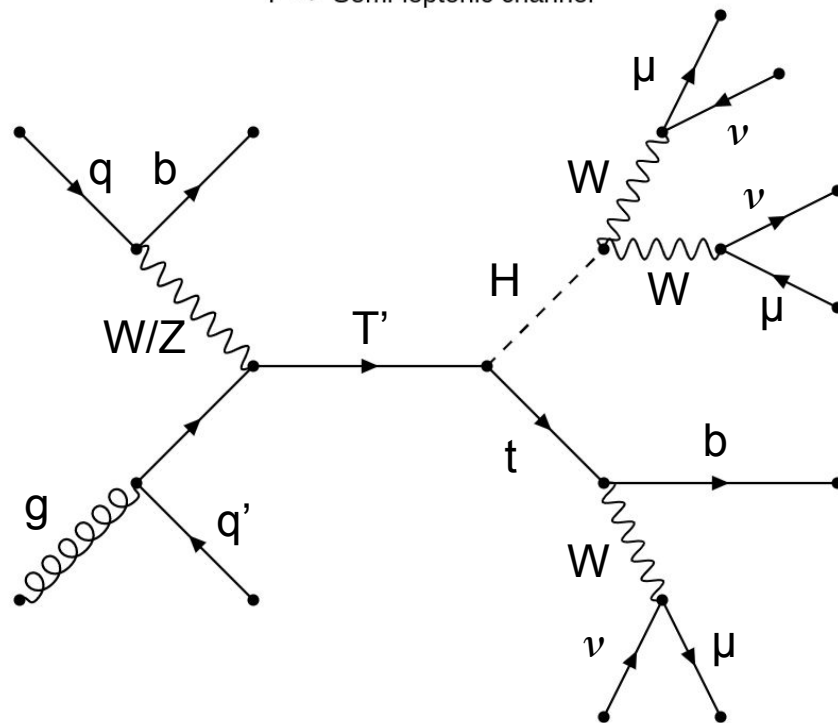# Software Review: Update

8 April 2022
Benjamin Blancon

Basic selection: 2 tight SS Muons with Pt > 20 GeV, |η| < 2.4 and tight isolation.

T' --> Semi-leptonic channel

Dataset:
/TTTo2L2Nu_TuneCP5_13TeV-powheg-pythia8/RunIISummer20UL18MiniAODv2-106X_upgrade2018_realis
tic_v16_L1v1-v1/MINIAODSIM: ttbar (146,010,000 Events).
/TprimeBToTH_M-700_LH_TuneCP5_PSweights_13TeV-madgraph_pythia8/RunIISummer19UL18MiniAOD
v2-106X_upgrade2018_realistic_v16_L1v1-v1/MINIAODSIM: signal (389,500 events).

