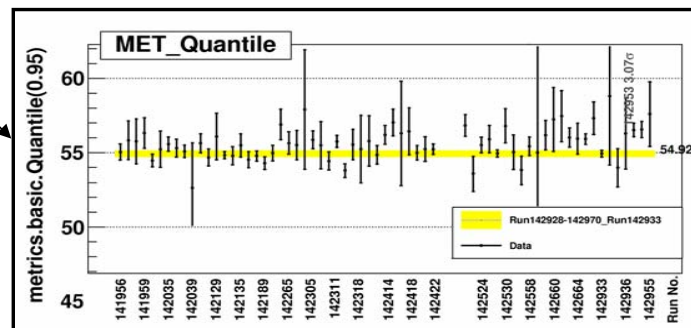
Purity = 55%
Projections for 30 pb⁻¹
30 signal events
S/√B = 6



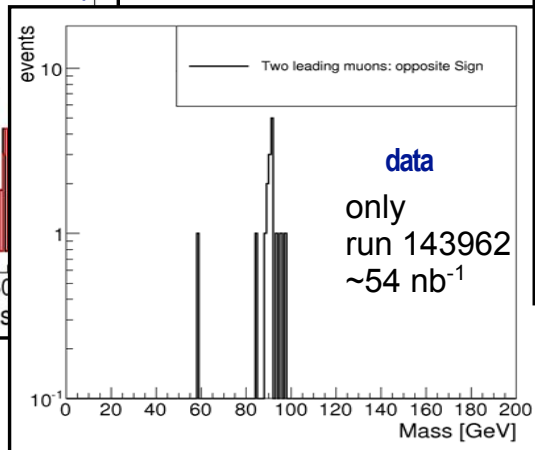
Work in Progress (Susy)



- Offline data quality assessment for SUSY group (aka SusyCAF team)
- Reference analyses
 - Single lepton (RA4) synchronization (cross check of analysis chain as preparation for publication)
 - Work on opposite and same sign di-lepton channels



Plots by Hannes Schettler
- primarily and non-official!



MC [muon channel]

Cut	Num evts					Efficiency (%)			
	Finn	Loukas/Georgia*	Robert	Chris	DESY**	Finn	Loukas/Georgia	Robert	Chris
total	207273	207273	207273	207273	207273				
cleaning + HLT_Mu9	45732	44584	45732	45732	45 593	100%	100%	100%	100%
1 tight Muon	14103	13733	14099	14103	14 053	30.80%	30.83%	30.84%	30.84%
no further loose Muon	11693	11274	11689	11693	11 650	25.29%	25.56%	25.57%	25.55%
no Electron	10154	10255	10149	10154	10 117	23.00%	22.19%	22.20%	22.19%
>=4 jets	3653	3696	3652	3653	3 637	8.29%	7.99%	7.99%	7.98%
MFT>100	3248	3092	3249	3248	3 234	6.94%	7.10%	7.10%	7.09%

* the ~2% difference observed up to the electron veto is due to the fact that for the HLT have NOT been used the REDIGI TriggerResults.
**Niklas,Matthias,I lannes,Dirk

Data [muon channel]

Selection: Exactly one muon, zero electrons, ≥ 2 jets $p_T \geq 30$, and $MET > 20$ (MET accessed by pat:MET=> pt()), where the muon, electron v4/RECO

Cut	Num evts on run 143962				
	Finn	Loukas/Georgia	Robert	Wing	Chris
cleaning + HLT_Mu9	29445	29406	29406	29445	29445
1 tight Muon	277	278	277	277	277
no further loose Muon	270	270	270	270	270
no Electron	268	268	268	268	268
2 jets	9	9	9	9	9
MET>20	7	5	8	7	8

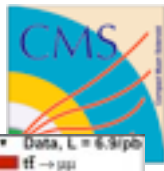
s://twiki.cern.ch/twiki/bin/view/CMS/SusyRA4SingleLeptonDocument

- First look at data in electron and muon channel to study leptons in data with SM signals (e.g. $Z \rightarrow \mu\mu$) (looser cuts than for SUSY selection)



Work in Progress (Top)

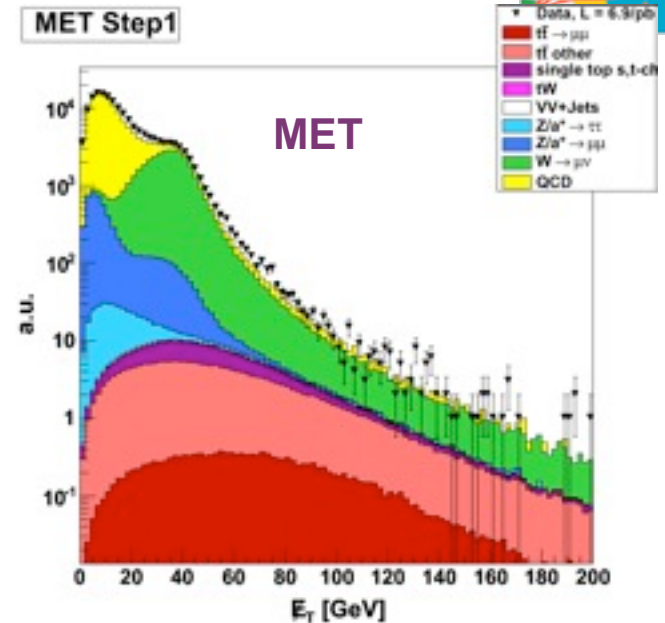
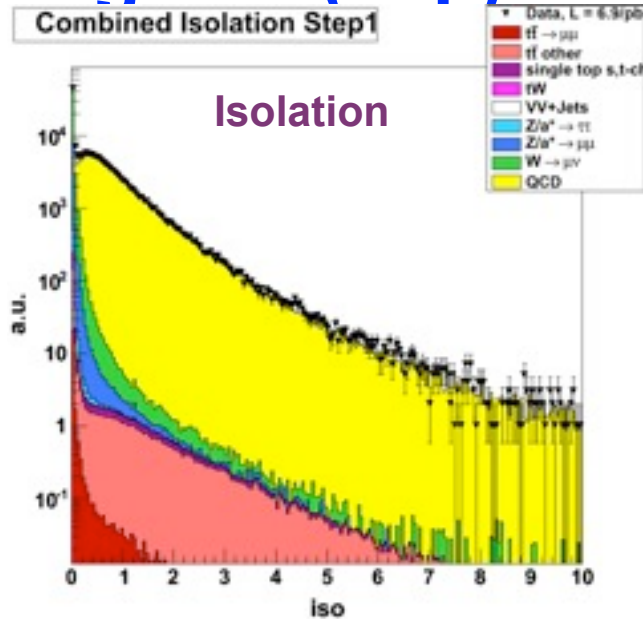
$t\bar{t} \rightarrow 2W2b \rightarrow \mu\mu$ with 6.9 pb⁻¹



Cut-based analysis

Control distributions
after 1st selection step:

1 good id muon with
 $p_T > 20$ GeV



Reconstructed top mass
after all selection cuts:
4 candidates in data

