Jet Trigger Commissioning Plans

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on behalf of the Jet Trigger Signature Group
Trigger General Meeting, 29 October 2014

Outlook

- Commissioning strategy
- Commissioning so far
- Commissioning timeline
- Specific Issues
- Questions and pending actions

Jet trigger commissioning strategy

- Run new features online as early as possible for functional validation and finding potential problems – commission with collisions later
- Compare with offline jets
  - Large overlap in performance is essential to avoid wasting bandwidth
  - Includes pileup subtraction
- Main goal is to commission/run with calorimeter full-scan
  - But keep partial-scan as (essential) plan B
- Staged approach:
  - Cosmics runs
    - M5 and M6 so far, much more work to follow
    - Improve monitoring, build up operations team, fine-tune strategy
  - Continue during beam commissioning period
    - Take all opportunities to deploy new features early
  - Be ready to use collisions data when it comes
    - Move quickly from commissioning to physics
  - Different calibrations, pileup subtraction, jet cleaning, L1Topo, combined triggers, tracks, re-clustering, grooming, etc
  - Determine data/MC corrections for early use in physics analyses

Jet trigger commissioning strategy

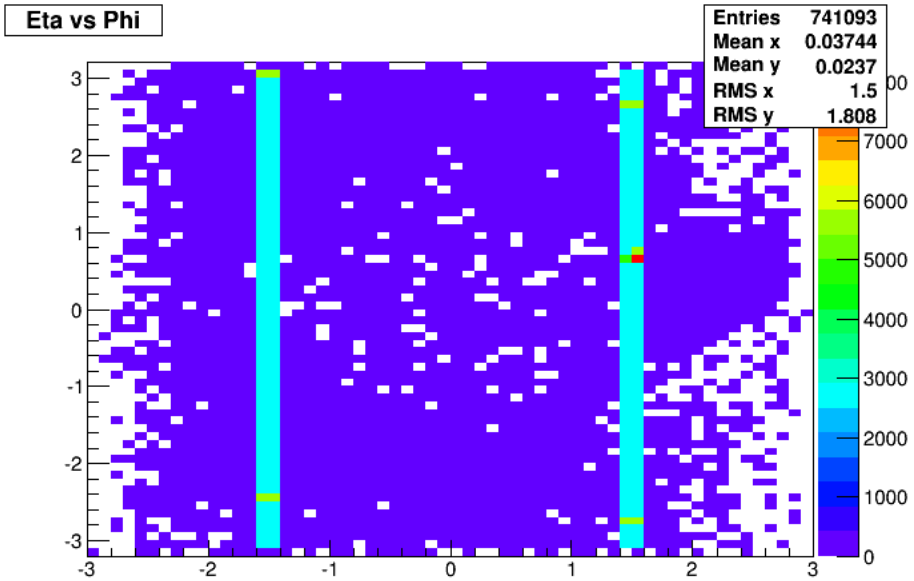
- Tight coupling with commissioning of HLTCalo
  - Studies of clustering performance and timing are key
  - Will need *both* EM and LCW clusters early on
  - Coordination with offline calo/jet critical for choices here

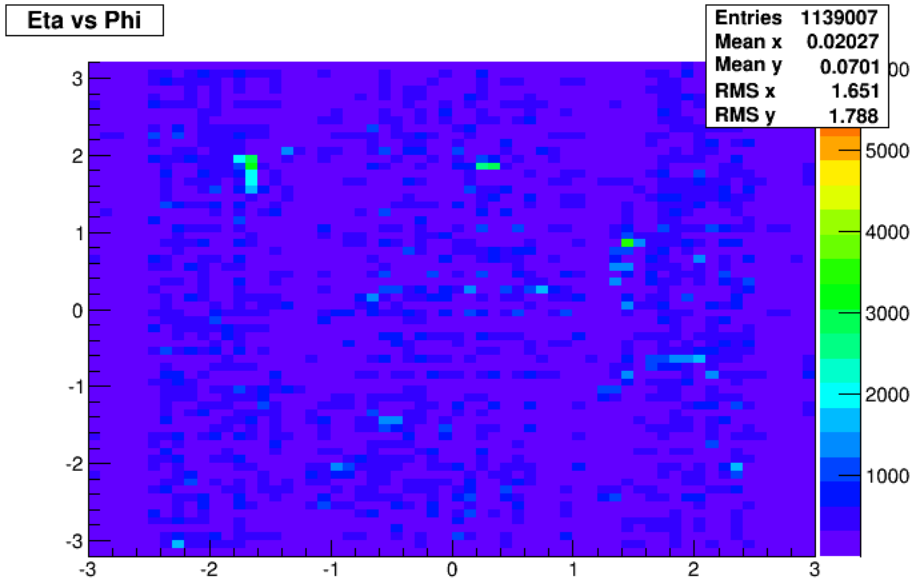
- Comparison with offline jets is critical
  - First few runs will already establish the baseline performance
  - Need full set of supporting triggers with multiple calibration options
  - Kinematic comparisons with offline (scale and resolution in eta, phi, Et)
  - Effects of jet cleaning studied

