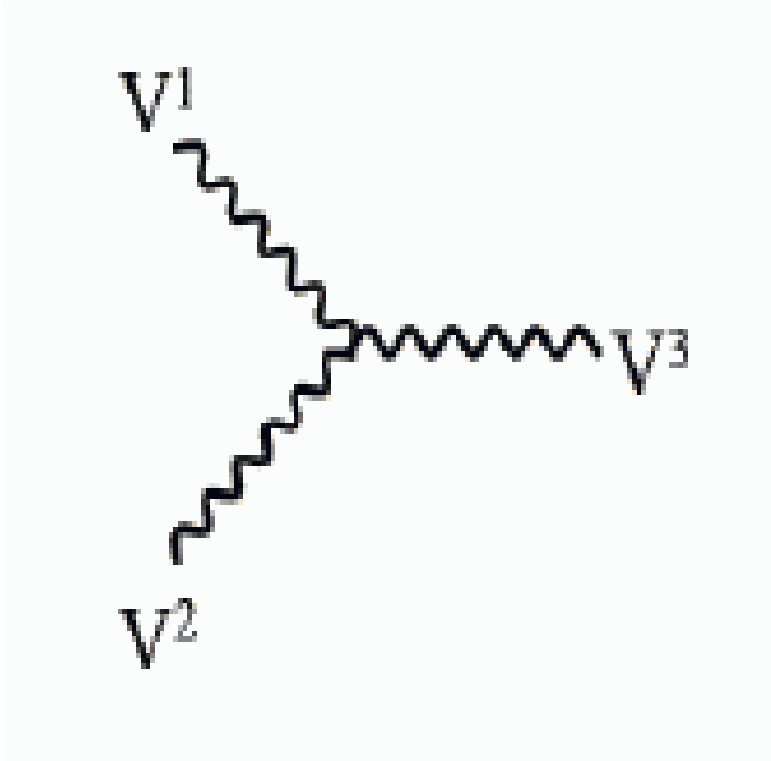
KFKI RMKI Budapest

Anomalous TGC in Z(νν)γ

Pál Hidas
György Vesztergombi

Triple Gauge Couplings



Triple Gauge Couplings (TGC)

charged (WWZ, WWγ)

exist in SM

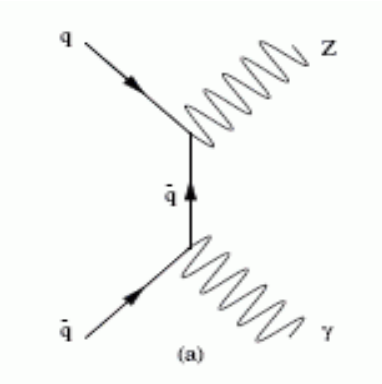
neutral (ZZZ, ZZγ, Zγγ, γγγ)

does not exist in SM ("anomalous")

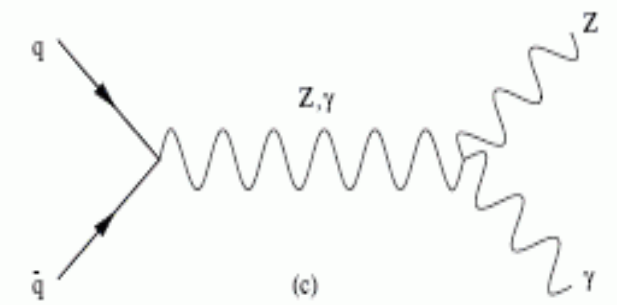
their observation indicates new physics beyond SM

pp -> Zγ

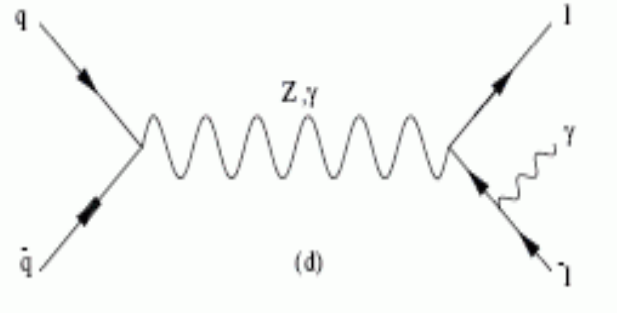
SM



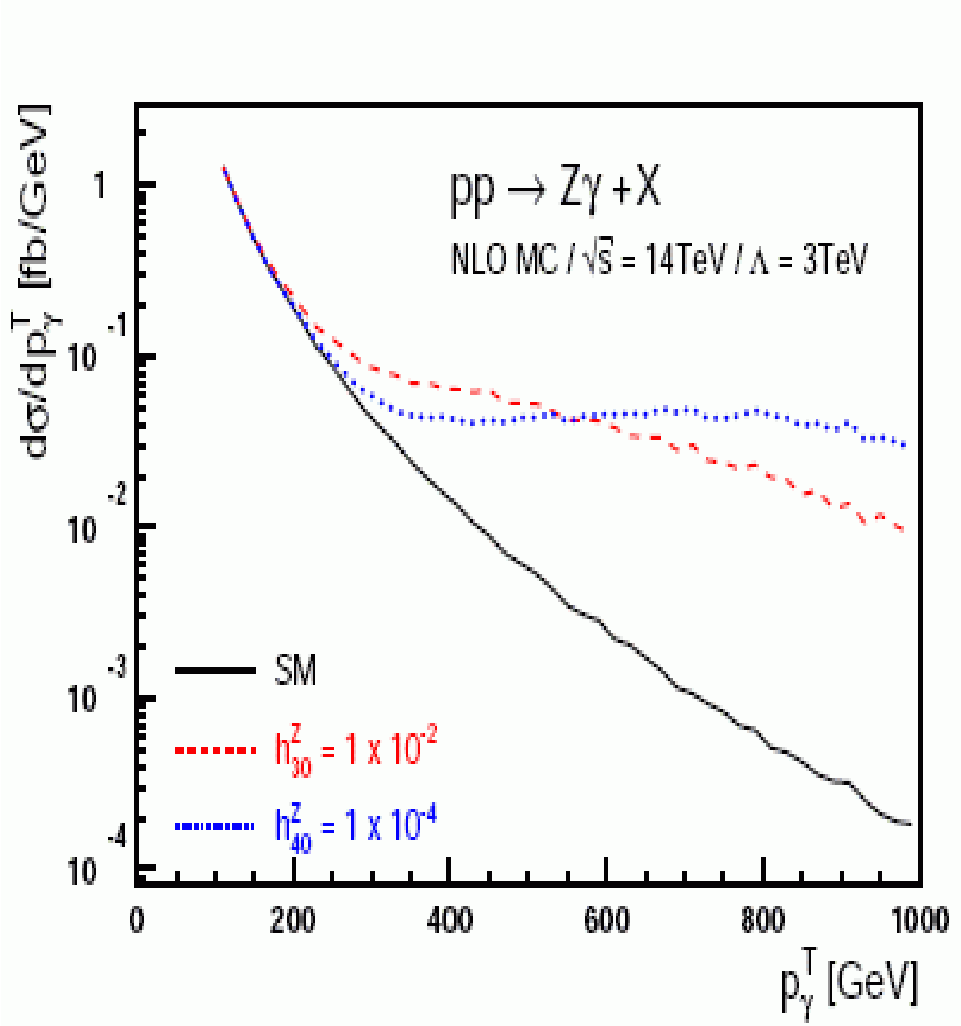
anomalous



radiative BG



Anomalous Zγ



CMS NOTE 2000/017

interesting γ pt > 400 GeV/c

Z -> νν signal

Signature

high missing Et (pt)

no reconstruction of Z

high pt isolated photon

no radiative photons → exactly 1 photon

photon pt balanced with missing Et

no high pt electrons, muons, tracks, jets

Data production

Signal generation with Baur Zgamma generator

https://twiki.cern.ch/twiki/bin/view/CMS/BaurZgamInterface

CMSSW_3_1_4 was used

No LHE (Les Houche Events) interface (CMSSW_3_1_6)

1) BaurZgamGenerator

2) Pythia, SIM, DIGI, RAW, HLT8E29

3) HLT1E31

4) RECO

Parameters used in Baur

1,-1 ! ISCATTER, IZ

0,0,-5e-2,1e-3 ! HZ0(1), HZ0(2), HZ0(3), HZ0(4)

0,0,0,0 ! HG0(1), HG0(2), HG0(3), HG0(4)

Data reconstruction

Signal and background further reconstruction from RECO

CMSSW_3_1_4 : PhysicsTools/PatAlgos

5) AOD (background channels usually available like this)

