EASY Tertiary DPDs making using EventView tools

- In TauDPDMaker
- 100% From scratch

Sylvie Brunet

Atlas DESY NAF and FDR Tutorial
DESY, Hamburg, 14/05/2008

Plan

Tutorial: https://twiki.cern.ch/twiki/bin/view/Atlas/TutorialTertiaryDPDWithEVTools

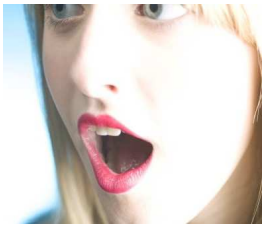
Tertiary DPDs using EventView tools:

Now: Brief Introduction

Then: Tutorial & exercises:

1) Tertiary DPDs From TauDPDMaker
2) Tertiary DPDs From scratch

(with a python code having **less than 50 lines**!!!)



Note: **TopDPDMaker** will be cover this afternoon by Marcello!

Tertiary DPDs in TauDPDMaker

Tertiary DPDs in this talk=
flat ROOT ntuples which can be analysed

- Take advantage of the existing EventView tools.
- Configure everything from scratch
- Flexible (can easily add new trees, new selections, etc)

Tertiary DPDs in TauDPDMaker: Usage So Far

- **Tool already quite useful! Example of people @ DESY who created their own tertiary DPDs for personal or general use.**

- **Björn Gosdzik**
  - Compare tau definition between different physics groups
- **Michael Böhler**
  - Study photon convertions in order to improve tau-recontruction
- **Stefan Mätting**
  - Study Z-> ee
- **Dörthe Ludwig**
  - Cross-check things in her SUSY analysis
- **Sebastian Johnert**
  - Cross-check things in his Z->tautau analysis
- **Myself**
  - Study FDR-1 data

Tertiary DPDs in TauDPDMaker: ControlSample ntuple

ControlSample ntuple in TauDPDMaker

- Originally created to analyze FDR-1 data within the TauWG

dijets, $Z \rightarrow \tau\tau/ee/\mu\mu$, $W \rightarrow e\nu/\mu\nu/\ \tau\nu$, $Z \rightarrow jj$, …

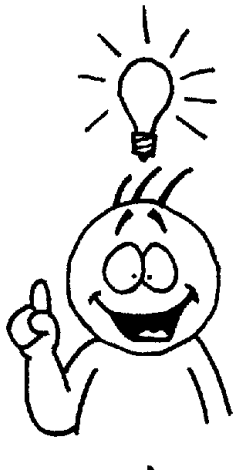
- General Content, with a focus on taus

RECO Stuff	True Stuff	Trigger Stuff	MissingET Stuff
Taus, electrons, photons, muons, jets, tracks, clusters	Taus, electrons, photons, muons, jets,	Objects and decisions	All sources (reco and true) and calibrations

All details: https://twiki.cern.ch/twiki/bin/view/Atlas/ControlSampleNtupleInTauDPDMaker#What_is_the_content_of_the_Contr

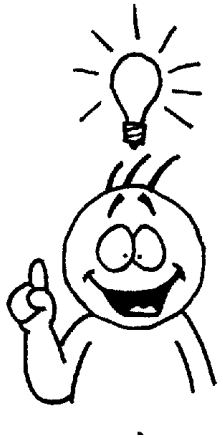
- **Usable by anybody interested in these type of studies** *(not only with FDR-1 data!),* **ntuples available on the GRID!**

Exercise 1 : Tertiary DPDs in TauDPDMaker



Today you will produce a ControlSample tertiary DPD using TauDPDMaker, and you will learn how to play with it

(and have a first contact with EventView) !



Exercise 1 :Tertiary DPDs in TauDPDMaker

1.1) create your first tertiary DPD (ControlSample ntuple)

- explore the resulting .root and log files.
- explore the structure of the code

1.2) Modifying your ControlSample ntuple

- play with MCTruth, trigger info, input collections, output names
- add more info on electrons
- modify the selections for electrons
- run on FDR-1 data (optional)

EventView tools

Tertiary DPDs with EventView tools

How does it work? 3 easy steps

1) Define ***Inserters***
2) Insert the wanted Inserters in a ***Event View Loop***
3) Define the ***UserData*** to be associated to the inserters

Inserters:

Definition of your particles. (taus, electrons, jets, reco/truth etc)

Define all the wanted selections (pt cut? Specific flag? Overlap removal? Likelihood cut?)