- Would benefit from special early runs with relaxed prescales for low threshold supporting triggers
  - Forward jets typically very difficult to study early
  - Need J+FJ for calibration sample for jet eta intercalibration

Jet trigger commissioning so far

- Cosmics runs: jet triggers in M5 and M6
  - EF_j0_perf_L1MU10, EF_j0_perf_L1J10, EF_j0_perf_L1RD0_EMPTY
- No offline monitoring plots yet, but online plots quite interesting
  - Effect of noise clear in many low ET clusters in e.g. run 242651 (left)
  - Solved later in run 242841 (right) – possibly noise masks applied now
- Online / on-the-job training for several future experts: Aparajita, Sebastien, Antonia, Lee





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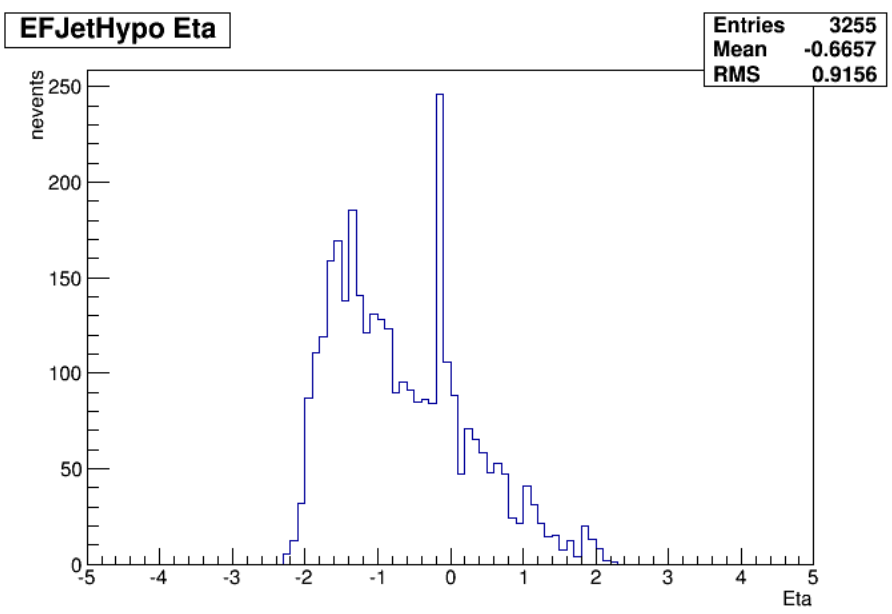
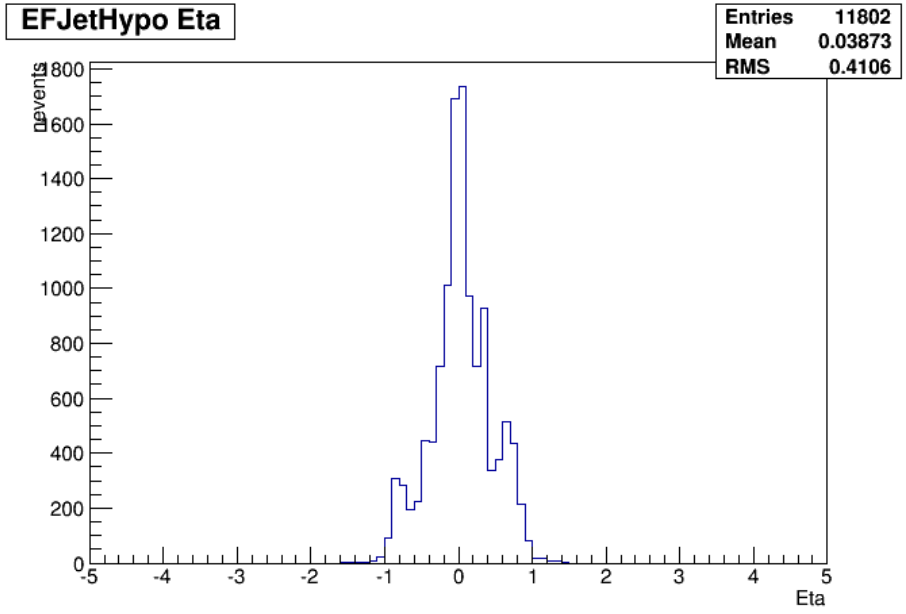
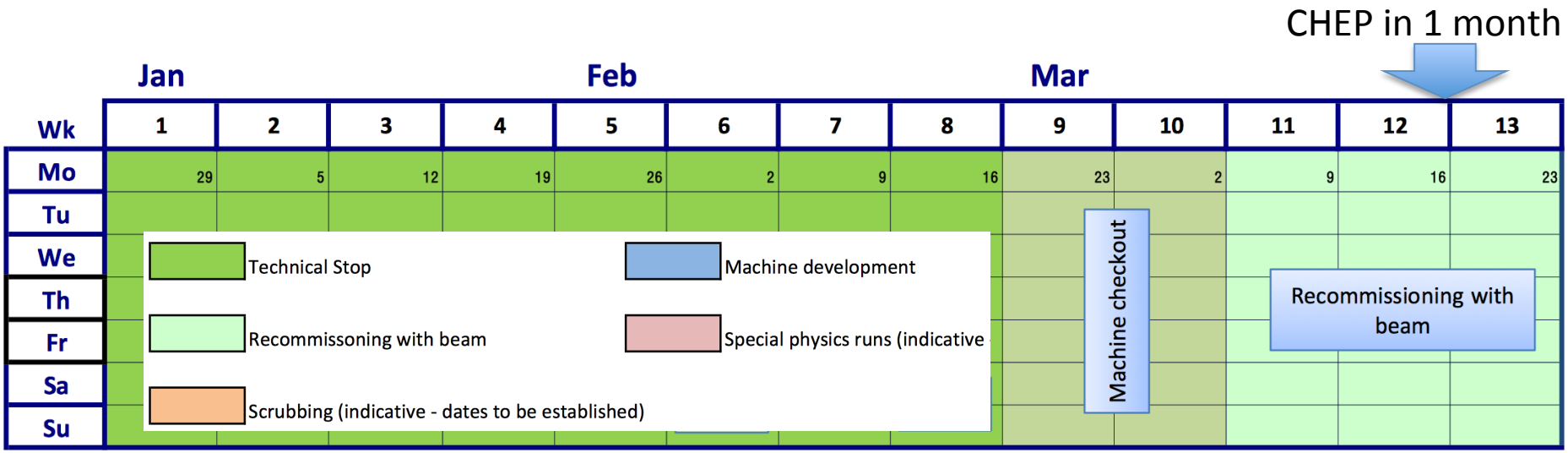




