Physics Validation

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22nd October 2013

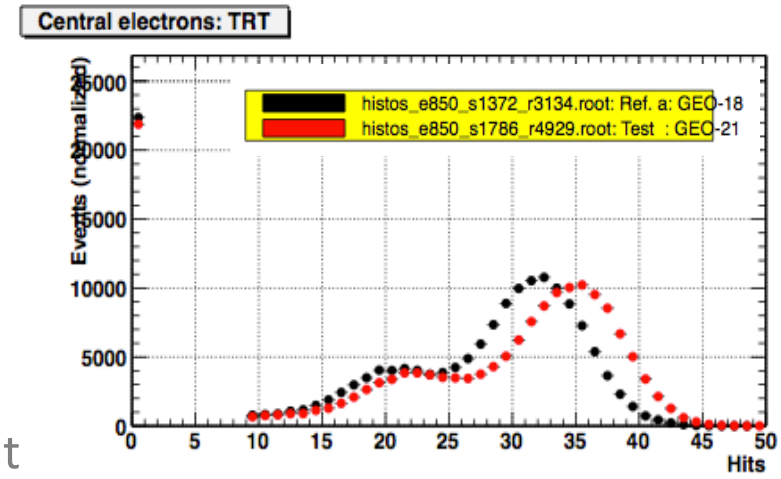
Simulation Steering Group Meeting

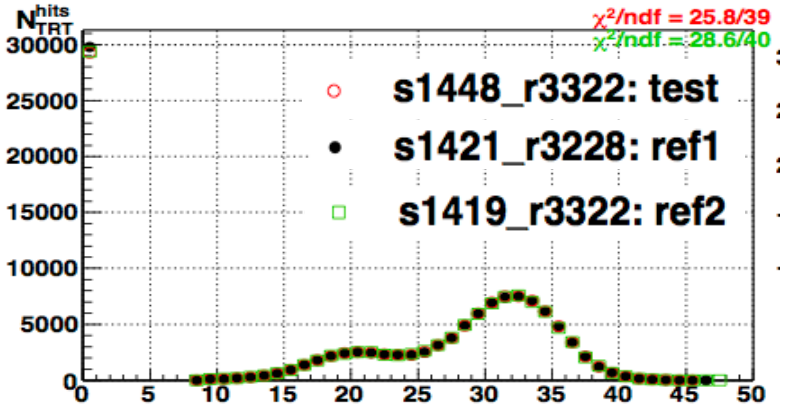
Update on validations 04/10/13

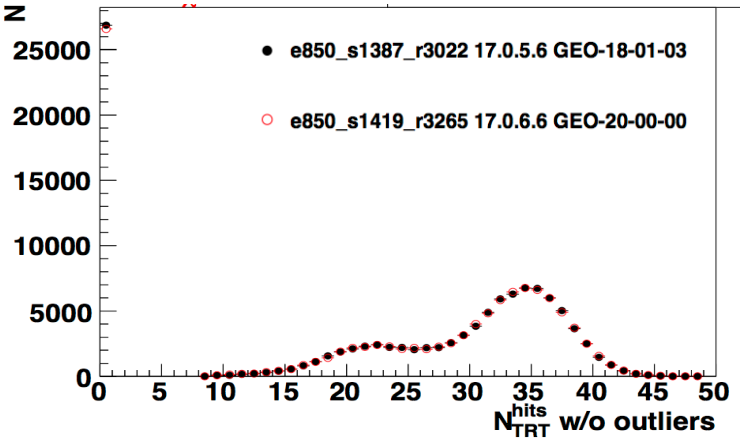
- (1) Validation of GEO-21 with MC11 configuration (no pileup).
  - Saw lots of differences, particularly N_{TRT} -> running some test jobs
- (2) Check on FTFP_BERT with G4 9.6 in 17.7.1.1.
  - Saw unexpected differences in electron (+photon) linearity & uniformity
  - Understood as bug in range cut in G4 for FTFP_BERT with FS
- (3) Validation of GEO-21 with 17.2.11.8 for QGSP_BERT_95NoMsc.
  - SUSY differences in jet response resolved (due to issue in their code)
  - Just need to understand muon SA/ST hit diffs (seen in all tasks). Stats?
- (4) Validation of IBL simulation in 17.3.11.1
  - Again SUSY differences resolved but jets see some difference in response
  - Probably due to frozen showers
- (5) Validation of athena multicore for IBL with 17.3.10.1.9.
  - Tau changes are in a variable that is purely from jets
    - Now have jet results
  - What level of differences are OK for AthenaMP?

Task 1: MC11 with GEO-21

- Reminder: saw differences mainly in N_{TRT} hits
- Looking back at previous GEO-18/20 validations see diff N_{TRT}
  - Diff seems to be due to pileup
    - See further details on next slide
  - Test looks like it has pileup but shouldn't







