NNCuts on LRHWW, Mll and MetSig

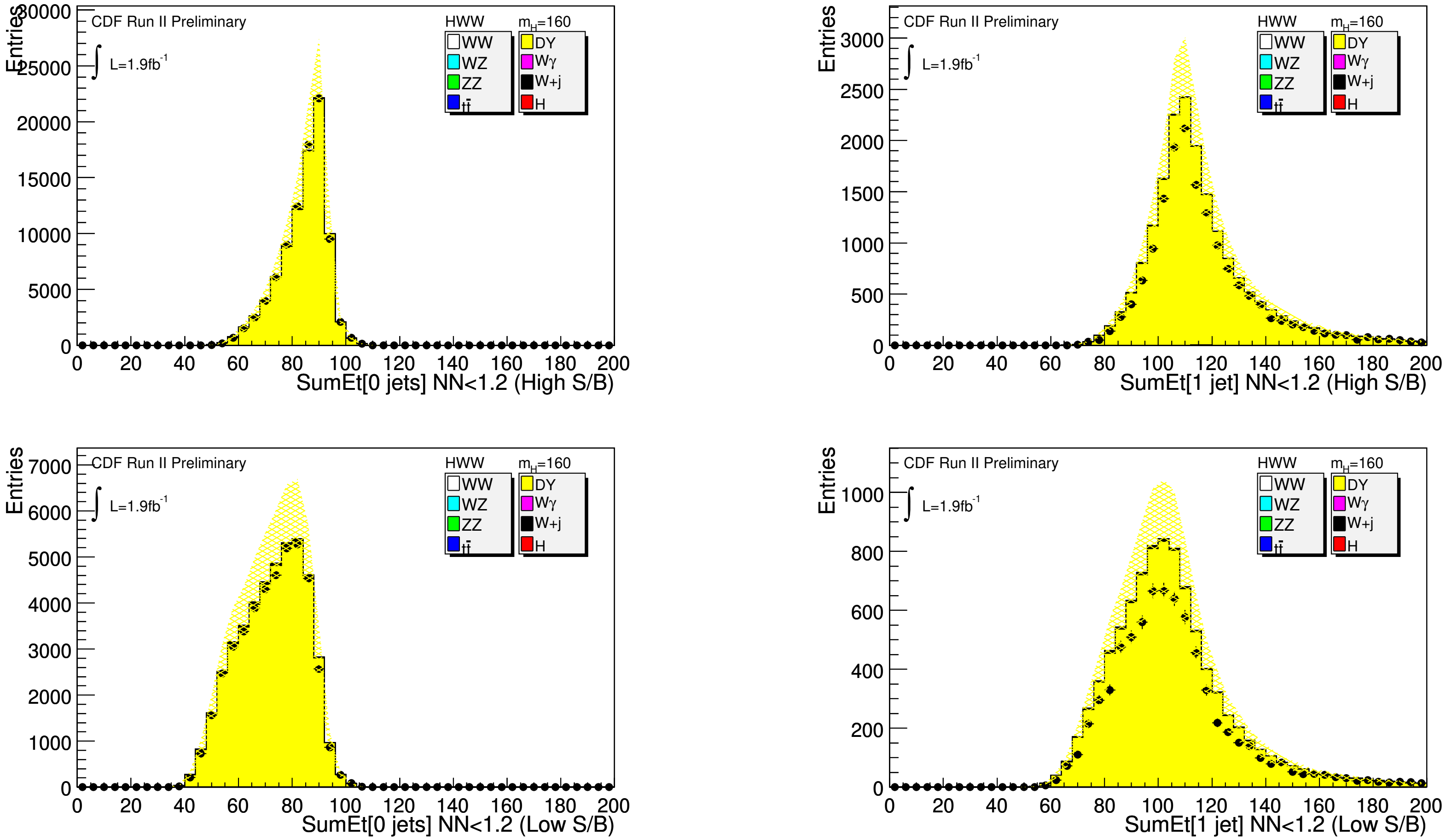
Richard St. Denis University of Glasgow/CDF

17 December 2007

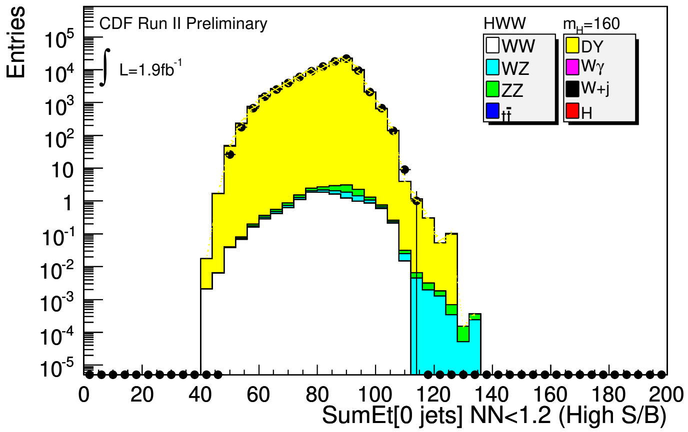
Outline

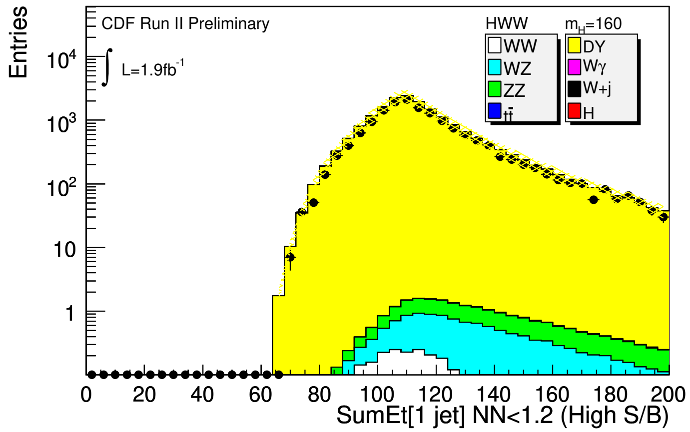
- MetSig, Met and SumEt by jet and Hi/Lo S/B
- BaseSameSign

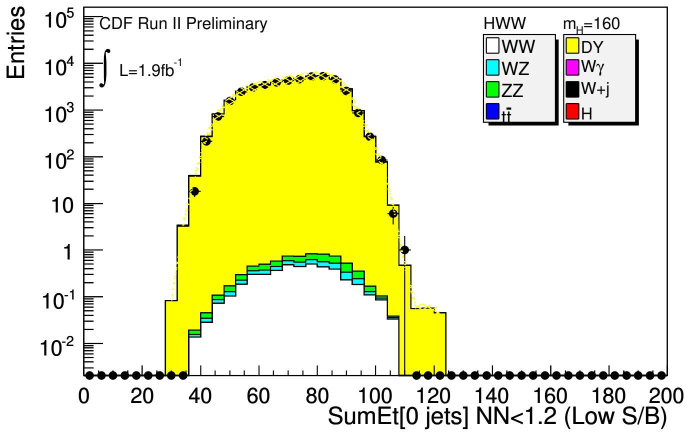
SumEt

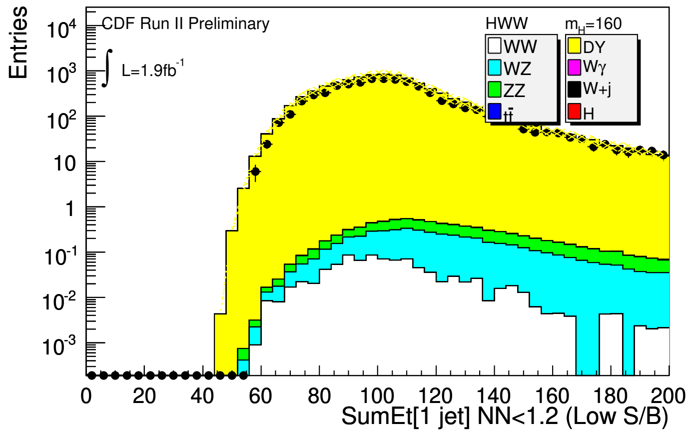

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
SumEt[0 jets] NN<1.2 (High S/B)
SumEt[1 jet] NN<1.2 (High S/B)
SumEt[0 jets] NN<1.2 (Low S/B)
SumEt[1 jet] NN<1.2 (Low S/B)

SumEt

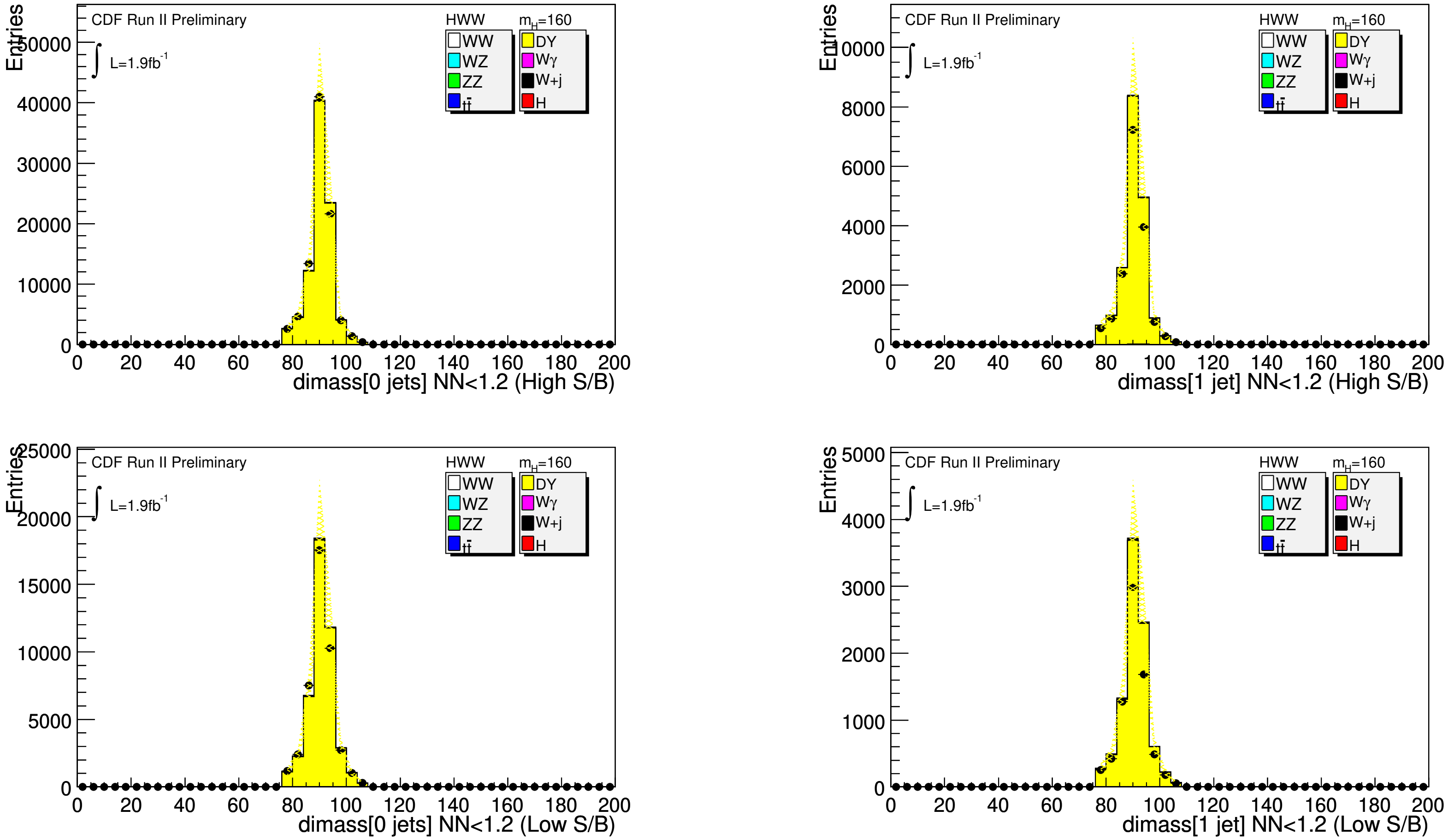

CDF Run II Preliminary
$\int L=1.9fb^{-1}$
HWW m_H=160
WW
WZ
ZZ
$t\bar{t}$
DY
Wγ
W+j
H
Entries
SumEt[0 jets] NN<1.2 (High S/B)


