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IFAEAtlasAnalysis

Introduction

This page is created by IFAE Barcelona. It is supposed to collect or share useful information about ATLAS analysis. In order to edit TWiki pages you have to register with your AFS password

Useful links

- **IFAE Cvs Repository** IFAECvsRepo
- **CSC data**
  - Status of AOD replicas on sites
  - Fast overview
  - List of datasets being reprocessed due to the 30 microns bug
  - panda monitor
  - Atlas Metadata Interface
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  - Streaming test data
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- **Analysis tools**
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  - Introduction into HighPtView
    - How to run Highptview
  - Introduction into TopView
  - Introduction into EventView
    - Tutorial about configurables: EventViewBuilderTutorialConf
    - Our own collected information: IFAEAtlasAnalysisEV
  - Introduction into StructuredAthenaAwareNtuple
- **MC production**
  - Introduction: see *Running Athena* in the Atlas WorkBook
  - MCFM main page
    - LHADPF: Les Houches library
  - _EvGen_ Validation
  - Digitization main page
- **General information**
  - Hypernews forum
  - atlas offline cvs repository

Trigger

- **official pages**
  - Trigger Hypothesis
  - Trigger Analysis Tutorial (updated)
  - Trigger Menu

- **General information**
  - Trigger performance overview by Monica Wiehlers in the Exotics meeting

- **detailed info**
  - Egamma triggers
  - Egamma trigger performance optimization, by Iwona Grabowska-Bold

Z+jets

- Z+jets plots "blessed" for conferences (new): link
- WZjetsCSC notes and plots

Object ID

Electron Reconstruction

- **Short description and Documentation**
  - I'm starting documentation in EventViewElectronDetailed, but this will take some time..
  - As long as the CSC note is not finished, the best EMID documentation can be found in the EgammaATLASRecoPerformance page. Here you can find the link to the most recent performance note.
  - A complete list of the AOD content can be accessed from the Class references in the AOD pages
  - A project to document the AOD content has started. So far the mosy useful documentation is the EgammaCBNT page and the documentation of the most important Electron Variables produced by the EV calculators in 12.0.x
  - Electron candidates are separated in reconstruction from Photon candidates by applying a loose track match. The default electron ID uses a hollow cone isolation and the *IsEM* flag which is composed of bits that correspond to various requirements on the shower shape in the calorimeter and the track in the ID (see ElectronGammaIsEM page). Alternative approaches using multivariate techniques (NN, Likelihood, HMatrix, ..) are in advanced stage of development.
  - A good source of information are also various recent talks in the EMID group
    - Egamma Status by S. Rajagopalan on the Stockholm ATLAS Overview Week
    - Comparative Electron ID studies by Jamie Boyd
    - A status report of Christophe Clement in the CAT meeting which contains documentations and distributions of the ID variables for electrons and fakes and the corresponding presentation in the T and P week.
    - A presentation of Gia Khoriauli about EM ID in 12.0.4
    - EM calibration in 12.0.4 by Claire Adam Bourdarios
- **More details about the Electron ID**
  - **AOD electron** :
    - Sliding Window Clusters in 5x5, 3x5 and 3x7
    - Clusters corrected for position and energy modulations
    - Separation of Electron and Photon candidates by a simple track match: DEta<0.025 , DPhi<0.05; E/p<4
    - Hadronic activitity < 20%
  - **Is EM** is calculated (no cut applied in AOD), using information about the Hadronic Leakage, the lateral shower shape in the second sampling of the EM Calorimeter, the lateral shower shape in the strips, the track Quality Cuts (# of hits and impact parameter), the track-calorimeter spatial matching, E/p and the fraction of high threshold TRT hits
    - More information: isEM bit mask
  - The **electron likelihood** parametrizes the distributions of various discriminating variables for signal (S) and background (B) which are then interpreted as PDFs. The signal probability S (or `em Weight`) and the background probability B (or `pion Weight`) are calculated as a product of the individual probabilities. The final discriminant is the likelihood ratio S/(S+B). The ATLAS electron likelihod uses e0/e, e1/e, e2/e, e3/e, Et Cone40/et, E237/E277, E233/E237,et/(et+Etha), e/p, deta1, dphi2, zvertex/errz, Weta1, Weta2, E2tsts1-Emins1, Fracs1, Isol and numtracks (see documentation of vaiables)