Looking for the Cuts!
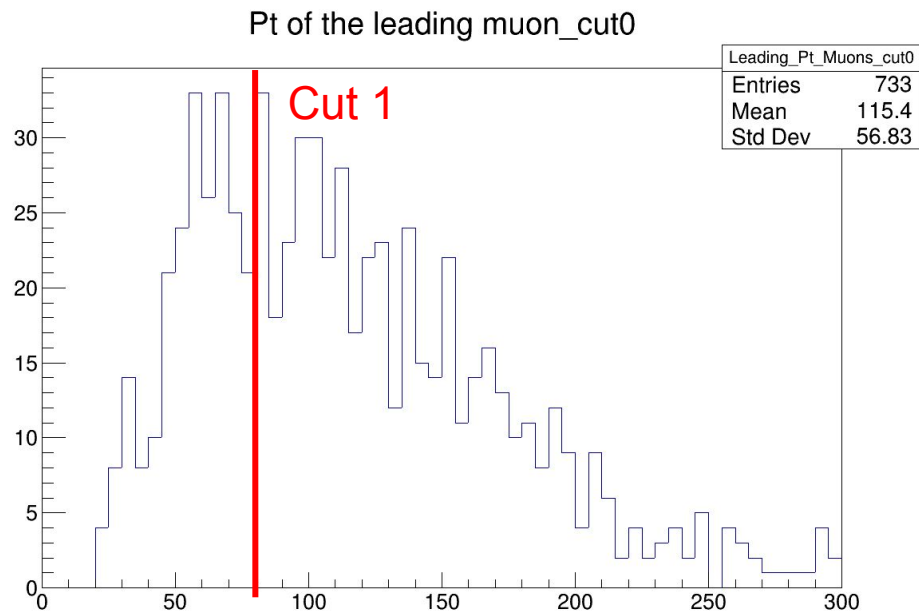
List of studied variables: ΔR/Δφ between the two muons.
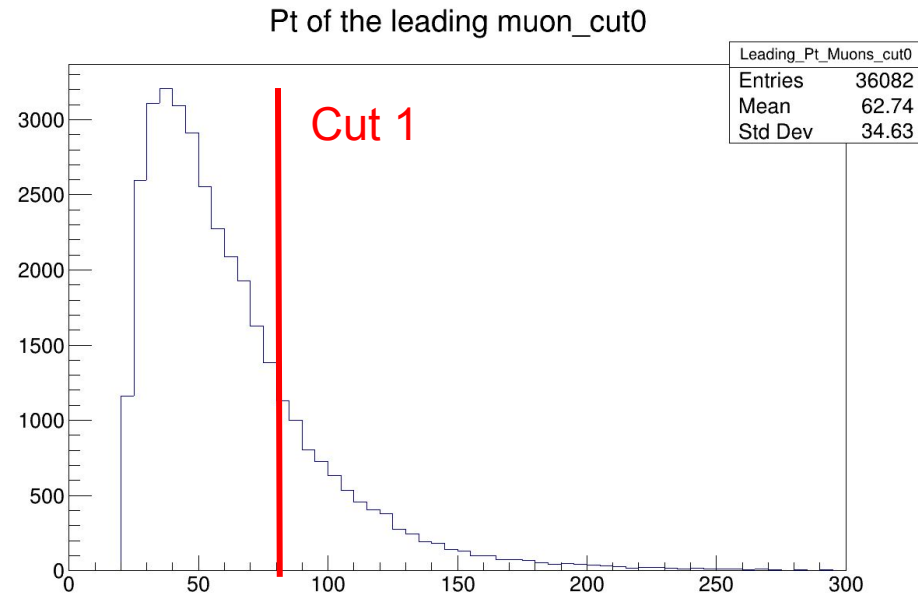Pt of the two muons.
St = Pt of the sum of the two muons.
Number of b-jets (mainly for the other backgrounds).

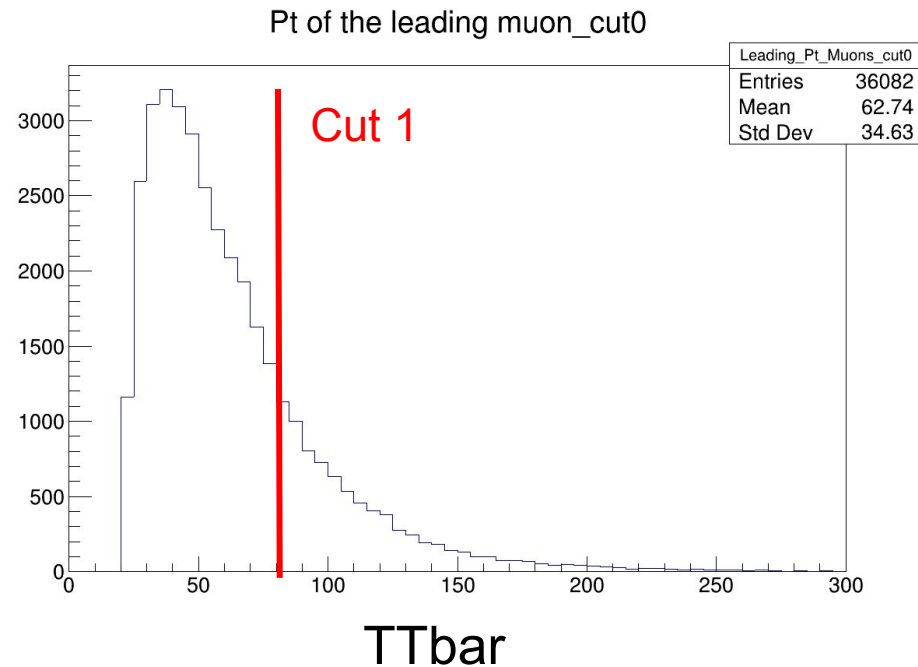2 possible strategies for the moment.

