

Control Plots

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Overview

- ▶ Pre-selection has been reoptimised
- ▶ First focus on agreement in control regions
 - This minimises effect of mismodelled QCD
- ▶ Have seen previously significant top contribution to W control regions
 - Investigated m_T as a means to discriminate
- ▶ Initially just varied met significance and leading jets-metnomu $\min\Delta\phi$ cuts
 - Tried adding all jets $p_T > 30$ to the $\min\Delta\phi$ calculation

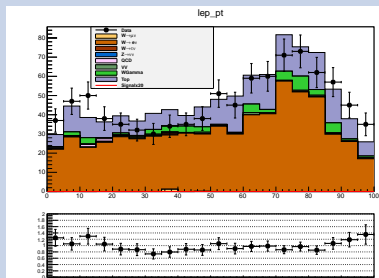
New Control Plots

- ▶ Cuts applied in all following plots are:
 - $\text{metnomu} > 90$, $\text{jet}_1 p_t > 50$, $\Delta\eta_{jj} > 3.6$, $\text{metnomu_significance} > 3$, $\text{jet}_{1,2}\eta < 4.7$, $\text{jet}_1\eta \cdot \text{jet}_2\eta < 0$, $m_{jj} \geq 800$, $\text{jet}_2 p_T > 40$
 - met , $\text{jet}_2 p_T$ and m_{jj} cuts chosen to be above highest trigger threshold and at at least 50% efficiency for run D trigger

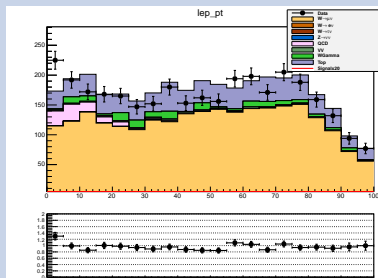
mT in W control regions

- Top contamination of W regions is up to 30% in some regions

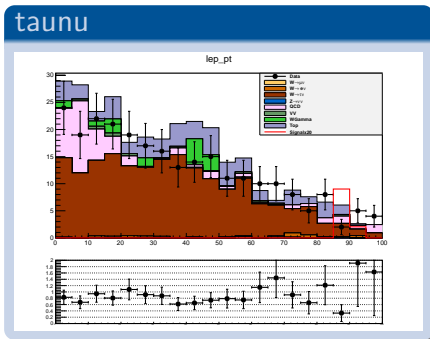
enu



munu



mT in W control regions

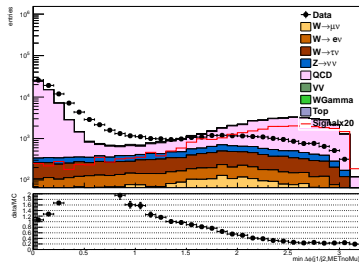


- ▶ mt doesn't seem to give any discrimination against top
- ▶ For tau does allow removal of QCD contamination
 - Have added an $m_T > 20 \text{ GeV}$ cut on tau control region

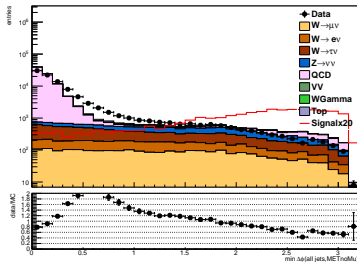
$\Delta\phi(j, met)$ variables - intro

- ▶ n.b. scale is different between plots
- ▶ Version with all jets $p_T > 30$ GeV has better data MC agreement
- ▶ QCD almost all moves to low values of variable

$\min(\Delta\phi(j_{1,2}, metnomu))$



$\min(\Delta\phi(all\ j(p_T > 30), metnomu))$



$\Delta\phi(j, met)$ variables - cut efficiency

Process	no cut	$j_{1,2} > 0.5$	$j_{1,2} > 1.0$	$j_{1,2} > 1.5$	all > 0.5	all > 1.0	all > 1.5
wel	2187	1854	1477	1073	1682	1185	727
wmu	2445	2087	1697	1243	1889	1379	901
wtau	5618	3392	2391	1653	2755	1763	1482
zvv	3924	3425	2977	2086	3170	2559	1556
qcd	80400	16088	9488	7363	7079	1597	489
vv	133	119	103	88	101	75	55
wg	421	349	306	248	292	209	135
top	1349	1180	1006	795	764	395	185
Signal	1488	1430	1354	1239	1407	1313	1178
Data	97100	29035	19927	14904	18192	9524	5753

