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H WW 2l selection for analysis skim and preselection

Complete:

Introduction

This document is a review for the CSA07 skimming and preselection of the H WW silver channel. The skim consists into event selection and AODSIM output. The preselection consists into event tag and selected collections added to the AODSIM output format.

H WW 2l selection

The electron and muon decays of the W bosons produce 2 high Pt leptons. The preliminary requirement is the logical OR between the following 9 HLT streams: HLT1MuonIso, HLT1MuonNonIso, HLT2MuonNonIso, HLT1Electron, HLT1ElectronRelaxed, HLT2Electron, HLT2ElectronRelaxed, HLTXElectronMuon, HLTXElectronMuonRelaxed. Tau leptons will be considered later. For a significative background reduction two tracks with a minimum Pt are required.

HLT paths

The HLT paths are the following:

```
module higgsToWW2LeptonsHLTFilter = hltHighLevel from "HLTrigger/HLTfilters/data/hltHighLevel.cfi
replace  higgsToWW2LeptonsHLTFilter.HLTPaths = {"HLT1MuonIso","HLT1MuonNonIso","HLT1Electron","HL
```

HiggsToWW2Leptons Filter module

A new filter module HiggsToWW2LeptonsFilter.cfi has been created. The module defines the collection names and cuts:

```
module higgsToWW2LeptonsFilter = HiggsToWW2LeptonsSkim {
  InputTag RecoTrackLabel            = recoTracks
  InputTag GlobalMuonCollectionLabel = globalMuons
  InputTag ElectronCollectionLabel   = pixelMatchGsfElectrons

  double SingleTrackPtMin = 20.0
  double DiTrackPtMin = 10.0
  double etaMin = -2.4
  double etaMax = 2.4
}
```

For the selection of Candidates the selector HiggsToWW2LeptonsSkim.cc was provided:
http://cmssw.cvs.cern.ch/cgi-bin/cmssw.cgi/CMSSW/HiggsAnalysis/Skimming/src/HiggsToWW2LeptonsSkim.cc?rev

HWW Skimming

The event selection is provided by the path HWWFilterPath (sequence of HLTFilter and 2LeptonFilter):

```
sequence higgsToWW2LeptonsSequence = {
  higgsToWWTrigReport &
  higgsToWW2LeptonsHLTFilter &
  higgsToWW2LeptonsFilter
```

```
}
path HWWFilterPath = { higgsToWW2LeptonsSequence }
vstring SelectEvents = {"HWWFilterPath"}
```

HWW Preselection

```
- lepton selection: Pt > 10 GeV , abs(eta) < 2.5
- choose hardest leptons as lepton1 and lepton2
- one lepton with pt>20 GeV
- lepton1 and lepton2 must have opposite charge
- met cut:  MET > 30 GeV
- invariant mass cut: InvMass > 12 GeV
```