EventView Loop :

"Big loop" where you insert all you need for your own ntuple (no need to use all the defined inserters)

UserData:

What will be written in your ntuple (kinematic variables, detailed variables, …)

Exercise 2: EventView tools:

Today you will get familiar with these steps and be able to play with them…

Exercise 2: EventView tools

2.1) Produce a tertiary DPD from scratch with less than 50 lines of python code!!!

- explore the (quite easy!) structure of the code

2.2) Modifying your tertiary DPD

- **know where to find relevant information**
- add taus
- add true taus
- truth-match the reco electrons with the true taus
- more advanced (optional):
  - play with overlap removal
  - play with trigger information
  - add missingET information

Tips for the exercices

- Take your time (*but not tooo much, a lot to learn!*) , take time to understand what you do and to explore what is proposed in the exercises

- **Don't be shy to ask questions, that is why we do a tutorial!**

- Please, don't re-use the release set up for secondary DPD making exercises, start a new one following the instructions on the Twiki

Summary

- **TauDPDMaker** can be used to make **tertiary DPDs**. Making tertiary DPDs **is easy**! Many people use it!
- The **"ControlSample" tertiary DPD** is quite general and it can be used for many studies. Ntuples available via the grid!
- Using the **"EventView tools" to produce tertiary DPD** is done in 3 quite steps

Now you will learn how to play with all that!

Tutorial link:

https://twiki.cern.ch/twiki/bin/view/Atlas/TutorialTertiaryDPDWithEVTools

Have Fun!

Backup

Tertiary DPDs in TauDPDMaker: Documentation / Support

Feedback received so far: easy to use!

General tertiary DPD section in the main TauDPDMaker page:

https://twiki.cern.ch/twiki/bin/view/Atlas/TauDPDMaker#Making_tertiary_DPD_i_e_ntuple_b

"How to", description of the content of the ControlSample TertiaryDPD, etc, see TWIKI page:

https://twiki.cern.ch/twiki/bin/view/Atlas/ControlSampleNtupleInTauDPDMaker

For code details of the ControlSample TertiaryDPD, see cvs repository:

http://atlas-sw.cern.ch/cgi-bin/viewcvs-atlas.cgi/offline/PhysicsAnalysis/TauID/TauDPDMaker/share/

Infos are in these files:

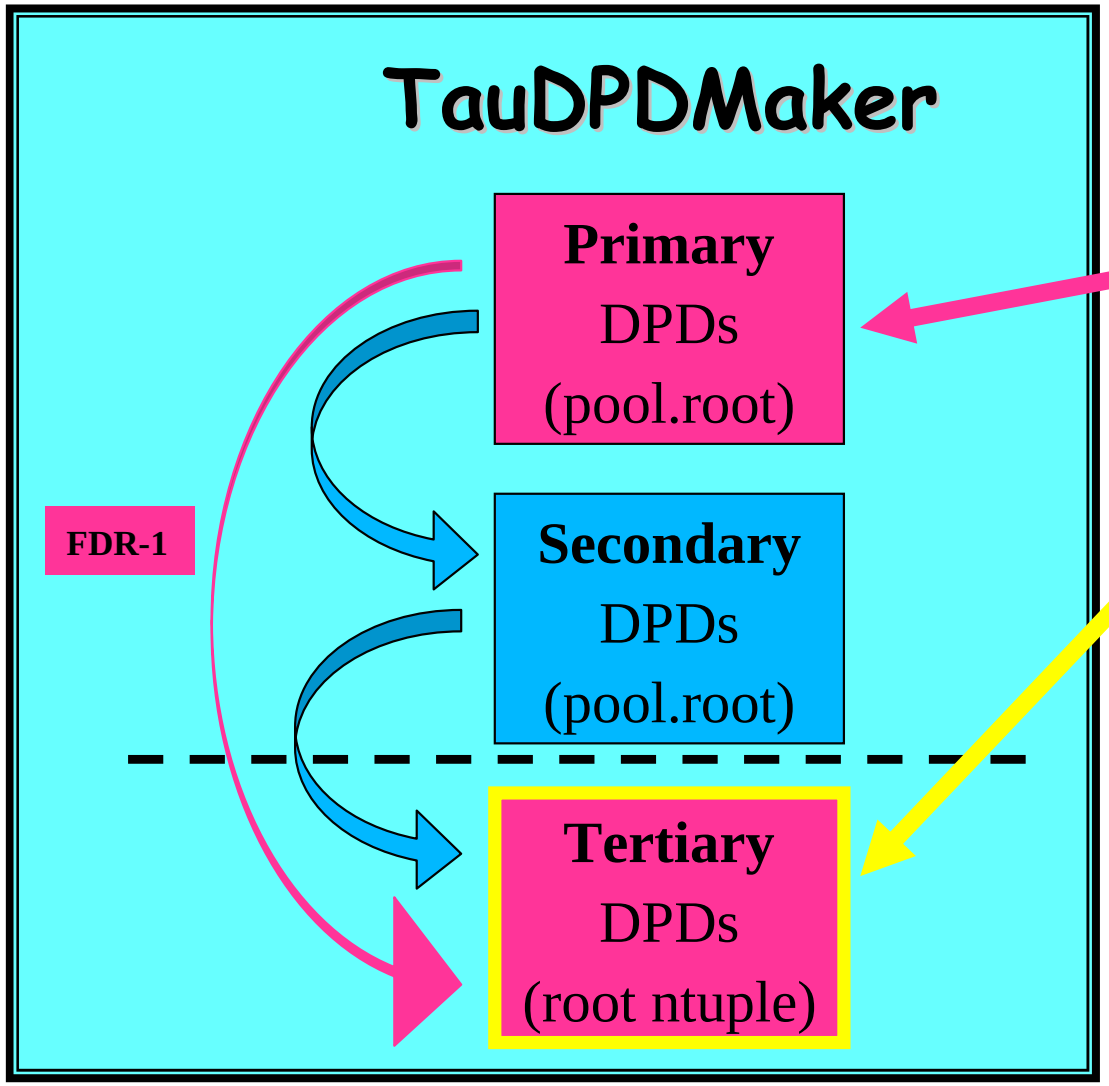
TertiaryDPD_ControlSampleTree.py
TertiaryDPD_EventViewCommonInput_Reco.py
TertiaryDPD_EventViewCommonInput_Truth.py

This tutorial:

https://twiki.cern.ch/twiki/bin/view/Atlas/TutorialTertiaryDPDWithEVTools

We are always answering questions via HyperNews (preferably) or emails…

Tertiary DPDs in TauDPDMaker



Goal: Want to perform physics analysis without using CBNTs

Tertiary DPDs = flat ROOT ntuples which can be analysed

∴ With TauDPDMaker, you can produce tertiary DPDs from AOD, ESD, Primary DPDs

Tertiary DPDs in TauDPDMaker: Principle (III)

- **Concrete & current code architecture**

/offline/PhysicsAnalysis/TauID/TauDPDMaker/share/

Define Inserters for reco particles (including trigger & missing ET)

Define Inserters for true particles

TertiaryDPD_EventViewCommonInput_Reco.py
TertiaryDPD_EventViewCommonInput_Truth.py

one .py file per tertiary DPD

Define Tertiary DPDs (or ROOT ntuples) containing:
-the chosen inserters
- associators between particles
- user data

TertiaryDPD_XYZTree.py

ControlSample ntuple: Content: RECO

Reconstructed Particles:

Type	Containers	Selections	Variables in ntuple
Taus	TauRecContainer ? Tau1P3PContainer	No Selections	-Basic Kinematics -All PID details -All details -match to true hadronic taus
Electrons	ElectronAODCollection	-isEMMasks=[0x3ff] (medium) -Et>=10 GeV	-Basic Kinematics -match to true electrons
Muons	StaccoMuonCollection	- best match -Et>=10 GeV	-Basic Kinematics -match to true muons
Tracks	TrackParticleCandidate	-No Selections	-Basic Kinematics
Clusters	EMTopoCluster	-No Selections	-Basic Kinematics
Jets	Cone4H1TopoParticleJets	-Et>=10 GeV	-Basic Kinematics -match to true QCD jets -match to true visible taus -match to true electrons -match to true photons