CDF Run II Preliminary
$\int L=1.9fb^{-1}$
HWW m_H=160
WW
WZ
ZZ
$t\bar{t}$
DY
Wγ
W+j
H
Entries
SumEt[1 jet] NN<1.2 (High S/B)

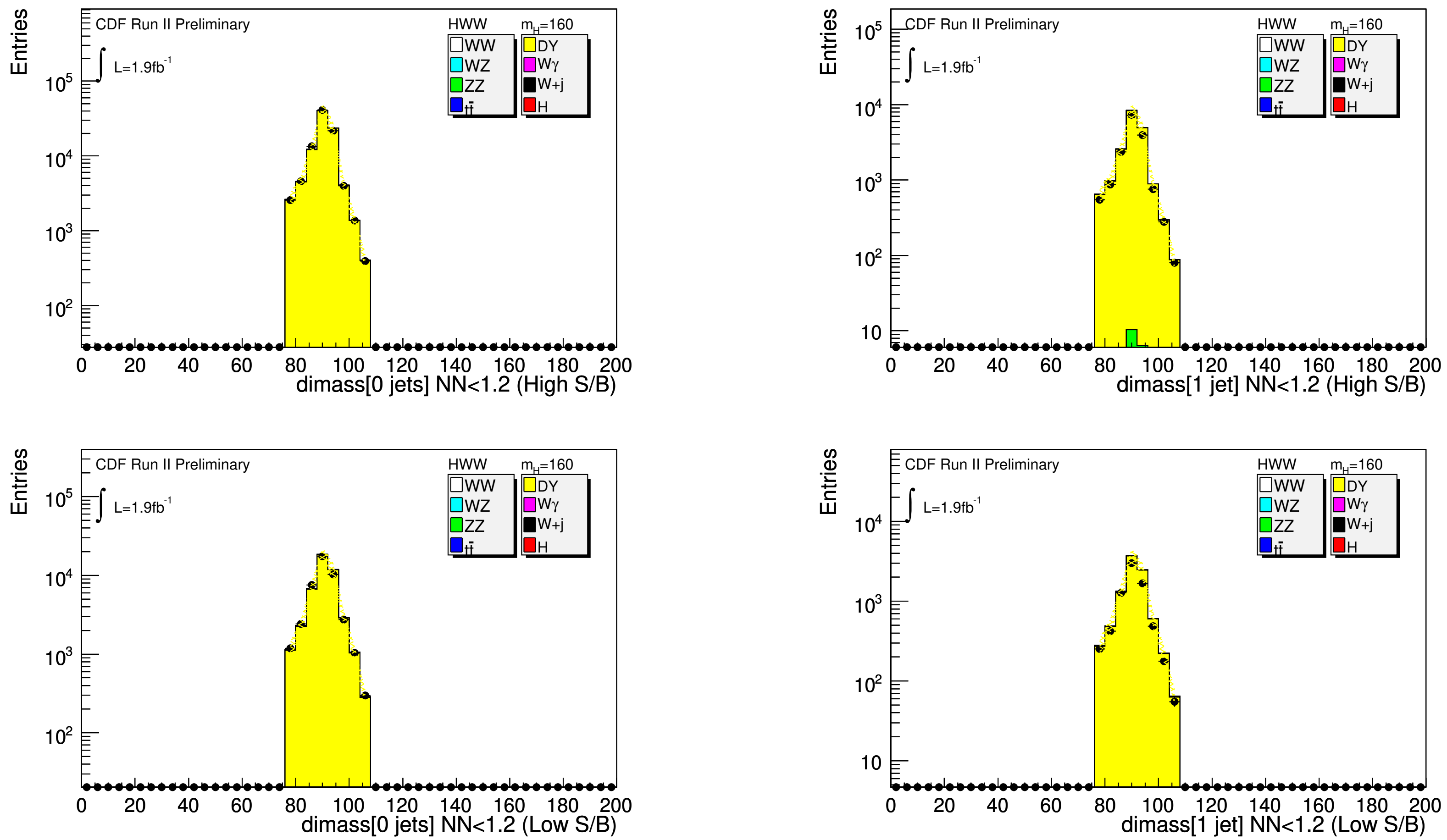

CDF Run II Preliminary
$\int L=1.9fb^{-1}$
HWW m_H=160
WW
WZ
ZZ
$t\bar{t}$
DY
Wγ
W+j
H
Entries
SumEt[0 jets] NN<1.2 (Low S/B)


CDF Run II Preliminary
$\int L=1.9fb^{-1}$
HWW m_H=160
WW
WZ
ZZ
$t\bar{t}$
DY
Wγ
W+j
H
Entries
SumEt[1 jet] NN<1.2 (Low S/B)

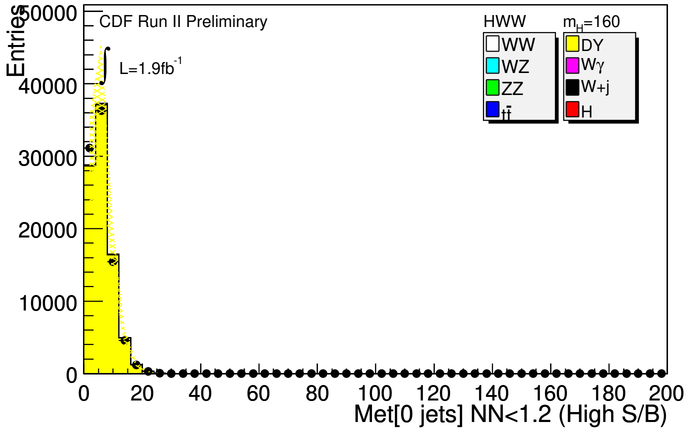
DiMass

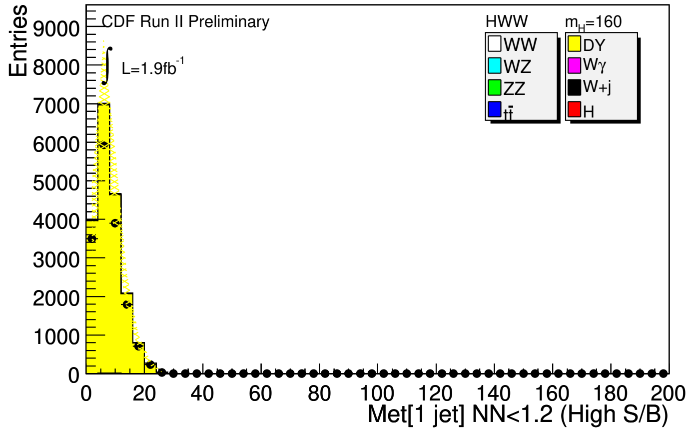

CDF Run II Preliminary
$\int$ L=1.9fb^{-1}
HWW
m_H=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
dimass[0 jets] NN<1.2 (High S/B)
dimass[1 jet] NN<1.2 (High S/B)
dimass[0 jets] NN<1.2 (Low S/B)
dimass[1 jet] NN<1.2 (Low S/B)

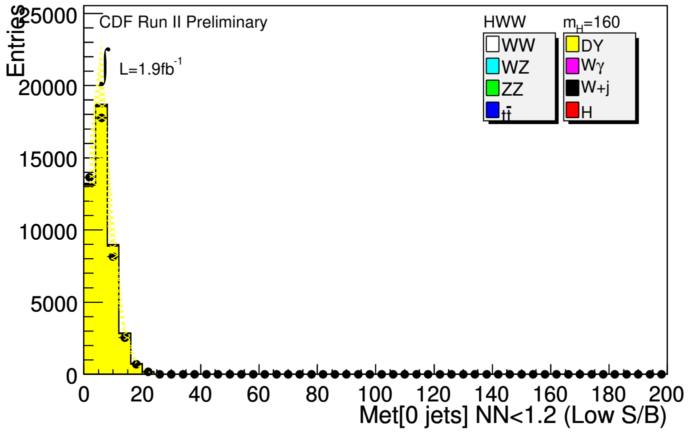
DiMass

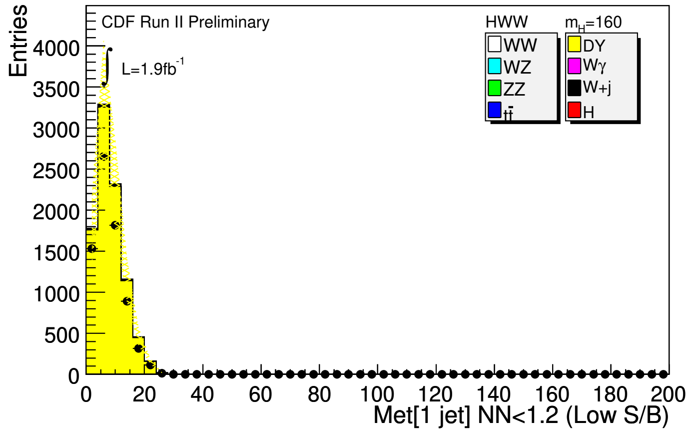

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
dimass[0 jets] NN<1.2 (High S/B)
dimass[1 jet] NN<1.2 (High S/B)
dimass[0 jets] NN<1.2 (Low S/B)
dimass[1 jet] NN<1.2 (Low S/B)