- ▶ All jets cut keeps more signal for an 80% reduction of QCD
 - Also reduces top by a factor of 2
- ▶ Propose moving to all jets cutting at 1

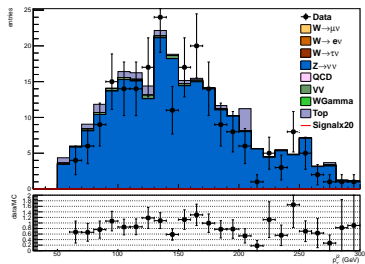
Data driven weights

- ▶ W and Z normalised to:
 - $N_C^{Data} - N_C^{Bkg} / N_C^{MC}$
- ▶ QCD normalised to difference between data and all other backgrounds

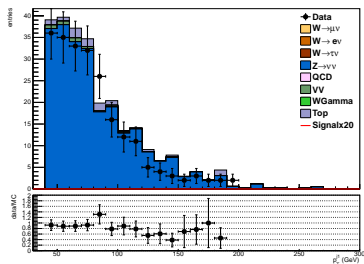
Background	Weight
$Z \rightarrow \nu\nu$	0.58
$W \rightarrow e\nu$	0.42
$W \rightarrow \mu\nu$	0.45
$W \rightarrow \tau\nu$	0.68
QCD	6.51