Skimming results with CMSSW_1_6_7

Dataset	Input events	Output events	Skim eff.	Notes
/H120_WW_2l/CMSSW_1_6_7-2l2nu_Skim-Higgs130_WW_2l/USER	17250	4229	24.5 %	misl. name
/H130_WW_2l/CMSSW_1_6_7-2l2nu_Skim-Higgs130_WW_2l/USER	17000	4704	27.7 %	
/H140_WW_2l/CMSSW_1_6_7-2l2nu_Skim-Higgs140_WW_2l/USER	16000	4938	30.9 %	
/H150_WW_2l/CMSSW_1_6_7-2l2nu_Skim-Higgs150_WW_2l/USER	19130	6380	33.3 %	
/H160_WW_2l/CMSSW_1_6_7-2l2nu_Skim-Higgs160_WW_2l/USER	51566	18442	35.8 %	
/H165_WW_2l/CMSSW_1_6_7-2l2nu_Skim-Higgs165_WW_2l/USER	51918	19062	36.7 %	
/H170_WW_2l/CMSSW_1_6_7-2l2nu_Skim-Higgs170_WW_2l/USER	43430	16116	37.1 %	
/H180_WW_2l/CMSSW_1_6_7-2l2nu_Skim-Higgs180_WW_2l/USER	28349	10741	37.9 %	
/H190_WW_2l/CMSSW_1_6_7-2l2nu_Skim-Higgs190_WW_2l/USER	20250	7735	38.2 %	
/H200_WW_2l/CMSSW_1_6_7-2l2nu_Skim-Higgs200_WW_2l/USER	17839	6924	38.8 %	
/H210_WW_2l/CMSSW_1_6_7-2l2nu_Skim-Higgs210_WW_2l/USER	16305	6382	39.1 %	
/WW_incl/CMSSW_1_6_7-2l2nu_Skim-WW_incl/USER	744261	40142	5.4 %	
/WZ_incl/CMSSW_1_6_7-2l2nu_Skim-WZ_incl/USER	362291	16214	4.5 %	
/ZZ_incl/CMSSW_1_6_7-2l2nu_Skim-ZZ_incl/USER	143113	10675	7.5 %	
/tW_inclusive/CMSSW_1_6_7-2l2nu_Skim-tW_inclusive/USER	438791	66789	15.2 %	
(*1) PDMuon-Gumbo-100pb	152637	42223	27.7 %	
(*2) PDMuon-Stew-100pb	1756592	139531	7.9 %	
(*3) PDMuon-Chowder-100pb	5002514	1015912	20.3 %	
(*4) PDElectron-Gumbo-100pb	1986548	38586	1.9 %	
(*5) PDElectron-Stew-100pb	179910	24295	13.5 %	

(*6) PDElectron-Chowder-100pb	4382197	849467	19.4 %	

(*1)/CSA07Muon/CMSSW_1_6_7-CSA07-Gumbo-B1-PDMuon-ReReco-100pb-Skims2-higgsToWW2LeptonsAODS

(*2)/CSA07Muon/CMSSW_1_6_7-CSA07-Stew-B2-PDMuonReReco-100pb-Skims2-higgsToWW2LeptonsAODSIM

(*3)/CSA07Muon/CMSSW_1_6_7-CSA07-Chowder-A3-PDMuon-ReReco-100pb-Skims2-higgsToWW2LeptonsAOI

(*4)/CSA07Electron/CMSSW_1_6_7-CSA07-Gumbo-B1-PDElectron-ReReco-100pb-Skims5-higgsToWW2LeptonsA

(*5)/CSA07Electron/CMSSW_1_6_7-CSA07-Stew-B2-PDElectronReReco-100pb-Skims5-higgsToWW2LeptonsAOI

(*6)/CSA07Electron/CMSSW_1_6_7-CSA07-Chowder-A3-PDElectron-ReReco-100pb-Skims5-higgsToWW2Lepton