6) PAT layer1

7) TGC Analysis (skimming)

8) Personal analysis (no CMSSW, ROOT only)

9) drawing of final plots (ROOT)

Signal data row

Dashboard | DBS Discovery | DataTransfer | SiteDB | CondDB | TOMon | Support | Login

Home - aSearch - Navigator - RSS - Status - Runs - Admin - Tools - Help - Contact - TinyURL | View

DBS instances: cms_dbs_ph_analysis_02 HELP

find dataset where dataset like *Znunugamma* and dataset.status like VALID* Search Reset

DBS discovery :: Adv. search :: Results Physicist

Found 5 results. Show all View results: grid | list mode Sort by DATASET desc | asc

/Znunugamma_Baur_CMSSW_3_1_4_GEN_SIM_DIGI_RAW_HLT8E29_7TeV/hidaspal-Znunugamma_Baur_CMSSW_3_1_4_AODSIM_fromRECO_7TeV-abceeb495412fbb98c36e711ce2a22e0/USER

Created 13 Mar 2010 09:59:48 GMT, contains 109600 events, 548 files, 1 block(s), 10.0GB, located at 1 site (show, hide), LFNs: cff, py, plain , $\int L$=N/A
Release info , Block info , Run info , Conf. files , Parents , Children , Description , PhEDEx , Create ADS , ADS , crab.cfg

/Znunugamma_Baur_CMSSW_3_1_4_GEN_SIM_DIGI_RAW_HLT8E29_7TeV/hidaspal-Znunugamma_Baur_CMSSW_3_1_4_GEN_SIM_DIGI_RAW_HLT1E31_7TeV_v2-e385b6c0ef68004e4529f12ed7ce5bda/USER

Created 12 Mar 2010 06:12:46 GMT, contains 109600 events, 548 files, 1 block(s), 147.3GB, located at 1 site (show, hide), LFNs: cff, py, plain , $\int L$=N/A
Release info , Block info , Run info , Conf. files , Parents , Children , Description , PhEDEx , Create ADS , ADS , crab.cfg

/Znunugamma_Baur_CMSSW_3_1_4_GEN_SIM_DIGI_RAW_HLT8E29_7TeV/hidaspal-Znunugamma_Baur_CMSSW_3_1_4_GEN_SIM_DIGI_RAW_HLT8E29_7TeV-4f94e3505679dfa209d057aaf87bb31a/USER

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Release info , Block info , Run info , Conf. files , Parents , Children , Description , PhEDEx , Create ADS , ADS , crab.cfg

/Znunugamma_Baur_CMSSW_3_1_4_GEN_SIM_DIGI_RAW_HLT8E29_7TeV/hidaspal-Znunugamma_Baur_CMSSW_3_1_4_RECO_7TeV-cb82d9ceba8d3b5a99d8c6f968653182/USER

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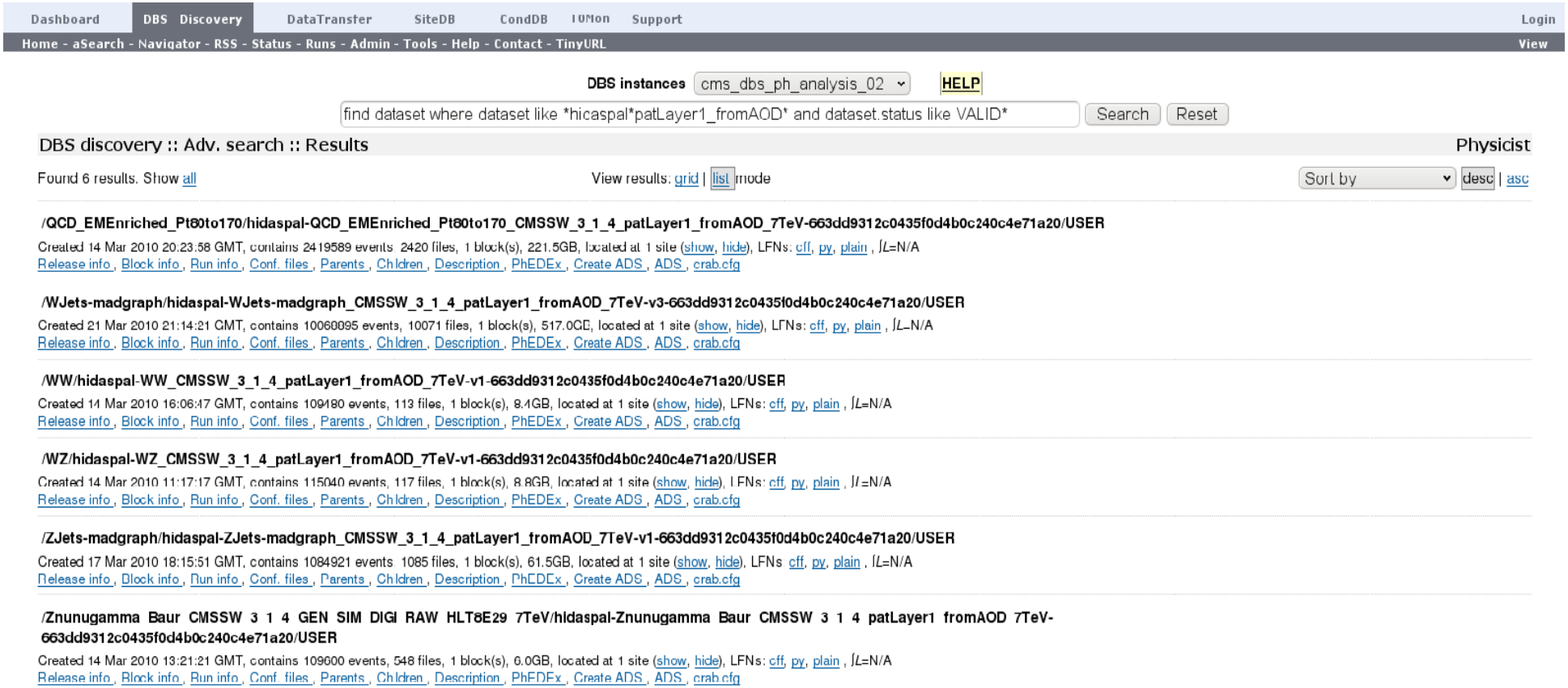
Release info , Block info , Run info , Conf. files , Parents , Children , Description , PhEDEx , Create ADS , ADS , crab.cfg

Number of results per page 10 Result page: 1

PatLayer1 data



+ Wgamma 100 kevents unpublished

Data summary

PAT Layer1 produced on grid and published on T2_HU_Budapest SE
TGC Analysis skim produced on grid and written on SE unpublished
Personal analysis done on local PCs (6+6 hours for all the data)

Channel	#Events	Size (GB) of PAT Layer1	Size (GB) of TGC skim	σ (pb) at 7 TeV
Znunugamma	109600	6.0	1.8	
Wgamma	107050	~6	1.7	
WW	109480	8.4	2.1	
WZ	115040	8.8	2.3	
WJets	10068895	517	152	
ZJets	1084921	61.5	16.8	
QCD (80-170)	2419589	221.5	51.2	