New control plots - mumu

Jet 1 pt

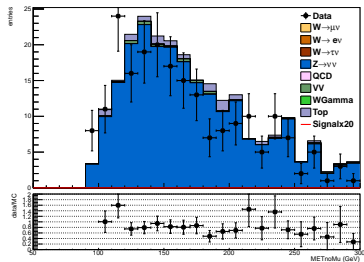


Jet 2 pt

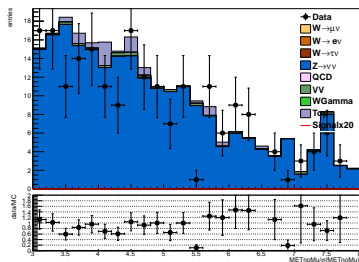


New control plots - mumu

MET_{nomu}

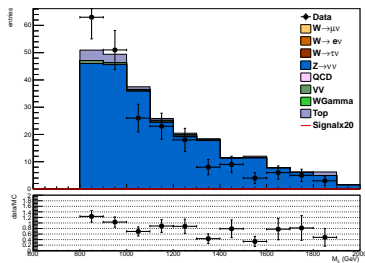


MET_{nomusig}

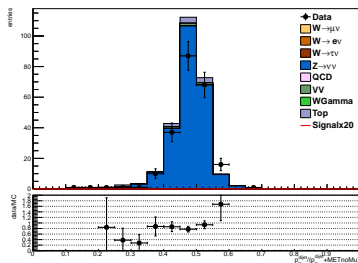


New control plots - mumu

Mjj

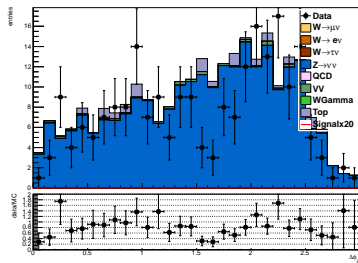


dijet-metnomu pt fraction

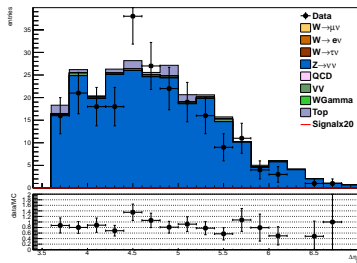


New control plots -mumu

Dphijj

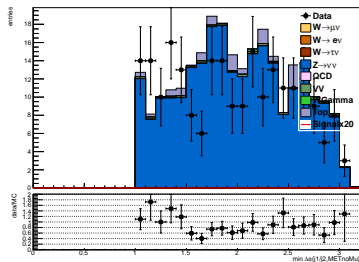


Detajj

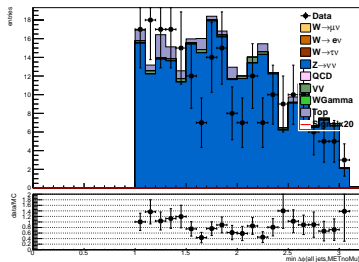


New control plots -mumu

Leading jets-met mindphi

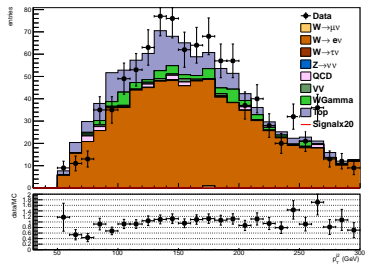


All jet-met mindphi

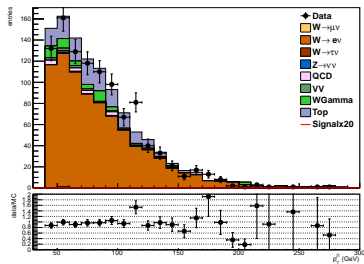


New control plots -enu

Jet 1 pt

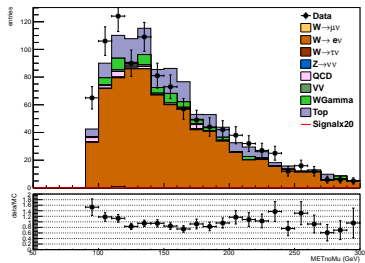


Jet 2 pt

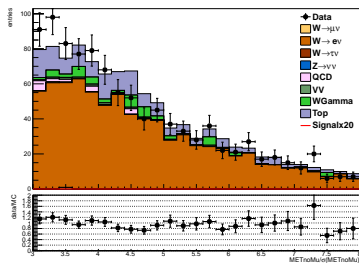


New control plots -enu

MET_{nomu}

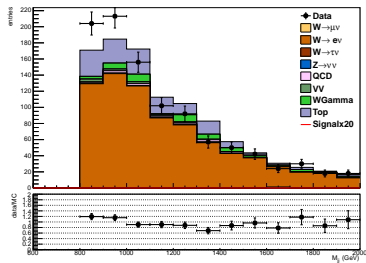


MET_{nomusig}

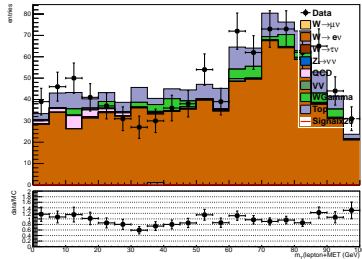


New control plots - enu

Mjj