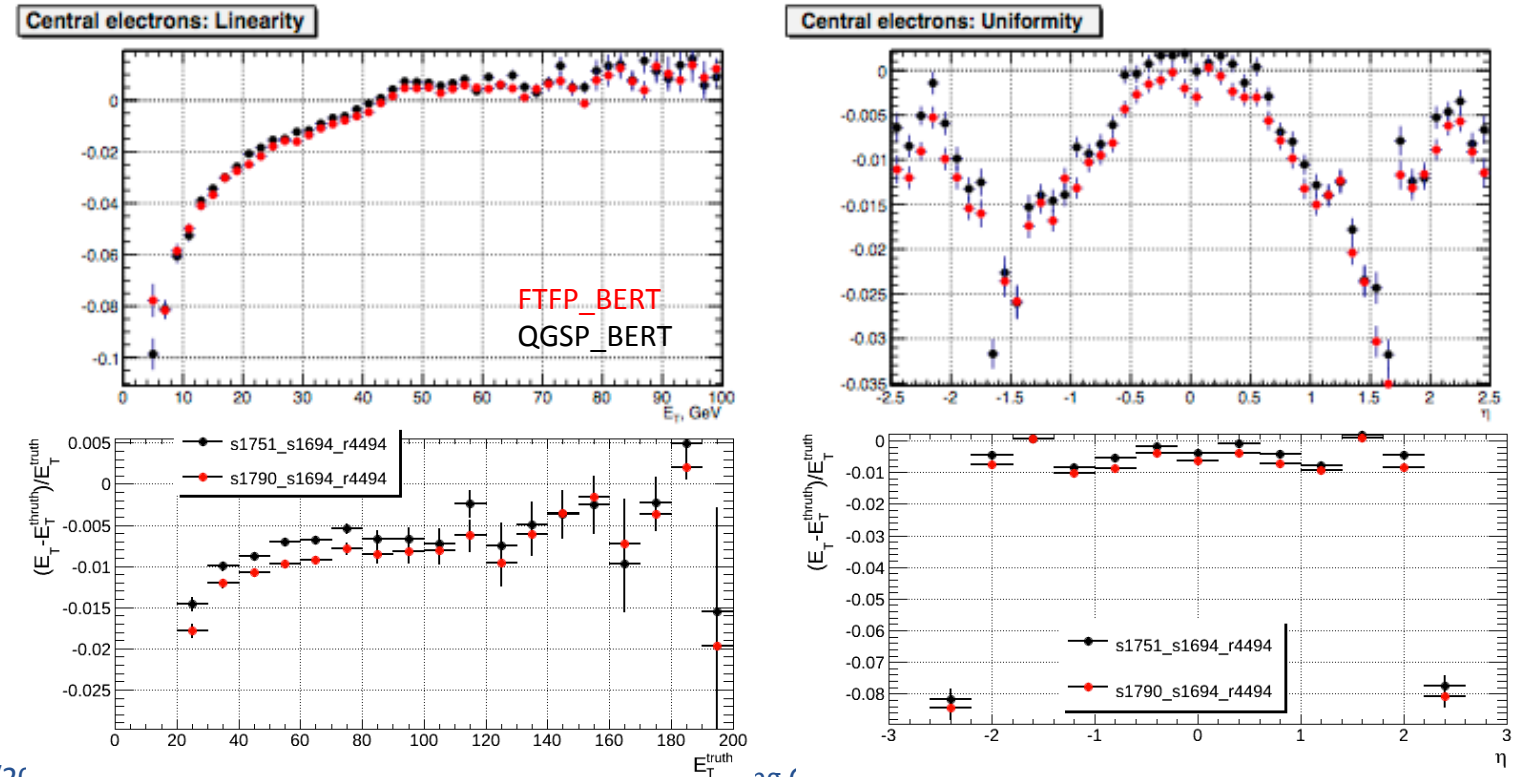
- Running Z->ee tests with 50ns bunch spacing and mu explicitly 0
  - Former ready; latter having some issues since JOs not present in 17.0.X.Y

Task 1: MC11 with GEO-21 (2)

- Summary of previous validations:
- S1372 (reference) - GEO-18 + no pileup -> peak of nTRT hits 32
  - sim : 16.6.7.18; reco : 17.0.X.Y
- s1786 (test) - GEO-21 + no pileup -> peak of nTRT hits 35
  - sim : 17.2.11.7.1; reco : 17.0.7.3
- s1368 - GEO-18 + pileup -> peak of nTRT hits 35
  - sim : 16.6.7.18; reco : 17.0.X.Y
- s1332 - GEO-18 + pileup -> peak of nTRT hits 35
  - sim : 16.6.7.14; reco : 17.1.4.X (or 17.2.1.X)
- s1421 - GEO-18 + no pileup -> peak of nTRT hits 32
  - sim : 17.1.3.1.1; reco : 17.0.X.Y
- s1448 - GEO-20 + no pileup -> peak of nTRT hits 32
  - sim : 17.1.4.2; reco : 17.0.X.Y
- Pileup seems the distinguishing feature between 32 and 35
  - Jose checked digi+reco tags and could find no issues

Task 2: FTFP_BERT (G4 9.6)

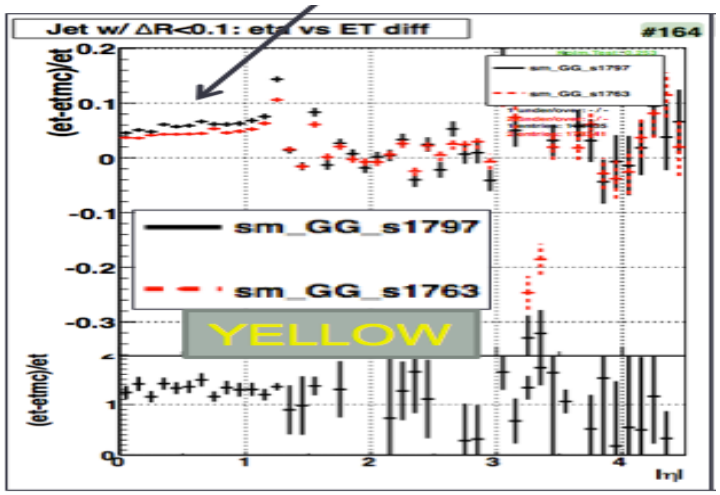
- Saw changes in electron/photon linearity and uniformity
  - John checked and EM models used are the same for both lists
- Guillaume traced this to bug in G4 range for FTFP_BERT with FS on
  - 30μm not 100μm as for QGSP_BERT (G4AtlasApps/python/atlas_calo.py)
  - Reruning validation test with 100μm for FTFP_BERT i.e. w/o FS on

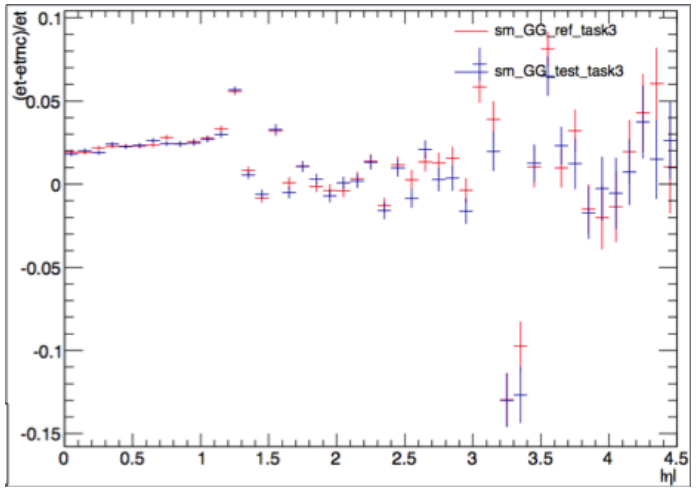


Tasks 3 (95NoMsc) and 4 (IBL)

- Issues in jet response seen by SUSY resolved
  - For all still need to resolve muon hits and for (4) fwd jet response (next)

(3)