Analysis strategy

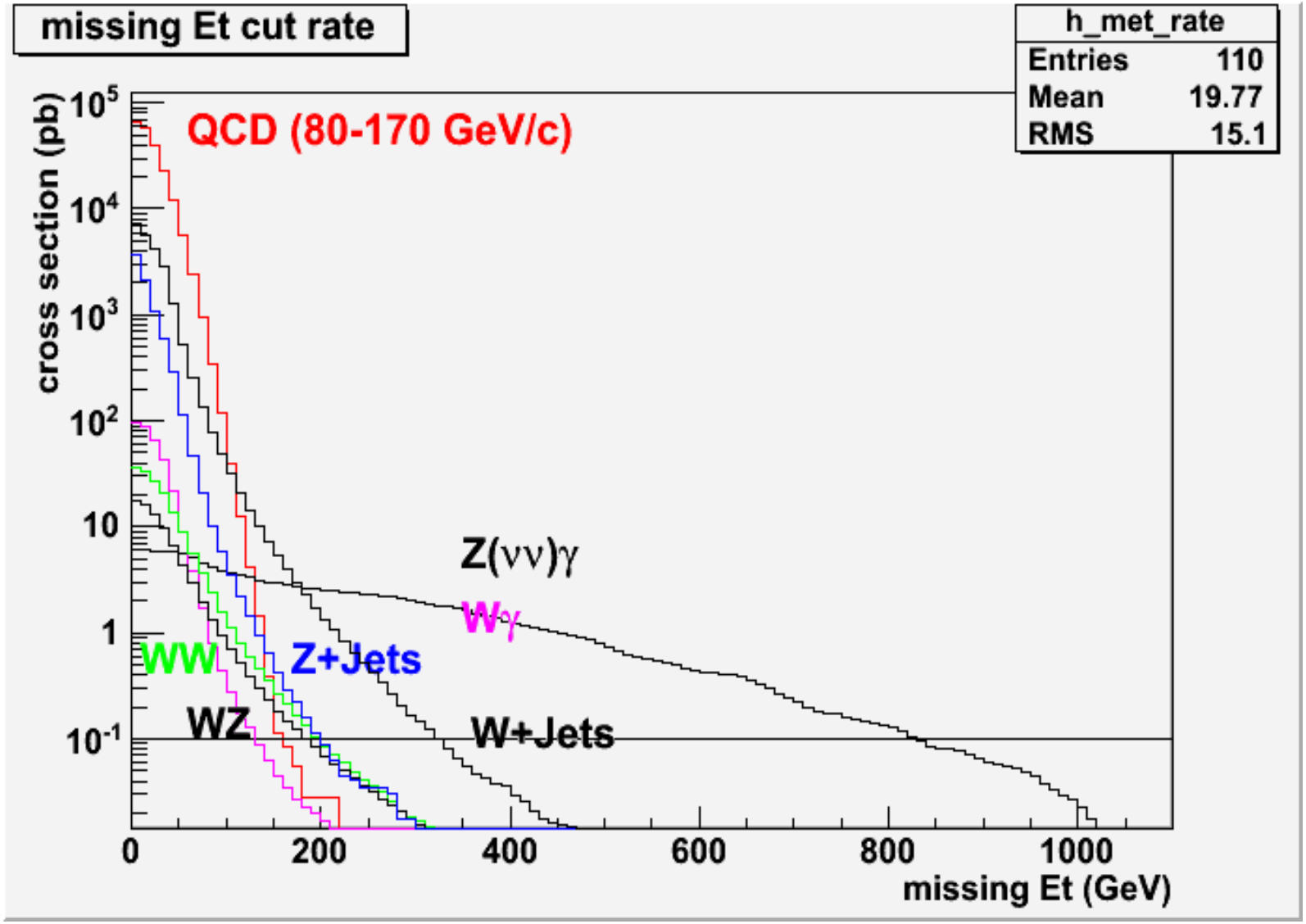
Use “selected layer1” objects

Determine necessary MET cut to eliminate background

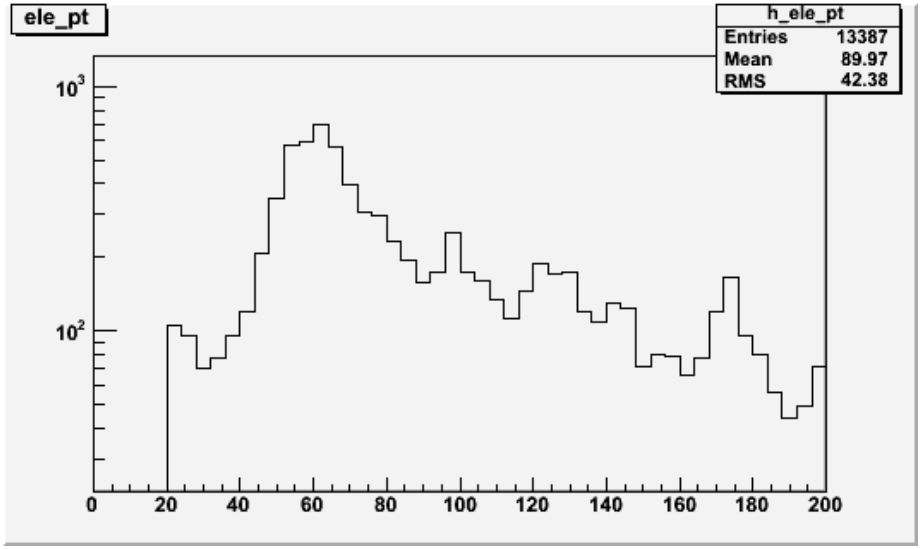
- 14 TeV cross sections used for the moment

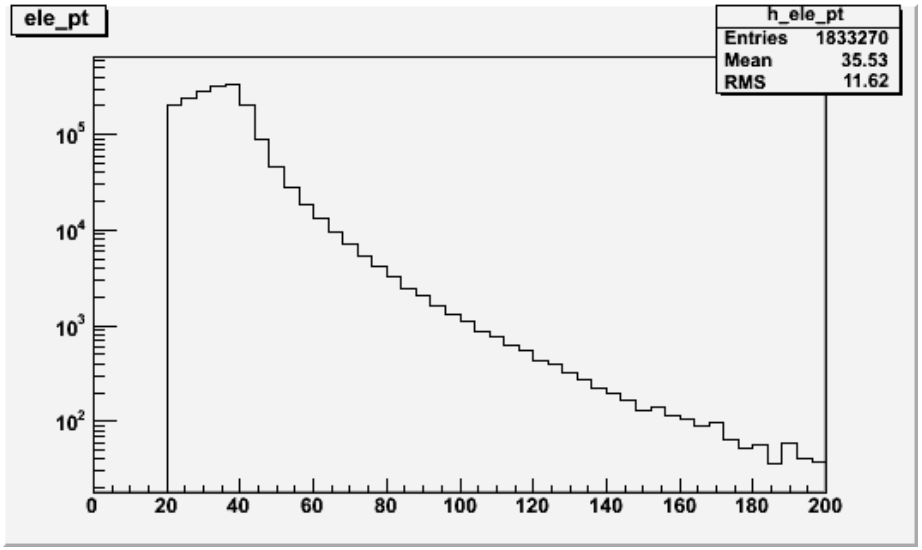
Look at photon distribution

Missing E_T rate



electron p_T





PAT selected layer1 electrons for Z(νν)γ

Electron cut chosen

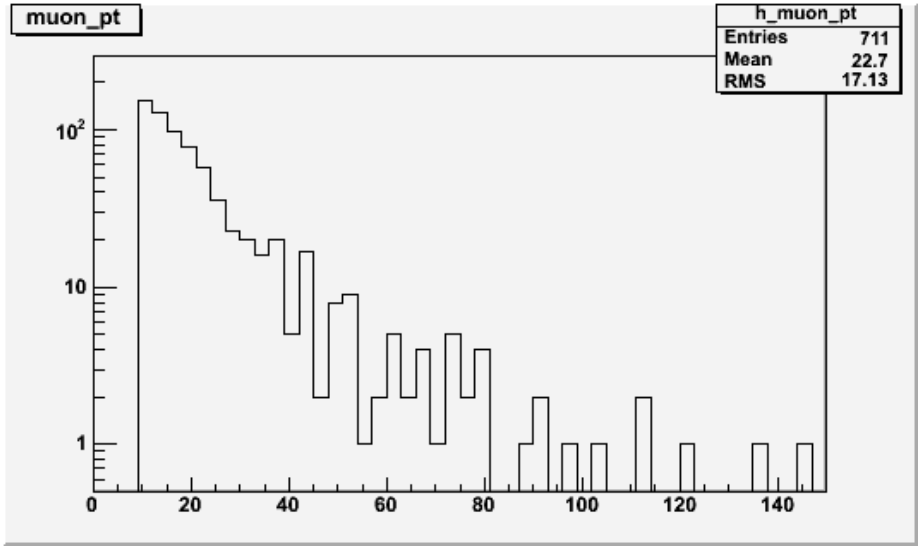
$p_T < 20$ GeV/c

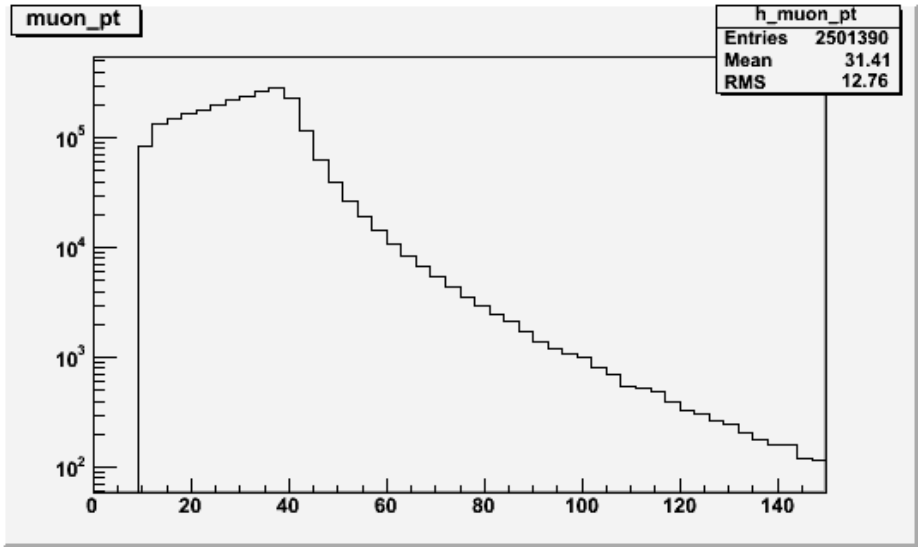
Equivalent with $n_e = 1$

For background (WJets)

