

egamma DPDs

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May 20, 2009

DPDs

- DPD \equiv Derived Physics Data \equiv data which have been processed for easier analysis.
- Processing can include:
 - ▶ Skimming (selecting events).
 - ▶ Slimming (removing parts of objects).
 - ▶ Thinning (removing some objects from containers).
 - ▶ Object-specific reprocessing (eg, recover γ 's from e container).
 - ▶ Reformatting (eg, write flat ntuple).
- Primary DPD (D1PD): POOL format. Centrally produced.
 - ▶ Undergoing validation.
- Secondary DPD (D2PD): POOL format. Specialized for individual/group analysis.
 - ▶ Nothing really defined yet.
- Tertiary DPD (D3PD): Flat ROOT format. May be produced individually or centrally.
 - ▶ Some prototypes available. Work underway to define content and tools.
 - ▶ Goal is to have a common set of tools across Atlas (with consistent naming). Physics groups could define their own D3PDs based on these.

egamma Primary DPDs

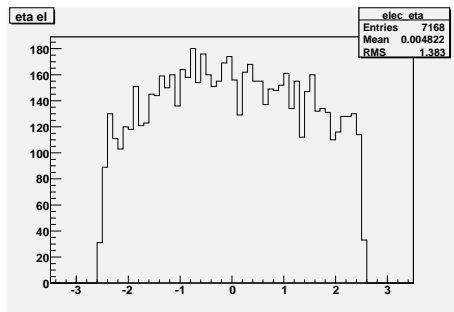
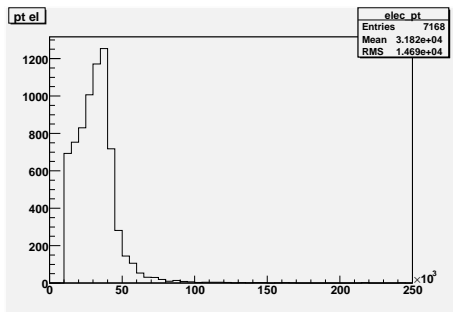
- See <https://twiki.cern.ch/twiki/bin/view/AtlasProtected/PrimaryDPDMaker>
- Main egamma DPD (DPD_EGAMMA)
 - ▶ Includes all events.
 - ▶ No slimming (removal of parts of objects).
 - ▶ Heavy use of thinning (removing some objects entirely).
 - ★ CaloCells, PrepRawData, Tracks, TrackParticles.
 - ▶ MC samples match DQ2 query `'*DPD_EGAMMA.*r672*'`
 - ▶ Cosmic ray samples match DQ2 query `'data08_cosmag*DPD_EGAMMACOMM*'`
- Single electron DPD (DPD_SINGLEEEL)
 - ▶ No slimming or thinning (full ESD information).
 - ▶ Event selection:
 - ★ Medium electron with $p_T > 10$ GeV.
 - ▶ MC samples match DQ2 query `'*DPD_SINGLEEEL.*r672*'`

egamma Primary DPDs

Primary DPDs can be analyzed using standard Athena tools. Ex:

```
include ('UserAnalysis/AnalysisSkeleton_topOptions.py')  
ServiceMgr.EventSelector.InputCollections = [ ... ]
```

Produces a file AnalysisSkeleton.aan.root with a tuple and some histograms. For PythiaWenu_1Lepton sample:



egamma Tertiary DPDs

- D3PDs:

- ▶ NA egamma group has also been making flat ROOT tuples for a number of data samples.
- ▶ Easier and faster to work with for simple things.
- ▶ Tailored for egamma analysis.
- ▶ Contents have been validated against AODs.

- Status:

- ▶ Proposed to egamma group as a standard group D3PD.
- ▶ Decided it would be useful, but contents and naming conventions should be harmonized with other tuples that have been used for egamma analysis. In progress.
- ▶ Further decided that the tools used to make the D3PDs were unsuitable, and new tools should be designed. Getting started.
- ▶ In the meantime, NA egamma group will maintain the existing D3PDs.

egamma D3PDs

- Documentation: <http://www.usatlas.bnl.gov/twiki/bin/view/AtlasSoftware/EgammaD3PDMaker.html>
- Contained objects:
 - ▶ Electron (El_)/Photon (Ph_):
 - ★ Kinematics: N, p_T, eta, phi, E, px, py, pz, m
 - ★ Particle: author, charge, pdgId
 - ★ Cluster shape: ethad1, f1, f1core, f3core, fracs1, iso, pos7, ...
 - ★ Discriminants: IsEM, ElectronWeight, BgWeight, PhotonWeight, ...
 - ★ Isolation: etcone20, etcone30, etcone40, etcone45
 - ★ Cluster: Cl_m_e_emb0, Cl_etab0, Cl_phib0, ...
 - ★ Tracking (El only): EoverP, Trk_chi2, Trk_phi, Trk_d0, Trk_z0, ...
 - ★ Track match (El only): deltaEta1, deltaEta2, deltaPhi2
 - ★ Brem fit (El only): bremClusterRadius, breamInvpT, bremRadius, ...
 - ★ Conversion: convAngleMatch, convTrackMatch
 - ★ Vertexing: etap, zvertex, errz
 - ★ Electron cuts: El_Loose, El_Medium, El_Tight, El_PtCut
 - ★ Photon cuts: El_Tight, El_Egamma
 - ★ Overlap: Jet0L, Muon0L, EgCluster0L, El_Photon0L, Ph_Electron0L

egamma D3PDs

- Contained objects:

- ▶ Missing ET (MET_Final_, MET_RefFinal_, ObjMET_Final_):
 - ★ et, ex, ey, sumet
- ▶ EM cluster (EgCl_)
 - ★ Energies: m_e_emb0, m_e_emb1, m_e_emb2, m_e_emb3, m_e_eme0, ...
 - ★ Positions: etab0, phib0, etab1, phib1, ...
 - ★ Moments: m1_eta, m1_phi, m2_r, m2_lambda, center_lambda, ...
 - ★ Overlap: ElectronOL, PhotonOL, MuonOL, JetOL
- ▶ Jets (Jet_)
 - ★ Kinematics: N, p_T, eta, phi, E, px, py, pz, m
 - ★ Particle: author, charge, pdgId
 - ★ Overlap: ElectronOL, PhotonOL, MuonOL, EgClusterOL
- ▶ STACO Muons (Mu_)
 - ★ Kinematics: N, p_T, eta, phi, E, px, py, pz, m
 - ★ Particle: author, charge, pdgId
 - ★ Isolation: SumTrkPtInCone, nTrkInCone, etcone10, nucone10, ...
 - ★ Quality: matchChi2, fitChi2, matchChi2OverDoF, fitChi2OverDoF
 - ★ Cuts: Staco, PtCut, Isolated
 - ★ Flags: hasCluster, hasCombinedMuon, bestMatch, ...
 - ★ Overlap: ElectronOL, PhotonOL, JetOL, EgClusterOL

egamma D3PDs

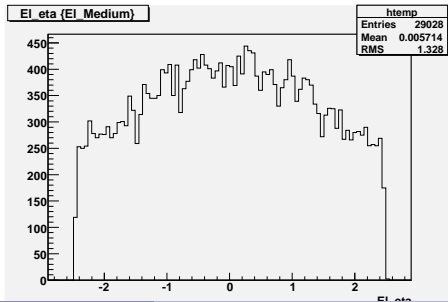
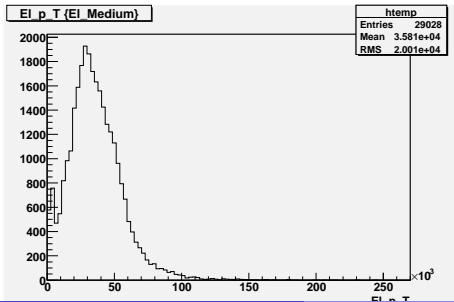
- Contained objects:
 - ▶ Truth (Truth_)
 - ★ Kinematics: N, p_T, eta, phi, E, px, py, pz, m
 - ★ Particle: status, barcode, charge, pdgId
 - ★ Isolation: etcone, etcone20, etcone30, etcone40, etcone50, ...
 - ★ Parents: nParents, ParentIDs, ParentBarcodes, ParentStatus, ...
 - ★ Decays: nDecay, DecayIDs, DecayBarcodes, DecayStatus, ...
 - ▶ Trigger:
 - ★ PassedTrigger
 - ★ PassedL1, PassedL1_trig
 - ★ PassedL2, PassedL2_trig
 - ★ PassedEF, PassedEF_trig
 - ▶ Global:
 - ★ runNumber, eventNumber, LumiBlock
 - ★ TimeStamp, TimeStampOffset, BunchCrossingID
 - ★ IsSimulation, IsCalibration, IsTestBeam
 - ★ eventWeight

Available data samples

- These data sets available:
 - ▶ Single electron and photon
 - ★ $7 < E_T < 80 \text{ GeV}$
 - ★ $80 < E_T < 500 \text{ GeV}$
 - ▶ $Z \rightarrow ee$
 - ▶ $J/\psi \rightarrow ee$
 - ▶ $W \rightarrow e\nu$
 - ▶ $W \rightarrow \mu\nu$
 - ▶ $H(120 \text{ GeV}) \rightarrow \gamma\gamma$
- Available on usatlas at `/usatlas/workarea/janovak/new_version`.
- Also on CERN project disk and from DQ2/Castor. See the Wiki page!
- Also see Wiki page for instructions on running on your own samples.

Example of making plots from D3PDs with PyROOT

```
import ROOT
import glob
tt = ROOT.TChain('FullReco0')
for f in glob.glob('/usatlas/workarea/janovak/new_version/'
                  'Wenu/*.root'):
    tt.Add(f + '/FullReco0')
tt.Draw('El_p_T', 'El_Medium')
tt.Draw('El_eta', 'El_Medium')
```



Summary

- Primary DPDs seem to be converging. Some samples available now for validation
 - ▶ <https://twiki.cern.ch/twiki/bin/view/AtlasProtected/PrimaryDPDMaker>
- Prototype ROOT tuples available.
 - ▶ <http://www.usatlas.bnl.gov/twiki/bin/view/AtlasSoftware/EgammaD3PDMaker.html>
 - ▶ Comments/requests to Julia Gray.
- Discussions underway on making tuple naming more consistent and changing to use new common tools.
 - ▶ <https://twiki.cern.ch/twiki/bin/view/AtlasProtected/EgammaD3PDProposal>