First strategy: Cut 1 (Pt of the first muon > 80 GeV)
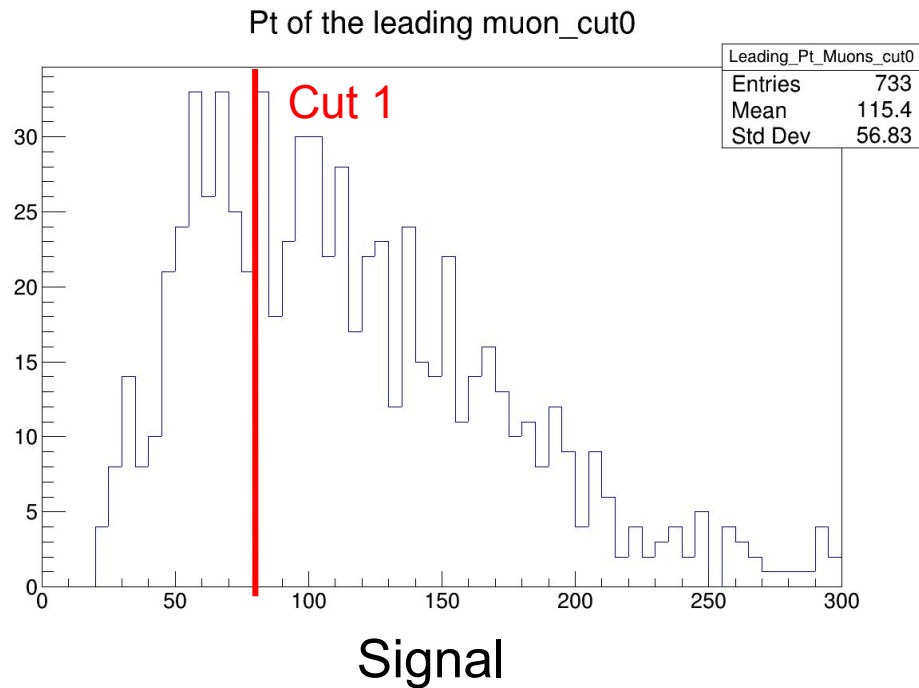
Pt of the leading muon_cut0

Leading_Pt_Muons_cut0	
Entries	733
Mean	115.4
Std Dev	56.83

Cut 1

Pt of the leading muon_cut0

Leading_Pt_Muons_cut0	
Entries	36082
Mean	62.74
Std Dev	34.63

Cut 1

Signal

TTbar

Pt of the leading muon_cut0

Leading_Pt_Muons_cut0	
Entries	733
Mean	115.4
Std Dev	56.83

Cut 1

Pt of the leading muon_cut0

Leading_Pt_Muons_cut0	
Entries	36082
Mean	62.74
Std Dev	34.63

Cut 1

Signal

TTbar

Selection	Signal	TTbar	S/B
Basic selection	25.12	3273.74	0.77%
Cut 1: Pt first muon > 80 GeV	17.34	739.00	2.35%

First strategy: Cut 2 (Pt of the second muon > 40 GeV)
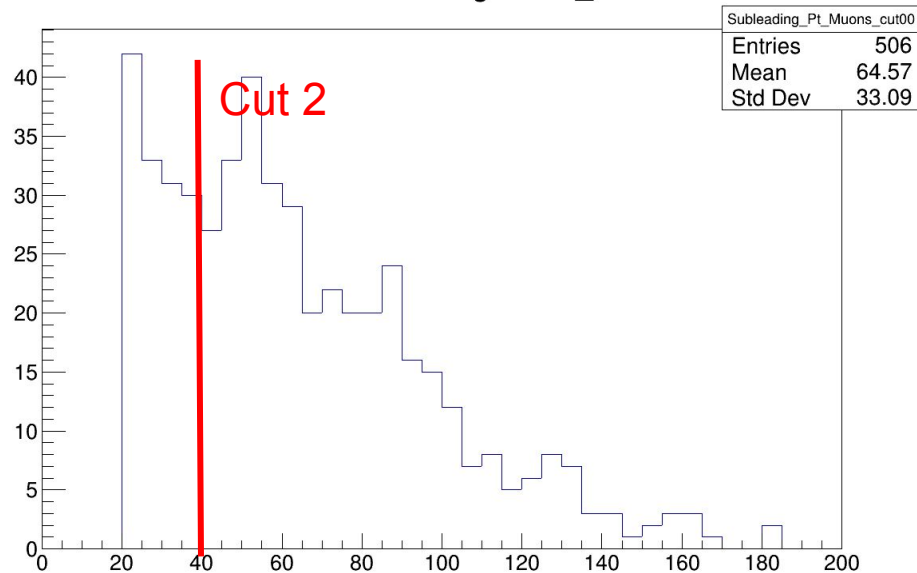
Pt of the subleading muon_cut00