The signal has fewer electrons than the background

muon p_T





PAT selected layer1 muons for Z(νν)γ

muon cut chosen

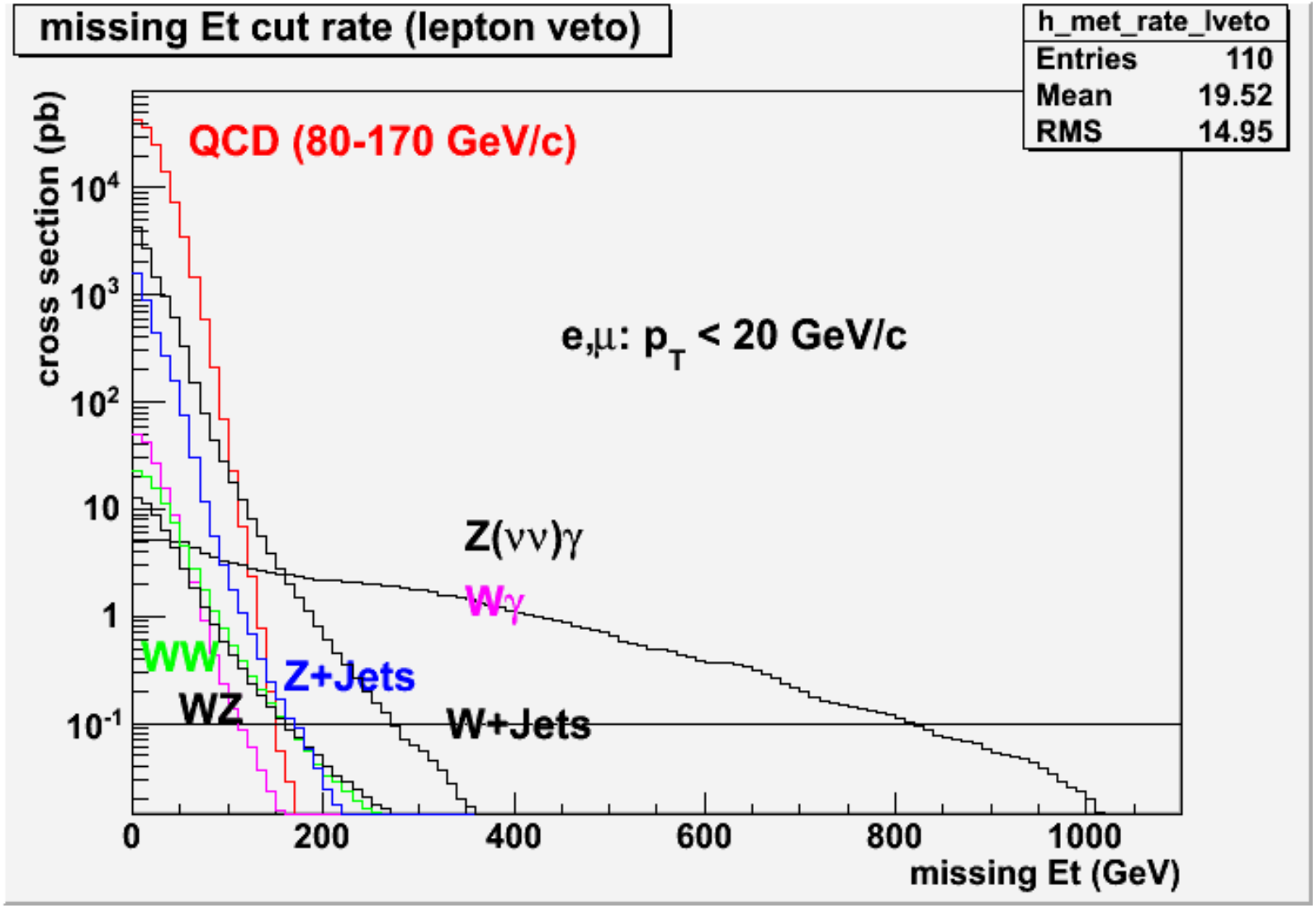
p_T < 20 GeV/c

could be 10 ?

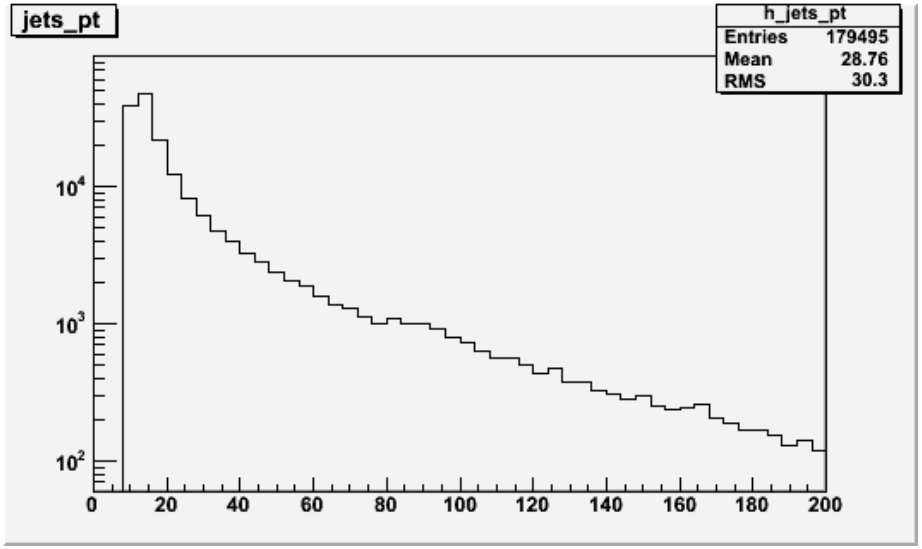
For background (Wjets)

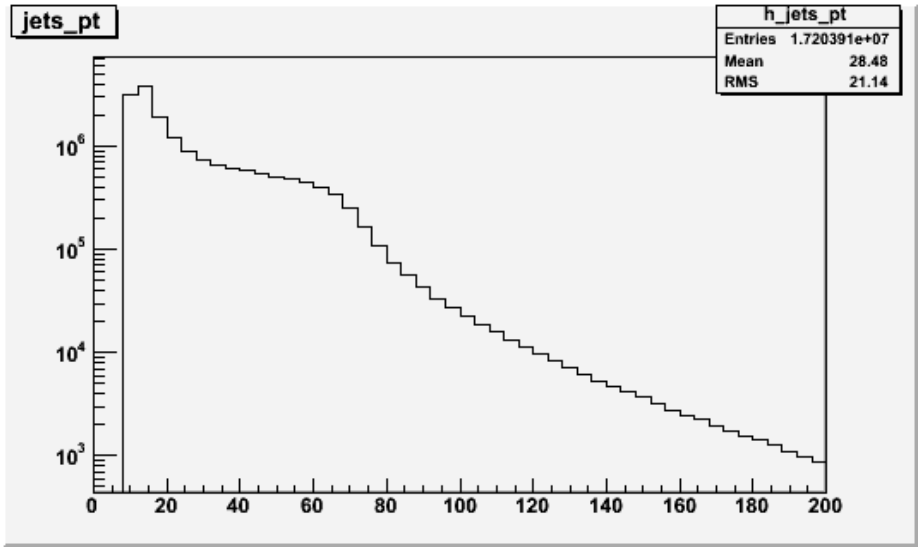
The signal has fewer muons than the background