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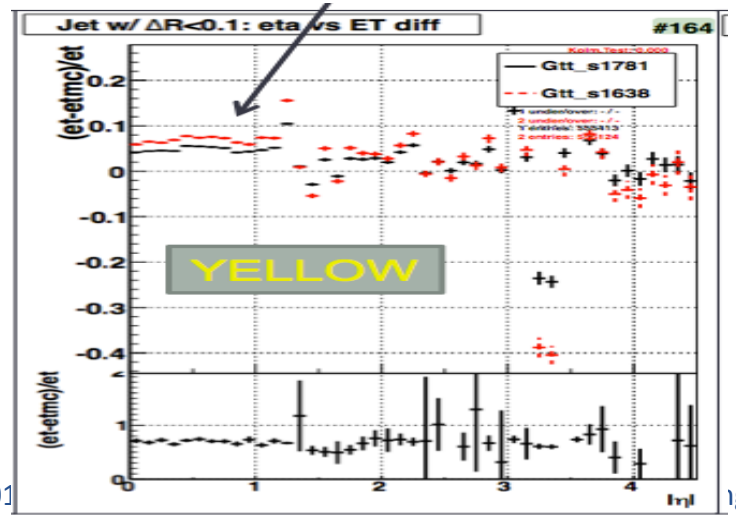
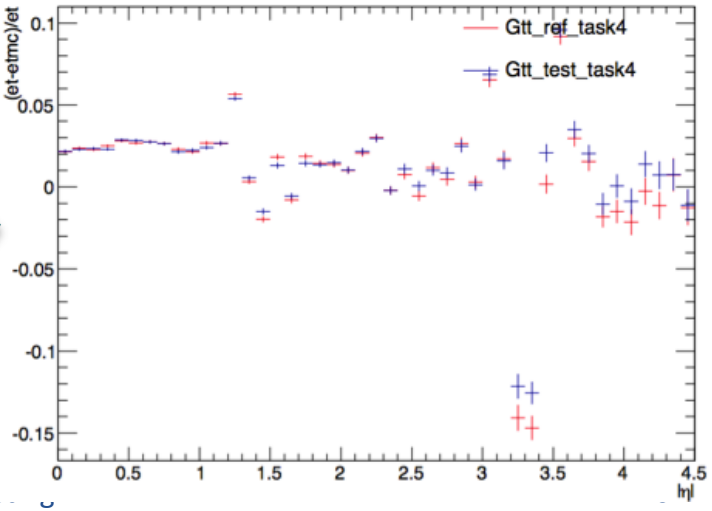
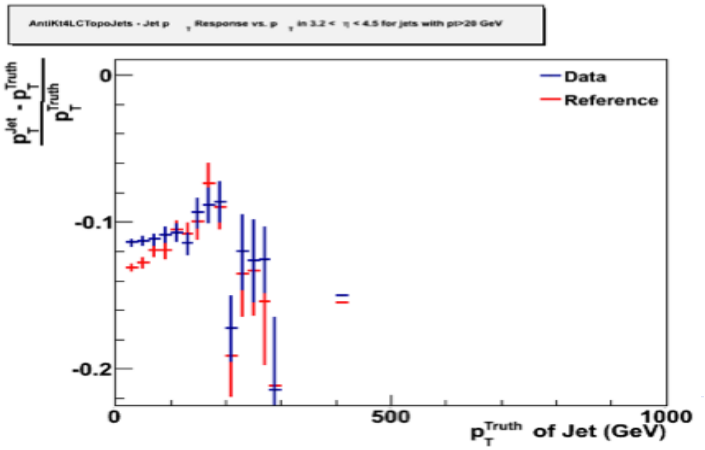


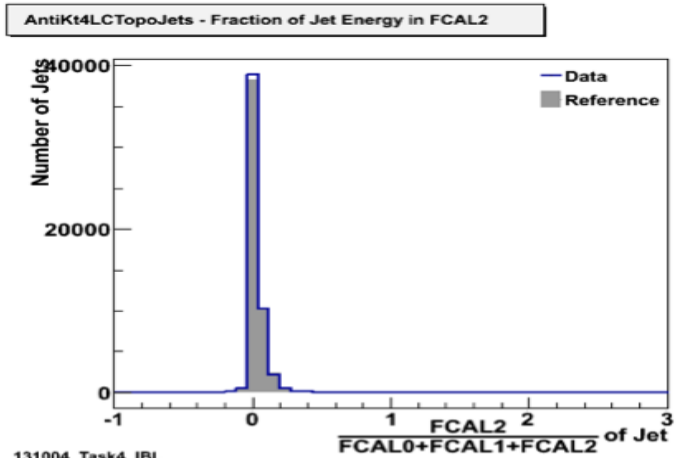


Task 4: IBL in 17.3.11.1

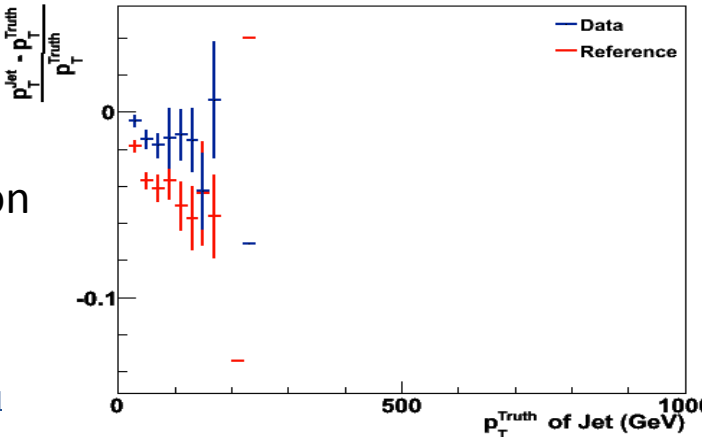
- Change in jet response at high η mostly due to low p_T (top)
  - Coming from change in E deposition in FCal2 layer (others OK)
- Likely due to test having FS for Fcal -> rerun ref with FS to check?
  - Differences seen in response (not Fcal2) for 17.3.10.1.1 FS validation (bottom)

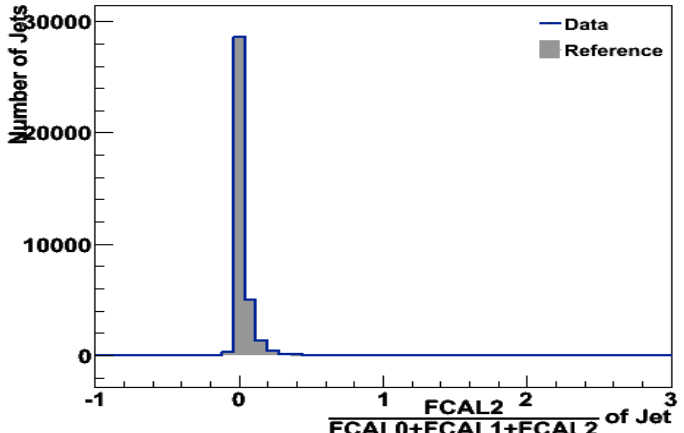
(4)