ControlSample ntuple: Content MC TRUTH

True Particles:

Type	Containers	Selections	Variables in ntuple
Taus	SpclMc	-Status code ! = 3 -Mother mass > 20 GeV	-Basic Kinematics for whole decay -Basic Kinematics for visible part -match to true hadronic tau -Navigable tree for all parents and up to 6 children generations
Electrons	SpclMc	-Et>=10 GeV -Only Stable -Mother mass > 20 GeV **or** mother is tau and tau's mother mass > 20 GeV	-Basic Kinematics - Navigable tree for all parents and 1 children generation
Muons	SpclMc	-Et>=10 GeV -Only Stable -Mother mass > 20 GeV **or** mother is tau and tau's mother mass > 20 GeV	-Basic Kinematics -Navigable tree for all parents and 1 children generation
Photons	SpclMc	-Et>=10 GeV -Only Stable -Mother mass > 20 GeV	-No variable, only used to define true QCD jets
Jets	Cone4TruthParticleJets	-Et>=10 GeV	-Basic Kinematics -match to true QCD jets -match to true visible taus -match to true electrons -match to true photons -match to true muons

ControlSample ntuple: Content TRIGGER & MissingET

Trigger Information:

- All Trigger Decisions for all trigger levels
- All Trigger Objects for all trigger levels

Reconstructed MissingET:

Calibrations	Variables in ntuple (for each Calibration)
MET_RefFinal, MET_RefEle, MET_RefMuon, MET_RefJet, MET_RefGamma, MET_RefTau, MET_CellOut, MET_MuonBoy, MET_CryoCone, MET_LocHadTopoObj, MET_LocHadTopo	-_ex -_ey -_et -_sumet

True MissingET:

Type	Sources (for each Type)	Variables in ntuple (for each source)
-MET_Truth -MET_Truth_PileUp (if available in MC sample)"	Int, NonInt, IntCentral, IntFwd, IntOutCover, Muons	-_ex -_ey -_et -_sumet

Primary DPDs

- **Finalized version for FDR-1 (no change since last report):**

Dijets: (back-to-back jet pair)

- jet: pT > 15 GeV, eta < 2.5
- abs(pT[i]-pT[j]) < pTMax / 1.5
- 2.74 < (jet[i].phi()-jet[j].phi()) < 3.54

$Z \rightarrow ll$, $W \rightarrow l\nu$ & $Z/W \rightarrow jj$:

- MET > 30 (10) GeV for W (Z)
- SumET < 400 GeV
- Z/W→lep: at least 1 (2) lepton(s) in the event for W (Z)
  - p_T > 15 GeV, η < 2.5
    - accept $W \rightarrow e\nu/\mu\nu/\tau\nu$, $Z \rightarrow \mu\mu/ee/\tau\tau/\mu\tau/\mu e/e\tau$ final states
- Z/W→jets: at least 2 Cone4H1TopoParticleJets
  - p_T > 15 GeV, η < 2.5