Missing Et rate



jet p_T





PAT selected layer1 jets for Z(νν)γ

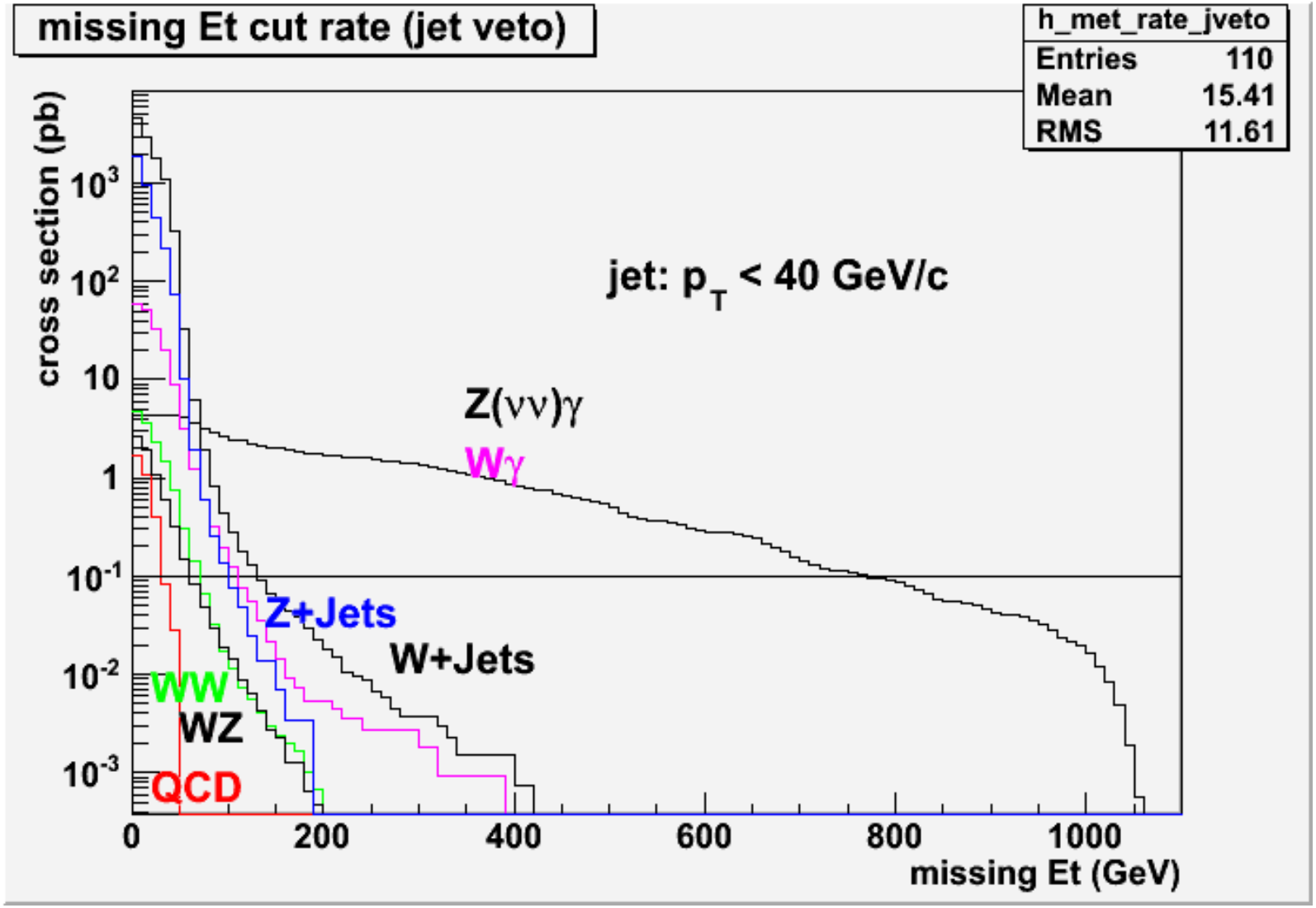
Jet cut chosen

$p_T < 40$ GeV/c

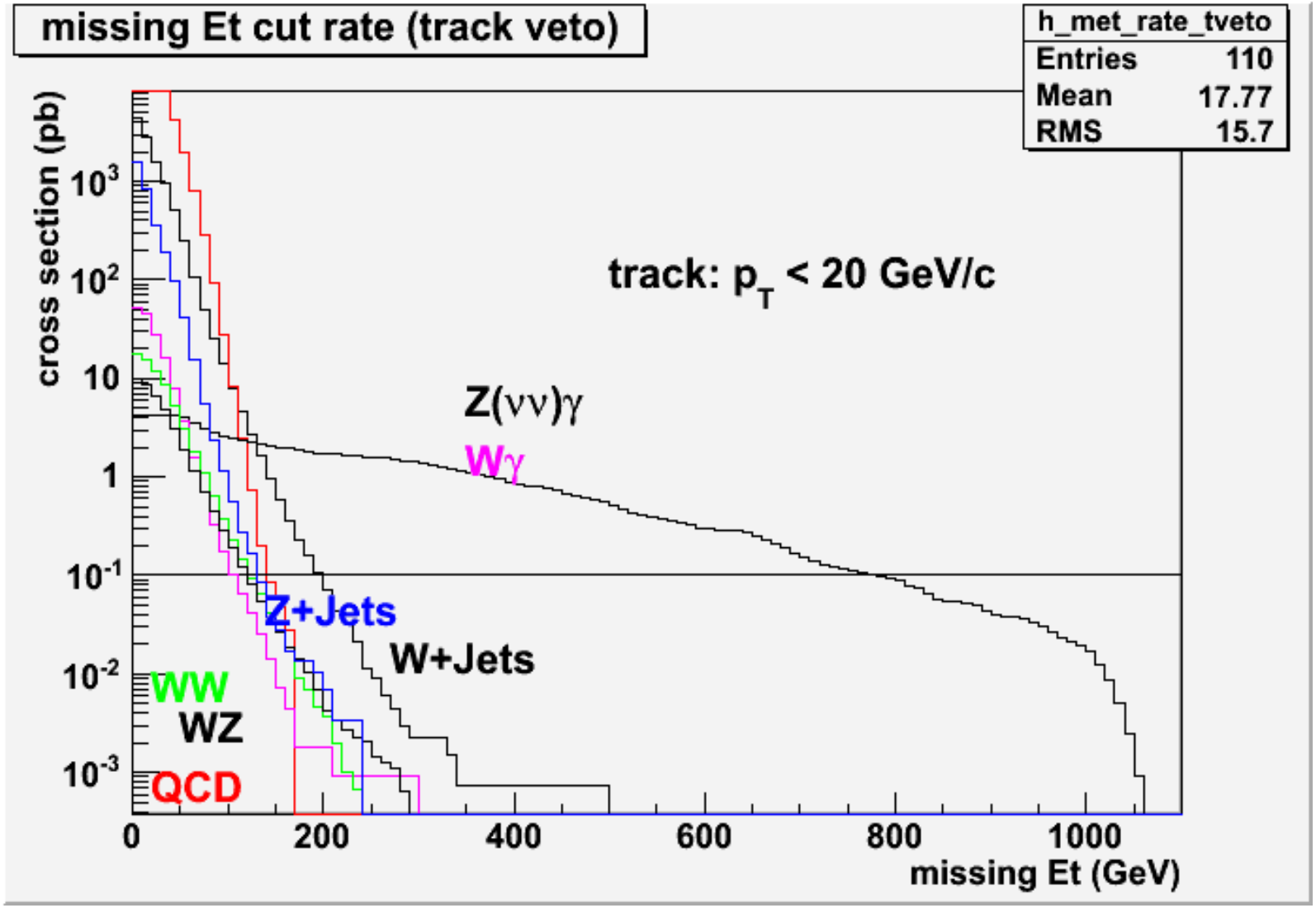
For background (WJets)

