Z/γ* background contribution in lepton charge asymmetry

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Z to dimuon background in W

- $Z \rightarrow \mu\mu$ is a main background in W sample
  - if one of dimuon is not detected because of muon detector coverage, it has a similar feature with W event in final state (one high pt muon + MET)
  - until now, we reject the events if there are multiple muons in the event
  - check Z background rate and W acceptance change with various cuts
- W and Z sample
  - Pythia $Z \rightarrow \mu\mu$: 1300 pb, 200K events /Zmumu/Summer09-MC_31X_V3_7TeV-v1/GEN-SIM-RECO
  - Pythia $W \rightarrow \mu\nu$: 7899 pb, 200K events /Wmunu/Summer09-MC_31X_V3_7TeV-v1/GEN-SIM-RECO
  - first muon requirement : a global muon with Pt > 25 GeV/c (no eta cut)

Z background rate :
first muon Pt > 25 GeV/c
no Z veto cut

first muon selection	Z background
any muon	0.1601
Global muon only	0.1599
Global+|eta|<2.1	0.1616
any muon, nut MET>20	0.0551
Global muon only+MET>20	0.0534
Global+|eta|<2.1 + MET>20	0.0504

Z to dimuon background in W

Z background rate

2nd muon veto	any muon	global muon	global+|η|<2.1
any	0.02683	0.03265	0.04247
Pt > 10	0.03294	003506	0.04430
Pt > 15	0.03535	0.03741	0.04608
Pt > 20	0.03909	0.04110	0.04891
Pt > 25	0.04563	0.04762	0.05404

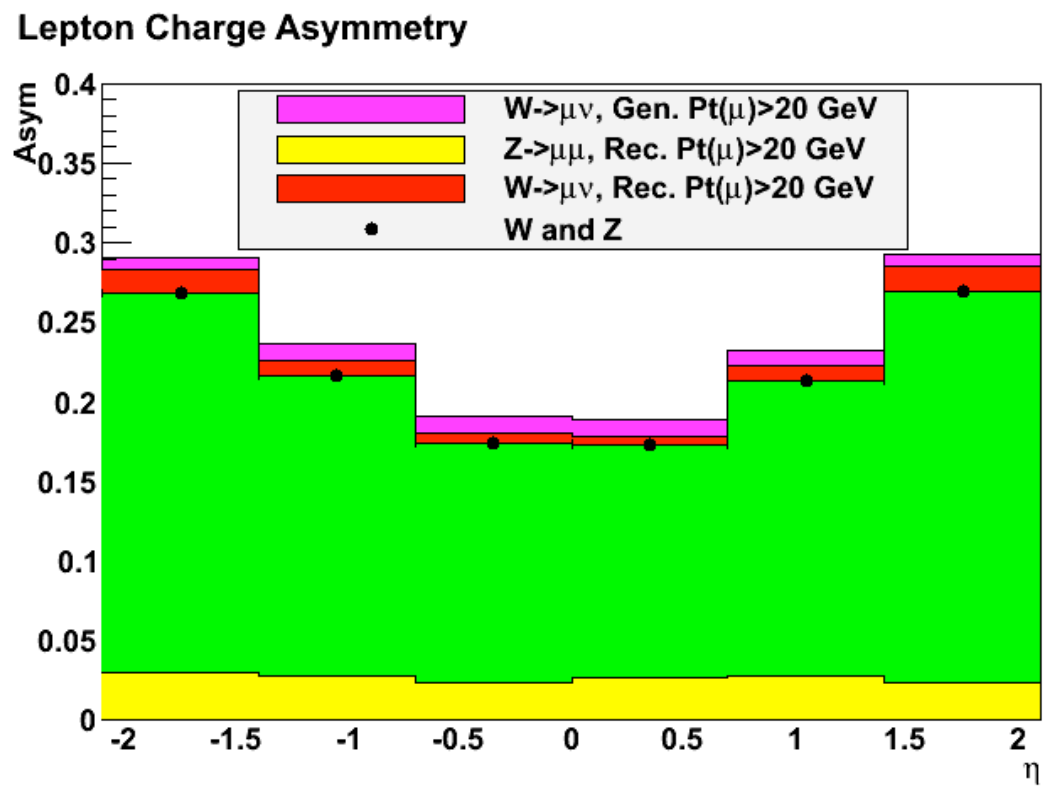
- Z bkg rate with additional MET>20 has a similar level (0.031)

W acceptance lose (ΔA) from the Z veto selection

2nd muon	Any	Global	Global+eta	Any	Global	Global+eta
	no MET			MET>20		
no	0.1119	0.0104	0.0079	0.1112	0.0105	0.0081
Pt>10	0.0081	0.0008	0.0008	0.0080	0.0008	0.0009
Pt>15	0.0062	0.0004	0.0005	0.0059	0.0004	0.0005
Pt>20	0.0053	0.0003	0.0003	0.0050	0.0002	0.0003
Pt>25	0.0047	0.0002	0.0002	0.0044	0.0002	0.0002

Summary

- We checked the Z background contribution varying the cut of the second muon
- Applying muon Pt>15 GeV/c in the second muon
  - reduce Z background up to ~ 3.5 % level
  - loose only 0.6 % W acceptance
  - we can consider this option to reject Z background in the analysis

lepton charge asymmetry
with MET>20
good global muon with
Pt > 20 GeV/c and |eta|<2.1

5% Z background