CutFlow using ttH Background Samples

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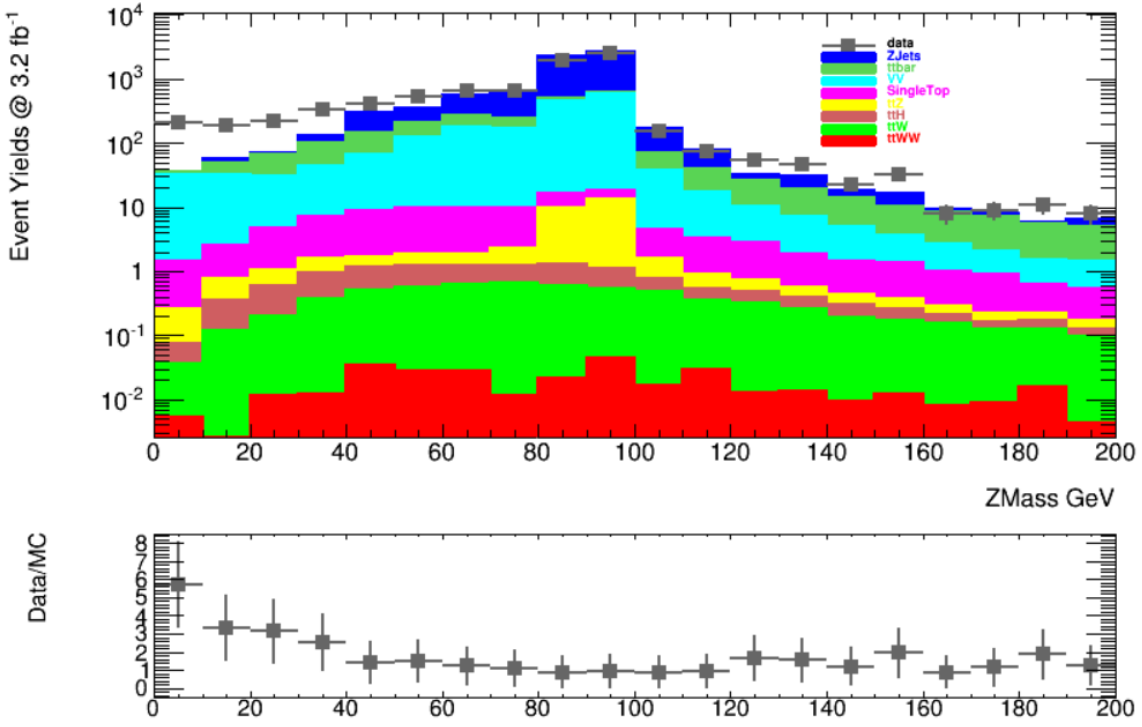
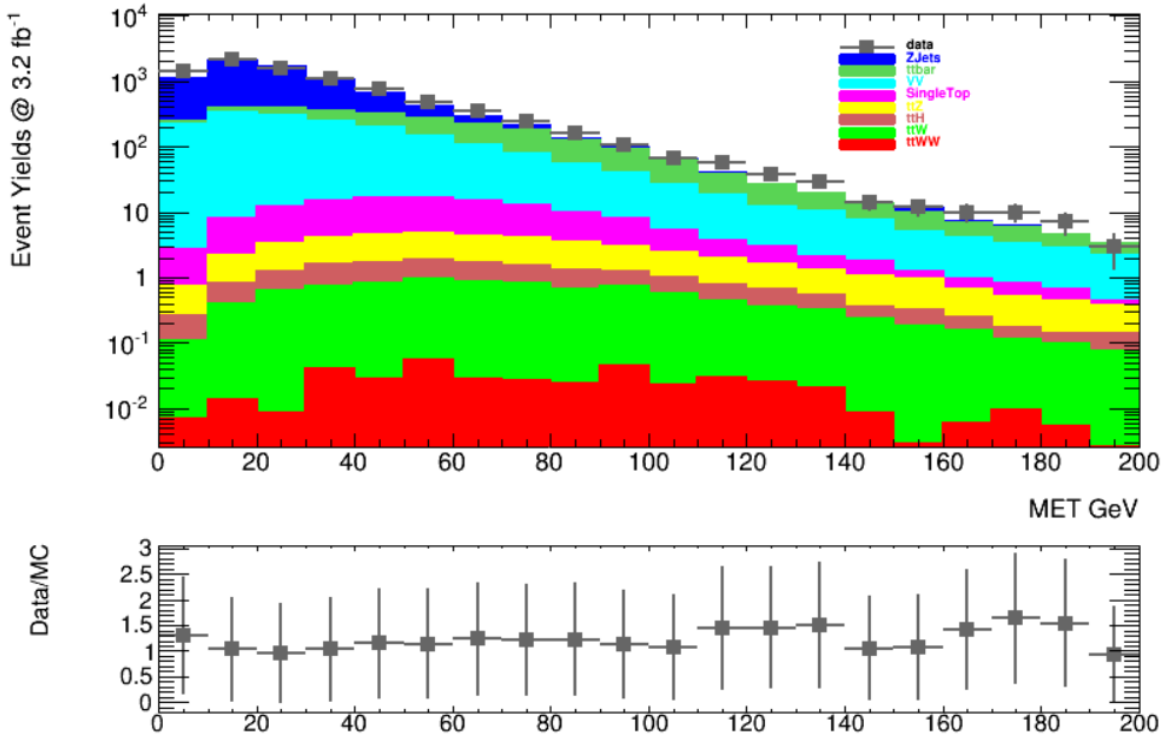
Introduction