Muon Reconstruction

- **Muon Identification**
  - STACO (STAtistical COmbination) is Saclay product which attempts to statistically merges the two independent measurements derived from the inner detector track with the spectrometer track at the IP.
  - MuIDCombined (written (in C++) by Alan Poppleton). Unlike STACO which statistically merges the two independently found tracks, this code performs a global refit of all hits associated with these tracks, taking into account the calorimeter mass profile which is approximated by two scattering planes.
- **Documentation**
  - Combined Muon Status by Peter Kluit at the Stockholm ATLAS Overview Week
  - MuonRecoPedia information about Atlas Muon reconstrucion software.
  - Muon Selection & Performance by David Adams at th U.S. muon software workshop (nice talk) (6/12/2006)
  - Muon Performance in 12.0.X by David Adams at the Muon Validation & Performance meeting (23/01/2007)
  - EV variables: -> muon part of the EVUD calculator documentation
  - Zmumu inclusive analysis (M.Schott thesis): -> link thesis (August 2007)
  - Impact of the initial layout on the ATLAS Muon Spectrometer Performance: -> ATL-COM-MUON-2005-009

Jet Reconstruction

- **Documentation**
  - Jet reconstruction
  - Jet-Tau-ETmiss Status Report bt Donatella Cavalli at the Stockholm ATLAS Overview Week
  - EV variables: -> jet part of the EVUD calculator documentation

MC data sets

- **Streaming test:**
  - wiki page for users

- **Pythia Z-> leplep inclusive**
  - Documentation
  - Z->ee: 5144 `trig1_misal1_csc11.005144.PythiaZee.recon.AOD.v12000601`
  - Z->mumu: 5145 `trig1_misal1_csc11.005145.PythiaZmumu.recon.AOD.v12000601`
  - Z->tautau->lep: 5146 `trig1_misal1_csc11.005146.PythiaZtautau.recon.AOD.v12000601`
- **Higgs group Z+jets *Loose* samples:**
  - Information:
    - generation conditions: ZplusJetsAlpgen
    - data sets: StandardModelCSCDatasets
  - ID 8130 .... 8135 (0 jets .... >=5 jets)
  - atlfast samples: `/castor/cern.ch/grid/atlas/users/jtanaka/HiggsWG/Z_samples/fast/CBNT/`
  - fully reconstructed Zee: `trig1_misal1_mc12.008131.AlpgenJimmyZeeNp1LooseCut.recon.AOD.v12000601` etc.
  - fully reconstructed Zmm: `trig1_misal1_mc12.008143.AlpgenJimmyZmumuNp1LooseCut.recon.AOD.v12000601` etc
- **Alpgen Susy background: Z->nunu**

    - Information: ZplusJetsAlpgen
    - ID: 8124 ... 8129
    - atlfast samples (directory contains also other SUSY background):
      `/castor/cern.ch/grid/atlas/datafiles/susy/atlfast/2006_b`
- **QCD background**
    - for Zmm: `trig1_misal1_mc12.017506.PythiaB_bbmu6mu4X.recon.AOD.v12000601`
    - for Zee: `trig1_misal1_mc12.005802.JF17_pythia_jet_filter.recon.AOD.v12000601`
- **Pythia SUSY background**
    - Overview and production status

Zmumu+jets analysis

- workplans:
    - workplan16Gener.pdf

TTbar semi-leptonic

cuts used

- "preselection" cuts already applied in FLIPA:
  - ♦ electron:
    - ◊ pT > 10 GeV
    - ◊ | | < 2.5
    - ◊ isLooseEM
    - ◊ isolation < 6 GeV
  - ♦ muon:
    - ◊ pT > 10 GeV
    - ◊ | | < 2.5
  - ♦ jets:
    - ◊ pT > 10 GeV
    - ◊ | | < 2.5

- cuts applied in the "real" analysis:
  - ♦ electron:
    - ◊ # of electrons > 0
    - ◊ pT > 30 GeV
    - ◊ isMediumEM()
    - ◊ etcone20 < 6 GeV
    - ◊ ΔR (ele, jets) > 0.3 for jets with pT ratio > 0.5
  - ♦ muon:
    - ◊ # of muons > 0
    - ◊ pT > 30 GeV
    - ◊ fit ^2 < 200
    - ◊ match ^2 < 100
    - ◊ nucone20 < 3
    - ◊ etcone20 < 2 GeV (etcone bug?!)
    - ◊ ΔR (muon, jets) > 0.3 for jets with pT ratio > 0.5
  - ♦ jets:
    - ◊ 1st jet pT > 65, 2nd, 3rd, and 4th jet pT > 40 GeV
    - ◊ | | < 2.5

efficiencies for CSC-like analysis

- CSC- cuts:
  - ♦ electron:
    - ◊ pT > 20 GeV
    - ◊ |eta| < 2.5 (without crack: abs(presel_electron_eta[0])<1.37 || abs(presel_electron_eta[0])>1.52)
    - ◊ isolation < 6 GeV
    - ◊ isMediumEM
  - ♦ muon:
    - ◊ pT > 20 GeV
    - ◊ |eta| < 2.5
    - ◊ isolation < 6 GeV
  - ♦ jets:
    - ◊ pT > 20 GeV
    - ◊ |eta| < 2.5