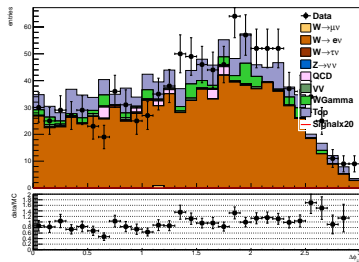


mt

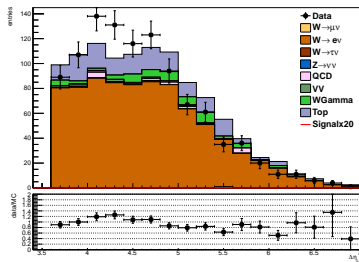


New control plots - $e\nu\mu$

Dijet Dphi

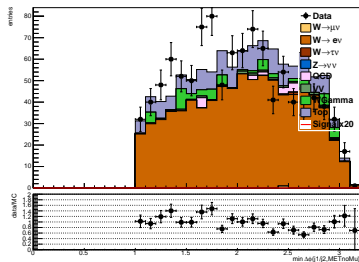


Detajj

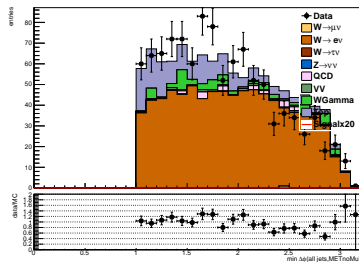


New control plots - $e\nu\bar{\nu}$

Leading jets-met mindphi

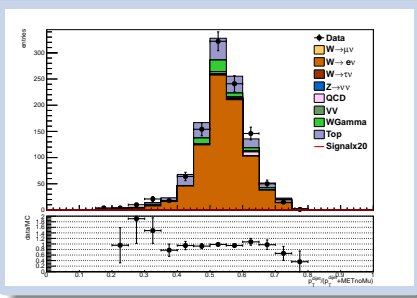


All jets-met mindphi



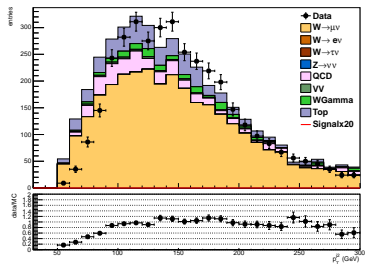
New control plots - enu

dijet-metnomu pt fraction

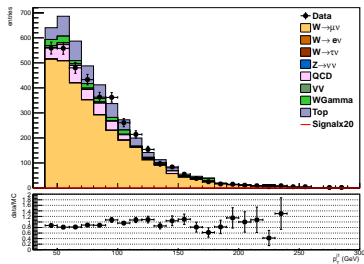


New control plots - $\mu\nu$

Jet 1 pt

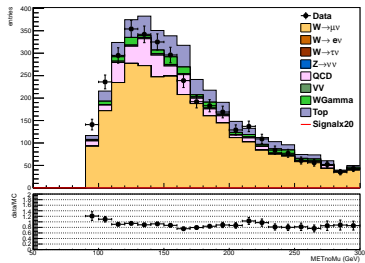


Jet 2 pt

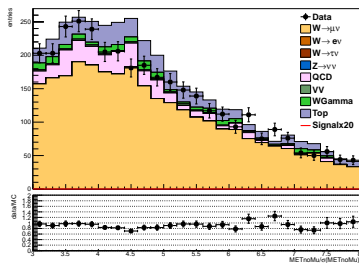


New control plots - munu

MET_{nomu}

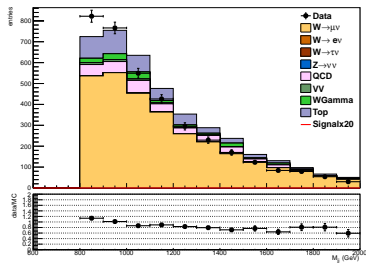


MET_{nomusig}

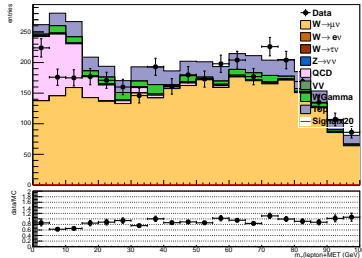


New control plots - $\mu\mu$

M_{jj}

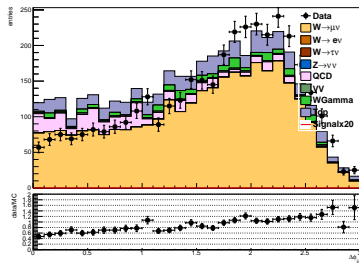


mt

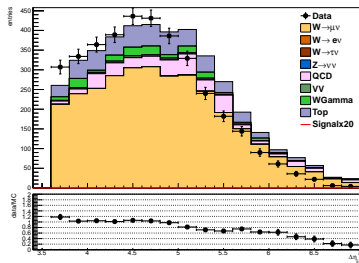


New control plots - $\mu\mu$

Dijet Dphi

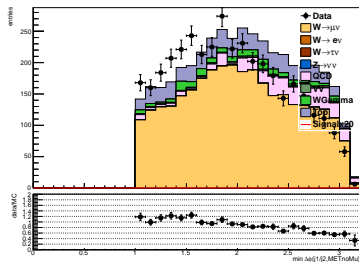


Detajj

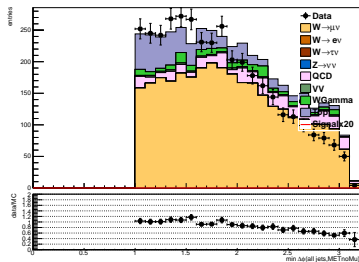