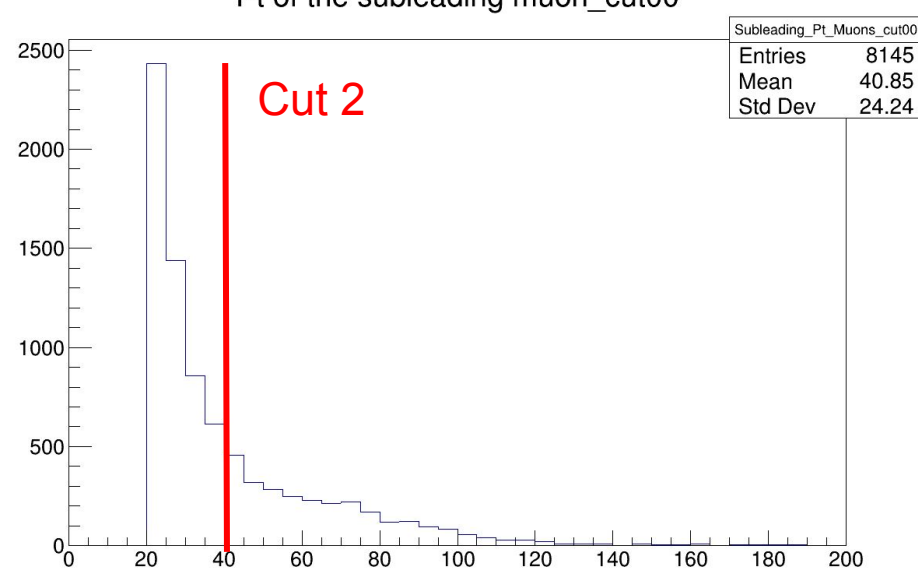| Subleading_Pt_Muons_cut00	
Entries	506
Mean	64.57
Std Dev	33.09

Cut 2

Pt of the subleading muon_cut00

Subleading_Pt_Muons_cut00	
Entries	8145
Mean	40.85
Std Dev	24.24

Cut 2

Signal

TTbar

Pt of the subleading muon_cut00

Subleading_Pt_Muons_cut00	
Entries	506
Mean	64.57
Std Dev	33.09
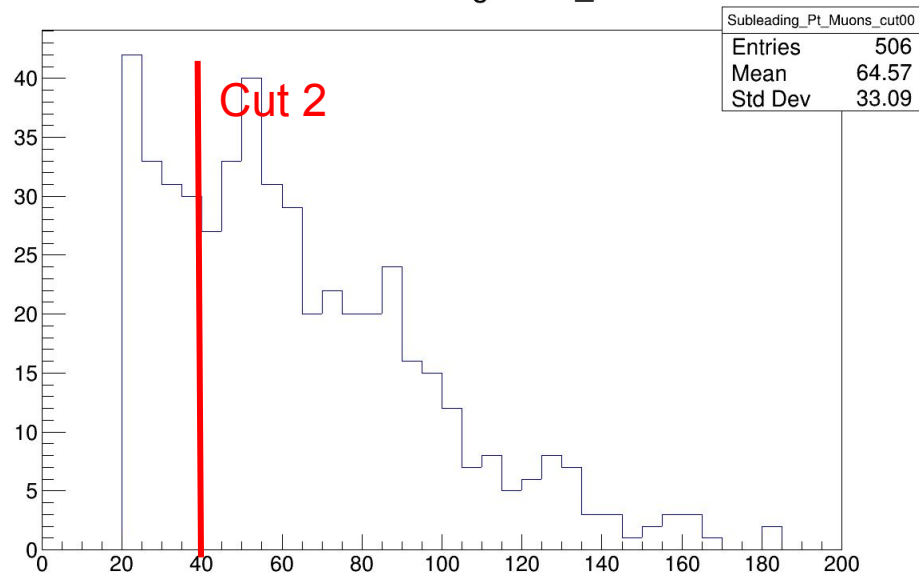
Cut 2