Met

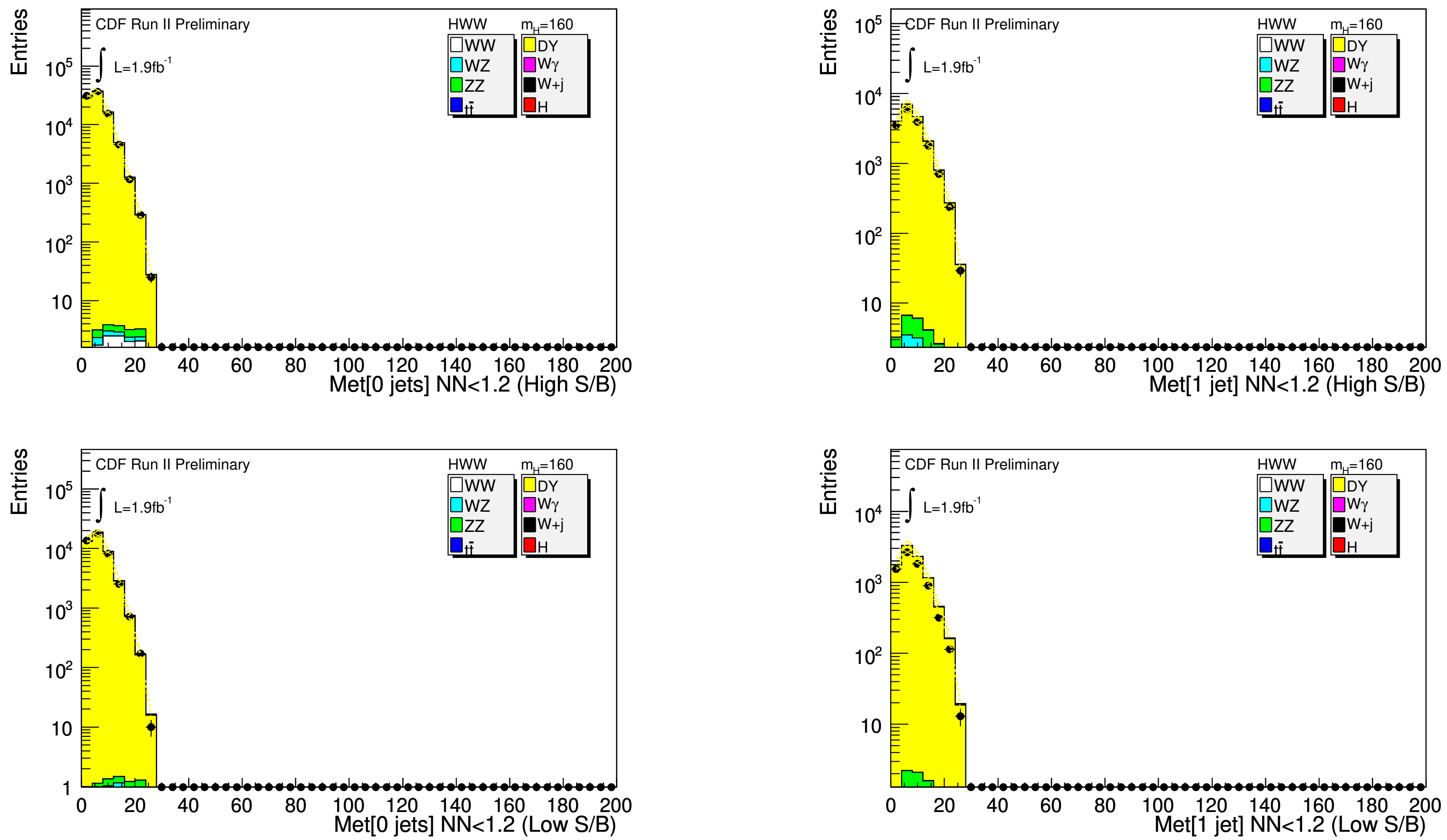

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
Met[0 jets] NN<1.2 (High S/B)


CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
Met[1 jet] NN<1.2 (High S/B)

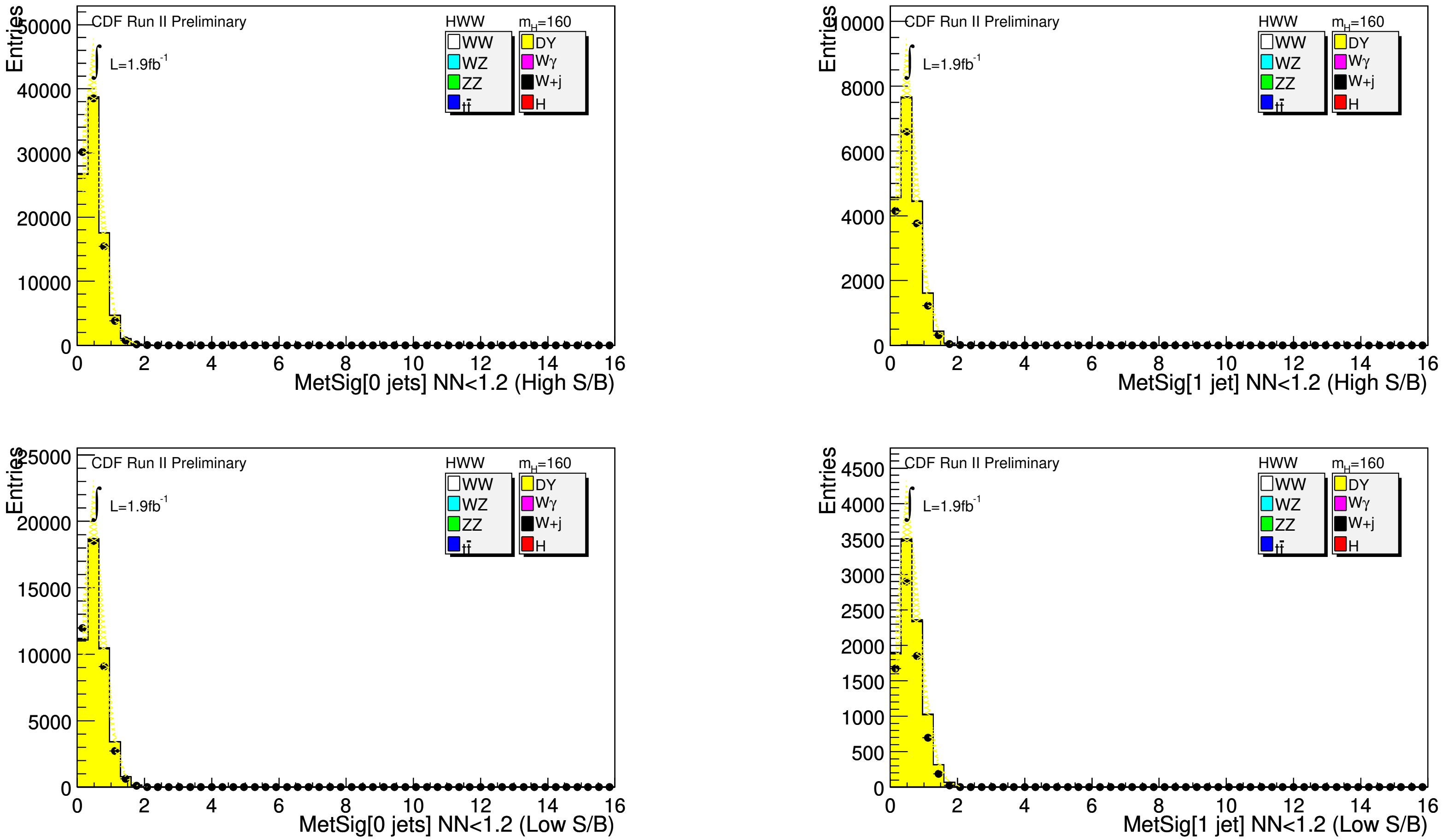

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
Met[0 jets] NN<1.2 (Low S/B)


CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
Met[1 jet] NN<1.2 (Low S/B)

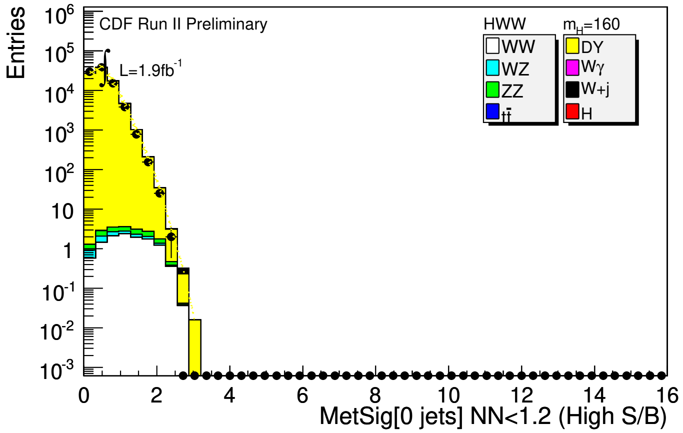
Met

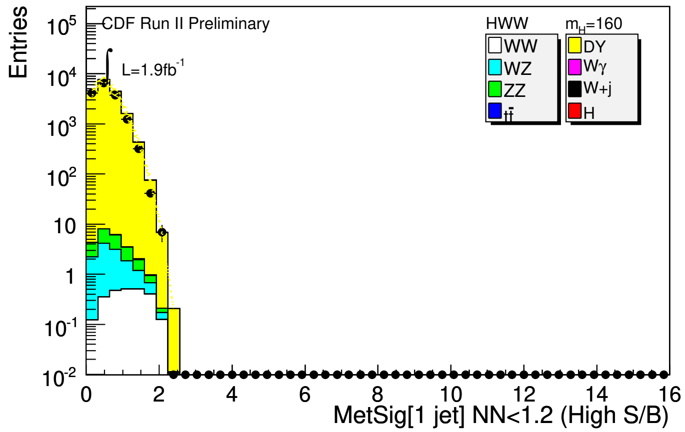

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
Met[0 jets] NN<1.2 (High S/B)
Met[1 jet] NN<1.2 (High S/B)
Met[0 jets] NN<1.2 (Low S/B)
Met[1 jet] NN<1.2 (Low S/B)

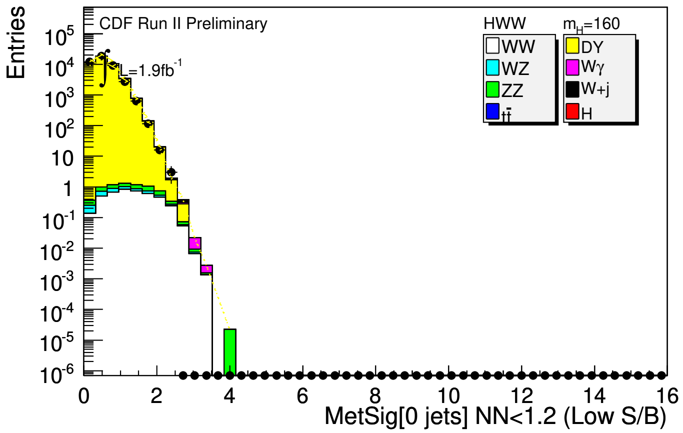
MetSig

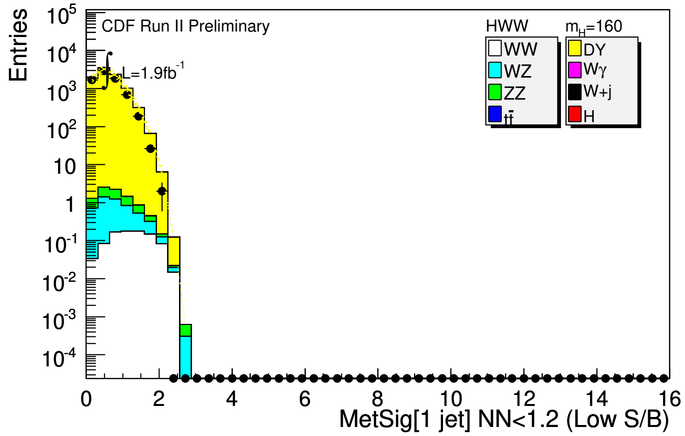

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
MetSig[0 jets] NN<1.2 (High S/B)
MetSig[1 jet] NN<1.2 (High S/B)
MetSig[0 jets] NN<1.2 (Low S/B)
MetSig[1 jet] NN<1.2 (Low S/B)

