

# TOPD3PDBOOSTED ANALYSIS PACKAGE

M. Amine Hyaya, Farida Fassi,  
Rajaa Cherkaoui El Moursli, Avi Gershon

PCI2011 Workshop, Valencia, May 22th-24th 2013



# Overview

2

- TopD3PDBoosted is a framework containing and managing the sub-packages necessary for Boosted top l+jets analysis
  - Standard top l+jets analysis is also available
- Aim is to unify the building and the structure of tools needed for applying the dedicated handling of physical objects
- These tools have to be used before starting a user analysis and they provide to events:
  - Definition and selection
  - Calibration & correction
  - All systematics
- TopD3PDBoosted is fully integrated in TopRootCore
- Up to date concerning common tool for recommended prescriptions
- Twiki:
  - <https://twiki.cern.ch/twiki/bin/viewauth/AtlasProtected/TopD3PDBoosted>

# Last update (1/2)

3

- TopD3PDBoosted package is entirely integrated into TRC
- New tag TopD3PDBoosted-12-01-18:
- The package contains:
  - Object selection compatible with the boosted scheme
  - Fat jets corrections, trigger info are available
  - SFs are computed and stored in the mini-tuples
  - NEvents, xsec, KFs for all MC samples as well as MC signals are available
- → dedicated class to extract this info for normalization purpose

# Last Update (2/2)

4

- MiniSLRunComb class (called by D3PDMiniSLComb binary)
  - provides the combination method that performs the boosted & resolved
  - event selection, correction and Top pair reconstruction
  - Resolved event reconstruction based on chi2 for jet sorting
- (New class that can enable/disable mc samples in a txt file)
- This class help in getting the RunNumber and event number of any 2012 dataset
- To run over all 2012 data it takes only ~24h
  - New Mini-Ntup root files will be available

# D3PDMiniSLComb (cutflow ex)

5

>> Electron channel					>> Muon channel				
=====					=====				
Boosted					Boosted				
=====					=====				
C0: Total Number Of Events	5000	5000	7081.04	6996.38	C0: Total Number Of Events	5000	5000	7081.04	6996.38
C1: FileUp+LumiReWeight+GRL	5000	5000	7081.04	6996.38	C1: FileUp+LumiReWeight+GRL	5000	5000	7081.04	6996.38
C2: (B) TRIGGER + LAr	1252	1252	1772.72	1791.86	C2: (B) TRIGGER + LAr	1211	1211	1691.15	1657.63
C3: VtxTrack>=5	1251	1251	1770.95	1790.04	C3: VtxTrack>=5	1210	1210	1689.37	1655.81
C4: >=1LEPT	1020	1020	1455.36	1453.99	C4: >=1LEPT	1030	1030	1445.1	1427.84
C5: ==1LEPT	984	984	1397.38	1398.48	C5: ==1LEPT	983	983	1386.34	1374.2
C6: OotheLEPT	897	897	1284.63	1277.87	C6: OotheLEPT	920	920	1295.21	1277.15
C7: Lepton Match to trigger	896	896	1282.22	1277.1	C7: Lepton Match to trigger	914	914	1285.62	1266.91
C8: JET CLEAN	893	893	1275.58	1272.69	C8: JET CLEAN	909	909	1278.38	1260.79
C9: MET	714	714	1032.25	1024.33	C9: MET	839	839	1179.58	1155.66
C10: MTW	613	613	866.805	867.637	C10: MTW	803	803	1144.42	1123.83
C11: >=AKt4J,Pt>25 DR(1,J)<1.5	368	368	507.122	520.88	C11: >=AKt4J,Pt>25 DR(1,J)<1.5	505	505	715.701	704.221
C12: LeptonJet (A10Pt,m,d12,dR,dPhi)	11	11	15.9498	16.0894	C12: LeptonJet (A10Pt,m,d12,dR,dPhi)	10	10	9.53835	10.3677
C13: >=1Ak4 jet, MV1 > 0.772	10	10	14.5293	15.4179	C13: >=1Ak4 jet, MV1 > 0.772	9	9	8.11784	9.0043
=====					=====				
Rewighted and saved: 10					Rewighted and saved: 9				
>> Electron channel					>> Muon channel				
=====					=====				
Resolved					Resolved				
=====					=====				
C0: Total Number Of Events	4990	4990	7066.51	6980.97	C0: Total Number Of Events	4991	4991	7072.92	6987.38
C1: FileUp+LumiReWeight+GRL	4990	4990	7066.51	6980.97	C1: FileUp+LumiReWeight+GRL	4991	4991	7072.92	6987.38
C2: (B) TRIGGER + LAr	4988	4988	7062.45	6976.17	C2: (B) TRIGGER + LAr	4989	4989	7068.86	6982.59
C3: VtxTrack>=5	1029	1029	1466.46	1462.18	C3: VtxTrack>=5	1318	1318	1859.8	1819
C4: >=1LEPT	993	993	1408.48	1406.68	C4: >=1LEPT	1269	1269	1799.47	1763.93
C5: ==1LEPT	906	906	1295.73	1286.06	C5: ==1LEPT	1181	1181	1684.43	1641.25
C6: OotheLEPT	886	886	1267.69	1261.69	C6: OotheLEPT	905	905	1277.5	1257.9
C7: Lepton Match to trigger	883	883	1261.05	1257.27	C7: Lepton Match to trigger	900	900	1270.26	1251.79
C8: JET CLEAN	704	704	1017.72	1008.91	C8: JET CLEAN	830	830	1171.46	1146.66
C9: MET	603	603	852.275	852.219	C9: MET	794	794	1136.31	1114.82
C10: MTW	284	284	410.899	406.562	C10: MTW	421	421	578.012	564.394
C11 4(3) Akt4 (pass JVF) pt>25	244	244	361.805	359.403	C11 4(3) Akt4 (pass JVF) pt>25	372	372	514.649	502.835
C12 >=1 Akt4 with MV1>0.772 (btag)	244	244	361.805	359.403	C12 >=1 Akt4 with MV1>0.772 (btag)	372	372	514.649	502.835
=====					=====				
Rewighted and saved: 244					Rewighted and saved: 372				