Signal

Pt of the subleading muon_cut00

Subleading_Pt_Muons_cut00	
Entries	8145
Mean	40.85
Std Dev	24.24

Cut 2

TTbar

Selection	Signal	TTbar	S/B
Basic selection	25.12	3273.74	0.77%
Cut 1: Pt first muon > 80 GeV	17.34	739.00	2.35%
Cut 2: Pt second muon > 40 GeV	12.68	254.41	4.98%

First strategy: Cut 3 (ΔR > 1.8)

Signal

TTbar
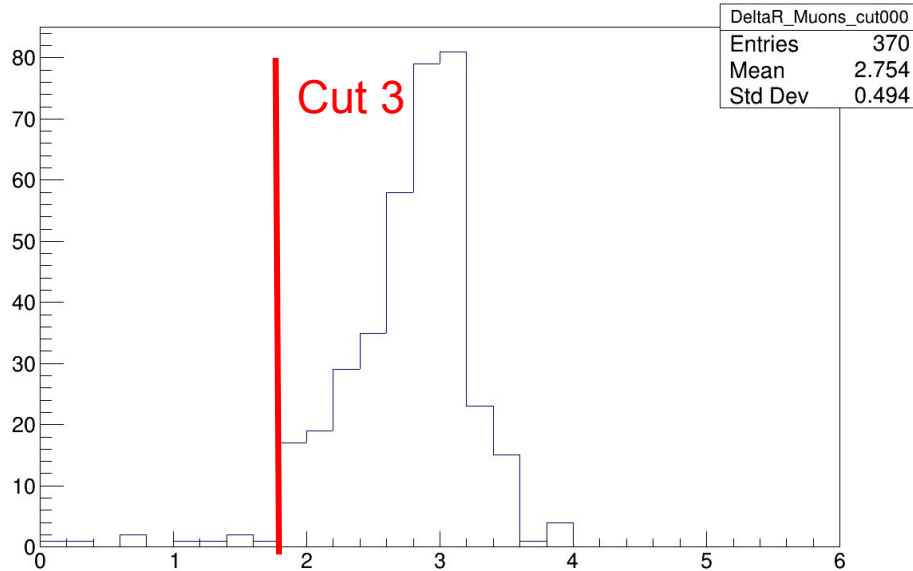
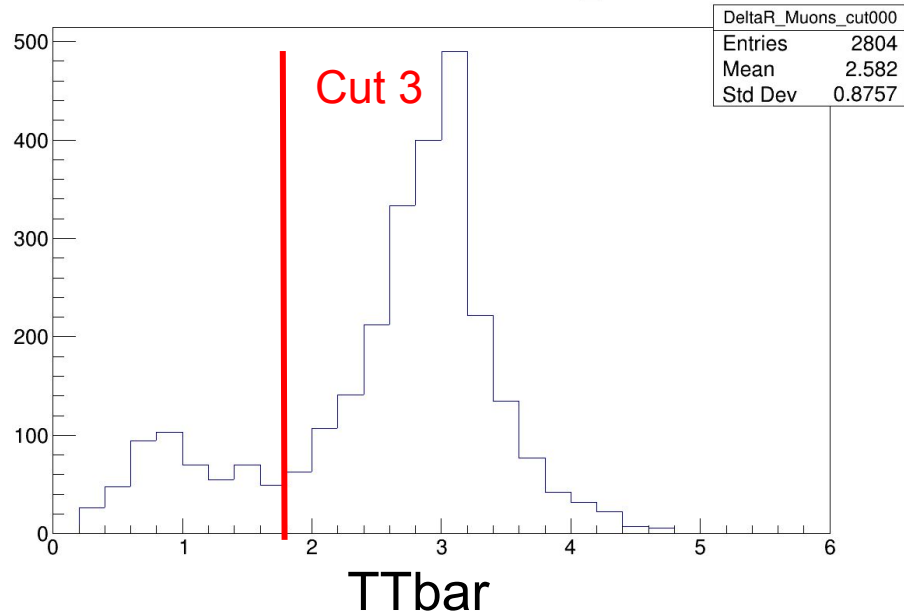Delta R between the 2 muons_cut000 (Signal)