- Look at background yields in charged higgs study.
  - Look at 3-lepton channel.
  - Use samples extracted with ttH framework.
    - ttWW, ttW, ttH, ttZ, SingleTop, VV, ttbar, Zjets.
- Lepton selection
  - Use ttH object selection which is already applied to the samples.
- Event selection
  - Three leptons.
  - Sum charge +/- 1
  - Zveto
  - At least two jets and no bjet allowed.
  - Mll(same charge) > 50 GeV
  - MET > 30 GeV
- Comparing with data @ 3.2 fb^{-1}

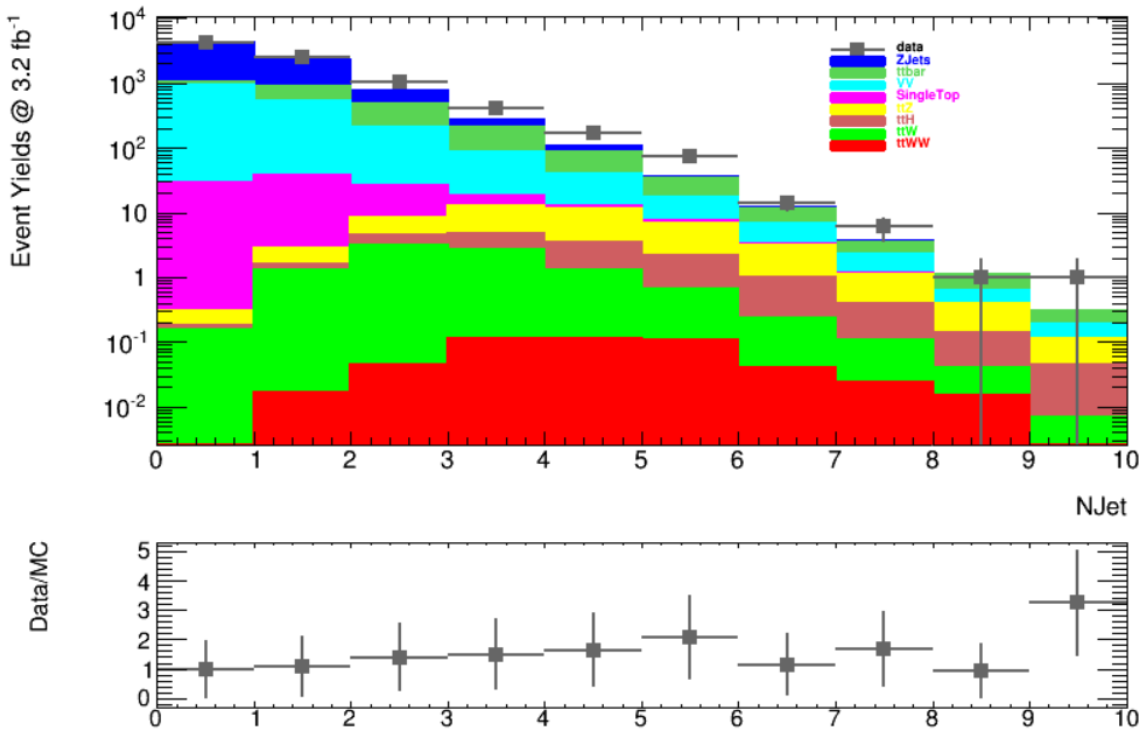
Zmass and MET

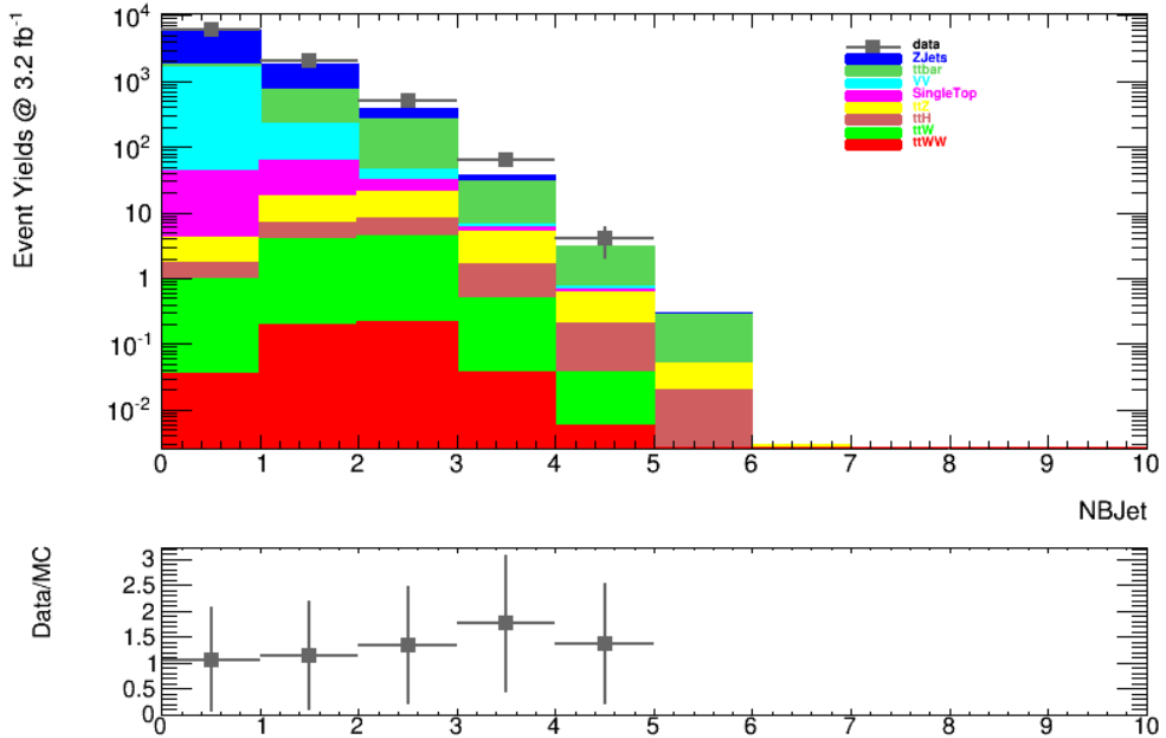




After three lepton and sum charge requirements.
Z window is 10 GeV.
Met requirement is 30 GeV