The signal has lower p_T jets than the background

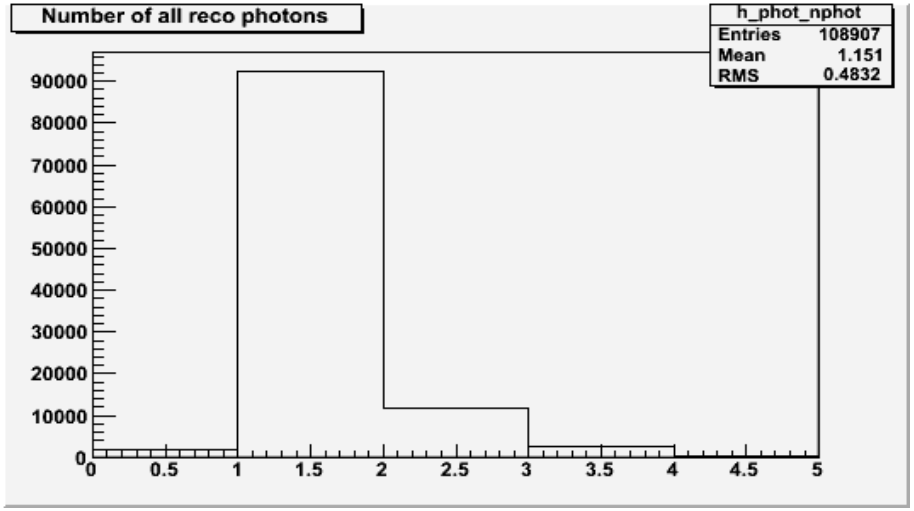
Missing E_T rate



Missing E_T rate

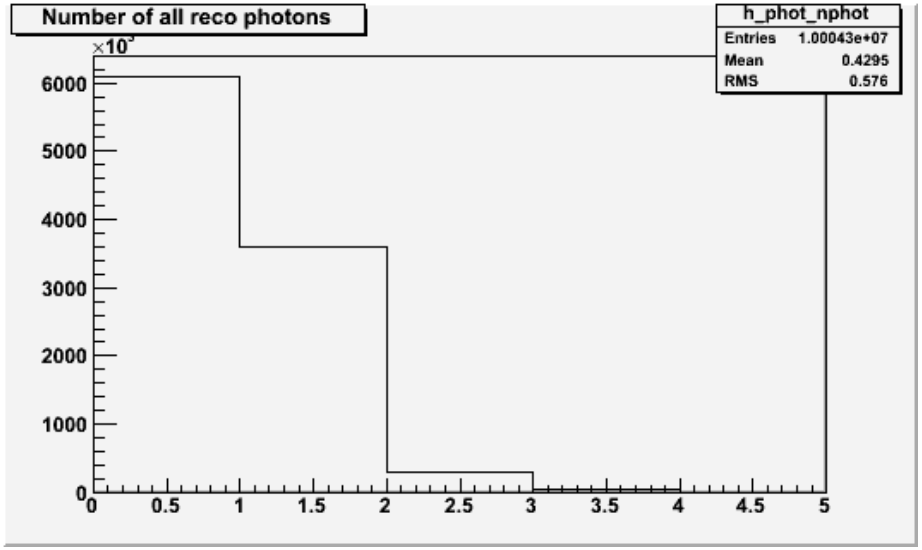


γ selection



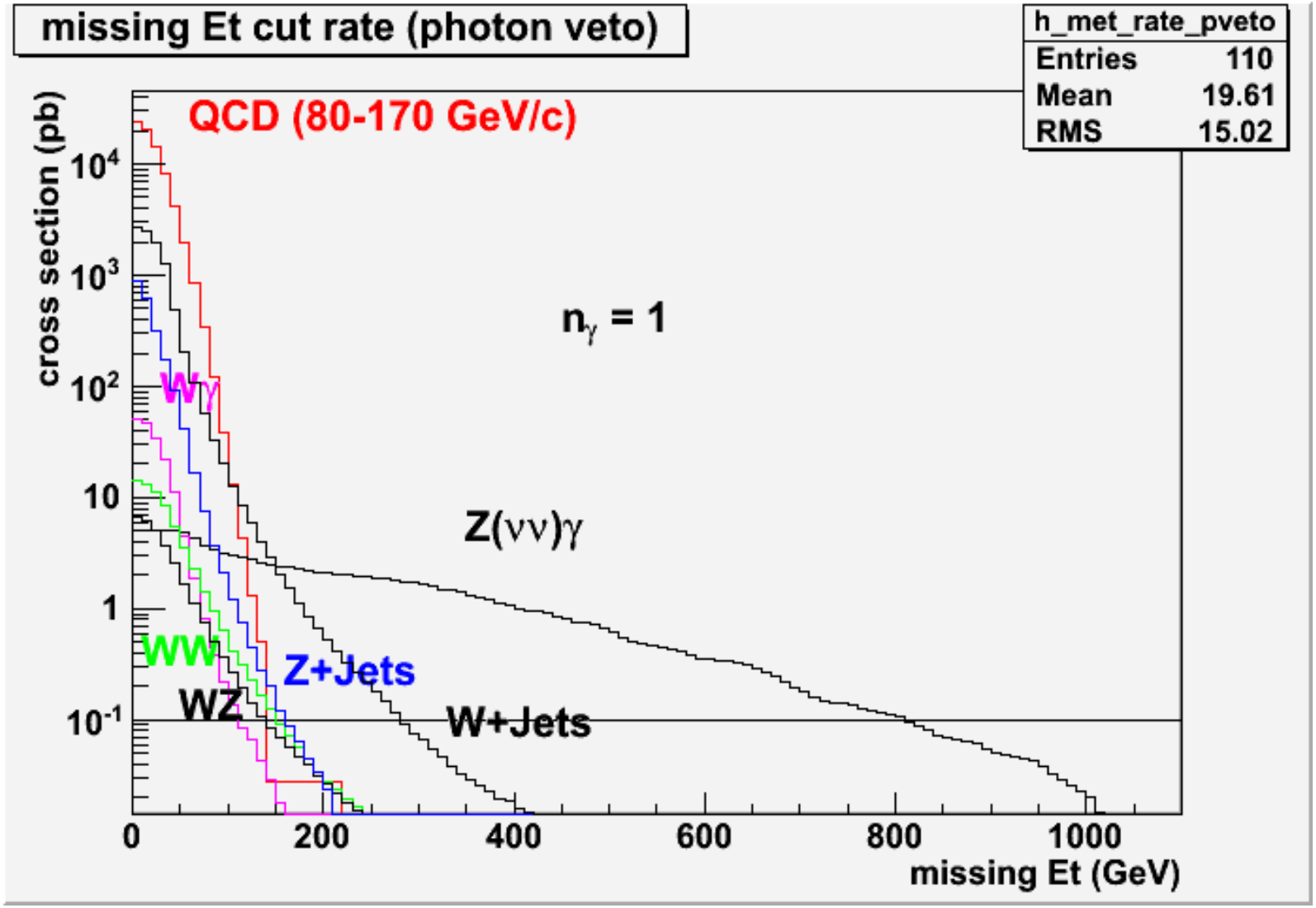
The signal has exactly 1 photon

$n^{\gamma} = 1$

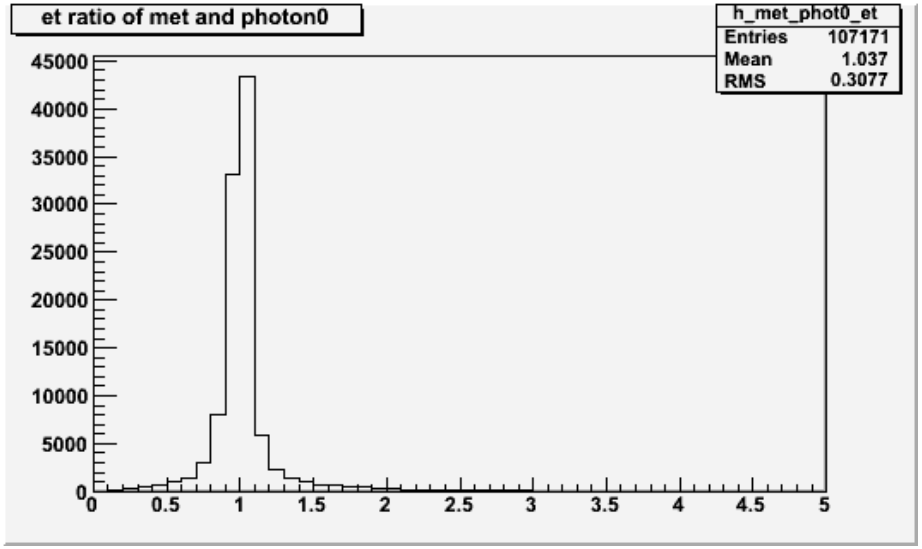


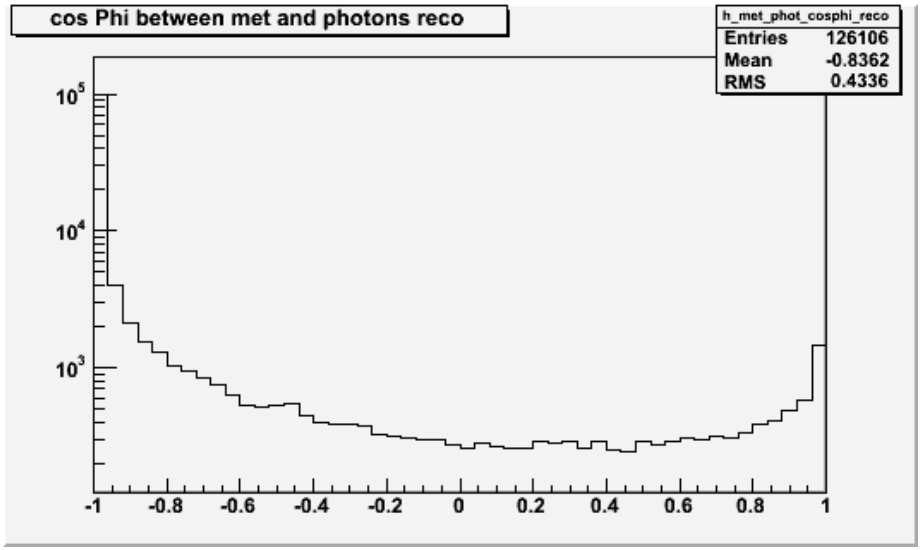
Background differs (e.g. WJets)