- in FLIPA second production (tag 02-06):
  - For the electron with the above cuts the efficiencies are:
    - Default cuts (one's above + just 1 electron no muons) : 15,89 % (77418 events)
    - Default + Miss ET > 20 GeV: 14,33 % (69847 events)
    - Default + Miss ET > 20 GeV + 4 Jets > 20 GeV: 8,22% (40055 events)
    - Default + Miss ET > 20 GeV + 4 Jets > 20 GeV + 3 Jets > 40 GeV: 5,68 % (27685 events)
  - For the muon with the above cuts the efficiencies are:
    - Default cuts (one's above + just 1 muon no electrons): 21,42 % (104394 events)
    - Default + Miss ET > 20 GeV: 19,52 % (95102 events)
    - Default + Miss ET > 20 GeV + 4 Jets > 20 GeV: 11,47 % (55858 events)
    - Default + Miss ET > 20 GeV + 4 Jets > 20 GeV + 3 Jets > 40 GeV: 7,83 % (38157 events)

MC samples

- For PROD-03:

*mc08.105200.T1_McAtNlo_Jimmy.recon.AOD.e357_s462_r541 (Xs = 217.06) PIC
*mc08.105204.TTbar_FullHad_McAtNlo_Jimmy.recon.AOD.e363_s462_r563 - PIC & IFIC
*mc08.106040.PythiaWenuJet_Ptcut.recon.AOD.e352_s462_r541
*mc08.106041.PythiaWmunuJet_Ptcut.recon.AOD.e352_s462_r541
*mc08.105500.AcerMC_Wt.recon.AOD.e352_s462_r541 (Xs = 14.325) PIC
*mc08.105502.AcerMC_tchan.recon.AOD.e352_s462_r541(Xs = 40.6736 pb)
*mc08.105011.J2_pythia_jetjet.recon.AOD.e344_s479_r541 (Xs = 56013300 pb)
*mc08.105012.J3_pythia_jetjet.recon.AOD.e344_s479_r541 (Xs = 3286720 pb)
*mc08.105013.J4_pythia_jetjet.recon.AOD.e344_s479_r541 (Xs = 151610 pb)
*mc08.105014.J5_pythia_jetjet.recon.AOD.e344_s479_r541 (Xs = 5088.42 pb) PIC

*mc08.108068.J2_pythia_jetjet_muFIXED.recon.AOD.e347_s462_r541
*mc08.108069.J3_pythia_jetjet_muFIXED.recon.AOD.e347_s462_r541
*mc08.108070.J4_pythia_jetjet_muFIXED.recon.AOD.e347_s462_r541

TTbar-> tau

MC samples

- Top MC samples are defined here. Any sample reconstructed with release 11 can found at panda monitor. Production with release 12 is on going, not much was produced until now (for Top analysis), however some few AODs were reconstructed by Elzbieta, and can be found at:
  - W->e nu: 5104 = /castor/cern.ch/grid/atlas/users/ashibata/cscpre12-5104
  - Z->tautau: 5188 = /castor/cern.ch/grid/atlas/users/ashibata/cscpre12-5200
  - ttbar: 5200 = /castor/cern.ch/grid/atlas/users/ashibata/cscpre12-5200
  - single top: 5501 = /castor/cern.ch/grid/atlas/users/ashibata/cscpre12-5200
- And replicated at pic at:
  - /nfs/atlas-data03/cosuna/official_data/cscpre12/csc11.005200.T1_McAtNlo_Jimmy.digit.RDO.v1100
- As the statistics for rel12 is not enough, we reconstructed more events (running on rel11 digit files) and placed them under:
  - /nfs/atlas-data03/cosuna/official_data/cscpre12/csc11.005200.T1_McAtNlo_Jimmy.digit.RDO.v1100
- Ntuples produced with the leptonic W's daughter-number fix are placed under:
  - /nfs/atlas-data03/fiorini/cspre12/ntuples `TopViewAANtuple.new.root` has been obtained merging the 2 other files.

