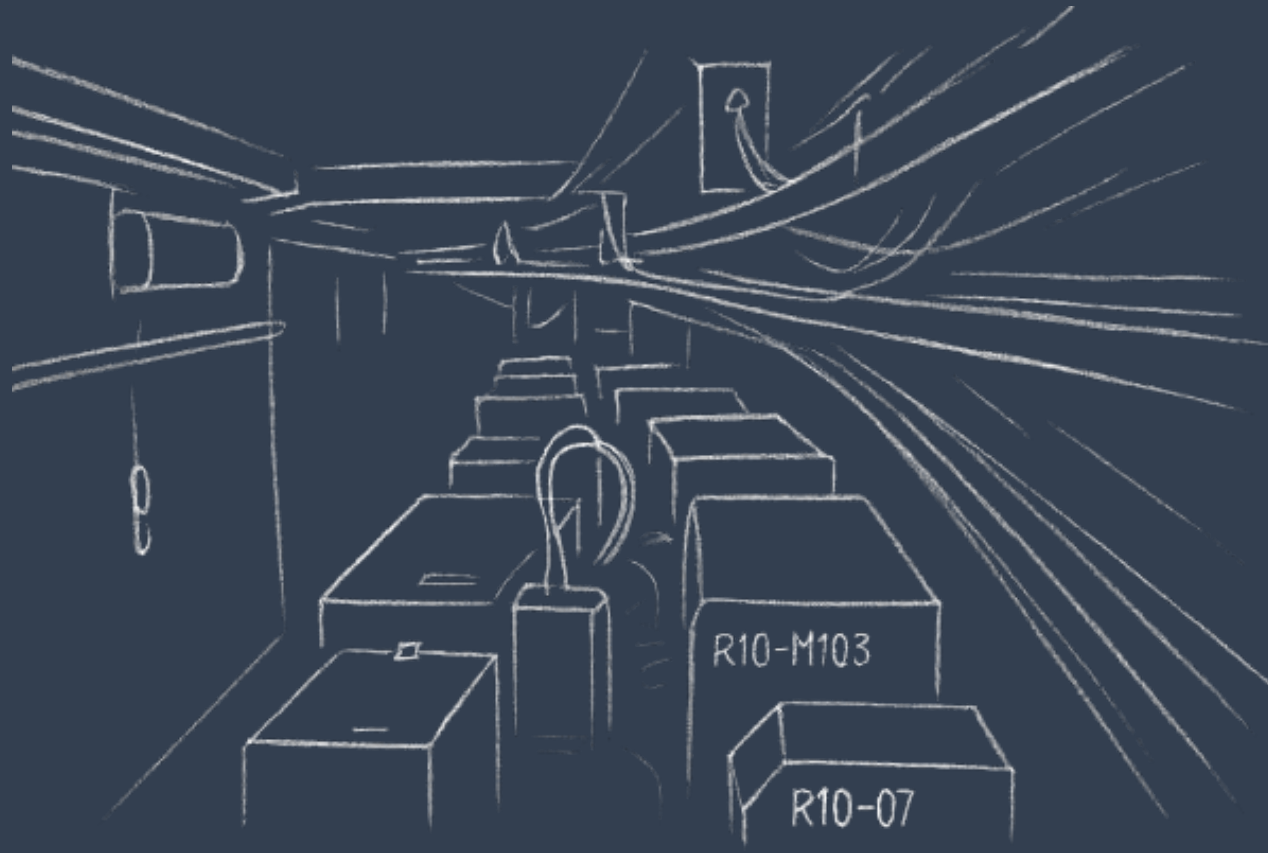
IHEP SUSY Group Meeting

Chengxin Liao

Institute of High Energy Physics
Chinese Academy of Sciences

Jul 16, 2025



C1N2 Status

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- FF already cross-check with wenyi and result can be matched
- BDT training for run2 already finished and apply the model to run2 sample and run3 sample
- Update LCG version and test code(Ongoing)
- Update support-note(Ongoing)

Fake Factor for Run2 and Run3

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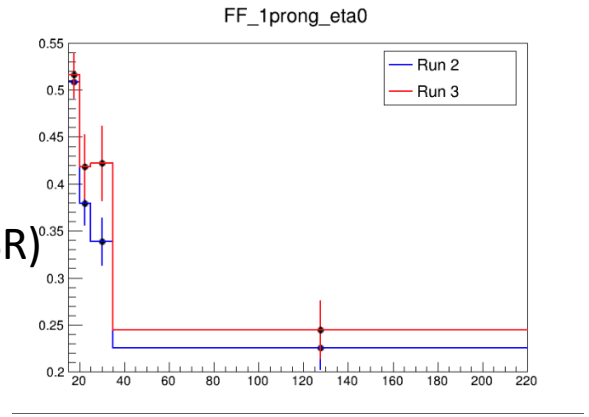
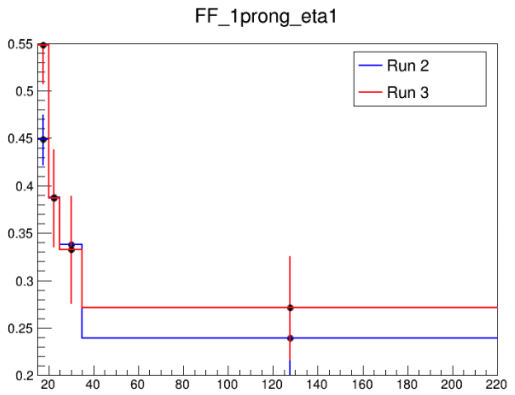
Selection:

nBaseTau == 1
nBaseLep >= 1, SigLep >= 1
MET trigger, MET >= 200
Same-Signal(Orthogonal with SR)
bVeto
ID: nMediumTau == 1
antiID: nMediumTau < 1

