News from Jet/Etmiss

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Latest

- Jet/Etmiss meeting yesterday (25/5) at P&P week
  - Mostly review of conf notes for ICHEP10
  - Good review to check where we stand on:
    - Trigger
    - Pile up studies
    - Jet clean up, corrections, resolution and uncertainties
    - Missing ET: definitions, corrections, uncertainties

Jet Trigger

- "Physics" menu:
  - is called "Physics_pp_v1": for pp run, v1 for version of L1-menu
  - to be used from ~1x10e30 to a few x10e32
- Physics_lumi1E31(_simpleL1calib) +MC_lumi1E31(_simpleL1Calib)
  - only have simpleL1calib version now: L1Calo will remain on EM-scale for this year
  - also have 1E32 version
  - Note that currently there differences in L1 Data and MC
- The threshold for the physics menu (L1) are settled
  - HLT thresholds → use EM-scale at HLT; still old thresholds....

MBTS	MBTS_A --- MBTS_C (and all individual MBTS as *forced* thresholds)
EM	EM2 --- EM3 --- EM5 --- EM10 --- EM10I --- EM14 --- EM14I --- EM85
JET	J5 --- J10 --- J15 --- J30 --- J55 --- J75 --- J95 --- J115 --- JB10 --- JF10 --- JB30 --- JF30 --- JB55 --- JF55 --- JB95 --- JF95
MUON	MU0 --- MU6 --- MU10 --- MU0_COMM --- MU15 --- MU20
TAU	HA5 --- HA6 --- HA6I --- HA8 --- HA11 --- HA11I --- HA20 --- HA30
XE	XE10 --- XE15 --- XE20 --- XE25 --- XE30 --- XE35 --- XE40 --- XE50
JE	JE60 --- JE100 --- JE200 --- JE300
TE	TE20 --- TE50 --- TE100 --- TE180
LUCID	LUCID_A --- LUCID_C
BCM	BCM_Comb --- BCM_AtoC --- BCM_CtoA --- BCM_Wide

"Jet" Items
adjusted thresholds

36 Jet items (+27 jet+X combined) implemented

Pile-up

- Talk on Status and prospects for pile-up jet corrections
  (D.Miller,A. Schwartzman)

Pile-up estimates for β*= 5 m @ 7 TeV

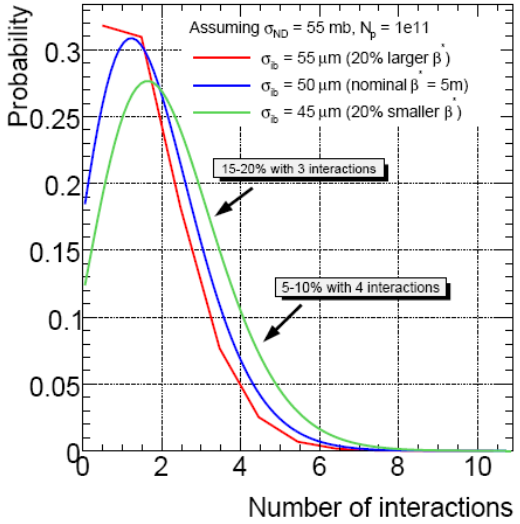
Assuming equal size beams, the mean of the Poisson process for multiple interactions is

$$N_{pp} = \frac{\sigma_{MB} N_p^2}{8\pi\sigma_{ib}^2}.$$

We measure $\sigma_{i\mathcal{L}}$ with the "beam spot": $\sigma_{i\mathcal{L}} = \sigma_{ib}/\sqrt{2}$. For the nominal $\beta^* = 5$ m (more info in backup)

N_{PV}	Probability
1	30%
2	27%
3	16%
4	7 %
5	2%
6	0.1%

We will likely need corrections up to $N_{PV} = 3$ for **all** analyses, and up to $N_{PV} = 5$ for analyses needing significant statistics (e.g. searches needing the last few %).



Effects of Pile-Up on jets/etmiss:

- Jet energy scale (JES) and mass distortions
- Angular smearing
- Spurious jets (Pure MB jets will affect jet multiplicity and isolation criteria)
- Fake and poor MET
  - MET defined from the hard scatter will be smeared: resolution degradation
  - Can also incur fake sources of MET

→ Currently, some tools are avialable to deal with event-by-event corrections or jet-by-jet

→Many things to be checked yet! See page 28 of David's talk and also https://twiki.cern.ch/twiki/bin/view/AtlasProtected/JetsWithPileup

Jet Corrections

- Clean-up criteria "almost" frozen:
  - Jet rejected (bad) if one of these condition true →
  - Most analysis reject events with at least 1 bad jet
  - Defined also criteria for ugly jets: real energy depositio…
    - TileGap3Frac > 0.5 || BCH_CORR_CELL > 0.5
  - Ok in JetUtils-01-01-27 (JetRecTools for BCH_CORR_CELL or in JetMomenta)

$$n90 \leq 5 \quad \&\& \quad f_{HEC} > 0.8,$$
$$f_Q > 0.8 \quad \&\& \quad f_{EM} > 0.95,$$
$$|t| \quad > \quad 50\ \mathrm{ns}.$$

- Several Jet Calibration Schemes in ATLAS
  - Simple p_T- and η-dependent calibration scheme (EM+JES)
  - Global Sequential calibration scheme (GS)
  - Global Cell-energy-density Weighting calibration scheme (GCW)
  - Local Cluster Weighting calibration scheme (LCW)

- All info about the recent recommendation for Jet can be found in:

https://twiki.cern.ch/twiki/bin/view/AtlasProtected/JetEtmissDataAnalysisRecommendationSummer2010

Missing ET

- Latest done/on going (Task Force):

  ➔Implemented in MissingET package the Eflow calibration of MET_CellOut by Frascati group, still under test.
  A new object will be provided soon ESD/AOD/D3PDs:
  MET_CellOut_eflow for validation issues.