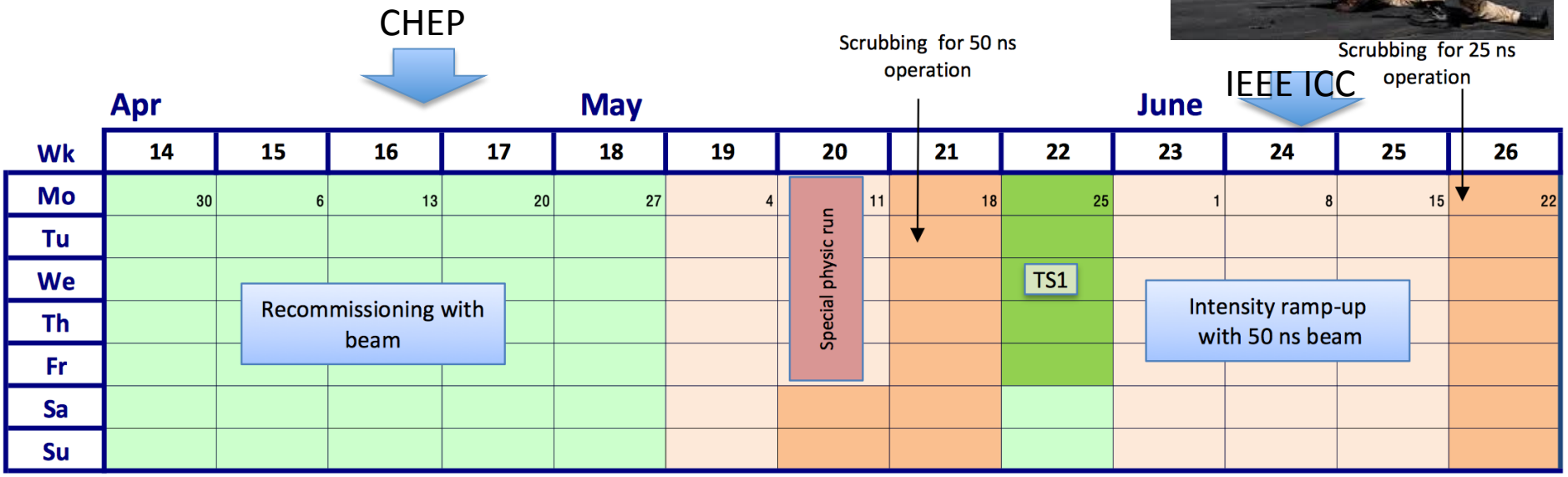
Comissioning timeline

- Should use well extra time afforded by LHC schedule
- Cosmics and single beam periods useful to deploy new (validated) features
- Important to be ready to analyze data quickly



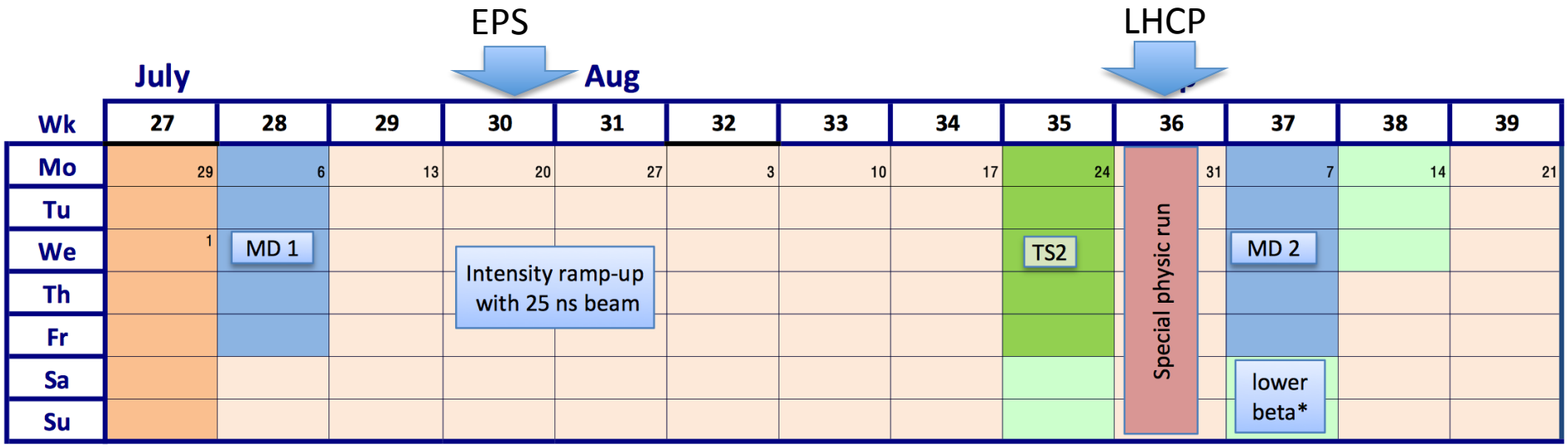
Jet trigger commissioning strategy

- Use data from special run in May for initial comparisons with offline jets
- Data from 50ns run:
  - Should allow detailed comparisons with offline
  - Need low-prescale triggers to collect calibration data (forward jets, eta intercalibration)
  - Pileup subtraction: use 50ns run to study higher pileup
  - Determine trigger efficiencies/corrections
  - Move to physics running



Jet trigger commissioning strategy

- Move to 25 ns run – final commissioning:
- Check performance against 50ns run
- Find differences: noise, calibration, pileup subtraction etc
- Probably need to re-derive efficiencies/corrections
- Accumulate calibration data for final 2015 jet calibration etc