New control plots - $\mu\mu$

Leading jets-met mindphi

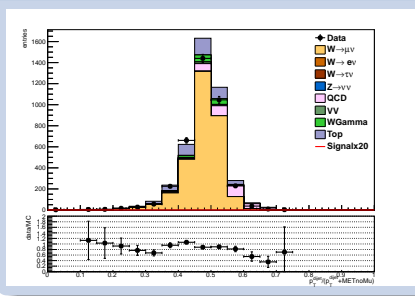


All jets-met mindphi



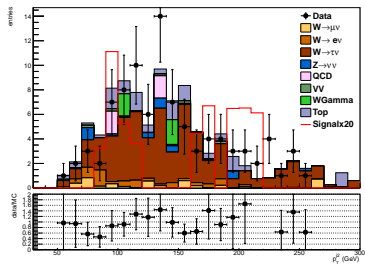
New control plots - $\mu\mu$

dijet-metnomu pt fraction

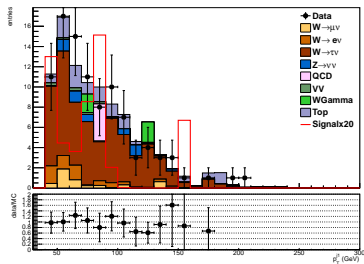


New control plots - taunu

Jet 1 pt

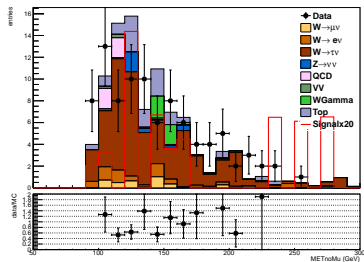


Jet 2 pt

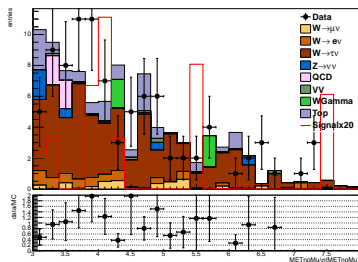


New control plots - taunu

MET_{nomu}

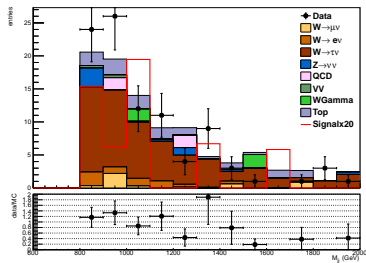


MET_{nomusig}

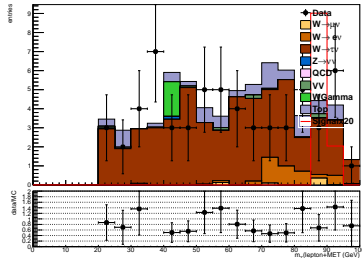


New control plots - taunu

Mjj

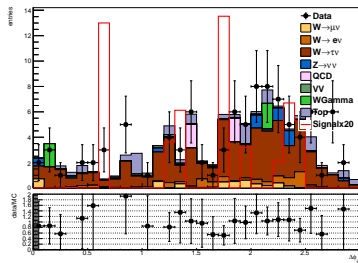


mt

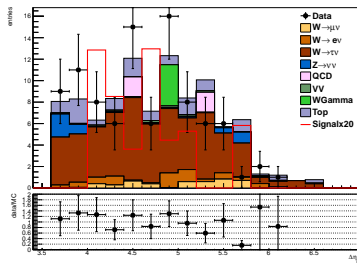


New control plots - taunu

Dijet Dphi

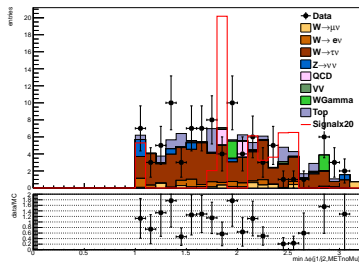


Detajj

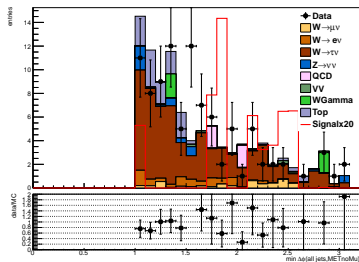


New control plots - taunu

Leading jets-met mindphi

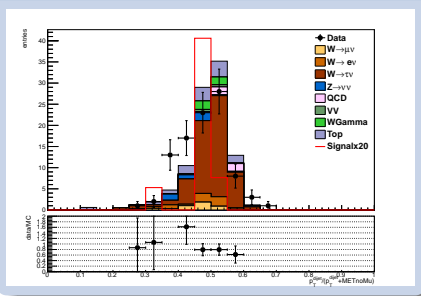


All jets-met mindphi



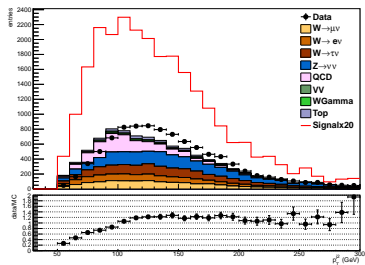
New control plots - taunu

dijet-metnomu pt fraction