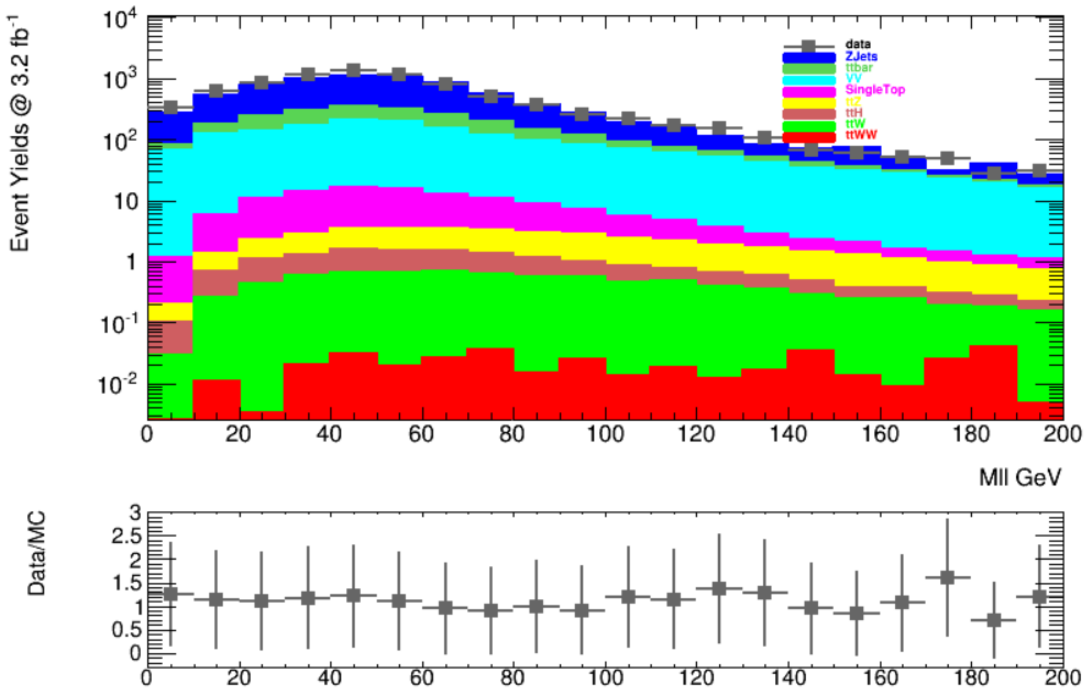
Njet and NBjet





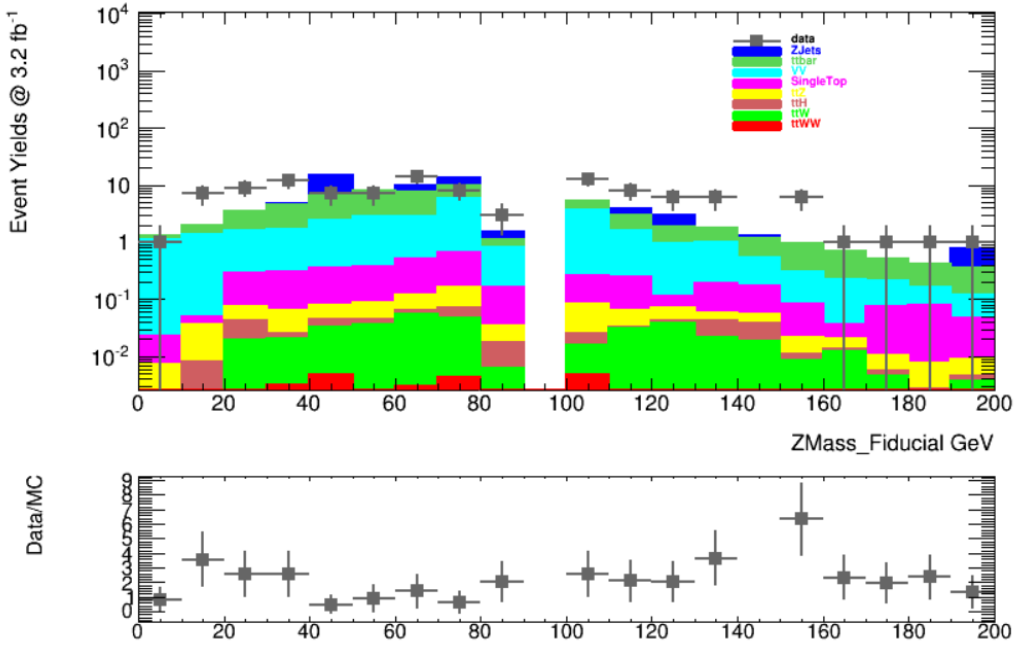
After three lepton and sum charge requirements.
Njet is number of jets passing jet selection and pt greater than 25 GeV, Njet >= 2
Nbjet is number of bjet with b-tagging efficiency 77%, Nbjet == 0