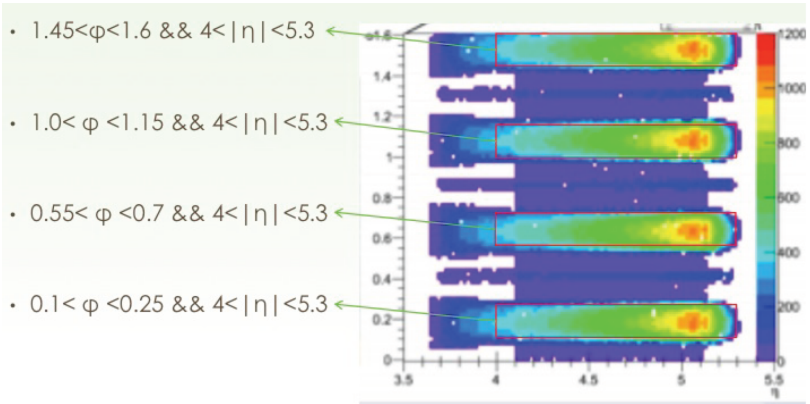
Specific issues

L1Topo Trigger Validation in Run II

- HT and multijet triggers:
  - M7: L1_HT0_AJ0all.ETA49 -> noalg_L1HT0-AJ0all.ETA49
    - Do functional validation with cosmics
    - Ideally compare with offline reconstruction using random L1
  - With collisions: E.g.: HT200_AJ20all.ETA25
    - Use single jet and lower threshold multijet triggers
- VBF Triggers
  - Use lower threshold and unprescaled dijet triggers
  - Need to ensure coverage across eta for dijets
  - Use same asymmetric (J30_J20) combination at L1
- Asymmetry trigger
  - Use same threshold multijet trigger (4J15)

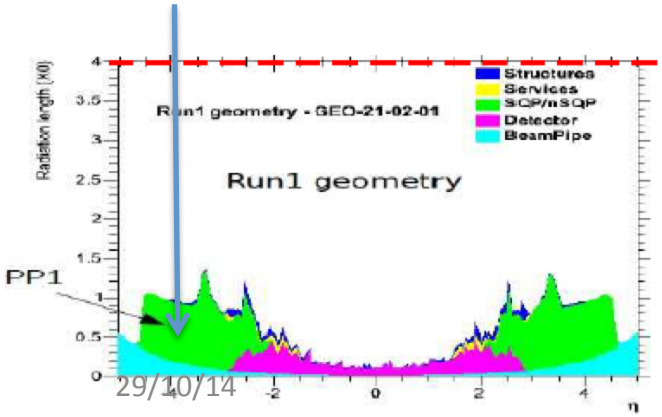
Specific issues – Jet calibration data

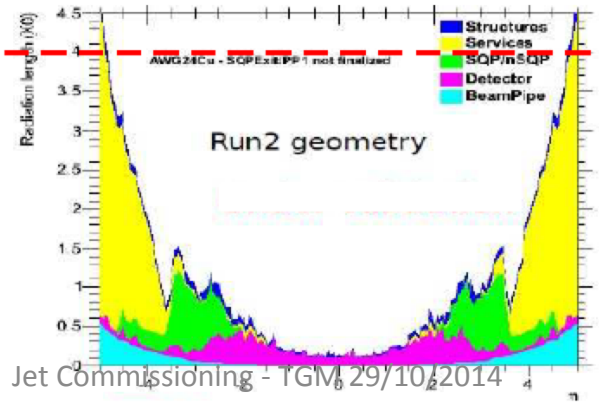
- Very important to collect enough data early on for offline jet calibration
- Forward region and intercalibration
- Even more important due to added material from IBL
  - Need ≈x16 increase in forward region