MetSig

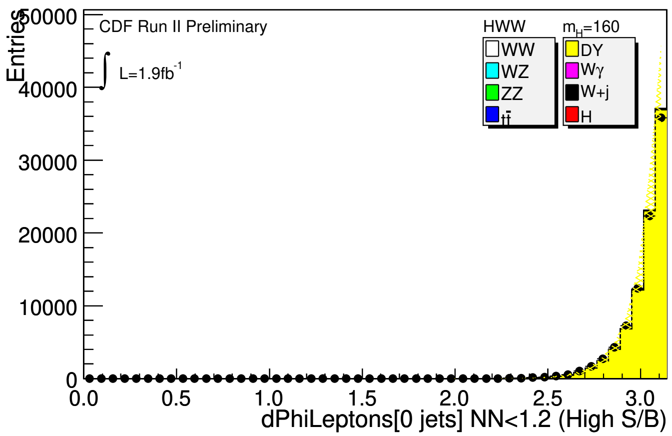

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
MetSig[0 jets] NN<1.2 (High S/B)

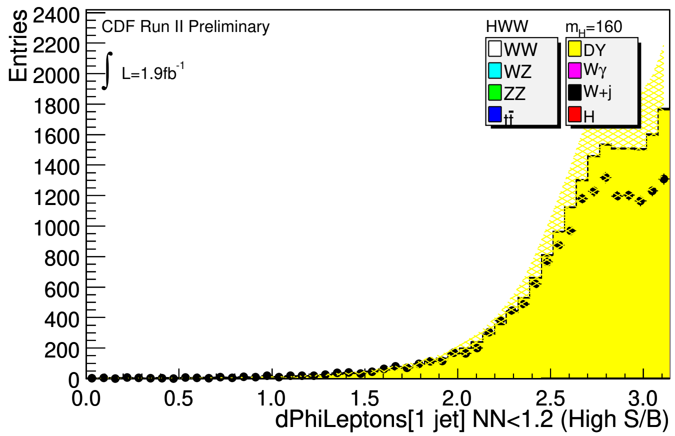

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
MetSig[1 jet] NN<1.2 (High S/B)

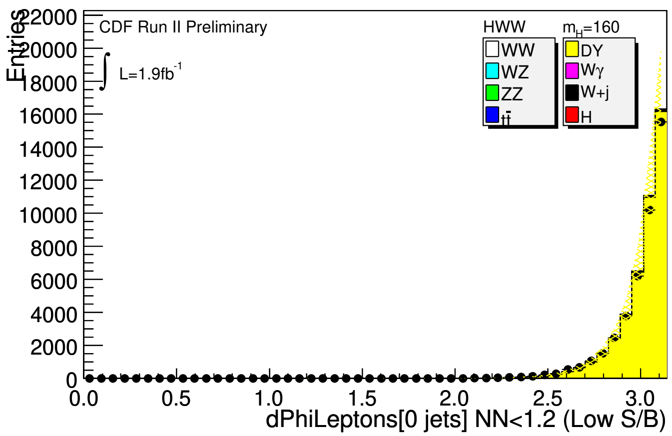

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
MetSig[0 jets] NN<1.2 (Low S/B)

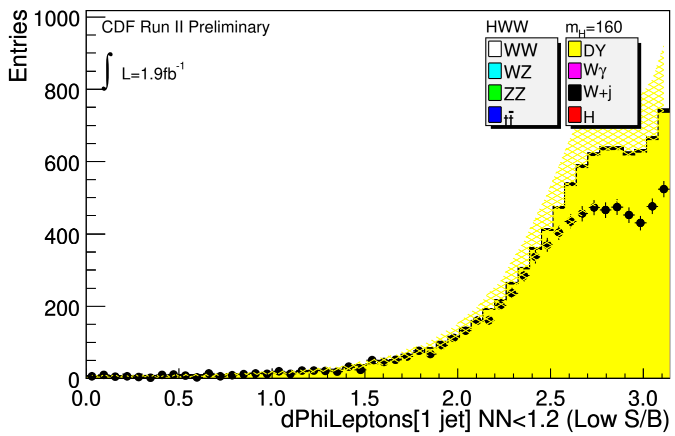

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
MetSig[1 jet] NN<1.2 (Low S/B)