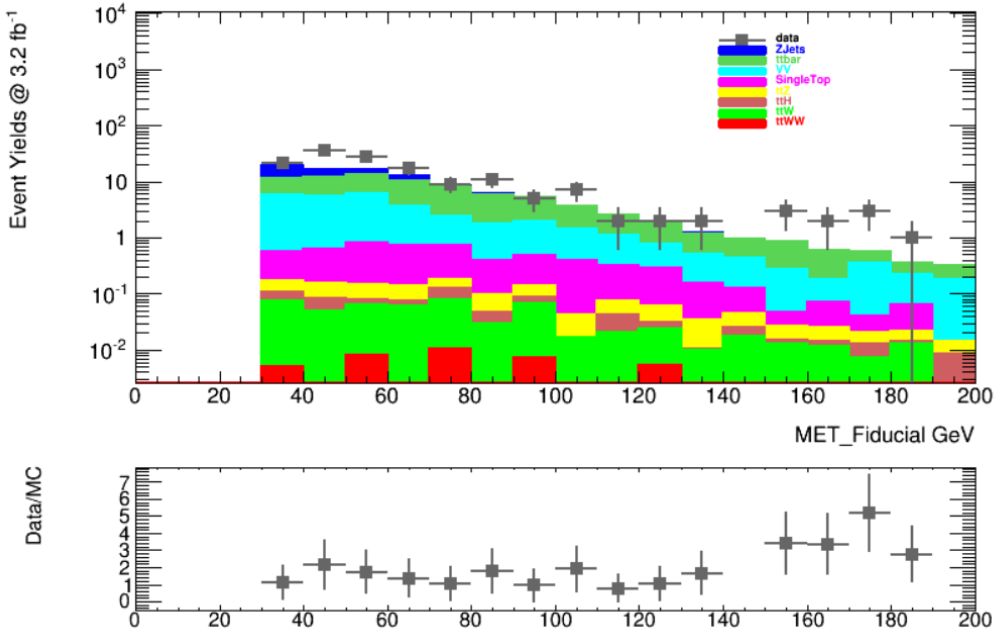
Mll



After three lepton and sum charge requirements.
Mll requirement is 50 GeV

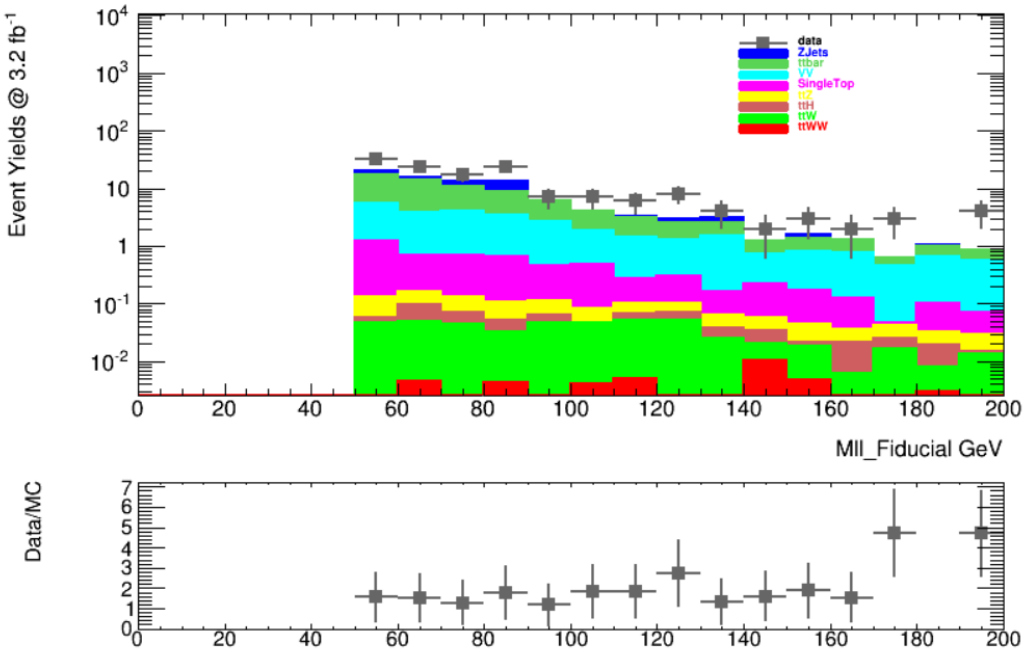
Zmass and MET

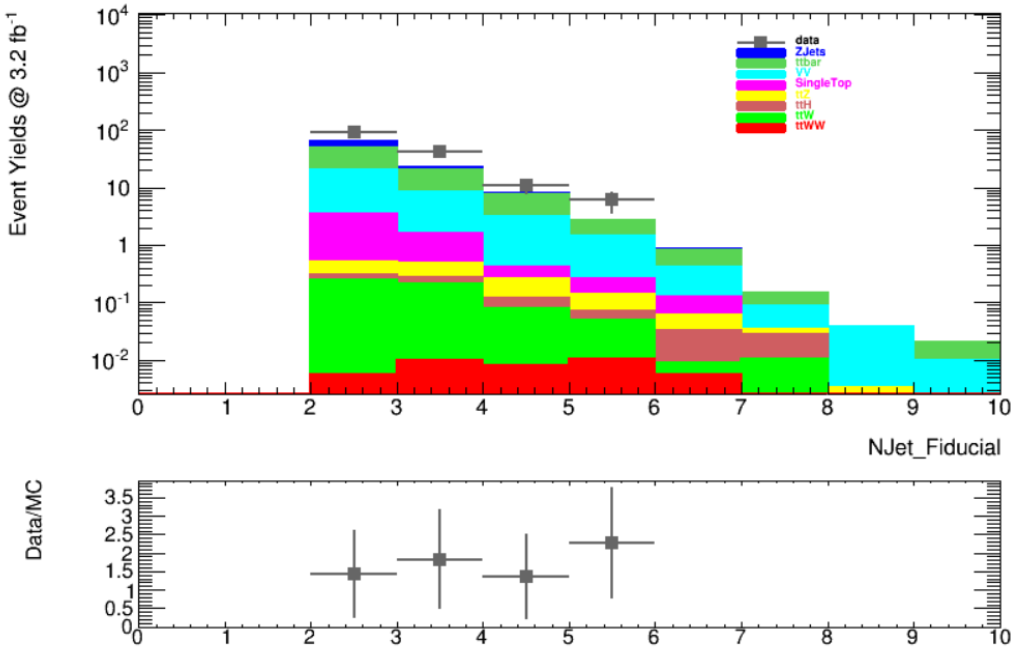




All event selection applied.

Mll and Njet





All event selection applied.

Cutflow

	ttWW	ttW	ttH	ttZ	SingleTop	VV	ttbar	ZJets	data
Raw	3.77	116.77	86.35	161.17	8399.55	26855.80	62161.21	4912497.00	5053465.00
NLep	0.49	9.47	8.56	29.39	91.77	1713.46	937.26	5037.33	8595.00
SumCharge	0.48	9.18	8.44	29.17	90.96	1705.68	932.59	5017.30	8543.00
Zveto	0.41	8.17	7.22	8.19	80.38	722.37	826.84	1201.78	4153.00
Jet	0.05	0.83	1.05	1.00	9.40	77.83	114.29	77.25	497.00
Mll	0.04	0.60	0.72	0.74	5.89	40.07	60.32	33.63	217.00
MET	0.04	0.52	0.64	0.64	5.22	27.27	50.41	23.81	150.00

	ttWW	ttW	ttH	ttZ	SingleTop	VV	ttbar	ZJets	data
Raw	0.13	0.55	0.49	1.10	14.28	37.40	38.98	4650.68	2247.99
NLep	0.04	0.16	0.15	0.13	1.43	9.11	4.78	109.65	92.71
SumCharge	0.04	0.15	0.15	0.13	1.42	9.09	4.77	109.52	92.43
Zveto	0.04	0.14	0.14	0.11	1.33	6.64	4.49	61.33	64.44
Jet	0.01	0.05	0.06	0.02	0.46	2.02	1.67	11.29	22.29
Mll	0.01	0.04	0.05	0.02	0.36	1.31	1.21	7.61	14.73