Primary DPDs

Containers: finalized version for FDR-1 (no change since last report):

```
#Event-by-event containers
StreamDPD = AthenaPoolOutputStream( "StreamDPD" )
StreamDPD.ItemList = ['EventInfo#*']
StreamDPD.ItemList+=["Analysis::TauJetContainer#Tau1P3PContainer"]
StreamDPD.ItemList+=["Analysis::TauDetailsContainer#Tau1P3PDetailsContainer"]
#Somehow, Tau1P3PDetailsContainer requires Tau1P3PPi0ClusterContainer...
StreamDPD.ItemList+=["CaloClusterContainer#Tau1P3PPi0ClusterContainer"]
StreamDPD.ItemList+=["Analysis::TauJetContainer#TauRecContainer"]
StreamDPD.ItemList+=["Analysis::TauDetailsContainer#TauRecDetailsContainer"]
StreamDPD.ItemList+=["ParticleJetContainer#Cone4H1TopoParticleJets"]
StreamDPD.ItemList+=["Rec::TrackParticleContainer#TrackParticleCandidate"]
StreamDPD.ItemList+=["egammaContainer#ElectronAODCollection"]
#Somehow, ElectronAODCollection requires egDetailAOD...
StreamDPD.ItemList+=["egDetailContainer#egDetailAOD"]
StreamDPD.ItemList+=["Analysis::MuonContainer#StacoMuonCollection"]
#MET_RefFinal and various terms contributing to it:
StreamDPD.ItemList+=["MissingET#MET_RefFinal"]
StreamDPD.ItemList+=["MissingET#MET_RefEle"]
StreamDPD.ItemList+=["MissingET#MET_RefGamma"]
StreamDPD.ItemList+=["MissingET#MET_RefJet"]
StreamDPD.ItemList+=["MissingET#MET_RefMuon"]
StreamDPD.ItemList+=["MissingET#MET_RefTau"]
StreamDPD.ItemList+=["MissingET#MET_CellOut"]
StreamDPD.ItemList+=["MissingET#MET_LocHadTopo"]
StreamDPD.ItemList+=["MissingET#MET_LocHadTopoObj"]
StreamDPD.ItemList+=["MissingET#MET_MuonBoy"]
StreamDPD.ItemList+=["MissingET#MET_CryoCone"]

#Containers needed by TertiaryDPD_ControlSampleTree.py
StreamDPD.ItemList+=["CaloClusterContainer#EMTopoCluster"]
StreamDPD.ItemList+=["Rec::TrackParticleContainer#StacoTrackParticles"]
StreamDPD.ItemList+=["MissingET#MET_Final"]

#Trigger container needed by EventViewTrigger (see TauDPD_EventViewAnalysis_ControlSample).
StreamDPD.ItemList+=["TrigConf::Lvl1AODPrescaleConfigData#AODConfig-0"]
StreamDPD.ItemList+=["LVL1_ROI#LVL1_ROI"]
StreamDPD.ItemList+=["TrigInDetTrackCollection#HLTAutoKey*"]
StreamDPD.ItemList+=["CombinedMuonFeature#HLTAutoKey*"]
StreamDPD.ItemList+=["TrigEMCluster#HLTAutoKey*"]
StreamDPD.ItemList+=["TrigT2Jet#HLTAutoKey*"]
StreamDPD.ItemList+=["TrigElectronContainer#HLTAutoKey*"]
StreamDPD.ItemList+=["TrigPhotonContainer#HLTAutoKey*"]
StreamDPD.ItemList+=["TrigTau#HLTAutoKey*"]
StreamDPD.ItemList+=["JetCollection#HLTAutoKey*"]
StreamDPD.ItemList+=["TrigMuonEFContainer#HLTAutoKey*"]
StreamDPD.ItemList+=["egammaContainer#HLTAutoKey*"]
StreamDPD.ItemList+=["egammaContainer#NoIDEF_RoI*"]
StreamDPD.ItemList+=["egammaContainer#egamma_RoI*"]
StreamDPD.ItemList+=["Analysis::TauDetailsContainer#HLTAutoKey*"]
StreamDPD.ItemList+=["Analysis::TauJetContainer#HLTAutoKey*"]
StreamDPD.ItemList+=["TrigMissingET#HLTAutoKey*"]
#Needed by one of the above trigger containers...
StreamDPD.ItemList+=["Rec::TrackParticleContainer#HLTAutoKey*" ]

########### Trigger Meta-data containers
StreamDPD_FH.Store = MetaDataStore
StreamDPD_FH.WriteOnExecute = False
StreamDPD_FH.WriteOnFinalize = True
# Write all IOV meta data containers
StreamDPD_FH.ItemList += [ "IOVMetaDataContainer#*" ]

#Write job-based MetaData header
StreamDPD_FHTool = AthenaPoolOutputStreamTool("StreamDPD_FHTool")
StreamDPD_FHTool.OutputCollection = "MetaDataHdr";
StreamDPD_FHTool.PoolContainerPrefix = "MetaData"
ToolSvc += StreamDPD_FHTool
```