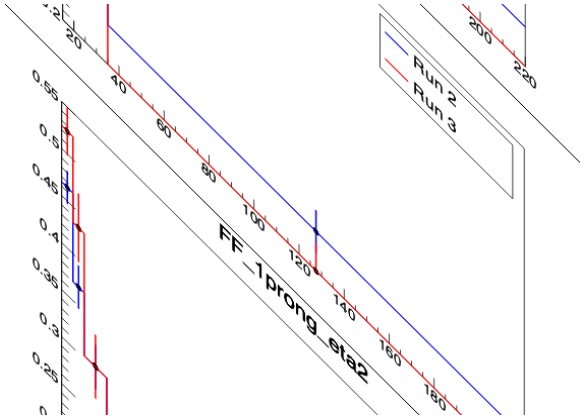
$0 < |\eta| < 1$



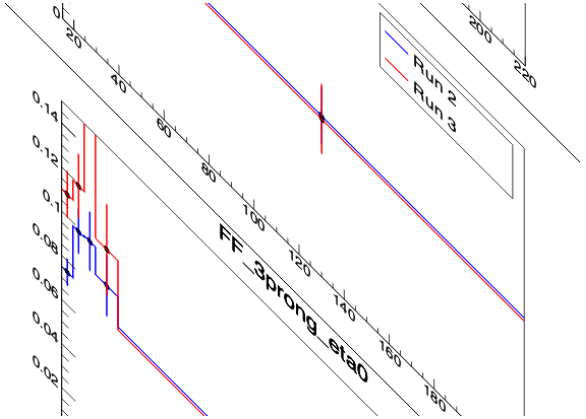
$1 < |\eta| < 1.37$

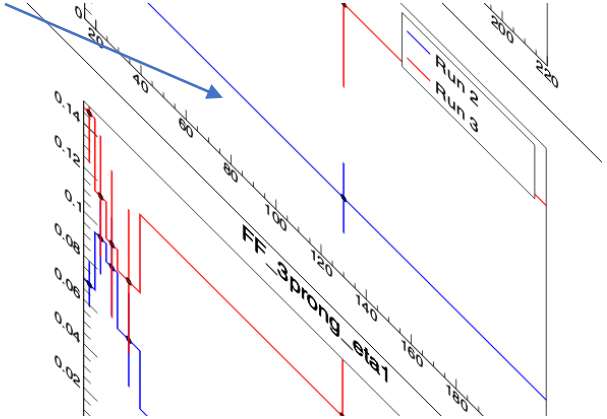


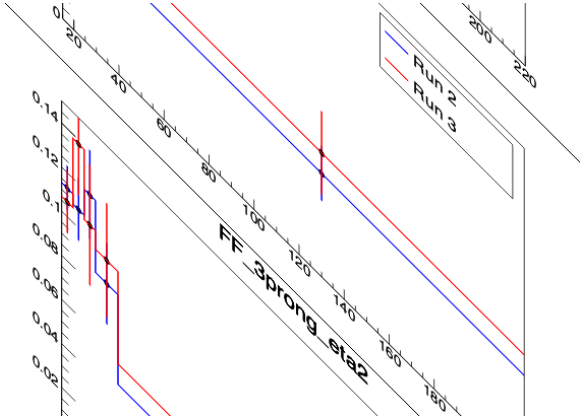
$1.52 < |\eta| < 2.5$



A small bump show in the last bin







Pre-Selection

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HH Pre-selection	LH Pre-selection
>= 2 medium taus	>= 1 medium taus
0 base lepton	1 base lepton, 1 signal lepton
MET ≥ 200; pass MET trigger	MET ≥ 200; pass MET trigger
1≤nJet	1≤nJet
Opposite-sign hadronic-hadronic tau pair	Opposite-sign lepton-hadronic tau pair
bveto	bveto
jet pt>100 GeV	jet pt>100 GeV
Mtt_reco <= 40 GeV || Mtt_reco >= 130GeV	Mtt_reco <= 40 GeV || Mtt_reco >= 130GeV

MC modeling in Pre-Selection(HH)

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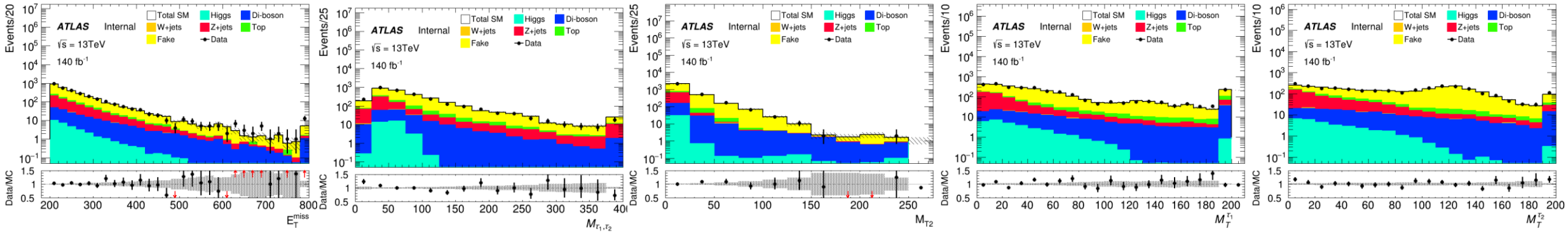
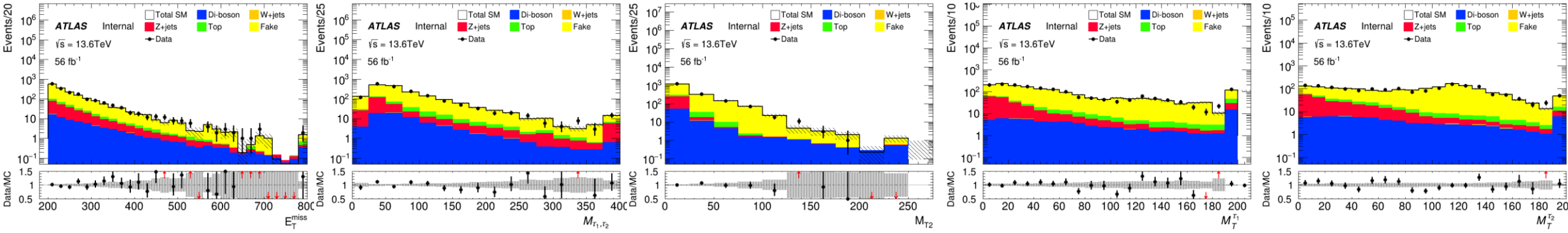
run2



run3



MC modeling in Pre-Selection(HH)