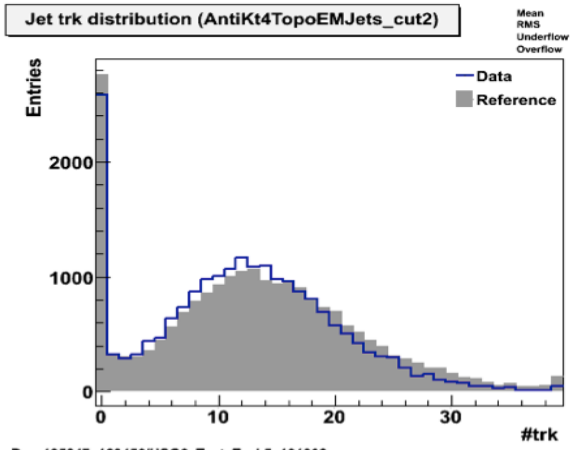
FS Validation

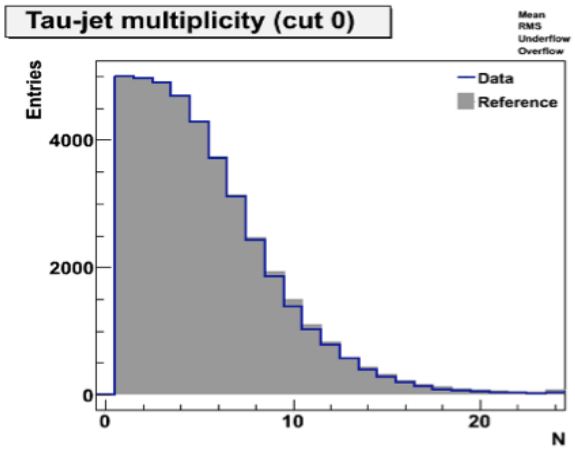


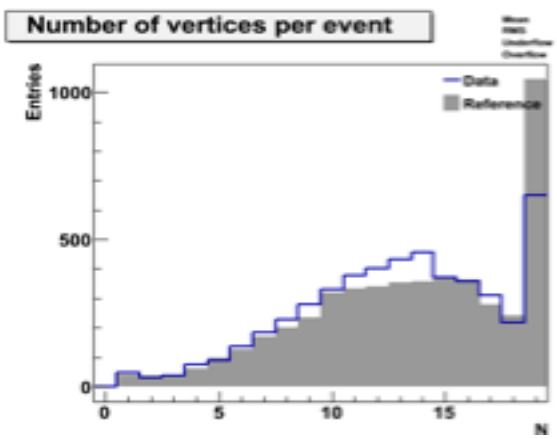


Task 5: AthenaMP

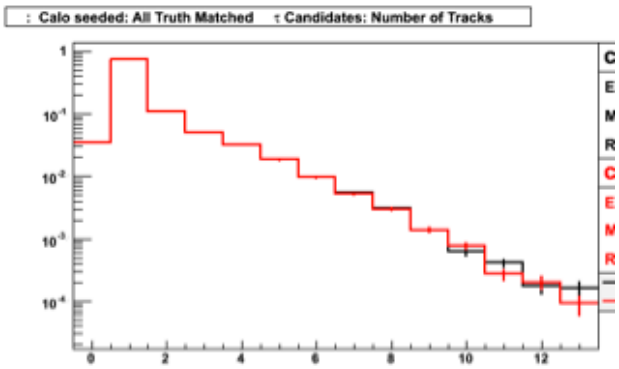
- Some diffs seen for tau track mult. and N_{tau} seen by Higgs (top)
  - These not seen by tau group
  - Likely due to small stats samples (5k) giving difference in mu, as seen in N_{PV}

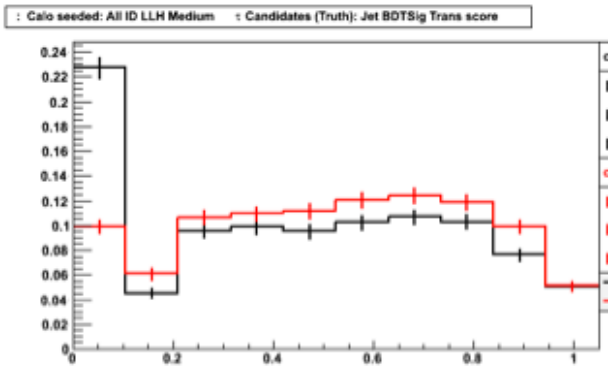






- Tau do see some differences in BDT output but purely from jets
  - Jets marked as green (plots OK within stats) + not a plot usually look at





Validations 18/10/13

- (1) Validation of Truth Tracking with 17.2.11.10.
  - Truth tracking for pileup and standard setup on the signal event. Differences expected in the number of tracks/vertices + additional effect likely in pileup, energy resolutions, efficiencies etc
  - Test : r4941 (17.2.11.10)
  - Reference : r4764 (17.2.11.1)

- (2) Check on digi+reco with 17.8.0.3.
  - Fixes problems seen with pileup in the previous cache. Two references: previous cache and latest validated 17.2; some changes to 17.2 expected
  - Test : s1469_r4930 (17.2.0.2,17.8.0.3)
  - Reference a) s1469_r4847 (17.2.0.2,17.8.0.2) – Cache with PU issue
  - Reference b) s1469_r4764 (17.2.0.2,17.2.11.1) - Latest validated 17.2

Overview

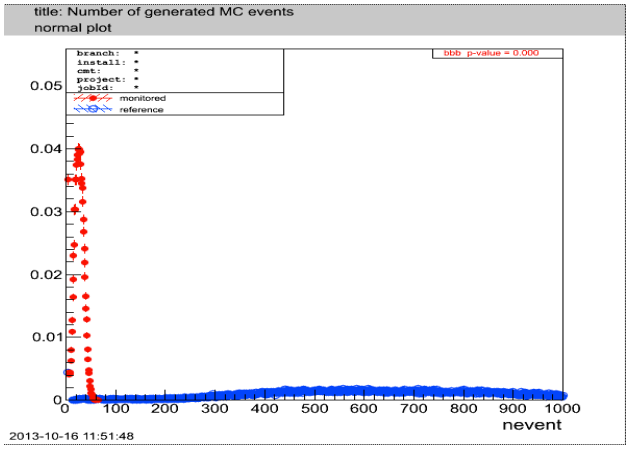
- Have results from:
  - Photons, electrons, jets, MET, primary tracking, b-tagging, muons (1), SUSY, Higgs (1), top, exotics (1)
- Still waiting for a couple of results:
  - Muons (2), secondary tracking, Higgs (2), exotics (2)
- Issues seen in both tasks (lots of red)
  - Quite some changes expected due to truth tracking but also saw non-tracking changes -> Found bug in submission for this task
  - For 17.8.0.3 a little difficult to know what to expect as no validated 17.7 or 17.8 for digi+reco, so comparing to 17.2 & lots of changes since then
    - Also some groups still using STACO muons but only 3rd chain present now
  - See next slides …