# Workflow & Main classes

6

- SemiLeptonicBoosted and MiniSLRunBoosted
  - Handles events selection and correction
  - Reconstruction the selected and corrected events
  - Redirect event to Boosted Mini-tuples
  
- MiniSLBoosted
  - Fills the BoostedMini-tuple with your selected/corrected event
  - Output-TTree is defined in this class
  - KFactors, Xsection and weights are stored in the BoostedMini-tuple
  - Access to different SFs using BoostedMini-tuple still in progress
  
- BoostedCorrections
  - Interface to the standard corrections and scales
  - Code to access and apply the dedicated Boosted corrections
    - Fatjet calibration, W+jets SFs, QCD corrections and all related-systematics stuff

# Binaries

7

- D3PD2MiniSLBoosted
  - Main code to put things together including systematics
  - Provides the user with a simple event loop
  - Features are defined in AppBaseBoosted (base class)
- BoostedCutflow/ResolvedCutFlow
  - application for single Data/MC file challenge exercise
- PrintCutFlowFromMiniNtup
  - A nice class to produce the event list for the whole dataset
- MiniSLBoostRun2012
  - Code to create the plots corrected, scaled and smeared
  - Information to get the luminosity normalization (Kfactors, Xsection, etc)
  - Still in beta state
- D3PD2MiniSLComb

# Running on the grid

8

- “submit\_2012\_use\_me”
  - ▣ Script for submission both data and MC to grid at once
  - ▣ Highly customizable
    - Run nominal analysis
    - Switch to run w/o corrections
    - Switch to run w/o systematics
    - Many flags to configure your BoostedMini-tuple outputs
  - ▣ All lists of datasets MC and data are available
  - ▣  
<https://svnweb.cern.ch/trac/atlasoff/browser/PhysicsAnalysis/TopPhys/TopD3PDBoosted/trunk/scripts/2012>
- Scripts to merge the BoostedMini-tuples are available