dPhiLeptons

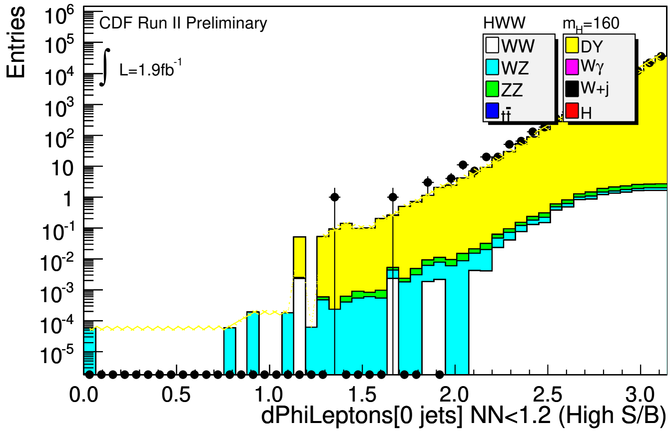


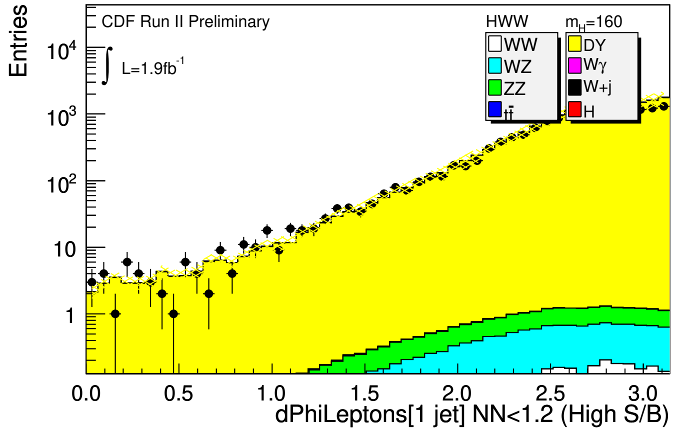


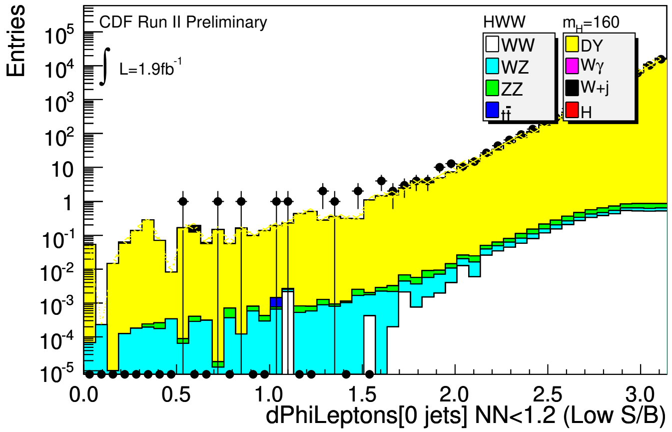


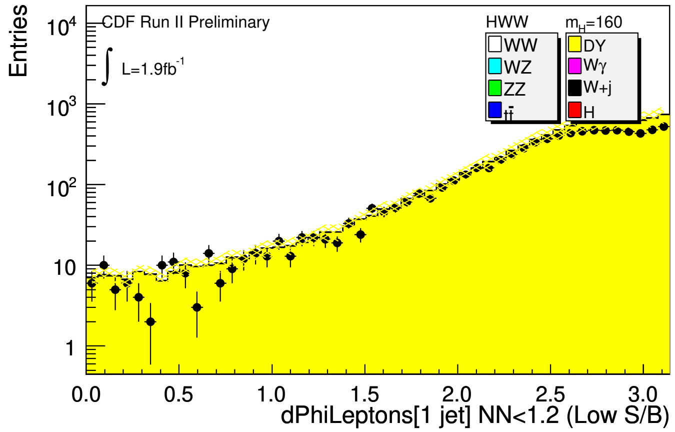


dPhiLeptons

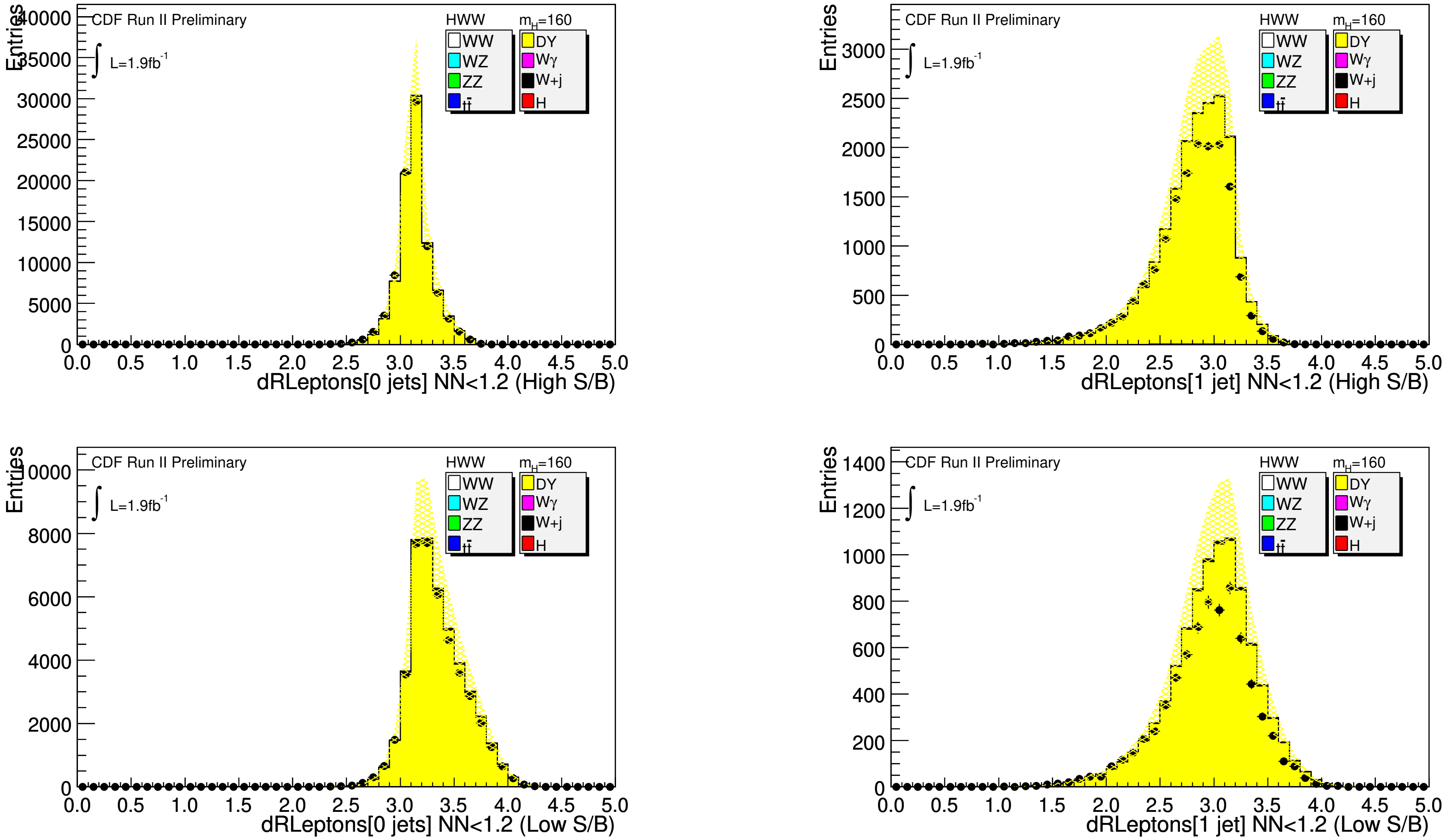




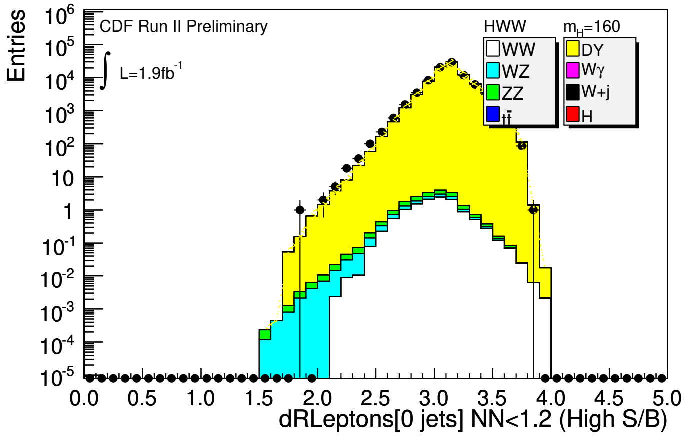


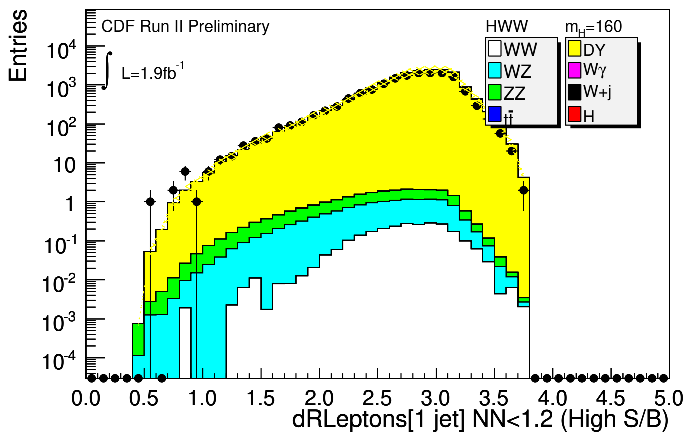


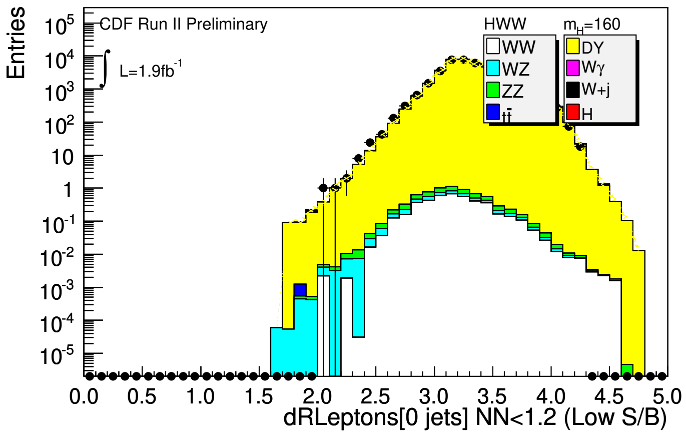
dRLeptons

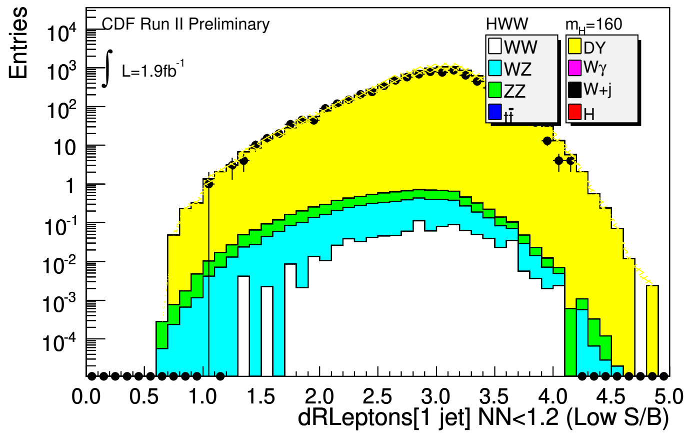

CDF Run II Preliminary
$\int L = 1.9 fb^{-1}$
HWW
$m_H = 160$
WW
WZ
ZZ
$t\bar{t}$
DY
Wγ
W+j
H
Entries
dRLeptons[0 jets] NN<1.2 (High S/B)
dRLeptons[1 jet] NN<1.2 (High S/B)
dRLeptons[0 jets] NN<1.2 (Low S/B)
dRLeptons[1 jet] NN<1.2 (Low S/B)

dRLeptons

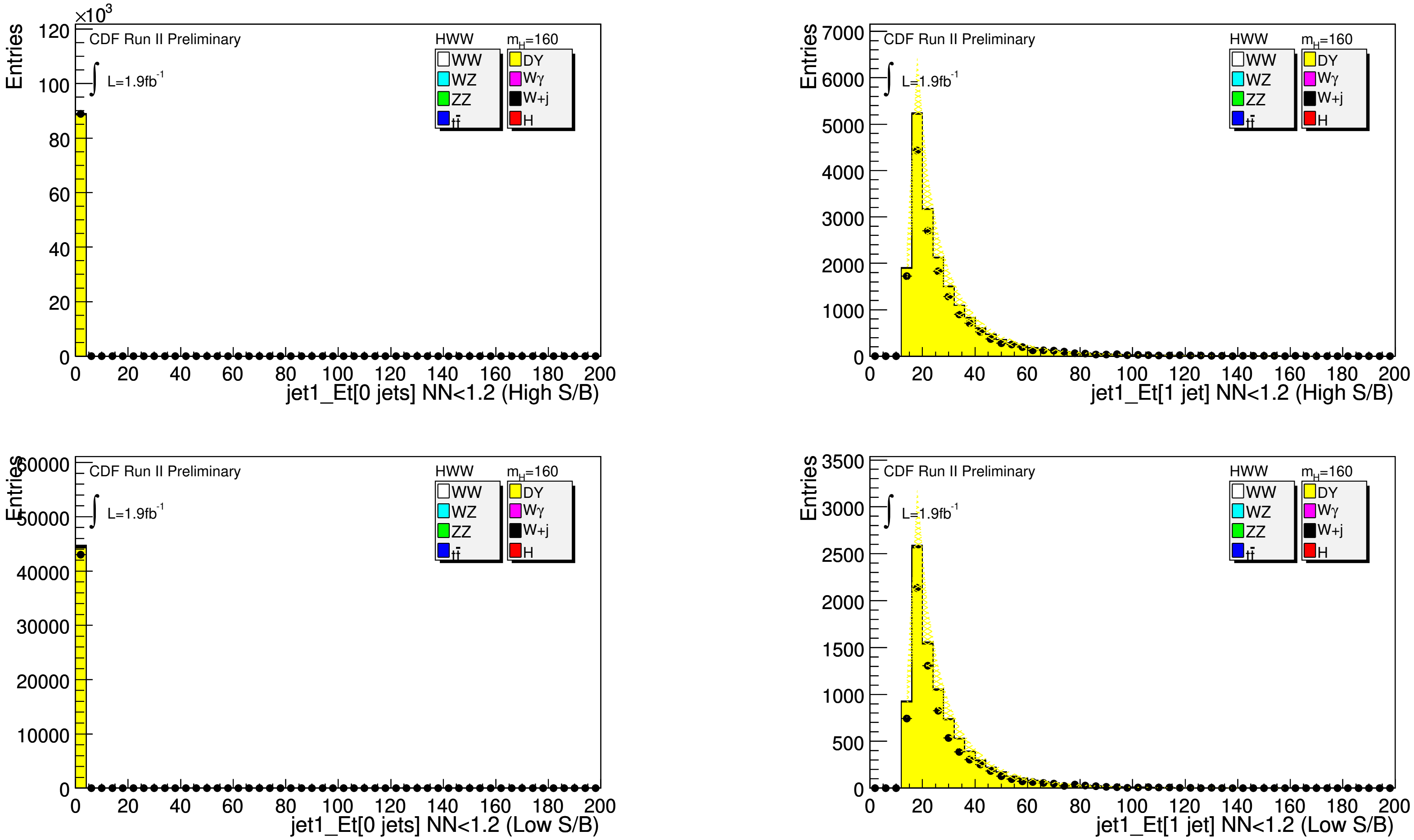

CDF Run II Preliminary
L=1.9fb^{-1}
HWW m_H=160
WW
WZ
ZZ
$t\bar{t}$
DY
Wγ
W+j
H
Entries
dRLeptons[0 jets] NN<1.2 (High S/B)


CDF Run II Preliminary
L=1.9fb^{-1}
HWW m_H=160
WW
WZ
ZZ
$t\bar{t}$
DY
Wγ
W+j
H
Entries
dRLeptons[1 jet] NN<1.2 (High S/B)

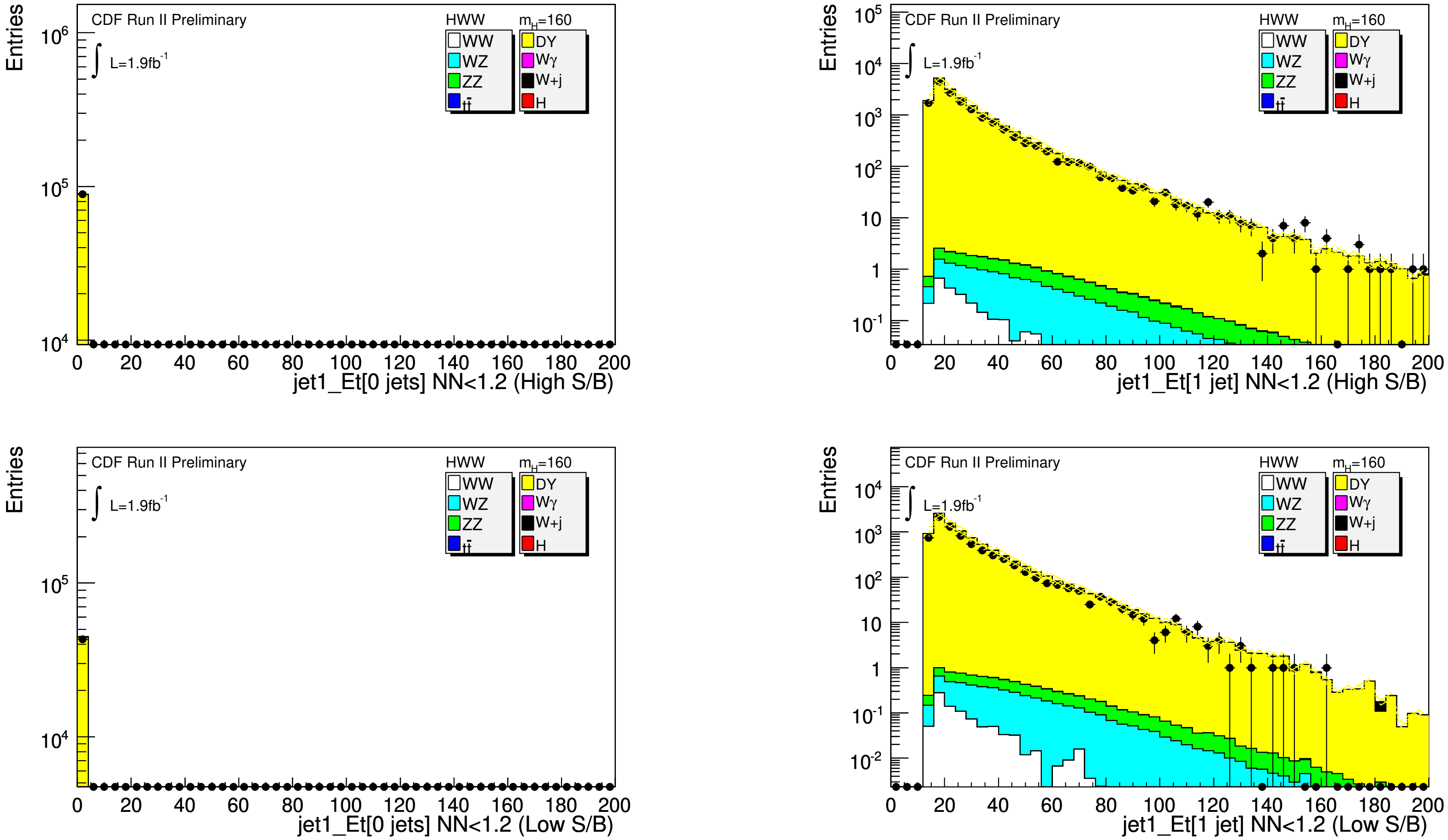

CDF Run II Preliminary
L=1.9fb^{-1}
HWW m_H=160
WW
WZ
ZZ
$t\bar{t}$
DY
Wγ
W+j
H
Entries
dRLeptons[0 jets] NN<1.2 (Low S/B)