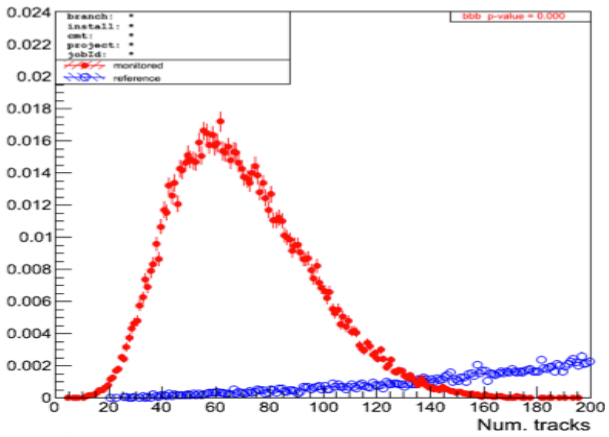
Meeting 2013-10-18 (Week 42) ( )

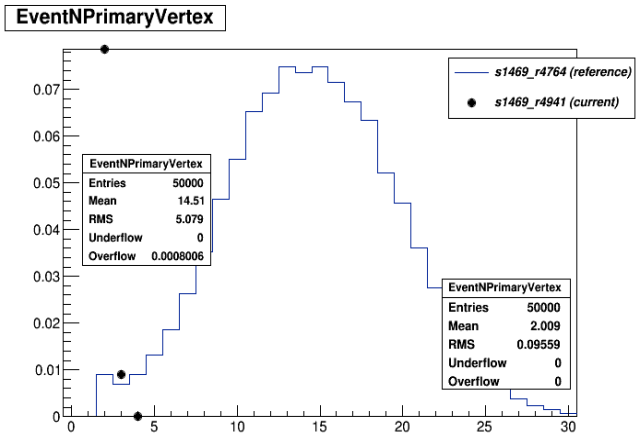
1	Validation of Truth Tracking with 17.2.11.10	Summary	MC12b	r4941	
2	Check on digi+reco with 17.8.0.3	Summary	MC12b	r4930	

Task 1: Truth Tracking

- To avoid filesize/memory issues, need to simulate with a 50ns window for in-time pileup
  - pileupInitialBunch = -2; pileupFinalBunch = 2
- Unfortunatley forgot the minus sign -> no pileup!
- Can see this in N_{gen}, N_{trk} and, most obviously, N_{PV}:







- Task resubmitted for next validation meeting.

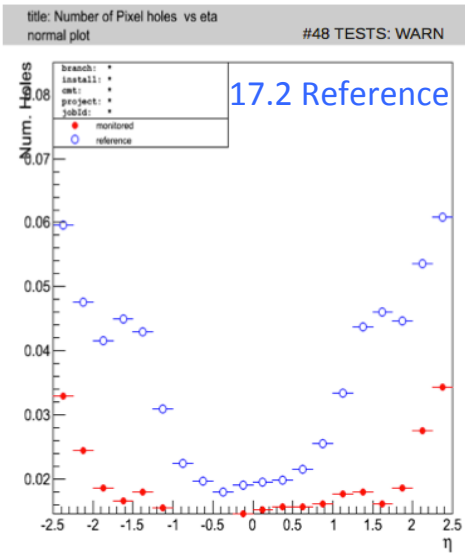
Task 2: Digi-reco in 17.8.0.3

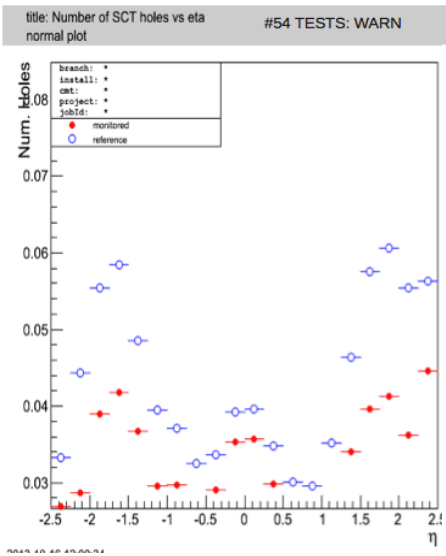
Summary

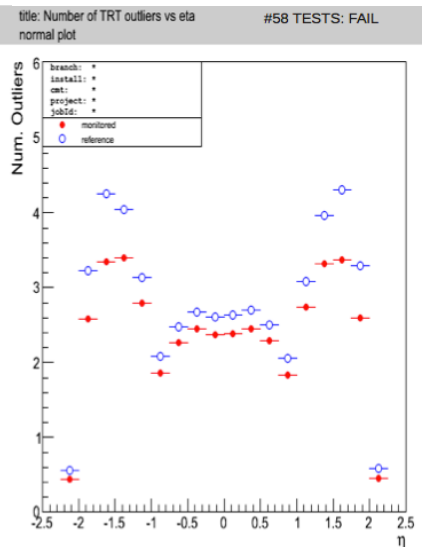
- Main difference is changes seen in tracking wrt 17.2
- Some differences in jets, particularly EM, but not too bad
- Above feed through to differences in b-tagging
- Changes in MET but believe understood
- Electrons/Photons look good (some small differences)
- Still waiting input from muons
  - Several groups (e.g. SUSY) report differences due to empty muon histograms but need to update their code to 3rd muon chain
- Some of the changes highlighted on next slides …

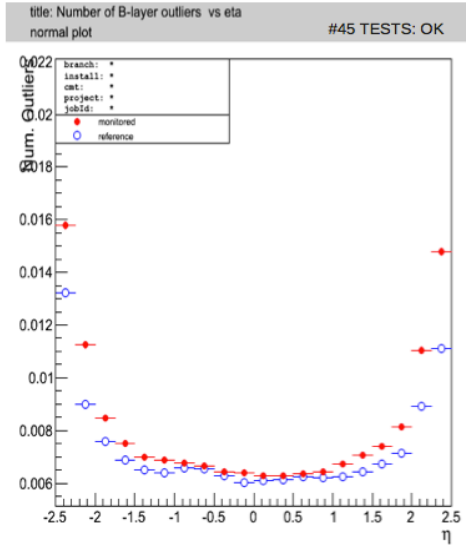
Task 2: Tracking Hits/Holes

- # pixel layers & SCT hits increased at high η. Also more TRT hits
- Less pix/SCT holes, ganged pix, TRT outliers; more b-layer outliers