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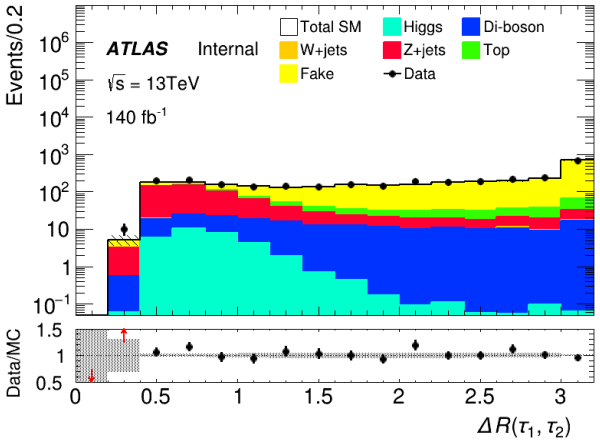
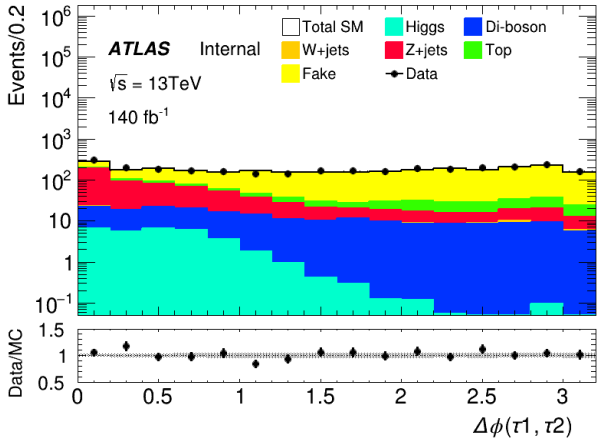
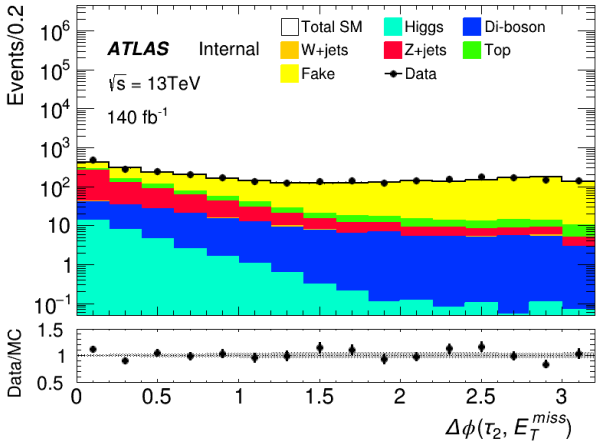
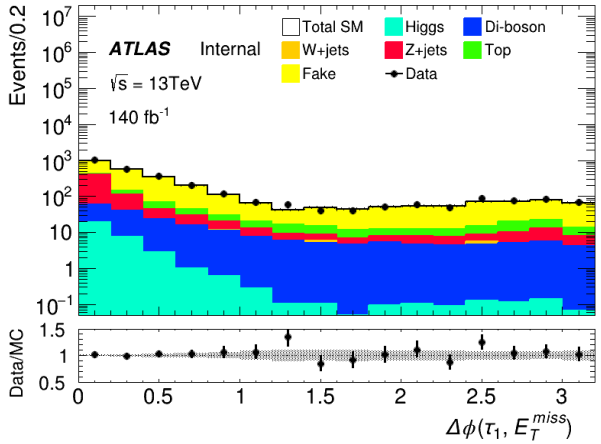
run2

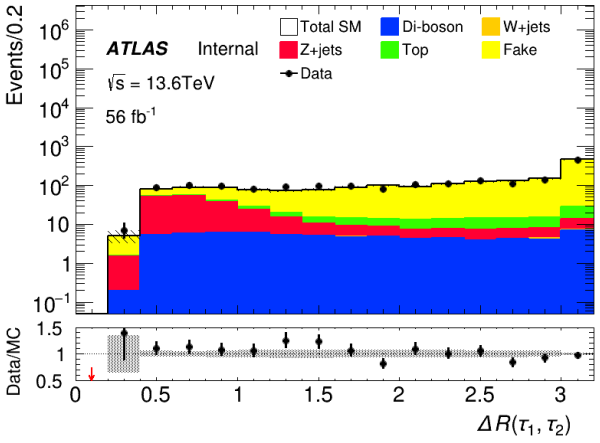


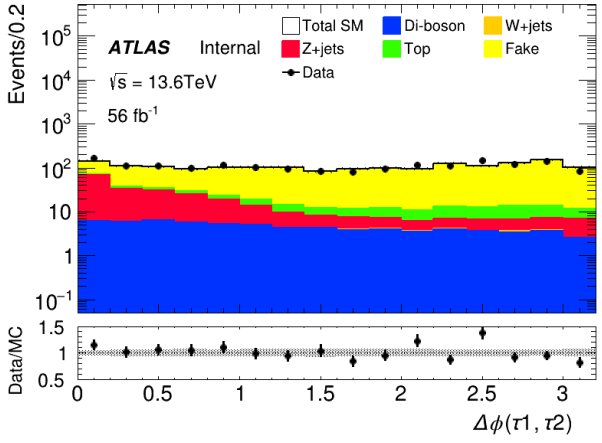


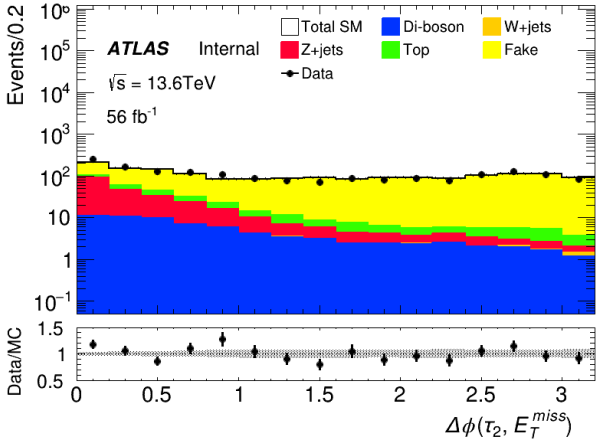


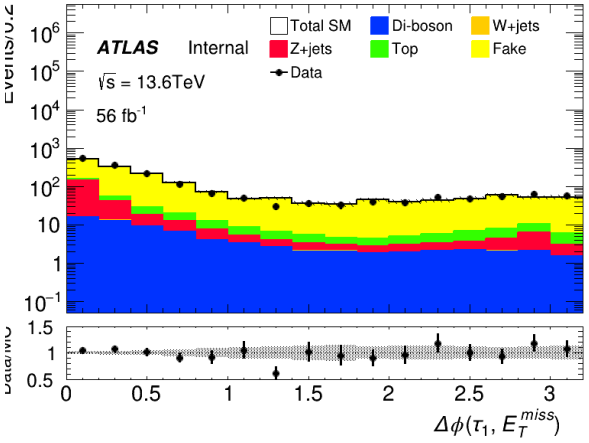


run3









MC modeling in Pre-Selection(HH)