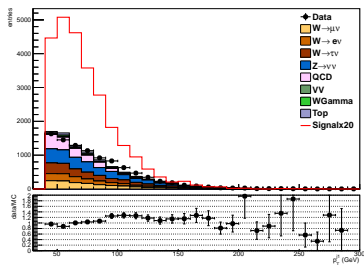


New control plots - sig

Jet 1 pt

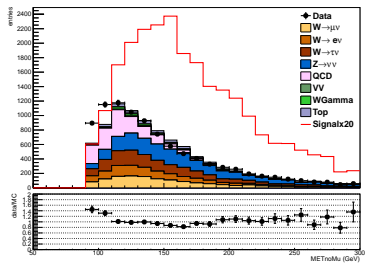


Jet 2 pt

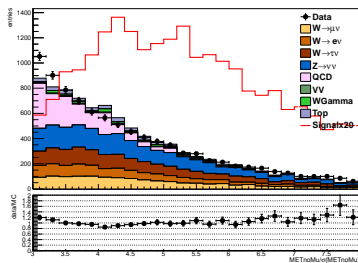


New control plots - sig

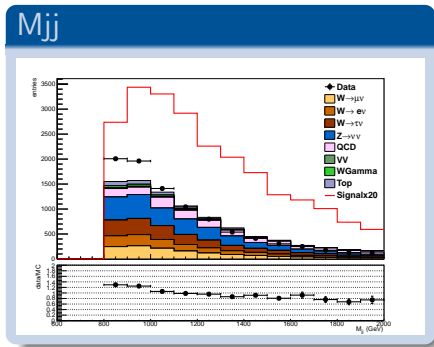
MET_{nomu}



MET_{nomu}sig

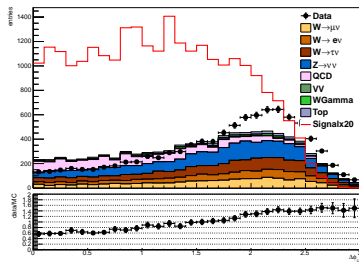


New control plots - sig

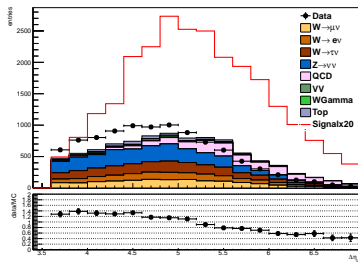


New control plots - sig

Dijet Dphi

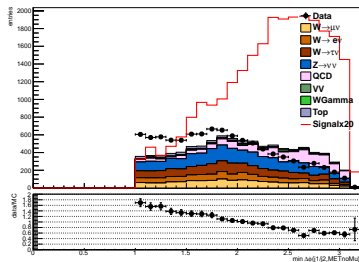


Detajj

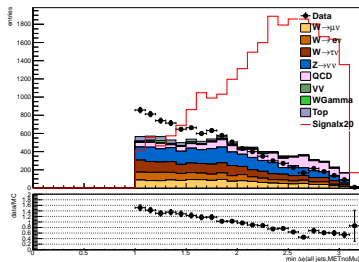


New control plots - sig

Leading jets-met mindphi

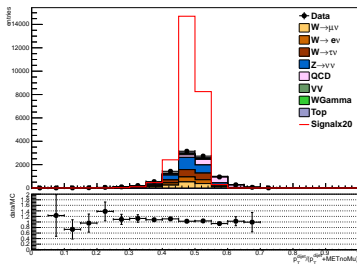


All jets-met mindphi



New control plots - sig

dijet-metnomu pt fraction



Conclusions

- ▶ Focused on agreement in control regions
 - This minimises effect of mismodelled QCD
- ▶ New pre-selection proposed:
- ▶ m_T cut added to $\tau\nu_{\tau}$ to reduce QCD
 - could consider also adding to $\mu\nu_{\mu}$ region
- ▶ Added all jets-met $\Delta\phi$ cut
 - Significant improvement over leading jets-met $\Delta\phi$ cut

Backup