  ➔Provide info of Calos and Regions for all MET_Ref Objects, to have also info in $|\eta|<4.5$ in ESD/AOD/D3PDs, this requires to convert MET_Ref objects in MissingETCalo objects.

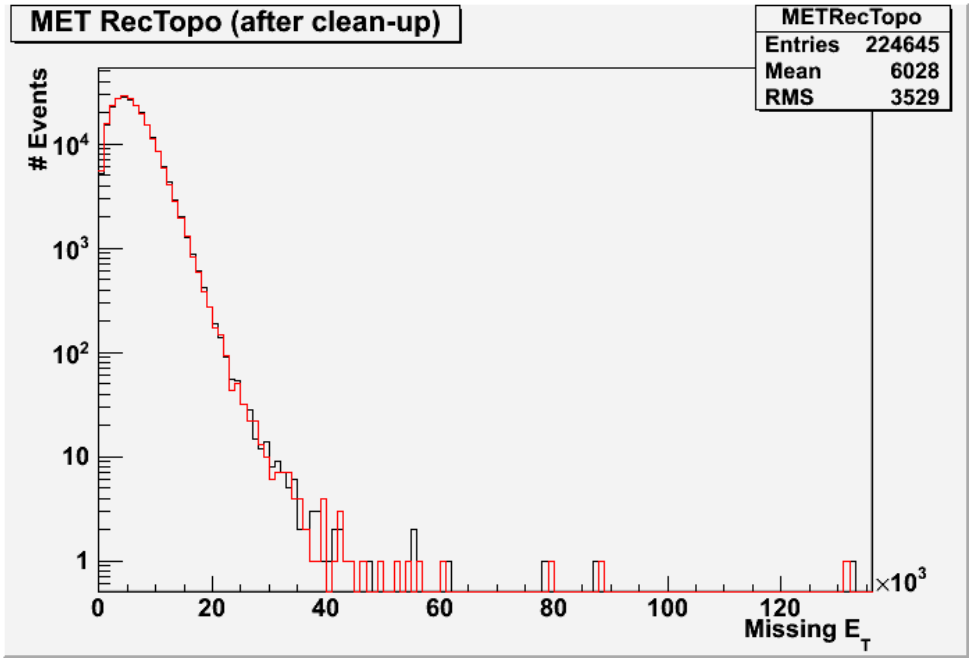
- Current status:
  - MET_Topo (Topocells at EM scale): Good Data-MC agreement in MET and METx, Data excess at negative METy, disagreement in SumET
  - MET_LocHadTopo (Topocells with Local Hadron Calibration): Data-MC agreement only slightly modified by calibration. No tails created by calibration.
  - Same for MET_CorrTopo (Topocells with Global Calibration)
  - MET_RefFinal: → Topocells calibrated according to parent object (**default now:** proper electron calib, gamma at EM scale, the rest with global calibration) + cryo correction+muon contribution. **Tails from muon term.**
  - SumET data-MC discrepancy comes from MET_Cellout → Soft physics retuning needed in Pythia?

Missing ET

- Note that MET_Topo must be recalculated in |eta| < 4.5:
  → Access info of the Regions. Since release 15.6.7.8 the Foward Region has been set to 3.2 < |eta|< 4.5. This calculation can be applied to all MET objects of type MissingETCalo. So:
- https://twiki.cern.ch/twiki/bin/view/AtlasProtected/EtMiss#How_To_Calculate_MET_Topo_in_eta
  - I tested it on one run …
  - Not big differences noticed

on **D3PD** from MET Production => **of April reprocessing** (fixed one bug in the MET Regions):

MET_Topo_etx (in |eta|< 4.5) =
MET_Topo_etx_CentralReg (|eta|< 1.5) +
MET_Topo_etx_EndcapRegion (1.5 <|eta| < 3.2) +
MET_Topo_etx_ForwardReg (3.2 <|eta| < 4.5)



Open technical issues

- Use EMJES scale for summer conferences:
  - A bug has been found which results in the EMJES being 0 for the leading jet in random events at the 0.01% level. This has been fixed in JetCalibTools-00-00-70.
  - *[To be confirmed]* Corrections not implemented for jet with $P_T^{emscale} < P_T^{min}$ (=10 GeV) → return fixed value for P_T^{min}
- MET open issues (official to do list):
  - Resolution curve: better understand data-MC comparison
  - **Need to converge on Muon-term (Muon-boy/Muon-ID)**
  - **MET scale uncertainty, How ?**
  - Understanding of forward region in the context of MET reconstruction
  - **Inclusion of cell weighting (global and local cell weights)**
  - **Consistent reconstruction of MET and jets**
  - RefFinal with more physics objects
  - Use of tracks to improve energy out-side physics objects (Cell-out)

Note: Cleaning, MET object studies etc can be done within OSCAR – on ESD and soon AOD – or using D3PD (standalone codes)!