TopView ntuples

- Ongoing detailed documentation on ntuple variables.
- For a full description of ntuple variables: Truth, Reco. Another description (should be the "official") here.
- release 11. Large TopView athena aware ntuples were produced with release 11.
- release 12. Few files were produced for release 12 (and TopView-00-12-xx) for validation. With this release two types of AAN are being generated, depending on the type of tau identification algorithm used (tauRec or tau1p3p):
  - /castor/cern.ch/grid/atlas/users/ashibata/cscpre12-TopView.
- Ntuples used in the analysis and corresponding MC info.

B-tagging

B tagging is done by default combining the results of 2 different algorithms: IP3D and SV1.

- IP3D calculates with tracks informations the 3-D impact parameter (`d`) of a b vertex candidate and its significance: `s = d/sigma(d)`.
- SV1 reconstructs secondary vertices in the BJet. SV1 algorithm uses a bottom-up approach: it fits vertices with all pairs of tracks, retaining the fit with the highest probability and fitting the remaining tracks of the jet to this vertex. All tracks below a certain fit probability will be rejected. A likelihood variable is calculated with the secondary vertex parameters (mass, fit probability, multiplicity and distance from the reconstructed primary vertex).
- The two informations are summed in a bjet weight variable, that is variable used to discriminate bjets from other jets. The standard cut on the weight is at value of 3 (b-tagged jets having a weight greater than 3). The cut can be changed in TopView inside `python/TopViewInserters_module.py` . The default tagging algorithm has an efficiency of 60% and a Rejection factor for light jets of 240 in ttjjenu and ttH events.
- More details are available at BTagging Homepage and the main BTagging algorithm is in CVS under: `PhysicsAnalysis/JetTagging/JetTagAlgs/BTagging`

Tau1p3p

Tau1p3p is the preferred Tau reconstruction method for the ttbar reference sample The tau1P3P algorithm is dedicated for reconstruction and identification of the hadronic tau's with visible energy from hadronic decays in the range 20 - 70 GeV, it is track-based, with energy-scale given by energy-flow approach.

- Tau1P3P Reference homepage
- Athena based algo Tau1p3p
- Latest atlas note on Tau1p3p

SUSY

Links

- Atlas Susy working group
- Susy MC production status
- Susy MC production information
- Old page for Rome production

Data

- Monitoring of Susy CSC production
- Cross sections for alpgen samples

COSMICS

Links

- Cosmics reconstruction

EV groupArea at PIC.

The PAT group is continuosly developing and applying patched to official atlas releases, even when the release is out. Therefore they make use the so called groupArea, where they install updates packages that will overload the default packages to be found in the release. In order to use the latest EV, SUSYView, TopView,... we need to install a given EVTag at PIC (exactly in the same way as they do in groupArea at CERN). There are several ways one can do that (consult here), but the easiest and faster is to use pacman.

I installed the latest EV version at:

```
/nfs/atlas-data02/scratch/AtlasSoftware/EVgroupArea/EventView-12.0.4.3
```

In order to use this area, prepend this path to your CMTPATH before running athena:

```
export CMTPATH=/nfs/atlas-data02/scratch/AtlasSoftware/EVgroupArea/EventView-12.0.4.3:$CMTPATH
```

Future updates can be installed in the same EVgroupArea directory using pacman

- **Using Pacman at PIC**

Let say you want to install EventView-$Release at PIC. First configure pacman:

```
* cd /nfs/atlas-data02/scratch/AtlasSoftware/pacman/pacman-$VERSION
* source setup.sh
```

Then go to the EV groupArea directory and create a new directory for the desired version

```
* cd /nfs/atlas-data02/scratch/AtlasSoftware/EVgroupArea/
* mkdir EventView-$RELEASE
* cd EventView-$RELEASE
```

and execute the pacman command:

```
* pacman -v all -get http://atlas-computing.web.cern.ch/atlas-computing/links/kitsDirectory
```

Installing a production patch at PIC*

Setup the athena release and pacman:

```
* source $VO_ATLAS_SW_DIR/software/12.0.6/setup.sh
* source /nfs/atlas-data02/scratch/AtlasSoftware/pacman/pacman-$VERSION/setup.sh
```

Then do

```
pacman -get http://cern.ch/atlas-computing/links/kitsDirectory/Production/cache:patch-name
```

The list of availables patches can be found at:
http://atlas-computing.web.cern.ch/atlas-computing/links/kitsDirectory/Production/cache/

Bibliography

Under this section are stored some interesting documents, talks and lectures that you can find helpful to consult during your analysis:

- K. Ellis Introduction to QCD at Colliders

Major updates:
-- UllaBlumenschein - 09 Jan 2007 -- Main.cosuna - 09 Jan 2007

%RESPONSIBLE% Main.unknown

%REVIEW% **Never reviewed**

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