Missing E_T rate



MET γ correlation



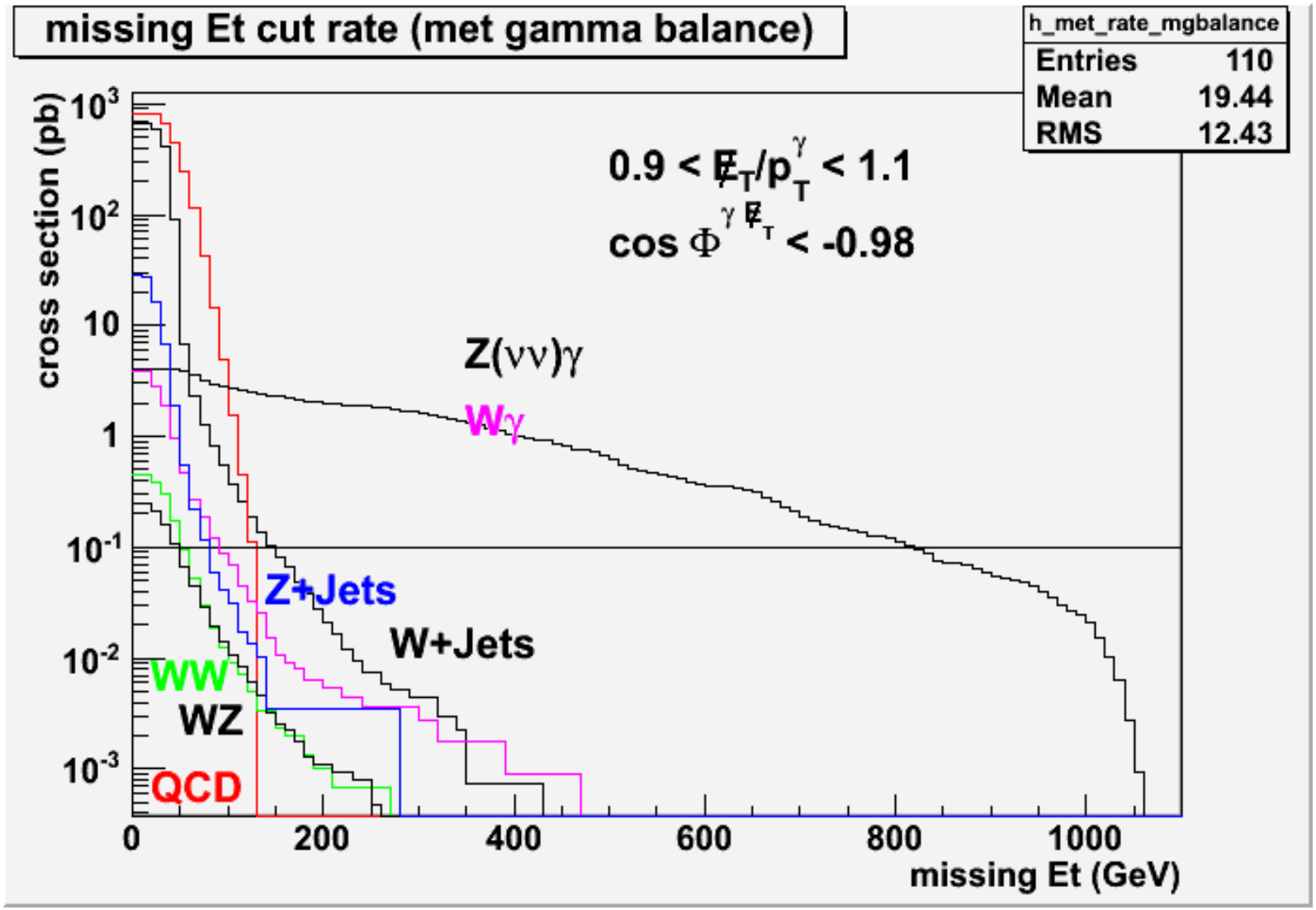


The signal has strong correlation between the missing Et and pt of the photon.