CDF Run II Preliminary
L=1.9fb^{-1}
HWW m_H=160
WW
WZ
ZZ
$t\bar{t}$
DY
Wγ
W+j
H
Entries
dRLeptons[1 jet] NN<1.2 (Low S/B)

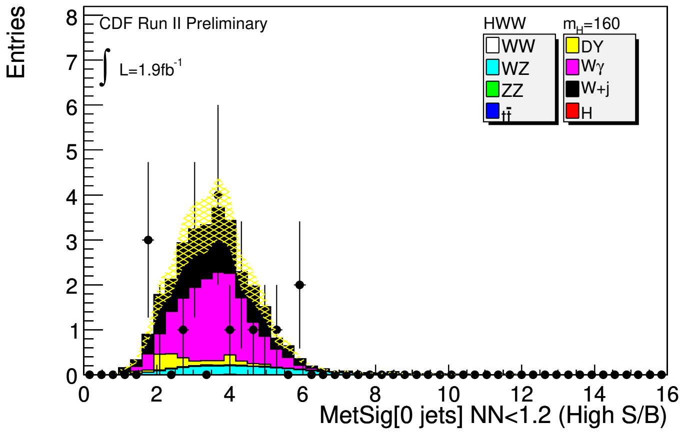
jet1 Et

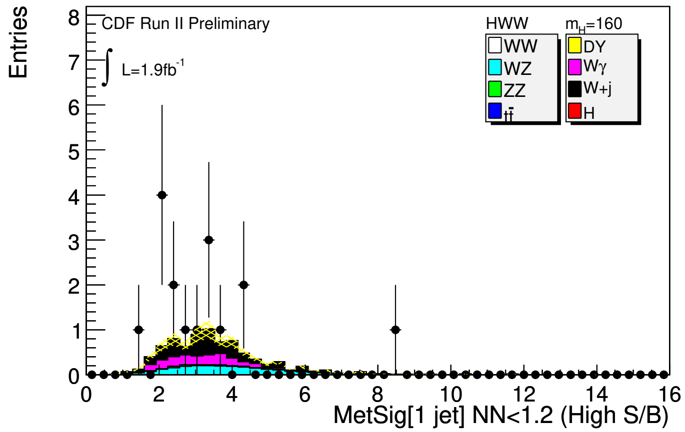

CDF Run II Preliminary
L=1.9fb^{-1}
HWW
m_H=160
WW
WZ
ZZ
$t\bar{t}$
DY
Wγ
W+j
H
Entries
×10^3
jet1_Et[0 jets] NN<1.2 (High S/B)
jet1_Et[1 jet] NN<1.2 (High S/B)
jet1_Et[0 jets] NN<1.2 (Low S/B)
jet1_Et[1 jet] NN<1.2 (Low S/B)

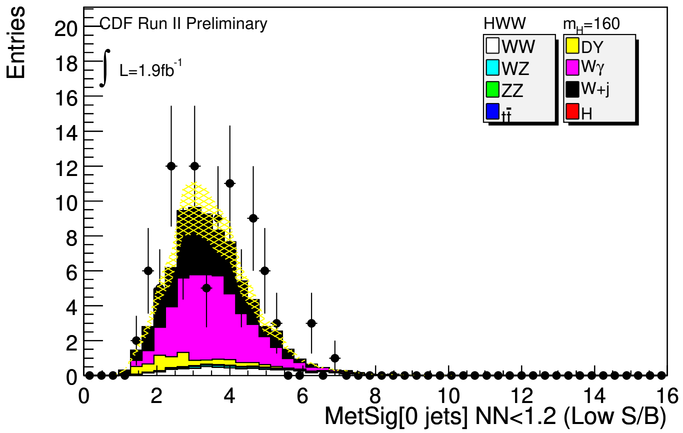
jet1 Et

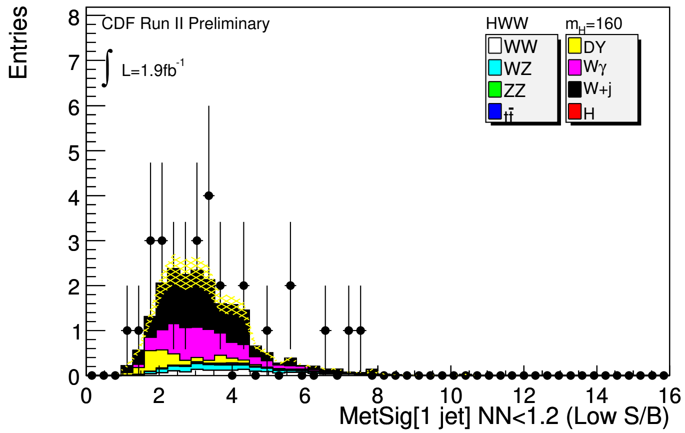

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
jet1_Et[0 jets] NN<1.2 (High S/B)
jet1_Et[1 jet] NN<1.2 (High S/B)
jet1_Et[0 jets] NN<1.2 (Low S/B)
jet1_Et[1 jet] NN<1.2 (Low S/B)