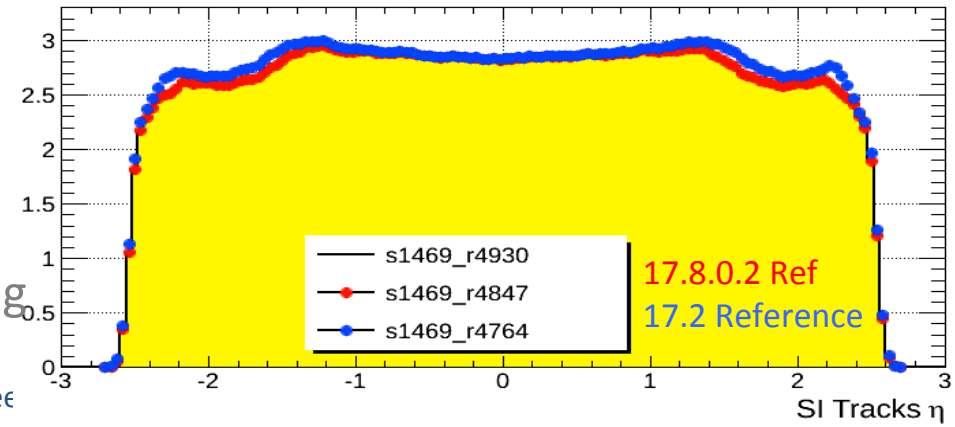






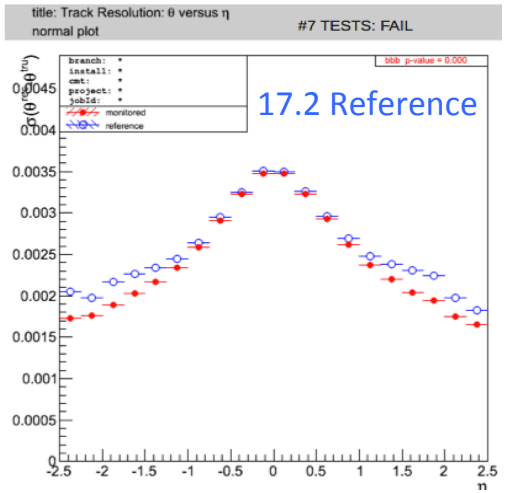


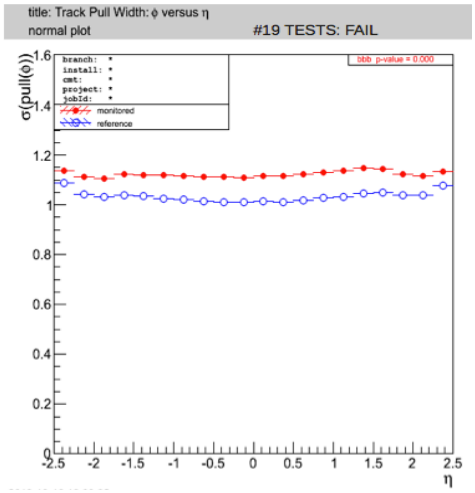
- -> More Si tracks at high η
- No changes seen wrt 17.8.0.2 reference
  - Little surprising given pileup bug
  - Double-checking

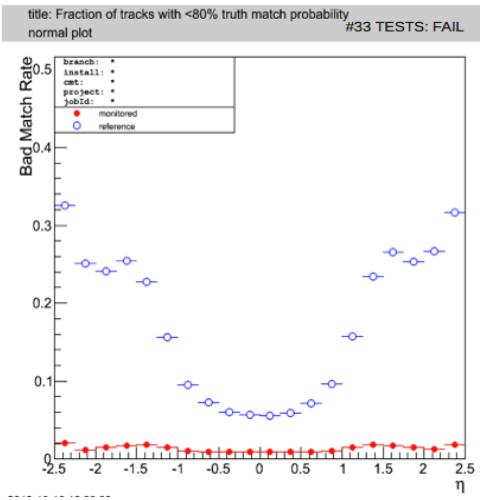


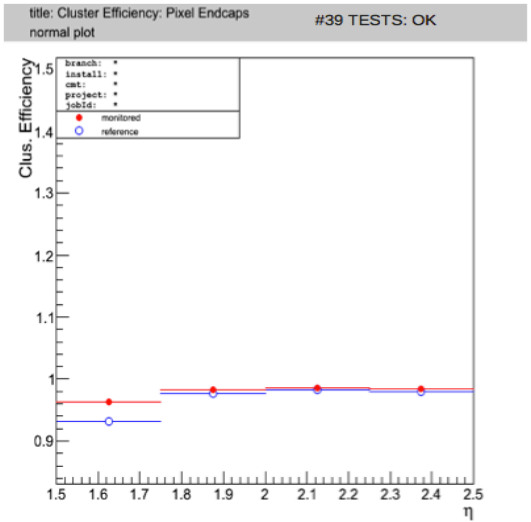
Task 2: Global Tracking

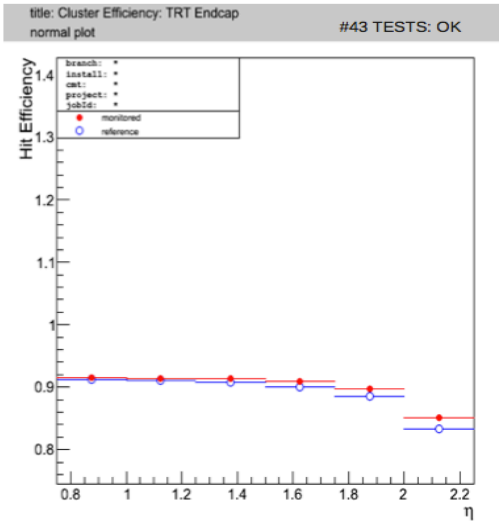
- Improved resolution at high η and better clus/hit eff in endcaps
- Less fakes (particularly at high η); Larger pull width, esp. in ϕ