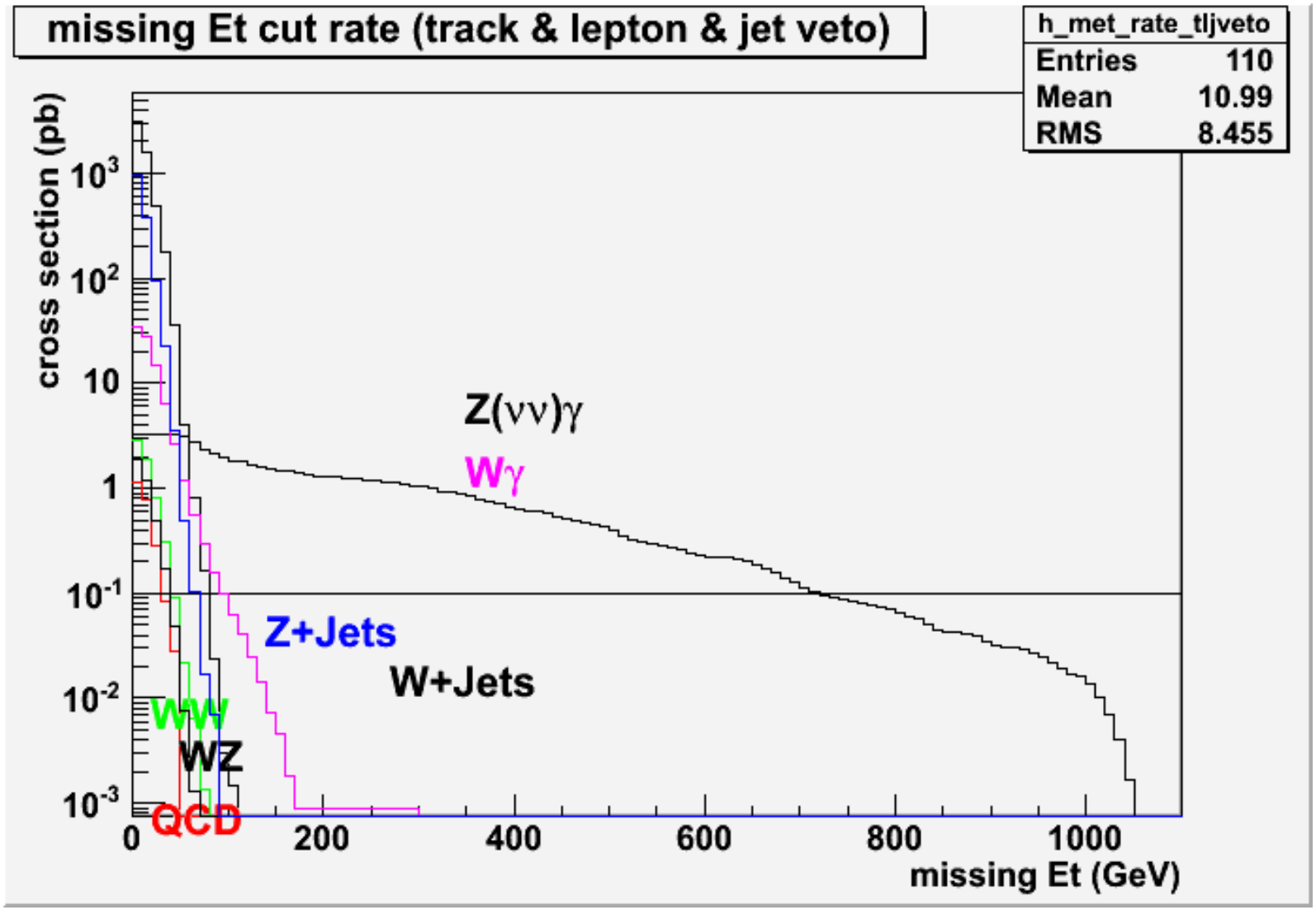
$0.9 < \text{ratio} < 1.1$

$\cos \Phi < -0.98$

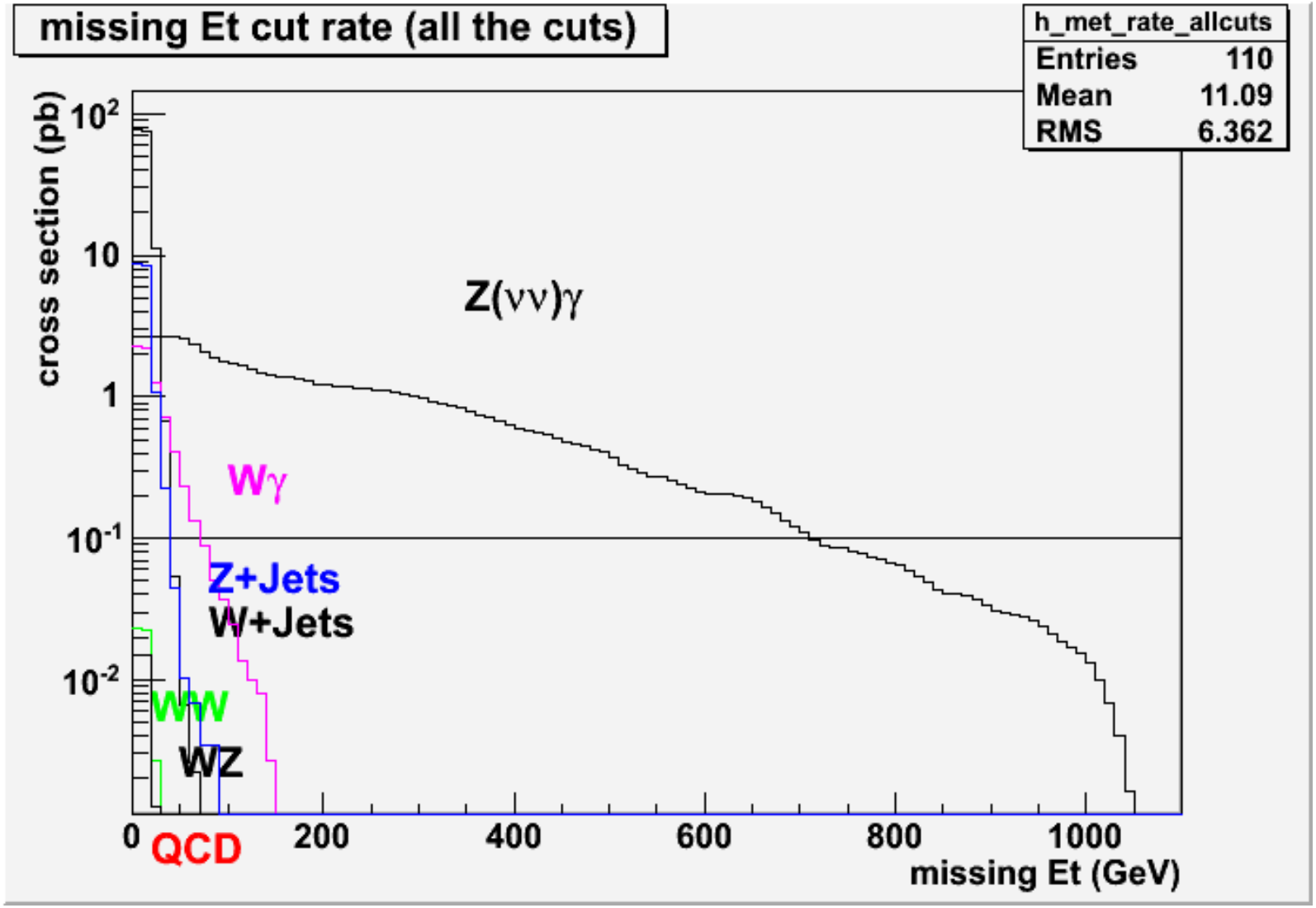
Missing E_T rate



Missing E_T rate



Missing E_T rate



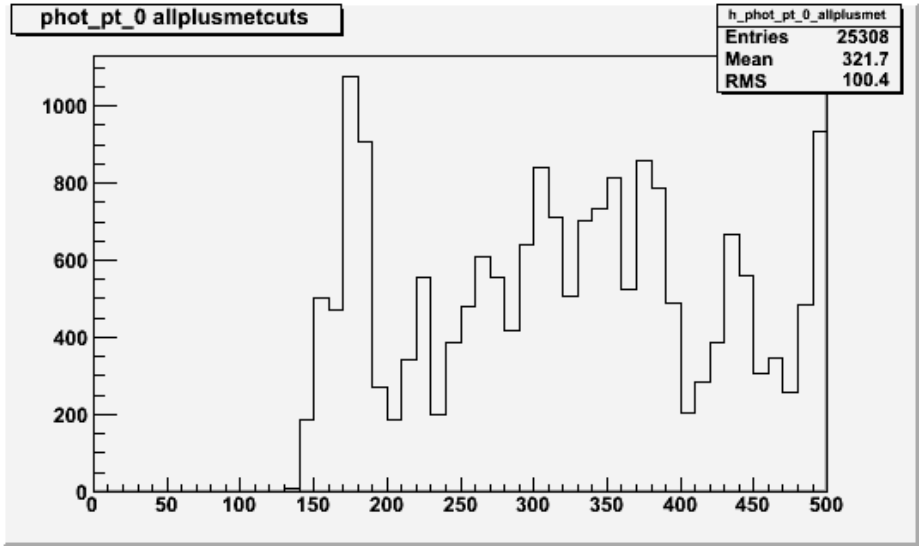
Cut summary

Cut	#Z(νν)γ	#Wγ	#W+jet	#QCD 80-170 GeV/c
No cut	108907	106371	10004300	2375612
$p_T^{e,\mu} < 20$ GeV/c	92992	55881	5839576	1525076
$p_T^{track} < 20$ GeV/c	77490	57412	5965203	932378
$p_T^{jet} < 40$ GeV/c	79286	64325	6281792	61
Lepton, track & jet veto	59773	38773	4227575	40
$N_\gamma = 1$	92279	56599	3586226	863320
MET & γ balance	72782	4344	907576	29332
All the cuts above	48049	2494	103989	0
+ MET < 150 GeV	25308	1 (300GeV)	0	0

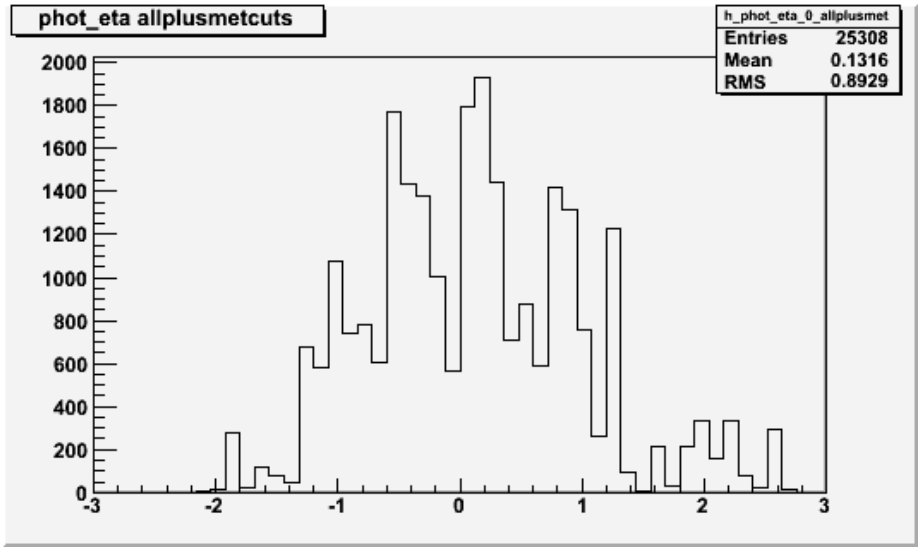
Discussion

- MET cut promising
  - 100 GeV : less than 10% background
  - 150 GeV : less than 1% background
  - Need more Wgamma events
- Lepton, jet and track cuts
  - Very efficient at high MET
  - Still not very tight
- Met – photon balance
  - More efficient at low MET

Photon



p_T of photon (see slide 4)



η of photon

Selection of AN2009_169 (Z->μμ):

|η|<2.5

Except between 1.442 and 1.556 (barrel endcap overlap region)

To do

Generate signals of several parameter sets in the anomalous region, as well as the SM case.

Ask for more Wgamma events.

Find 7 TeV cross sections.