Delta R between the 2 muons_cut000 (TTbar)
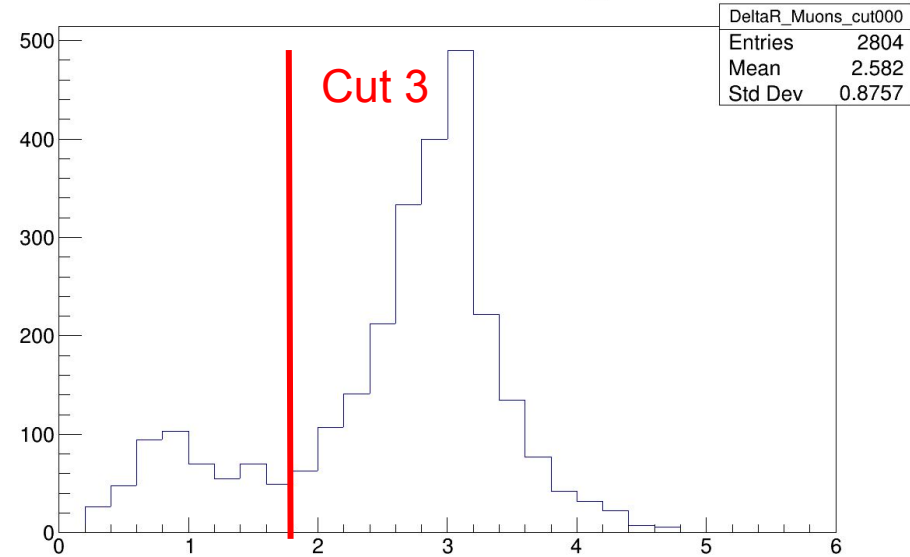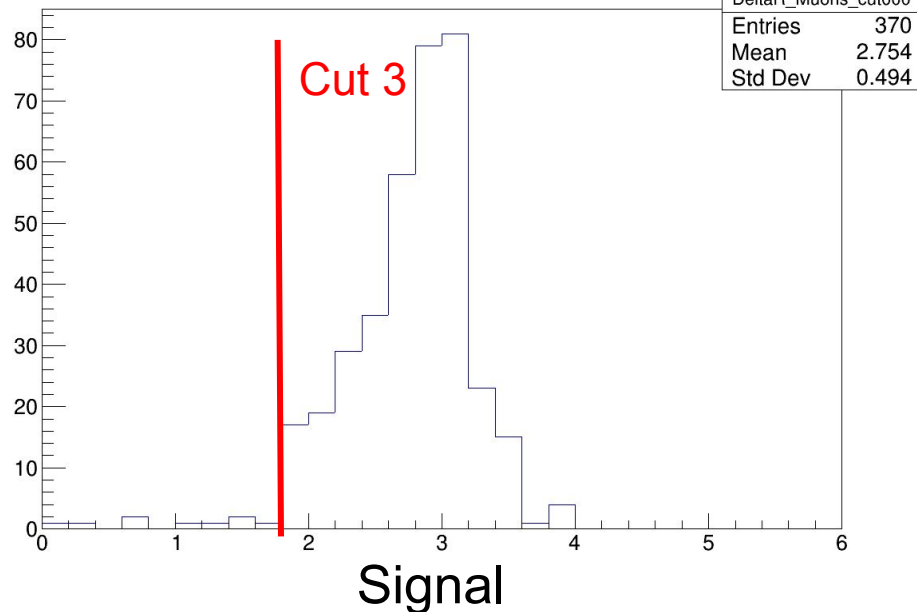
Selection	Signal	TTbar	S/B
Basic selection	25.12	3273.74	0.77%
Cut 1: Pt first muon > 80 GeV	17.34	739.00	2.35%
Cut 2: Pt second muon > 40 GeV	12.68	254.41	4.98%
Cut 3: ΔR > 1.8	12.37	207.56	5.96%

Second strategy: Cut 1 (St > 160 GeV)