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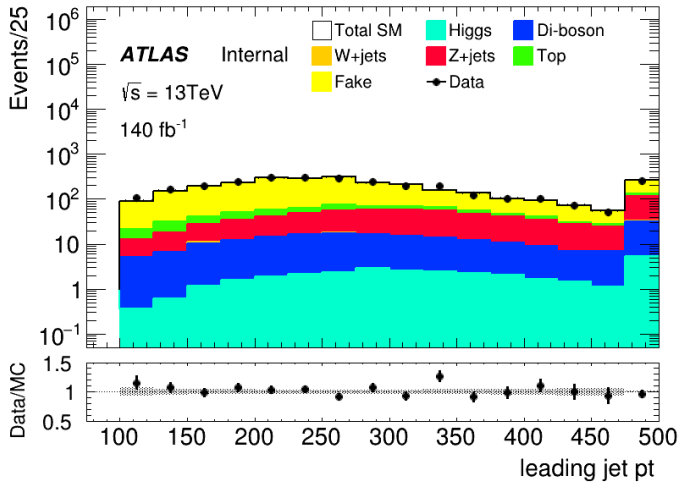
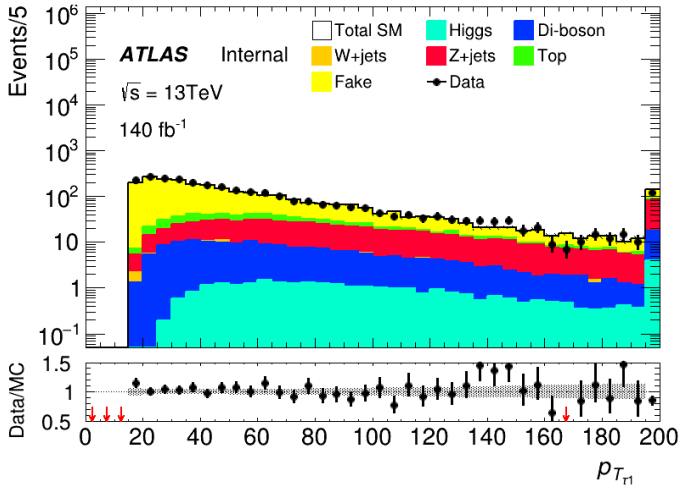
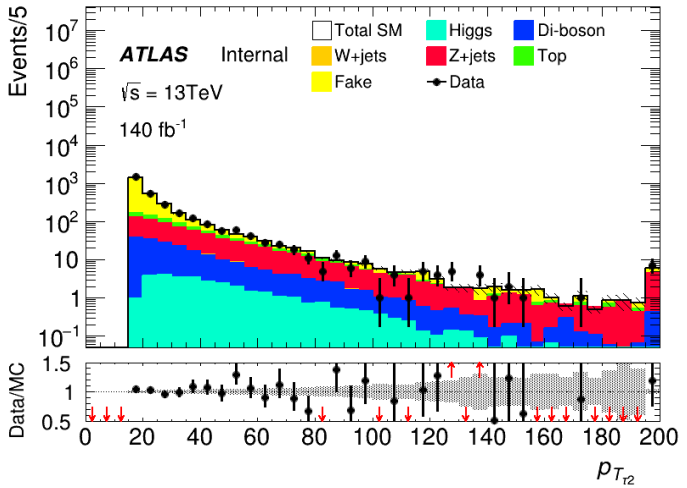
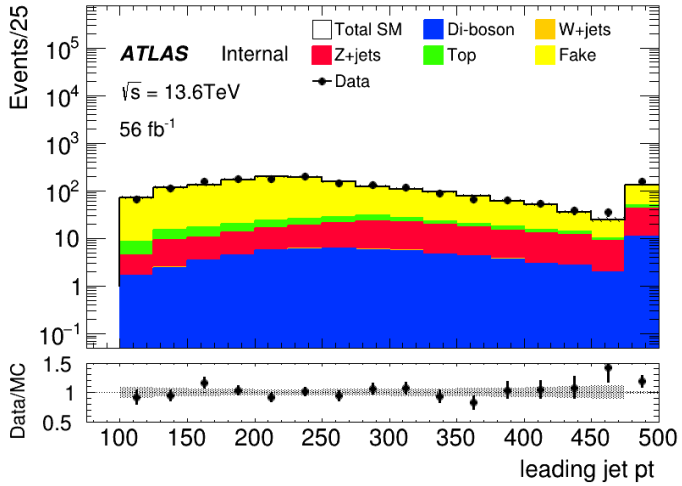
run2

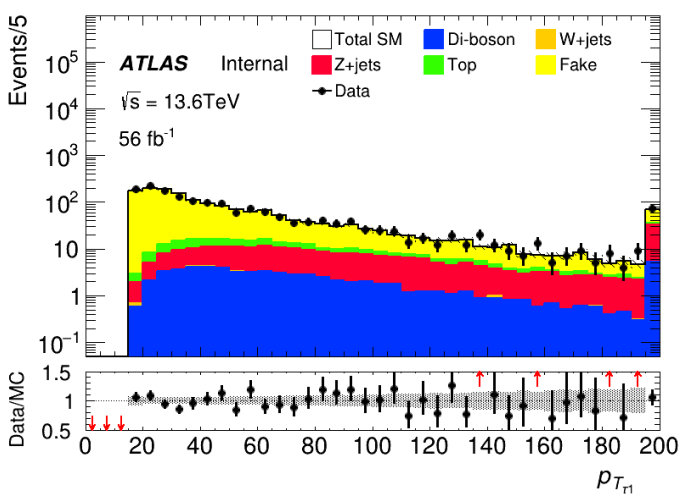


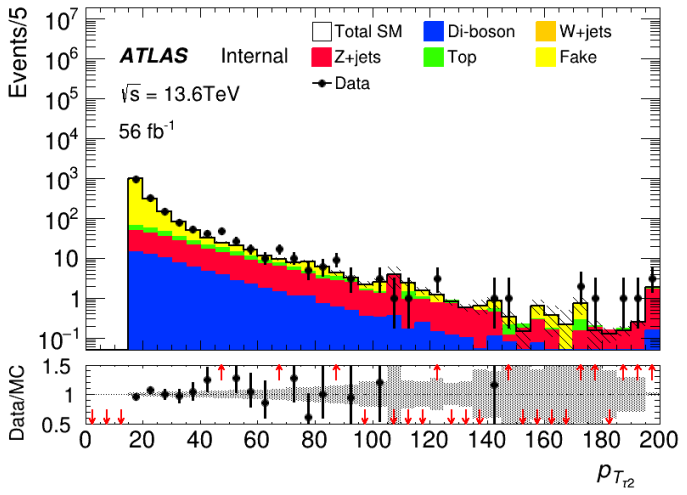




run3







MC modeling in Pre-Selection(LH)

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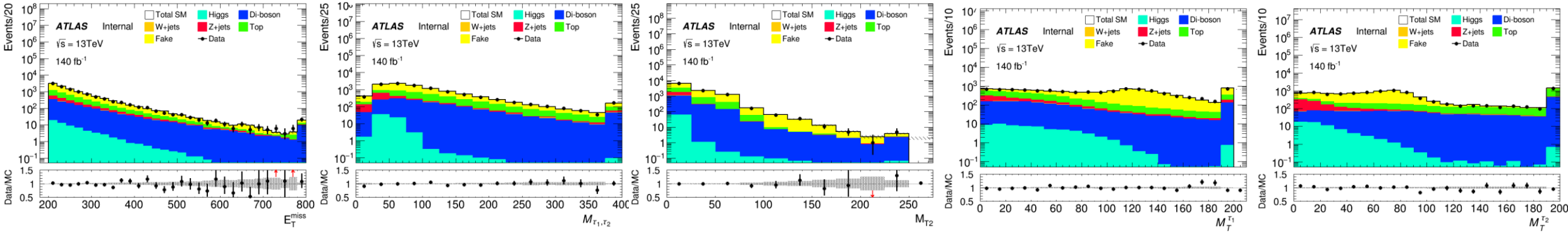
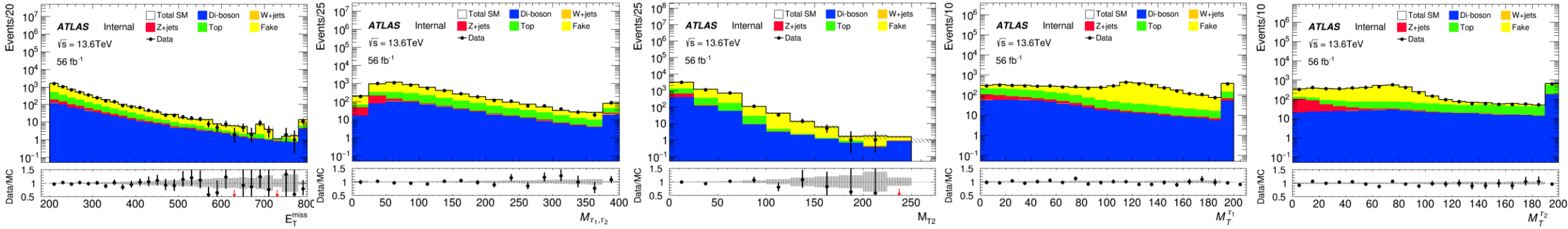
run2



run3



MC modeling in Pre-Selection(LH)