Base SameSign

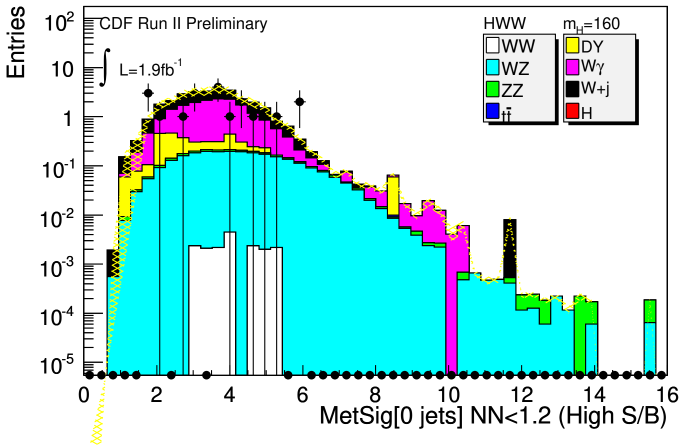


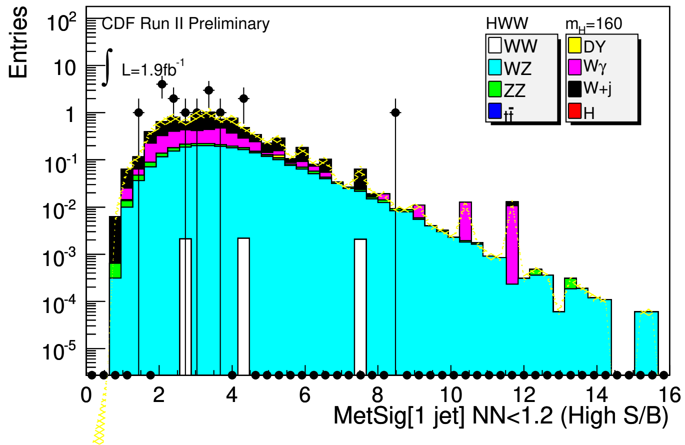


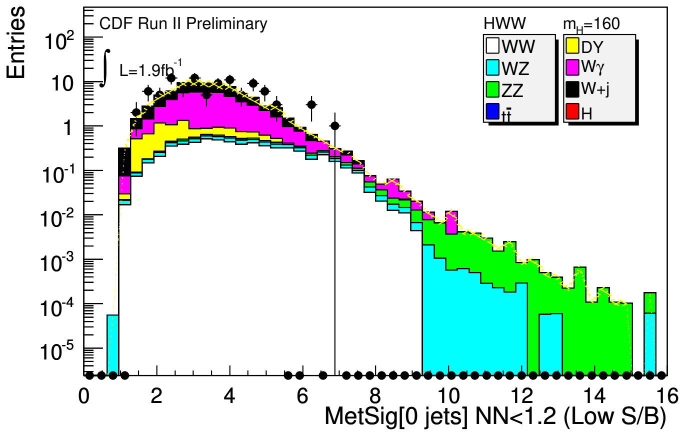


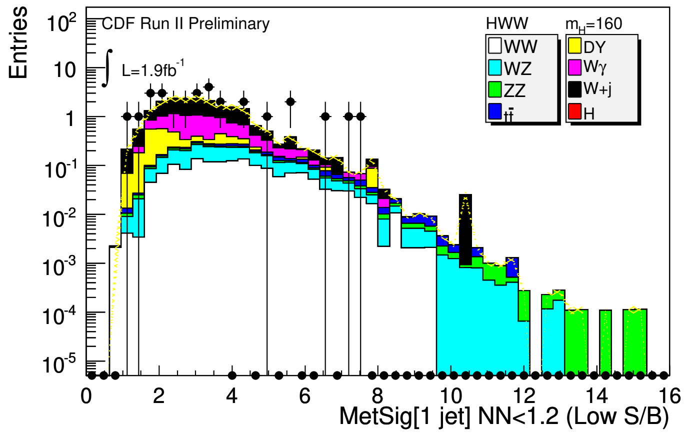


Base SameSign

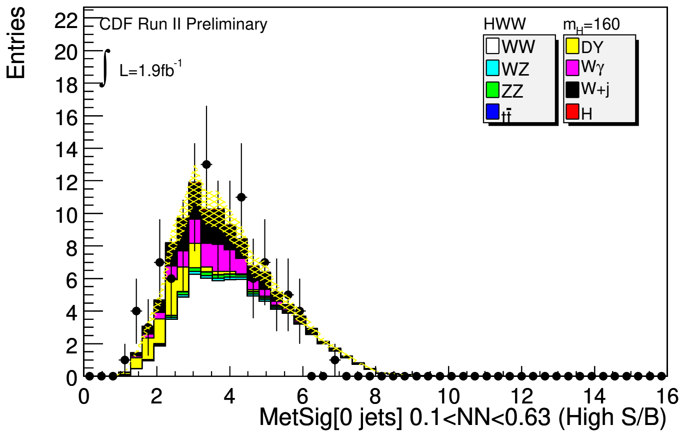


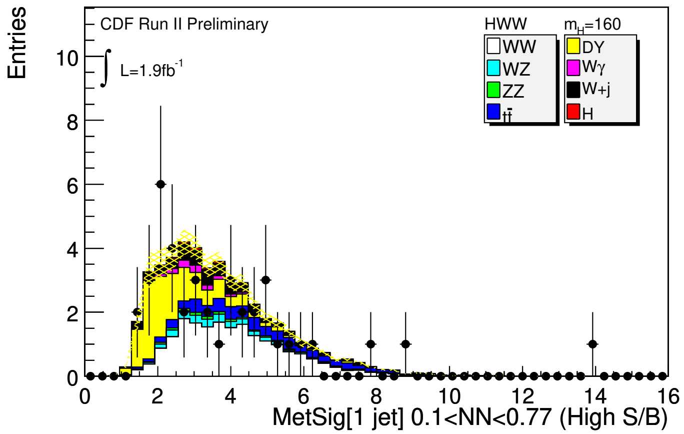


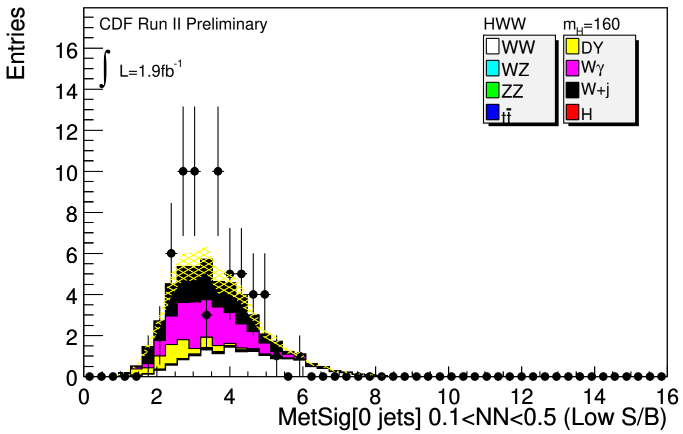


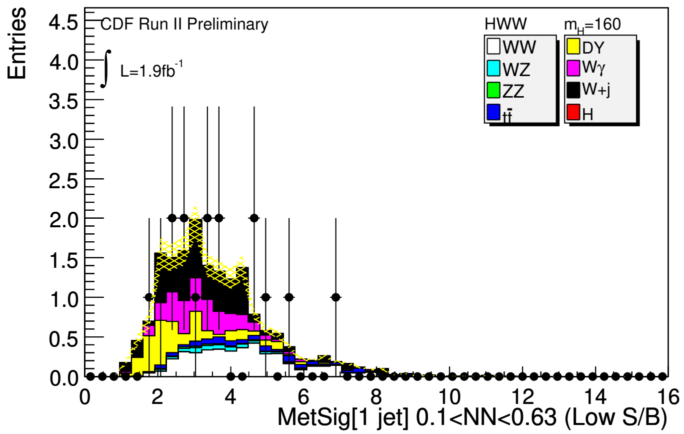


Base

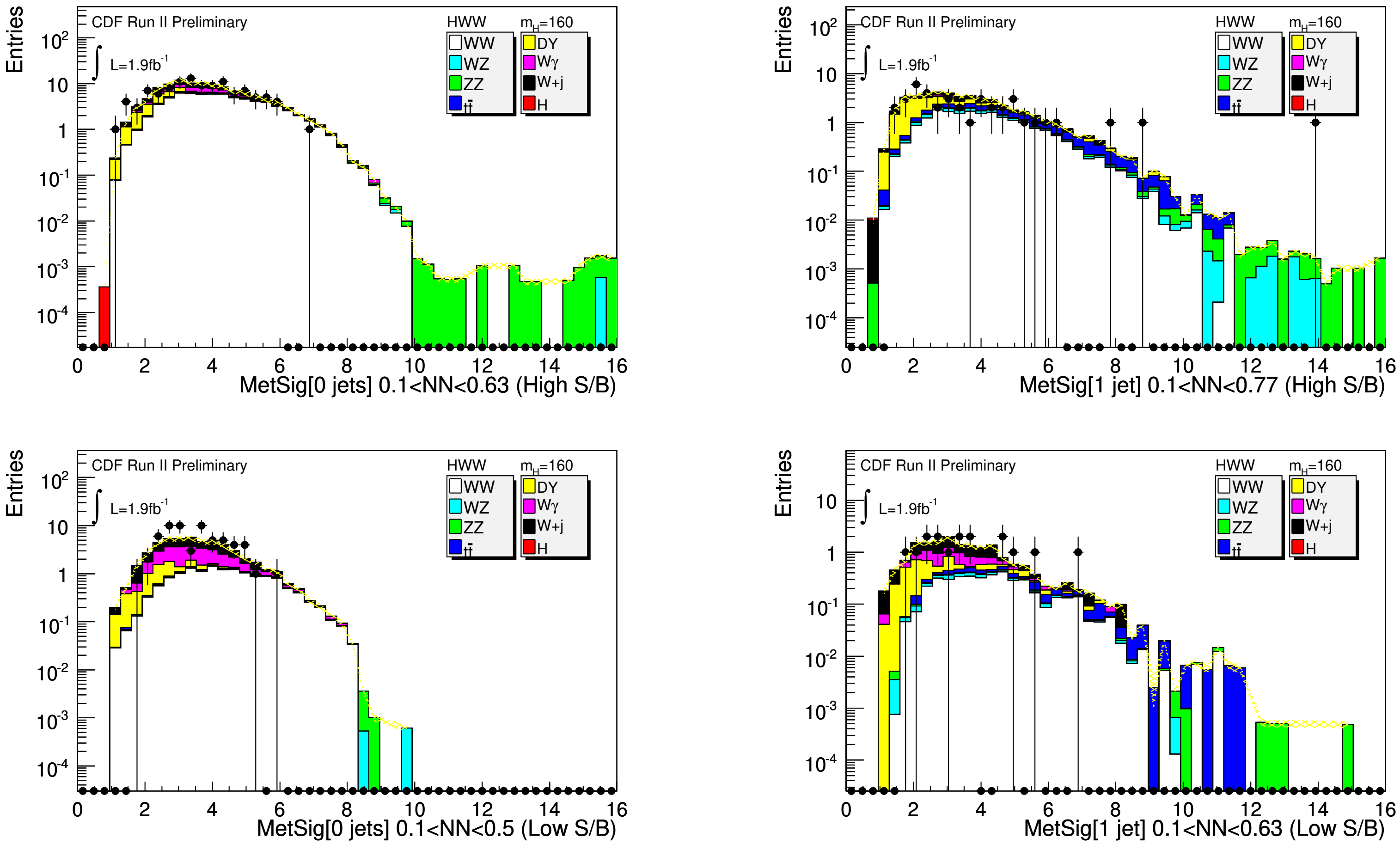

CDF Run II Preliminary
$\int L=1.9fb^{-1}$
HWW $m_H=160$
WW
WZ
ZZ
tt
DY
Wγ
W+j
H
Entries
MetSig[0 jets] 0.1<NN<0.63 (High S/B)


CDF Run II Preliminary
$\int L=1.9fb^{-1}$
HWW $m_H=160$
WW
WZ
ZZ
tt
DY
Wγ
W+j
H
Entries
MetSig[1 jet] 0.1<NN<0.77 (High S/B)

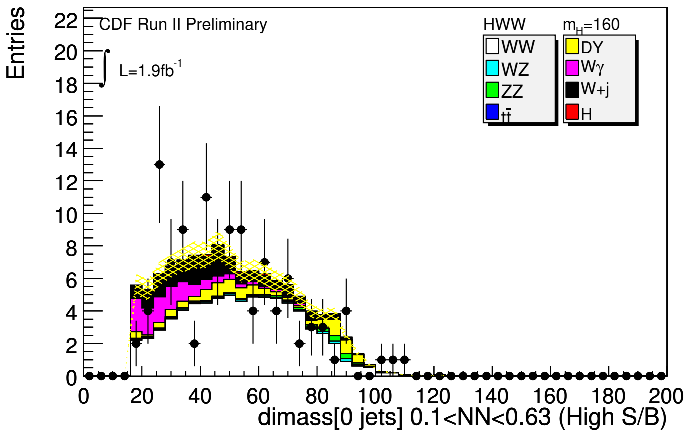

CDF Run II Preliminary
$\int L=1.9fb^{-1}$
HWW $m_H=160$
WW
WZ
ZZ
tt
DY
Wγ
W+j
H
Entries
MetSig[0 jets] 0.1<NN<0.5 (Low S/B)

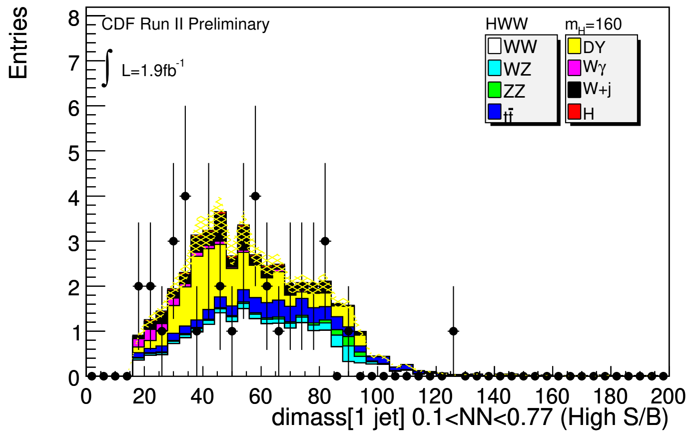

CDF Run II Preliminary
$\int L=1.9fb^{-1}$
HWW $m_H=160$
WW
WZ
ZZ
tt
DY
Wγ
W+j
H
Entries
MetSig[1 jet] 0.1<NN<0.63 (Low S/B)

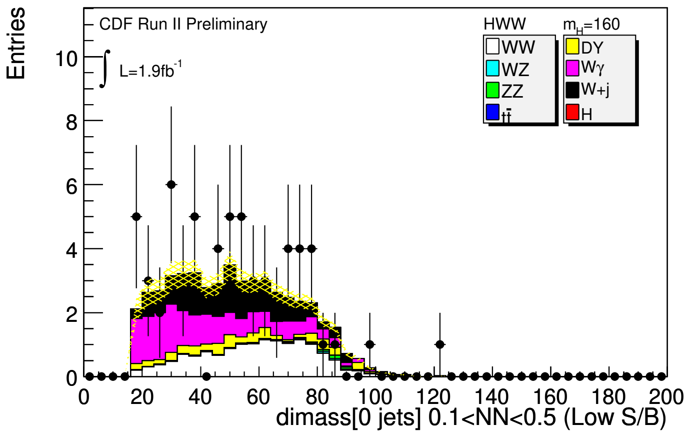
Base

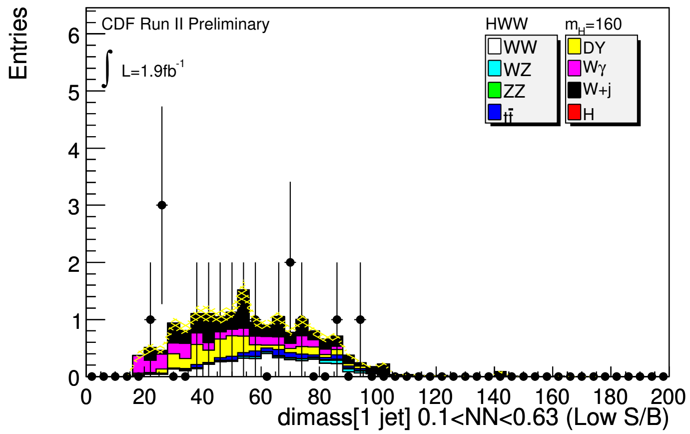

CDF Run II Preliminary
∫ L=1.9fb⁻¹
HWW
m_H=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
MetSig[0 jets] 0.1<NN<0.63 (High S/B)
MetSig[1 jet] 0.1<NN<0.77 (High S/B)
MetSig[0 jets] 0.1<NN<0.5 (Low S/B)
MetSig[1 jet] 0.1<NN<0.63 (Low S/B)