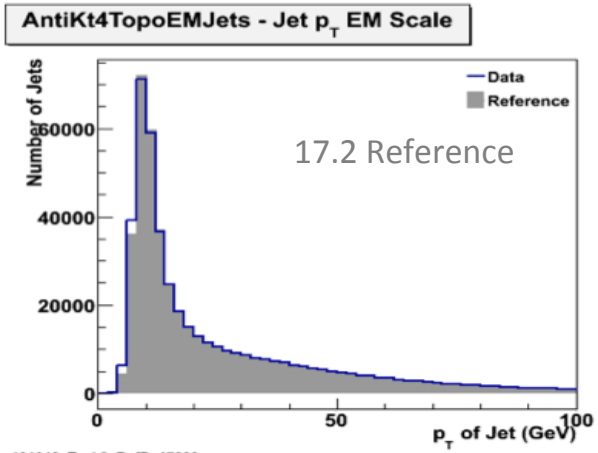


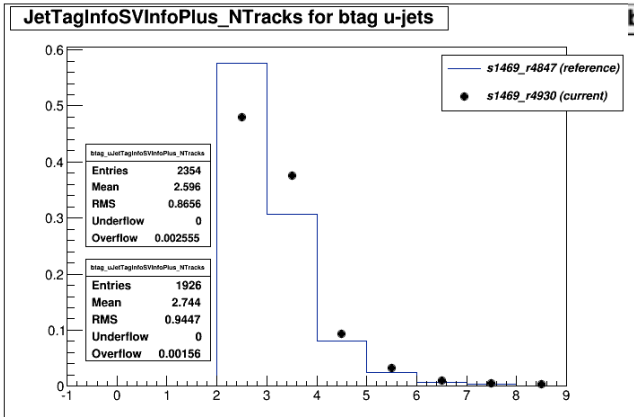


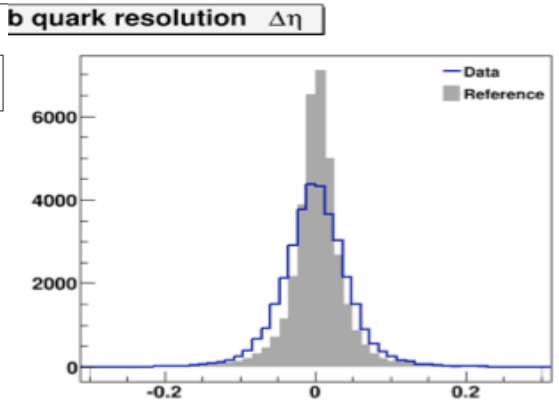
- Again no changes wrt 17.8.0.2 ref
- Need to follow up on tracking changes wrt 17.2 series

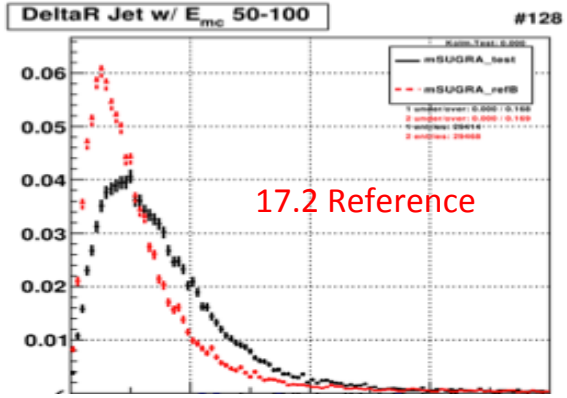
Jets/b-tagging

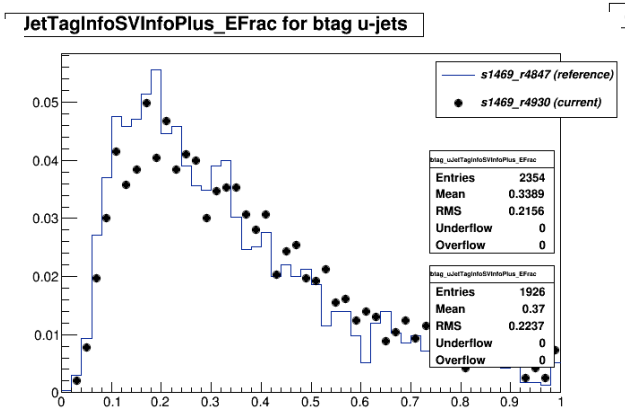
- Jets generally look good for LC, but some changes for EM
  - SUSY see degredation in ΔR between reco jet and closes truth jet
- Increase in N_{trk}/jet for u/b jets (presumably related to track diffs)
- Worse position resolution for u/b and changes in Efrac/Mass