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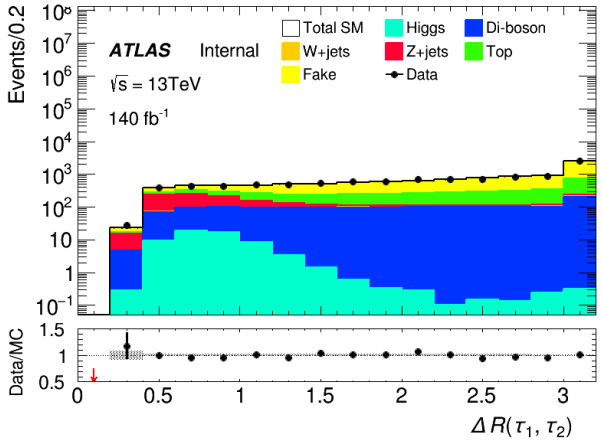
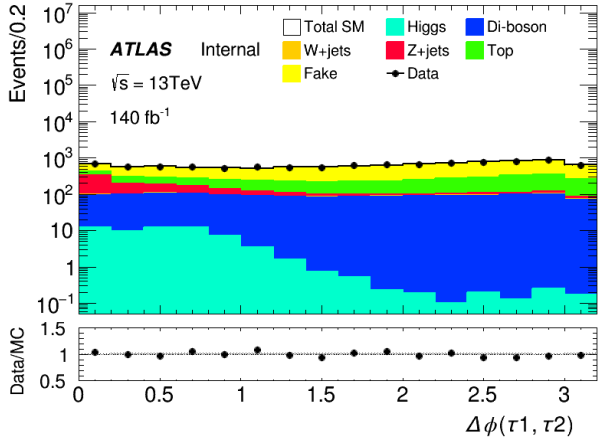
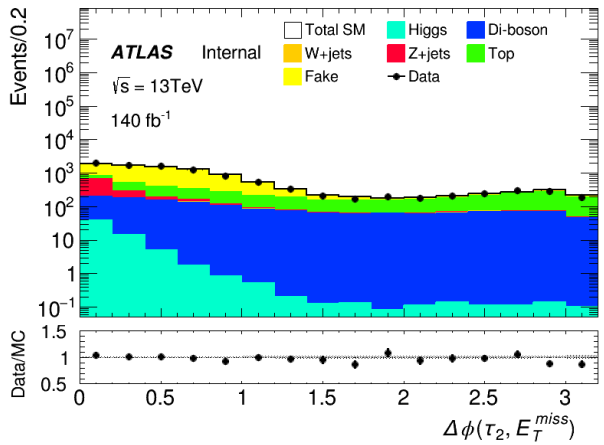
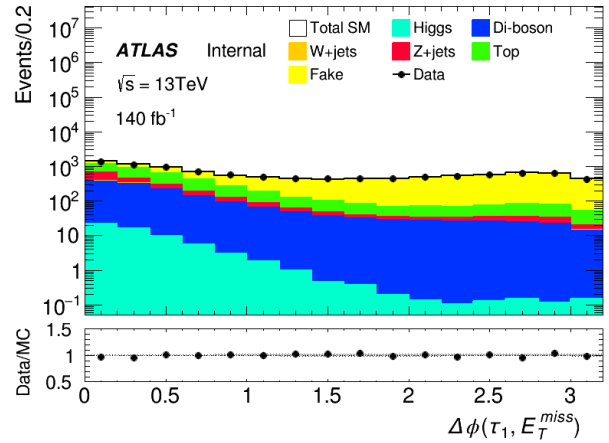
run2