Preselection results with CMSSW_1_6_7 reconstruction and CMSSW_1_6_9 electron ID

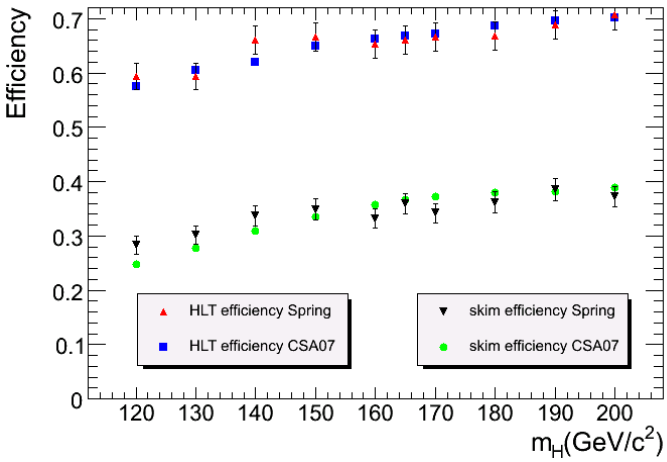
Dataset	Input events	Marker events	Presel. rel. eff.	Note
/H120_WW_2l/CMSSW_1_6_9-2l2nu_Preselection-Higgs120_WW_2l/USER	4229	2505	59.2 %	
/H130_WW_2l/CMSSW_1_6_9-2l2nu_Preselection-Higgs130_WW_2l/USER	4704	2879	62.6 %	
/H140_WW_2l/CMSSW_1_6_9-2l2nu_Preselection-Higgs140_WW_2l/USER	4938	3090	62.6 %	
/H150_WW_2l/CMSSW_1_6_9-2l2nu_Preselection-Higgs150_WW_2l/USER	6380	4257	66.7 %	
/H160_WW_2l/CMSSW_1_6_9-2l2nu_Preselection-Higgs160_WW_2l/USER	18442	12662	68.7 %	
/H165_WW_2l/CMSSW_1_6_9-2l2nu_Preselection-Higgs165_WW_2l/USER	19062	13221	69.4 %	
/H170_WW_2l/CMSSW_1_6_9-2l2nu_Preselection-Higgs170_WW_2l/USER	16116	11259	69.9 %	
/H180_WW_2l/CMSSW_1_6_9-2l2nu_Preselection-Higgs180_WW_2l/USER	10741	7605	70.8 %	
/H190_WW_2l/CMSSW_1_6_9-2l2nu_Preselection-Higgs190_WW_2l/USER	7735	5501	71.1 %	
/H200_WW_2l/CMSSW_1_6_9-2l2nu_Preselection-Higgs200_WW_2l/USER	6924	4984	72.0 %	
/H210_WW_2l/CMSSW_1_6_9-2l2nu_Preselection-Higgs210_WW_2l/USER	6382	4602	72.1 %	
/WW_incl/CMSSW_1_6_9-2l2nu_Preselection-WW_incl/USER	40142	12606	31.4 %	
/WZ_incl/CMSSW_1_6_9-2l2nu_Preselection-WZ_incl/USER	16214	4278	26.4 %	
/ZZ_incl/CMSSW_1_6_9-2l2nu_Preselection-ZZ_incl/USER	10675	3601	33.7 %	
/tW_inclusive/CMSSW_1_6_9-2l2nu_Preselection-tW_incl/USER	66789	15092	22.6 %	
/CSA07Muon/CMSSW_1_6_9-2l2nu_Preselection-MuonGumbo-100pb/USER	42223	2010	4.8 %	
/CSA07Muon/CMSSW_1_6_9-2l2nu_Preselection-MuonStew-100pb/USER	139531	122	0.1 %	
/CSA07Muon/CMSSW_1_6_9-2l2nu_Preselection-MuonChowder-100pb/USER	1015912	106278	10.5 %	
/CSA07Electron/CMSSW_1_6_9-2l2nu_Preselection-ElectronGumbo-100pb/USER	38586	3905	10.1 %	
/CSA07Electron/CMSSW_1_6_9-2l2nu_Preselection-ElectronStew-100pb/USER	24295	122	0.5 %	
/CSA07Electron/CMSSW_1_6_9-2l2nu_Preselection-ElectronChowder-100pb/USER	849467	77813	9.2 %	

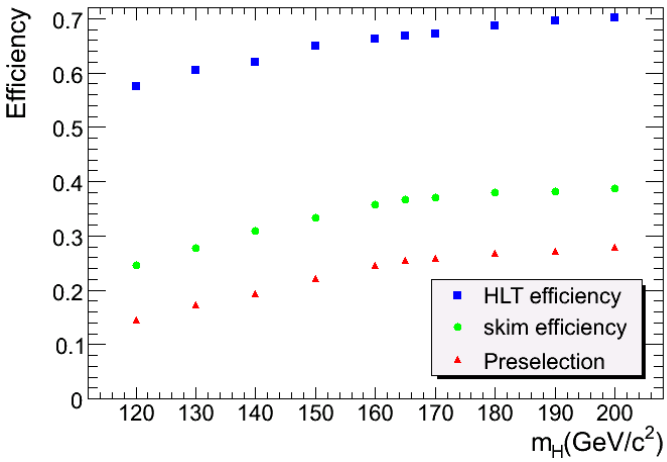
Warning

```
* Dataset published with CRAB_2_0_4 and CRAB_2_1_0. More recent CRAB versions manage LFN with dif
```

Efficiencies plots

```
* Efficiencies comparison between Spring07 and CSA07:          * CSA07 efficiencies for HLT , S
```





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Editor/Reviewer and date	Comments
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