Pt of the sum of the two muons_cut0
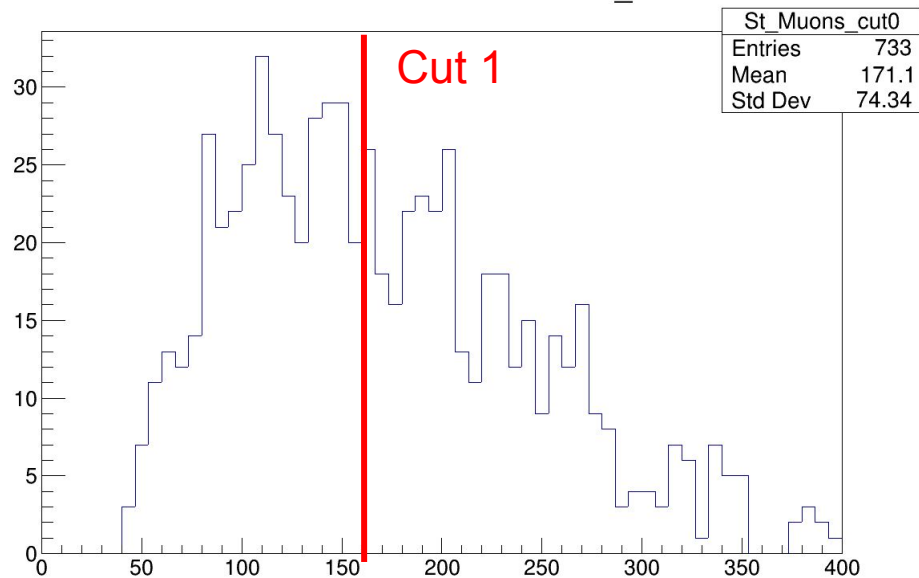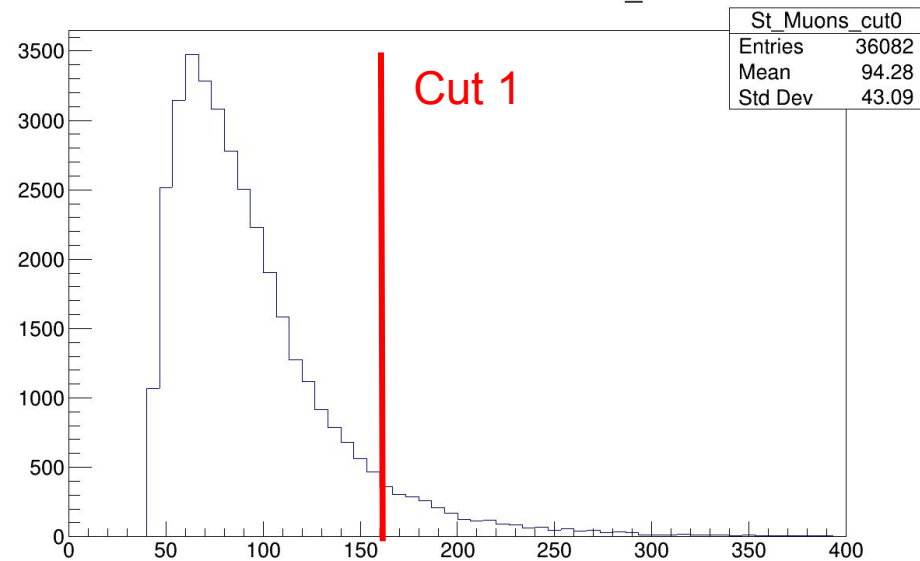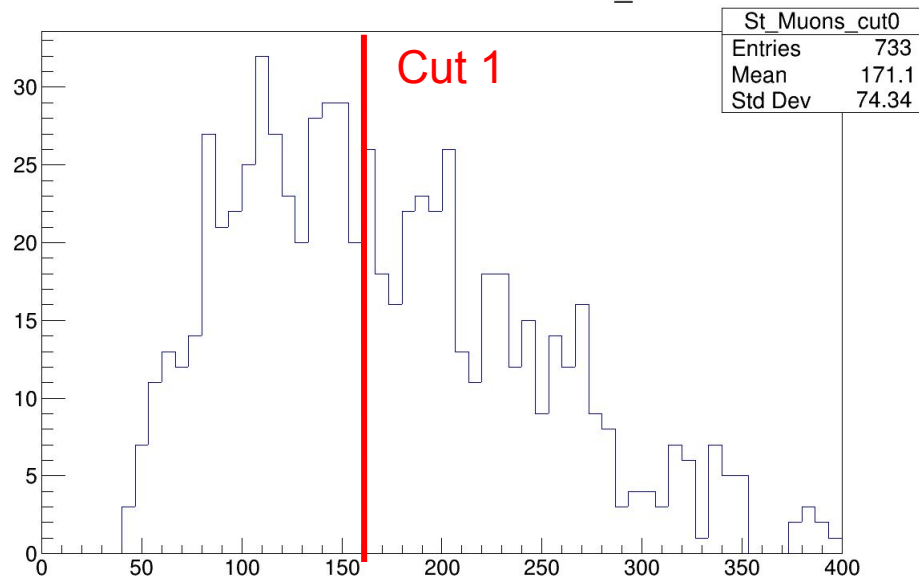
St_Muons_cut0	
Entries	733
Mean	171.1
Std Dev	74.34