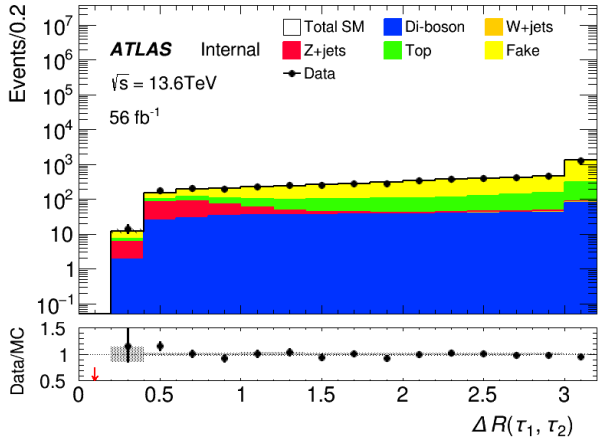


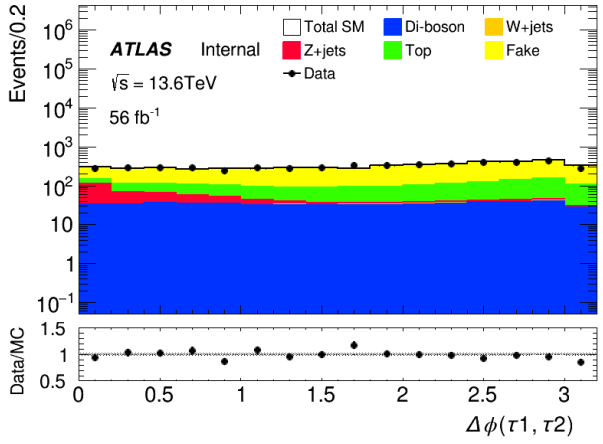


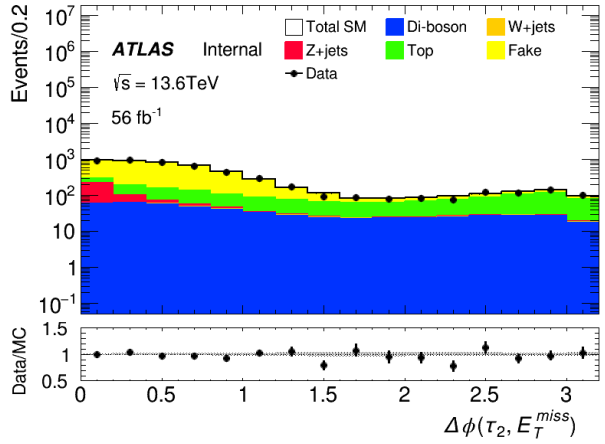


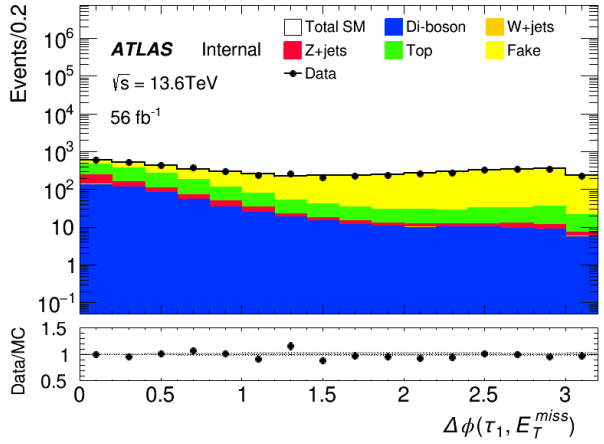


run3









MC modeling in Pre-Selection(LH)

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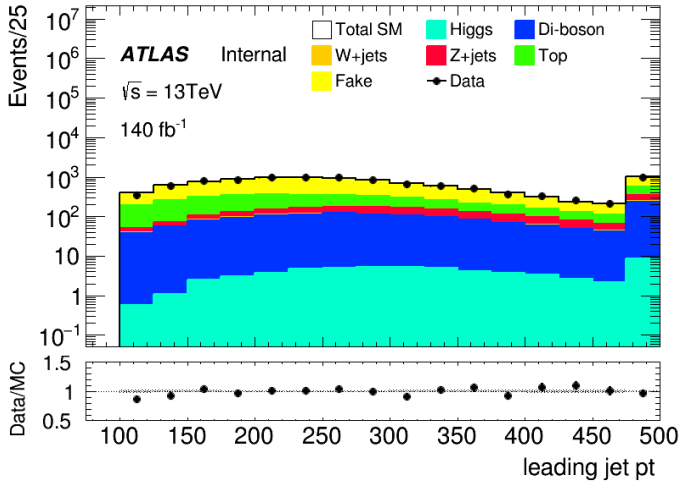
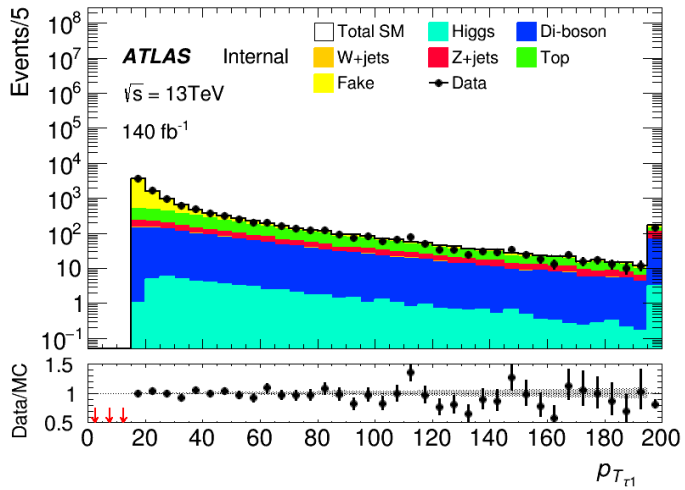
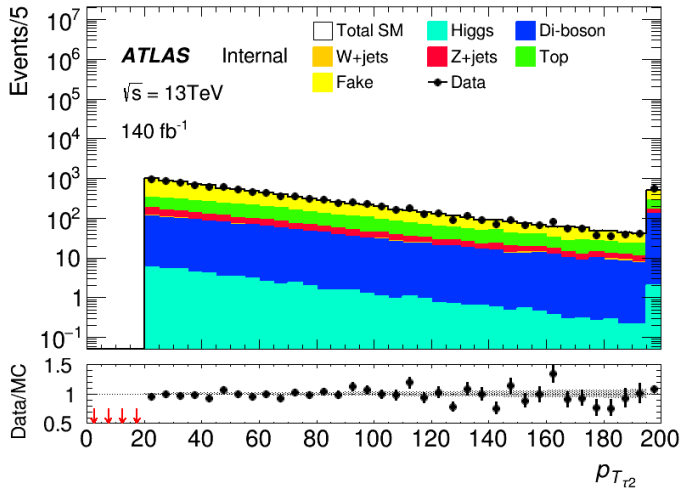
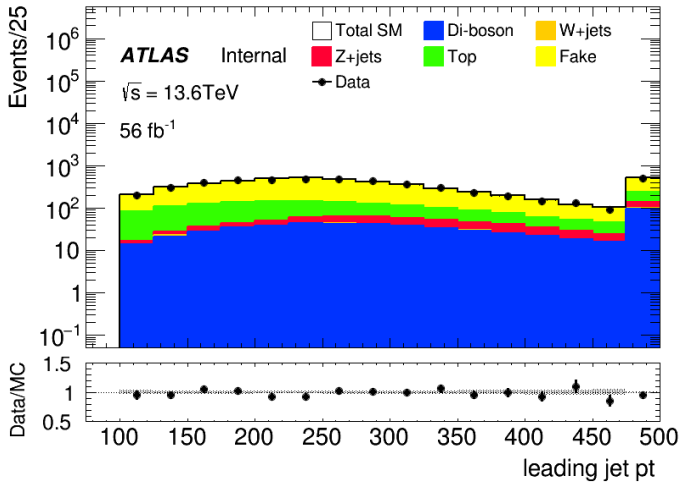
run2

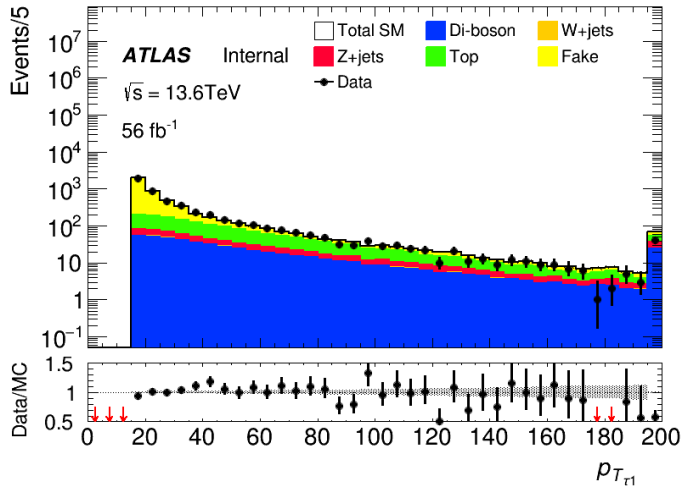


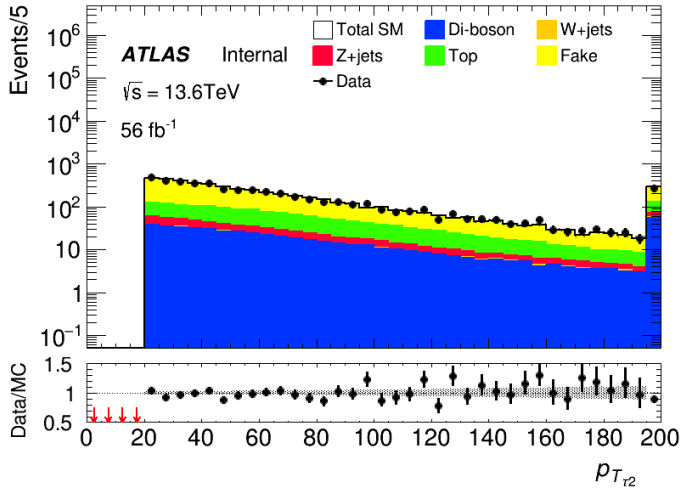




run3







C1N2 SR(HH and LH)