MET	0.01	0.04	0.05	0.01	0.34	0.96	1.10	7.20	12.25

Event cutflow @ 3.2fb^{-1}

All selection applied.

Left is central value while right is statistical uncertainty.

Details of object selection

Electrons

- pt > 10 GeV
- |eta| < 2.47, and not 1.37 < |eta| < 1.52 (use el->caloCluster()->etaBE(2))
- pass **LooseAndBLayer** Likelihood ID (if reading flags from DAOD, keep using LooseLH, but apply the following BL hit cut before the ID selection)
- |z0 sin theta| < 2 mm
- |d0 significance| < 10
- pass isolation (Loose working point in IsolationSelectionTool)

Muons

- pt > 10 GeV
- |eta| < 2.5
- pass loose muon quality requirement: MuQuality ≤ 2 (or muon_isLoose = 1 with group ntuples)
- |z0 sin theta| < 2 mm
- |d0 significance| < 10
- pass isolation (Loose working point in IsolationSelectionTool)

Jets

- pass jet clean criteria ("LooseBad" in the JetCleaningTool)
- pt > 25 GeV
- |eta| < 2.5
- remove jets with |JVT| < 0.64 and |eta| < 2.4 and pt < 50 GeV (use jet->jetP4("JetEMScaleMomentum").eta())
- BTag: BTagMV2c20 > -0.4434 (77% eff)

https://twiki.cern.ch/twiki/bin/viewauth/AtlasProtected/TTHtoLeptonsPreliminarySelection#Electrons