Base

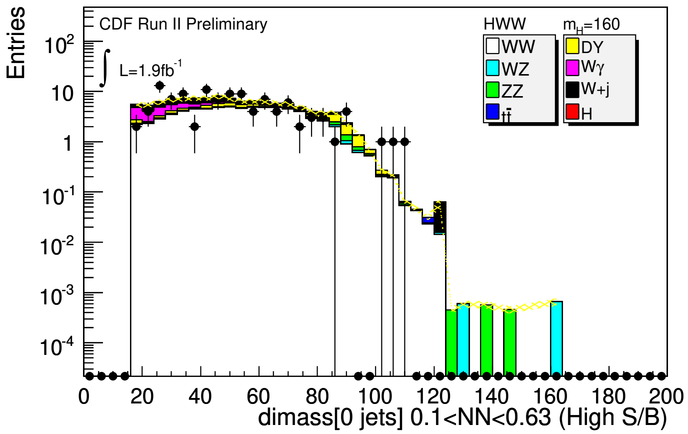

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
dimass[0 jets] 0.1<NN<0.63 (High S/B)

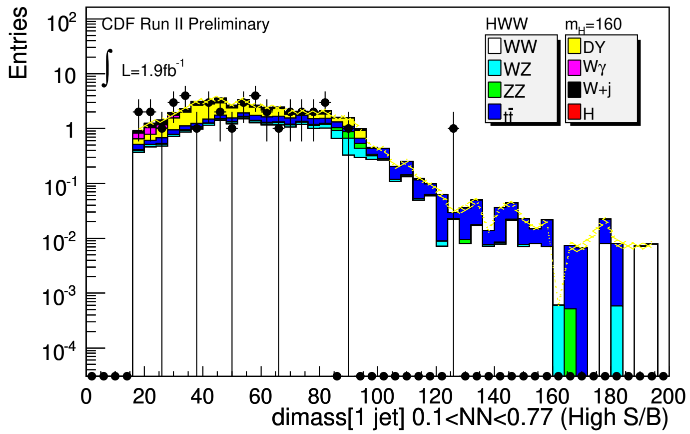

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
dimass[1 jet] 0.1<NN<0.77 (High S/B)

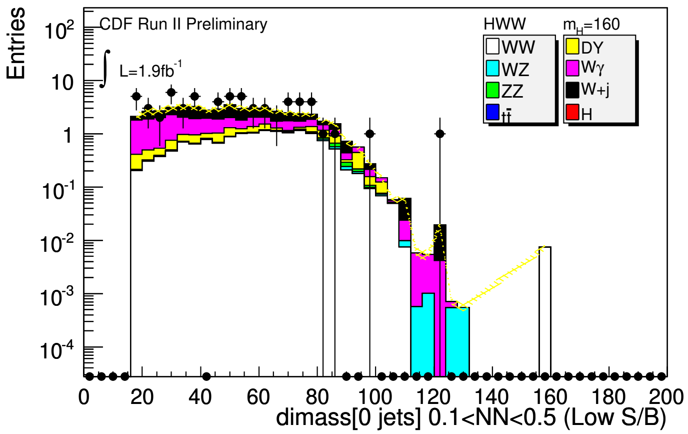

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
dimass[0 jets] 0.1<NN<0.5 (Low S/B)

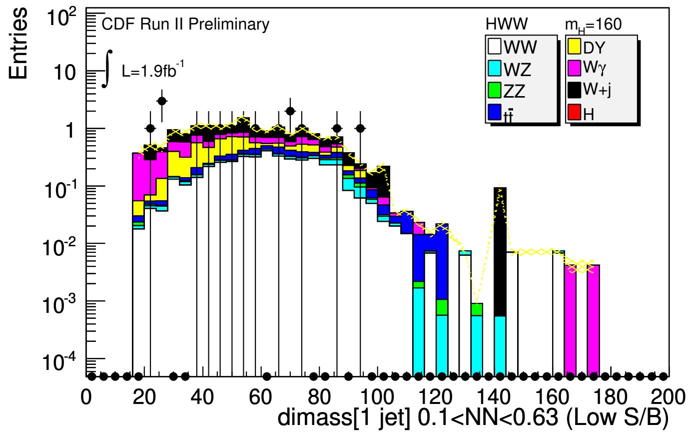

CDF Run II Preliminary
L=1.9fb-1
HWW
mH=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
Entries
dimass[1 jet] 0.1<NN<0.63 (Low S/B)

Base

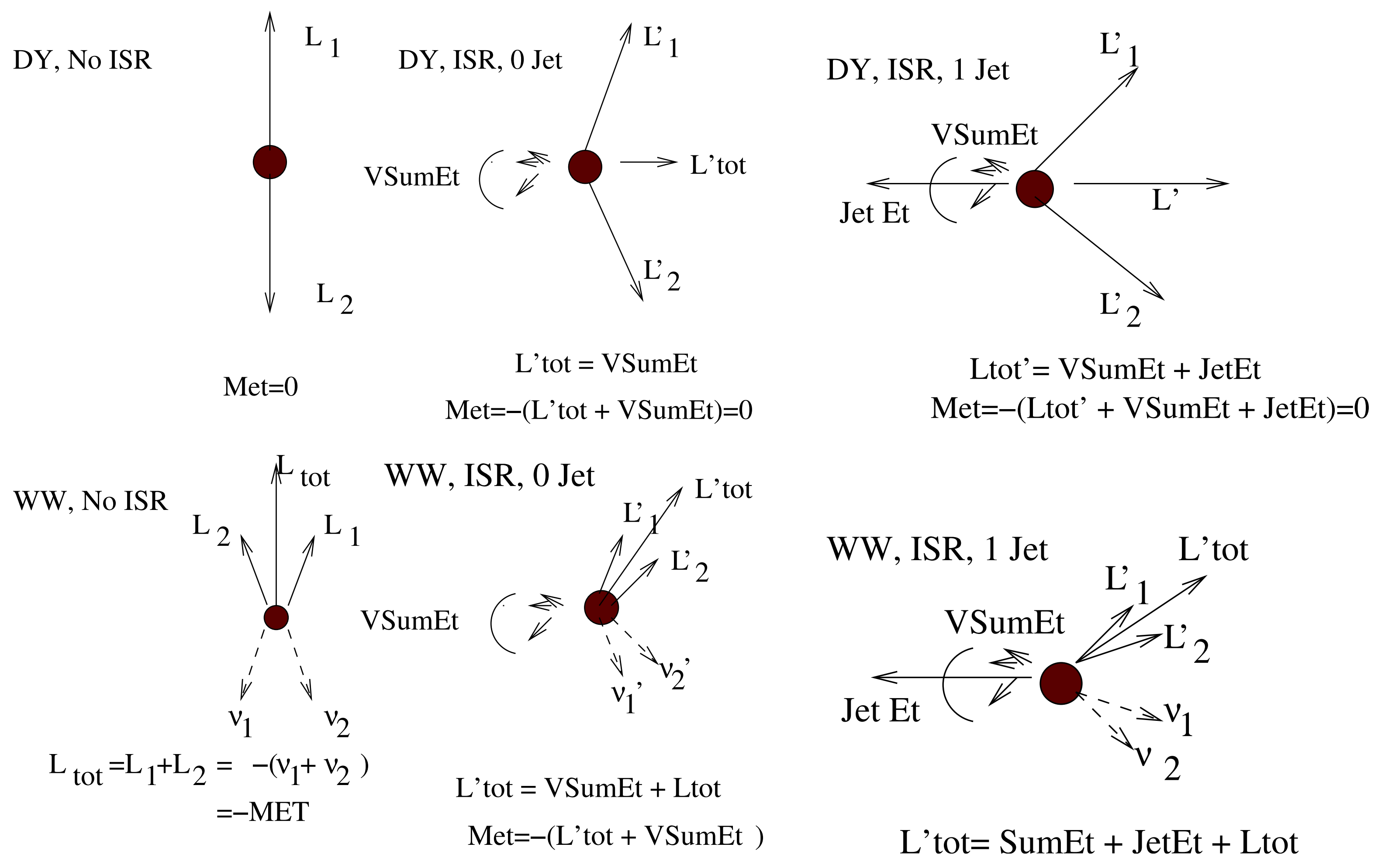

Entries
CDF Run II Preliminary
∫ L=1.9fb⁻¹
HWW
m_H=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
dimass[0 jets] 0.1<NN<0.63 (High S/B)


Entries
CDF Run II Preliminary
∫ L=1.9fb⁻¹
HWW
m_H=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
dimass[1 jet] 0.1<NN<0.77 (High S/B)


Entries
CDF Run II Preliminary
∫ L=1.9fb⁻¹
HWW
m_H=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
dimass[0 jets] 0.1<NN<0.5 (Low S/B)


Entries
CDF Run II Preliminary
∫ L=1.9fb⁻¹
HWW
m_H=160
WW
WZ
ZZ
tt̄
DY
Wγ
W+j
H
dimass[1 jet] 0.1<NN<0.63 (Low S/B)

Calibrating SumEt



Calibrating SumEt: DY

- DY: for CM or No ISR and no jet:

$$L_1 + L_1 = 0$$

- DY: for ISR and no jet

$$L_1' + L_2' = L_{tot}$$

- DY: for ISR and 1 jet

$$L_1' + L_2' = L_{tot} = \sum E_T + E_t^{jet}$$

This estabilishes the relationship between observed $\sum E_T$ and the vector to add to the CM vector. If a jet is present, then the table of Jet and $\sum E_T$ needs to be applied. The quantities are $\sum E_T{}^{DY0}$ and $(\sum E_T{}^{DY1}, E_t^{jet1})$.

Applying SumEt Calibration:WW

- WW: for CM or No ISR and no jet:

$$L_1 + L_2 = L_{tot} = \not{E}_T = \not{E}_{T\,obs} = -(\nu_1 + \nu_2)$$

Here, $L_{tot} \equiv L_{CM}$

- WW: for ISR and no jet

$$L_1' + L_2' = L_{tot}' = \sum E_T{}^{WW} + L_{tot}$$

Hence

$$L_{tot} = L_{tot}' - \sum E_T{}^{WW}$$

We assume now that $\sum E_T{}^{WW} = \sum E_T{}^{DY}$ For a given $\sum E_T{}^{WW}$ and substitute in the corresponding calibration for $\sum E_T{}^{DY}$.

- WW: for ISR and 1 jet

$$L_1' + L_2' = L_{tot}' = \sum E_T{}^{WW} + E_t^{jet} + L_{tot}$$

Hence

$$L_{tot} = L_{tot}' - \sum E_T{}^{WW} - E_t^{jet}$$

We assume now that for $(E_t^{jet})^{WW}$ $(\sum E_T{}^{WW})_{1\,jet} = (\sum E_T{}^{DY})_{1\,jet}$
For a given $(SumEt^{WW})_{1\,jet}$ and $(E_t^{jet})^{WW}$ substitute in the corresponding calibration for $(\sum E_T{}^{DY})_{1\,jet}$ and $(E_t^{jet})^{DY}$