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Input sample:

bkg: run2 bkg sample passed pre-selection(HH/LH)
sig: 100_70, 120_90, 140_90(only run2)

Hyperparameters:

HH: Ntrees = 300, MaxDepth = 6, MinNodeSize = 1%, Learning rate = 0.05
LH: Ntrees = 200, MaxDepth = 6, MinNodeSize = 1%, Learning rate = 0.05

Weight choose: abs(physics weight)

Split strategy: Separate entries by using mod 5, for Fake bkg, if separate follow sequence, all weighted entry will split into first fold

BDT distribution for LH and HH

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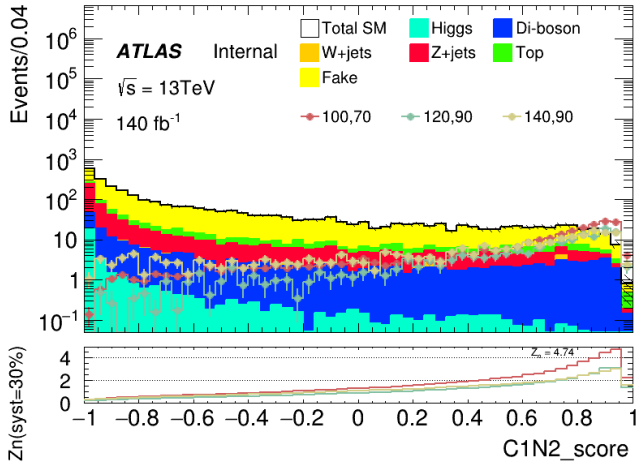
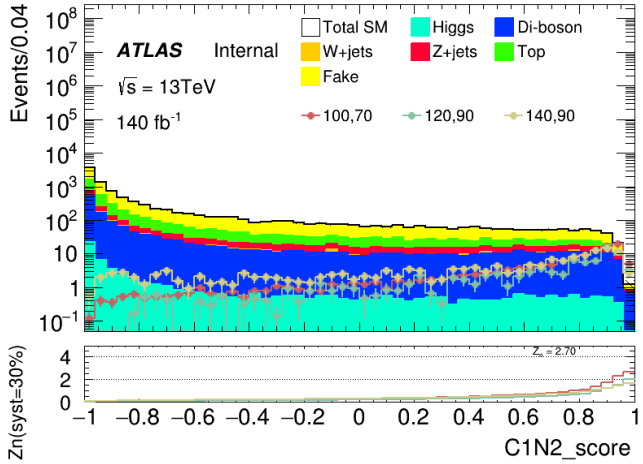
HH