Cut 1

Pt of the sum of the two muons_cut0

St_Muons_cut0	
Entries	36082
Mean	94.28
Std Dev	43.09

Cut 1

Signal

TTbar

Pt of the sum of the two muons_cut0

	St_Muons_cut0	
Entries		733
Mean		171.1
Std Dev		74.34

Cut 1

Pt of the sum of the two muons_cut0

	St_Muons_cut0	
Entries		36082
Mean		94.28
Std Dev		43.09
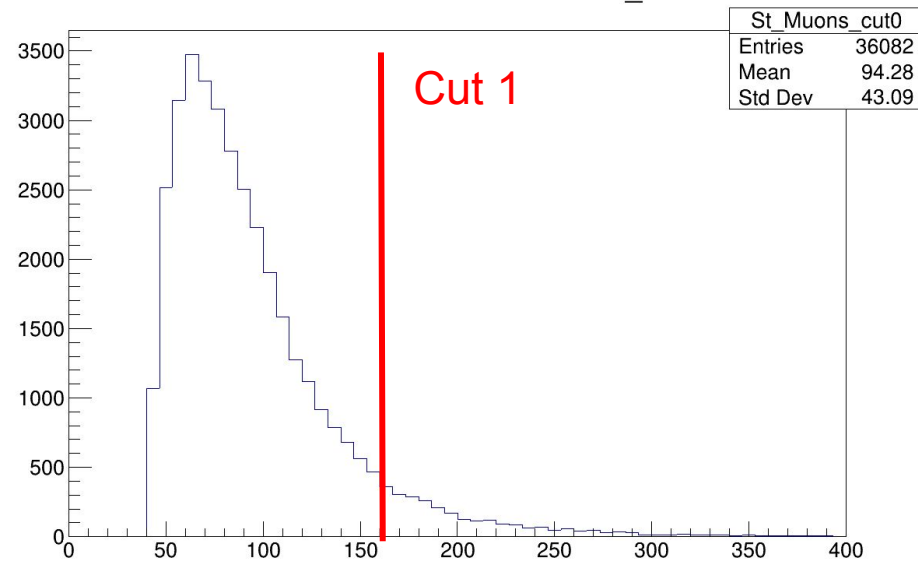
Cut 1

Signal

TTbar

Selection	Signal	TTbar	S/B
Basic selection	25.12	3273.74	0.77%
Cut 1: St > 160 GeV	12.68	246.06	5.15%

Second strategy: Cut 2 (ΔR > 1.8)

Delta R between the 2 muons_cut00

DeltaR_Muons_cut00	
Entries	370
Mean	2.74
Std Dev	0.5043

Cut 2

Delta R between the 2 muons_cut00

DeltaR_Muons_cut00	
Entries	2712
Mean	2.501
Std Dev	0.9032

Cut 2

Signal

TTbar

Delta R between the 2 muons_cut00

DeltaR_Muons_cut00	
Entries	370
Mean	2.74
Std Dev	0.5043

Cut 2

Delta R between the 2 muons_cut00

DeltaR_Muons_cut00	
Entries	2712
Mean	2.501
Std Dev	0.9032

Cut 2

Signal

TTbar

Selection	Signal	TTbar	S/B
Basic selection	25.12	3273.74	0.77%
Cut 1: St > 160 GeV	12.68	246.06	5.15%
Cut 2: ΔR > 1.8	12.20	190.81	6.39%

Selection	Signal	TTbar	S/B
Basic selection	25.12	3273.74	0.77%
Cut 1: Pt first muon > 80 GeV	17.34	739.00	2.35%
Cut 2: Pt second muon > 40 GeV	12.68	254.41	4.98%
Cut 3: ΔR > 1.8	12.37	207.56	5.96%

First strategy

Selection	Signal	TTbar	S/B
Basic selection	25.12	3273.74	0.77%
Cut 1: St > 160 GeV	12.68	246.06	5.15%
Cut 2: ΔR > 1.8	12.20	190.81	6.39%

Second strategy

There are at least 10 signal events (even with an extra cut asking for at least one b-jet).

The results are roughly the same (number of signal events, S/B). The first strategy has 3 Cuts but I cut on the St for the second strategy.

⟶ Need to find a variable where the signal stands out the background to choose the best strategy!

I also have to check if the signal events are the ones we are waiting for. ⟶ ONGOING.