# Class for plots

9

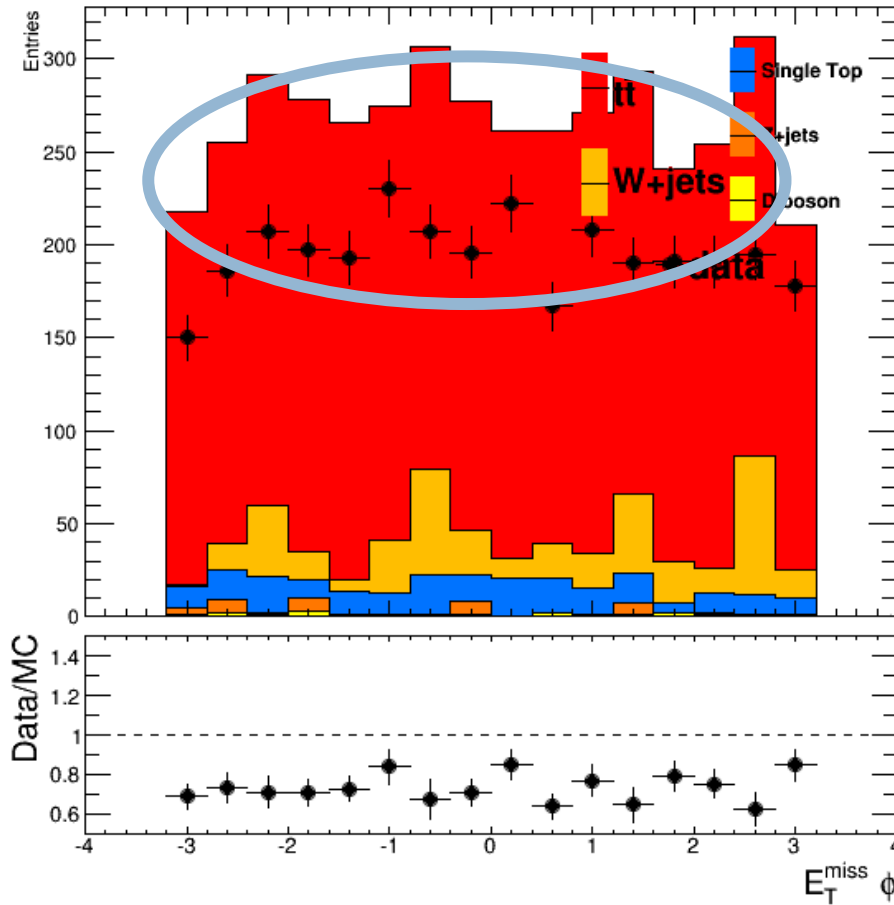
- dq2-get (all Mc&Data) To a specific folder: say **allFiles/**
- Copy TopD3PDBoosted/script/untar.rb
- Run: `ruby untar.rb` = this will untar all the root files into next folders.
  - You can run over and over, this will not write over existing files. (case you need to dq2-get once more)
- Copy TopD3PDBoosted/script/makeMiniLists.sh
  - Run: `source makeMiniLists.sh` = this will produce a list of root files inside the **allFiles** directory. (output is `miniNupList2012el.txt` and `miniNupList2012mu.txt`)
- **Produce control plots:**
  - **MiniSLBoostRun2012 -f miniNupList2012el.txt**
  - Control plots are now in
  - `/run> root OutputHistos.root`

More info Twiki:

[https://twiki.cern.ch/twiki/bin/viewauth/AtlasProtected/TopD3PDBoosted#How to run D3PD2MiniSLBoost](https://twiki.cern.ch/twiki/bin/viewauth/AtlasProtected/TopD3PDBoosted#How_to_run_D3PD2MiniSLBoost)

# Plot Example (Very Preliminary)

10



**30% excess in MC**

**New SFs are being studied to correct MC**

# Perspective for full 8TeV dataset

11

- 1. TopD3PDboosted analysis package
  - improve robustness
  - package maintenance/update/bug fixes
  - improve combine selection for both boosted and resolved
  - improve resolved reconstruction package integration
  - provide boosted and resolved reconstruction ttbar system separately as well as for the combined selection
  - mini-tuples production
  - Package documentation/twiki
- 2. Resolved reconstruction
- 3. Boosted reconstruction
- 4. w+jets background estimation (data-driven)

# Backup Slides

# More application

13

- **BoostedCutFlow**: executable for MC challenge that uses SemiLeptonicBoosted.cxx class
- **D3PD2MiniSLBoosted**: executable for production of MiniNups that uses SemiLeptonicBoosted.cxx class
- **D3PD2MiniSLComb**- executable aims to produce the MiniNupl root file that uses SemiLeptonicBoosted.cxx and SemiLeptonicResolved.cxx classes for combination
- **Submit\_2012\_use\_me.sh**: script to submit jobs on the grid with D3PD2MiniSLBoosted
  - It can be customized as needed
  - Resubmit until all job are finished
  - tar once and resubmitting several times
  - No need to wait for the job to finish (in case you spot failed jobs).