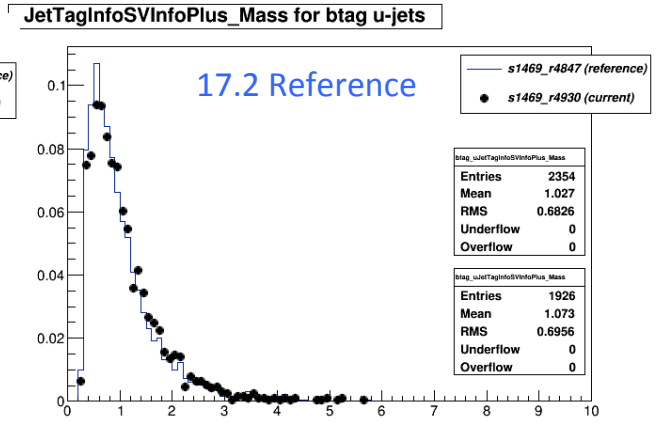






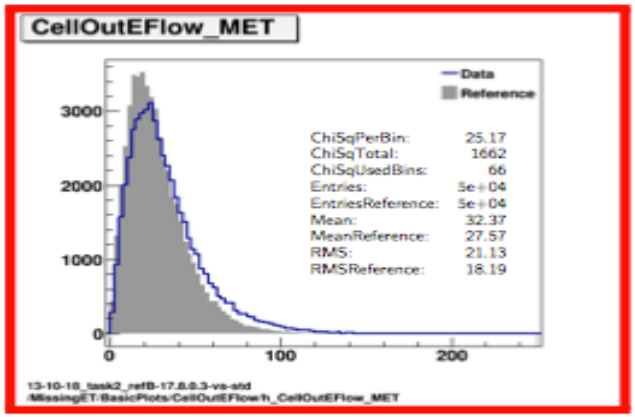


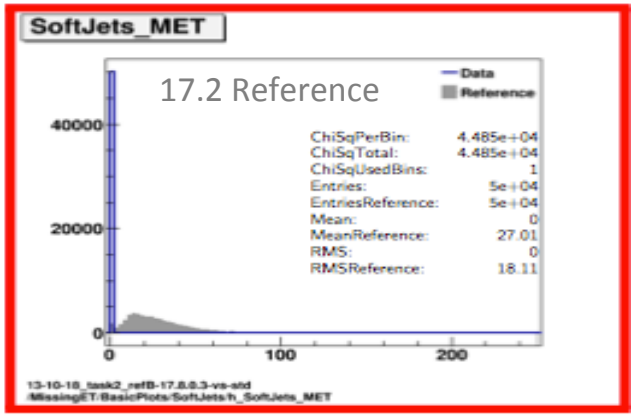


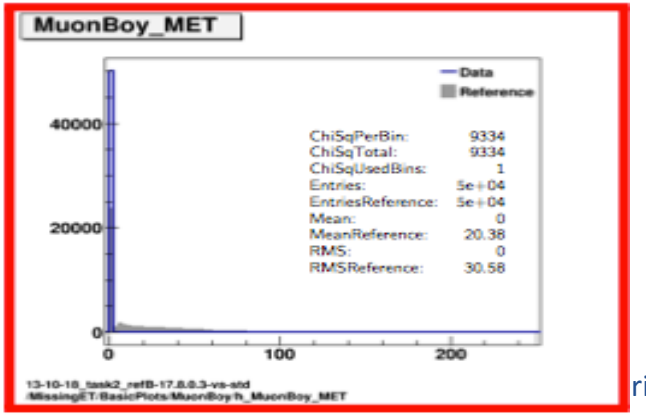


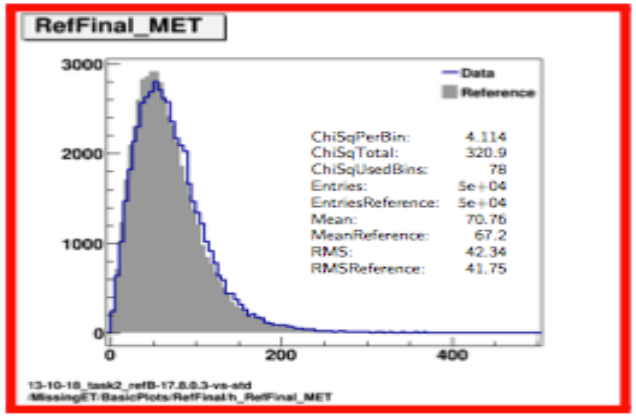
Task 2: MET

- Changes in SoftJets/CellOut terms
  - Due to them being combined in 17.2.4.7.1 (between reference and test)
- Empty muon term -> MET not updated to use 3rd muon chain?
  - Probably explains change in overall MET/SET -> check without muon term



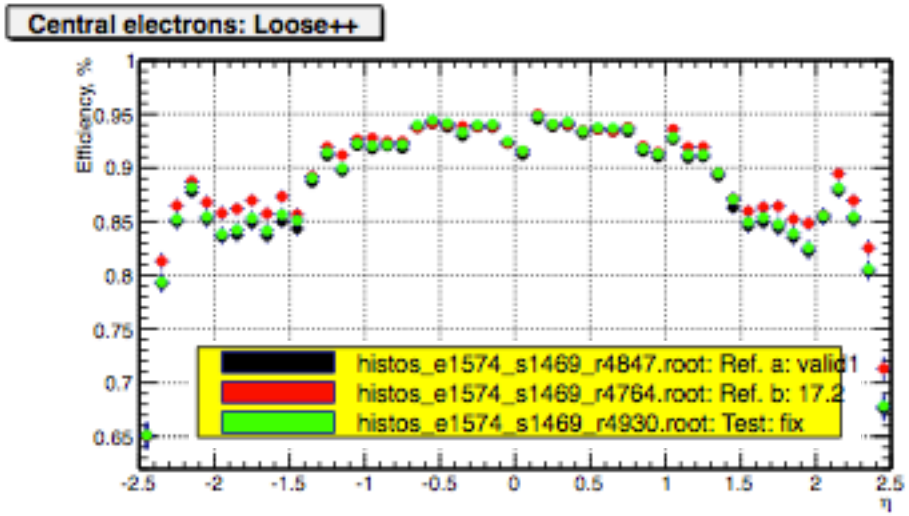


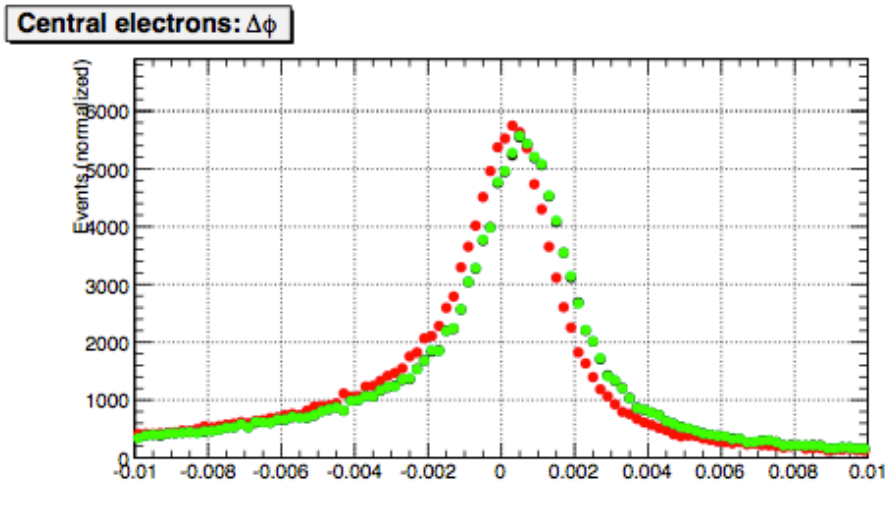




Task 2: Electrons

- Lower efficiency in endcaps and shift in track match Δϕ wrt 17.2
  - Similar to 17.8.02 though





Upcoming Validations

- LAr range cut: full validation with 200 value [JIRA] *
  - Done
- Validation of ISF AFII with 17.6.0.7 [JIRA] *
  - Reco running
- Re-validation of Truth Tracking with 17.2.11.10 [JIRA] *
  - Reco running
- Fixed check on FTFP_BERT with G4 9.6 in 17.7.1.1 (no FS) [JIRA]*
  - Simul running
- Check completion of Calo/MS GEO updates in 17.2.11.9.2 [JIRA]
  - Issues with reco crashing -> new cache being built soon
- Validation of ISF G4 and AFII with 17.7.2.1 [JIRA]
  - Waiting for cache
- IBL and ITK simul and digi+reco validations in 17.3.12 [JIRA]
  - Subsequently recheck simul in 17.7.2 when available
  - Waiting for cache(s)
- Tasks with * are likely for the next validation meeting.

Necessary input for validation tasks

Reminder

- Simulation
  - Developments (packages) should be in a cache available on the grid
  - We need to know which is the cache to be used
- Digi+reco
  - same as for simulation
- Conditions and geometry options
  - Dhould be available to be used at the grid
    - (in the form of DBRelease when needed)
- Extra files
  - We can use extra files **only if** they have been collected in a release cache and can be specified via JOs
- Configuration
  - Need to know if any special configuration has to be used
    - JOs settings, preExecs, …