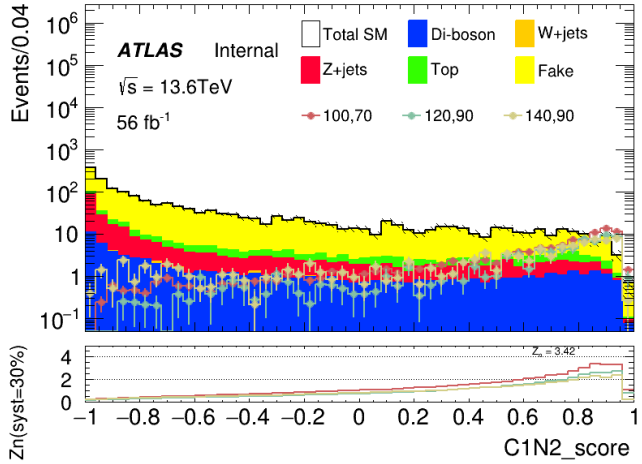
LH

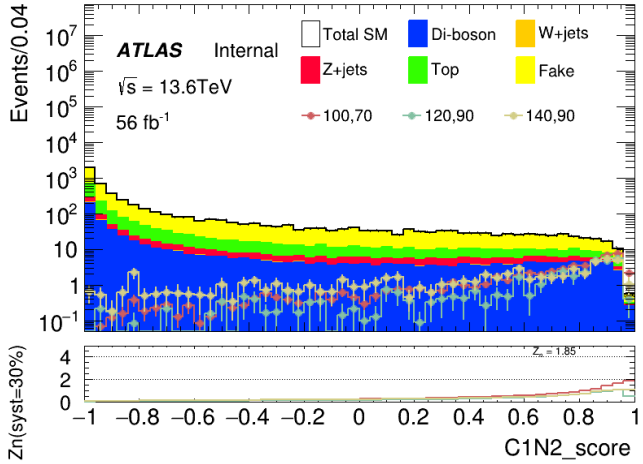
run2





run3





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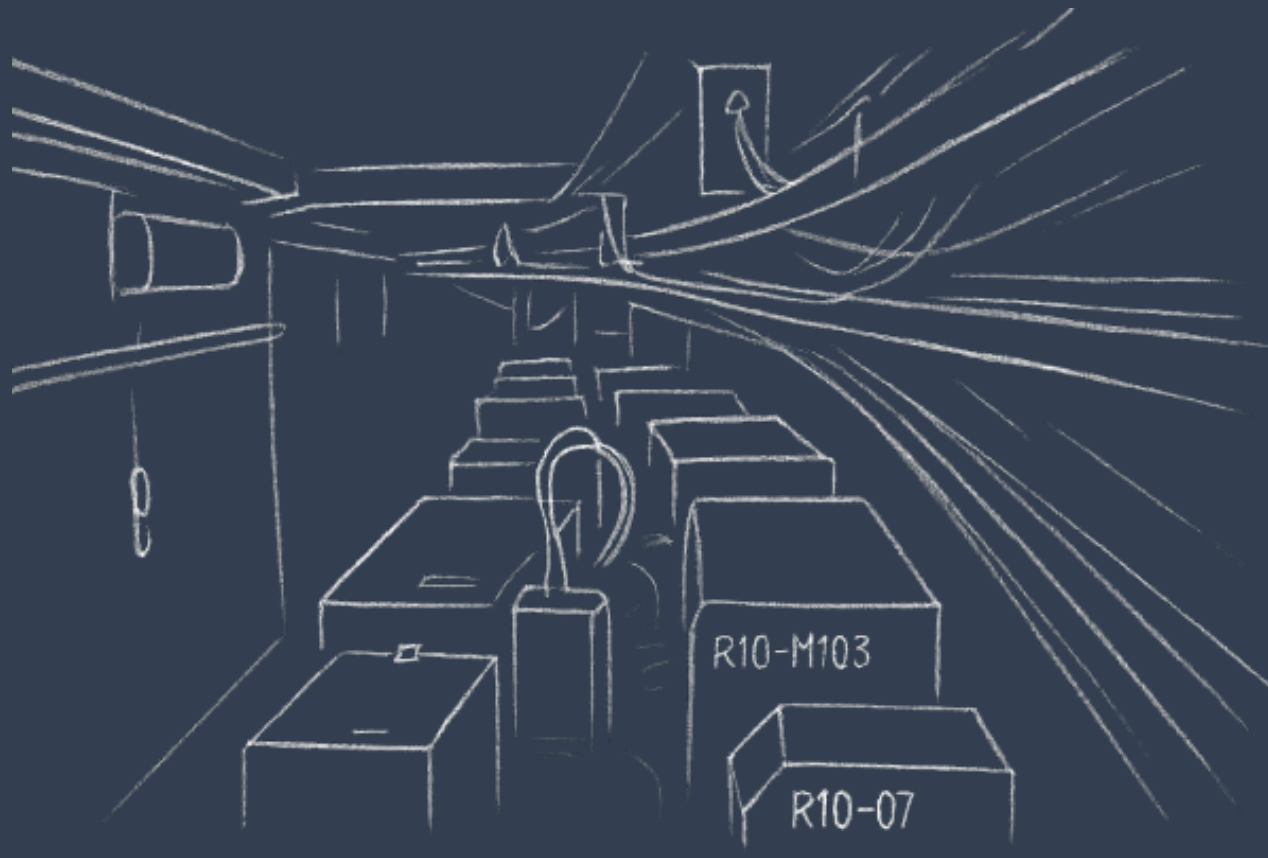
ATLAS EXPERIMENT

Backup



Cross-Check FF

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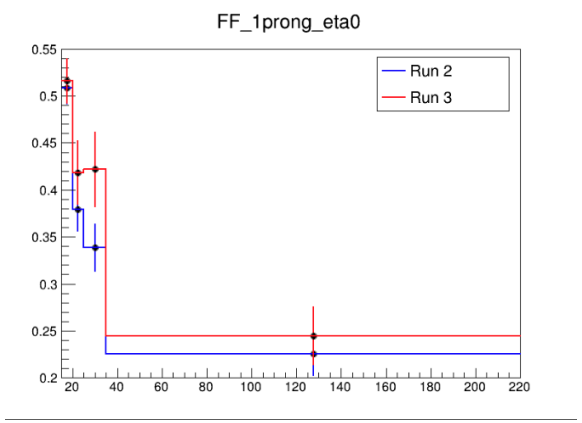
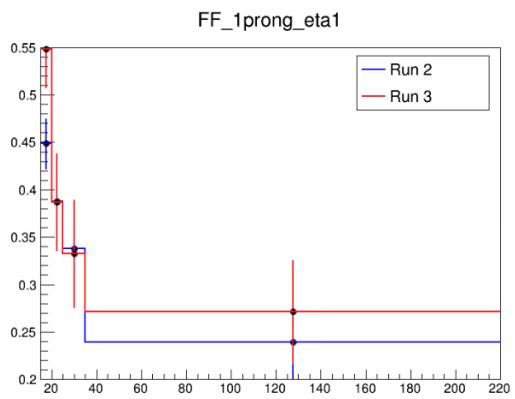
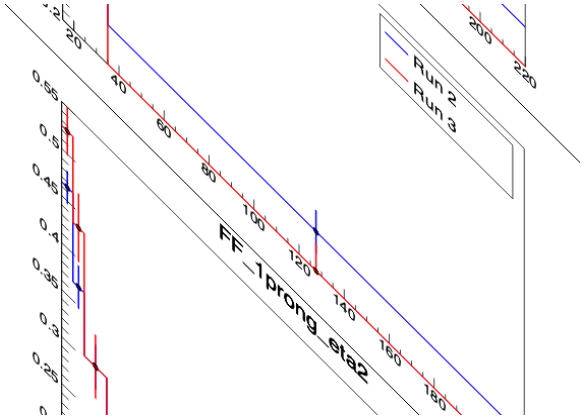
$0 < |\eta| < 1$ | $1 < |\eta| < 1.37$ | $1.52 < |\eta| < 2.5$

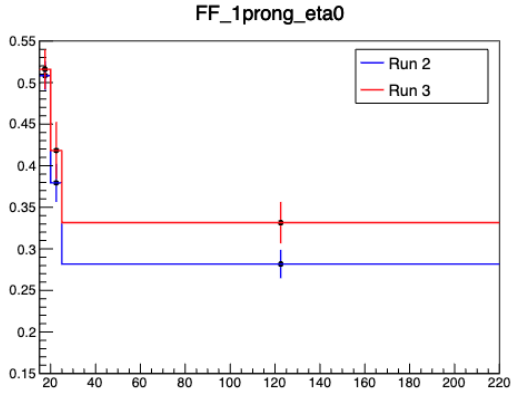
My result

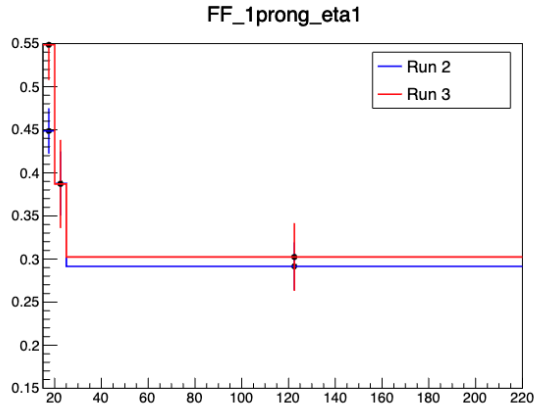


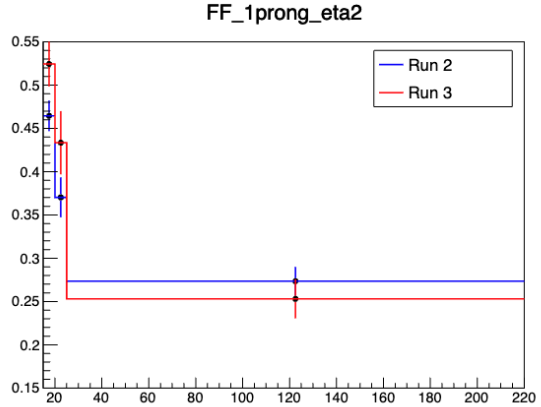




Wenyi's result







Same value for first two bins and different in last bin for different rebin strategy
I check FF with same rebin method in case, it turns out we are the same