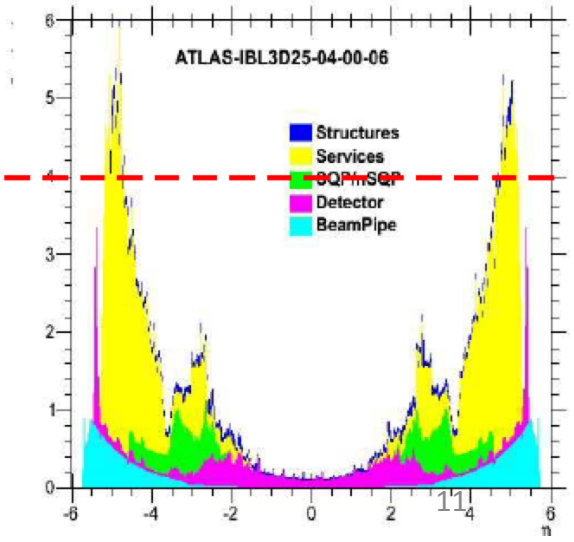


Run 1 **DC14** **Run 2?**

Eta=4

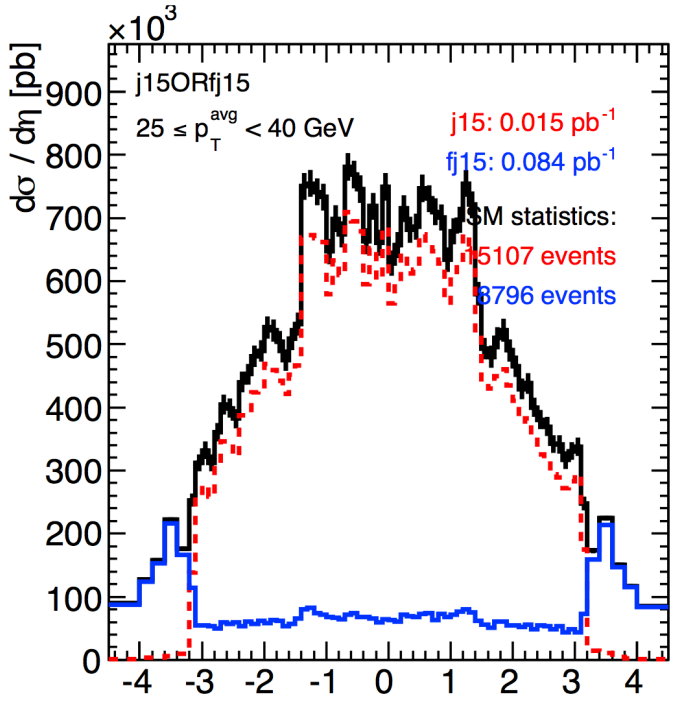


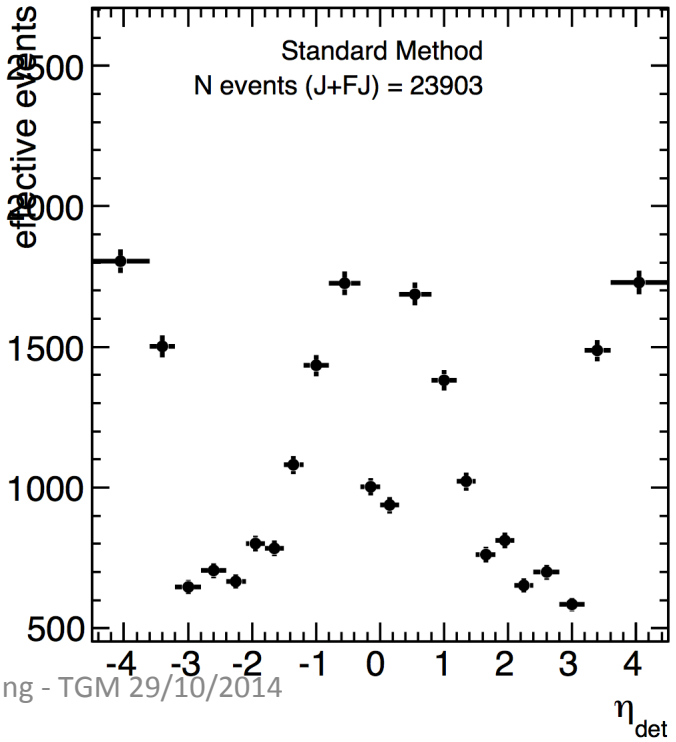




- Problem:
  - Lowest pT bin is critically low: fewer than 10k events in lower $\langle p_T \rangle$ bins
  - Also critically low for forward jets with $\langle p_T \rangle$ between 65-115 GeV
- Current thoughts:
  - L1Random: for the low $\langle p_T \rangle$ bins
  - Central + forward jets (j20?) for $\langle p_T \rangle$ around 75 GeV - 115 GeV

Jim Lacey





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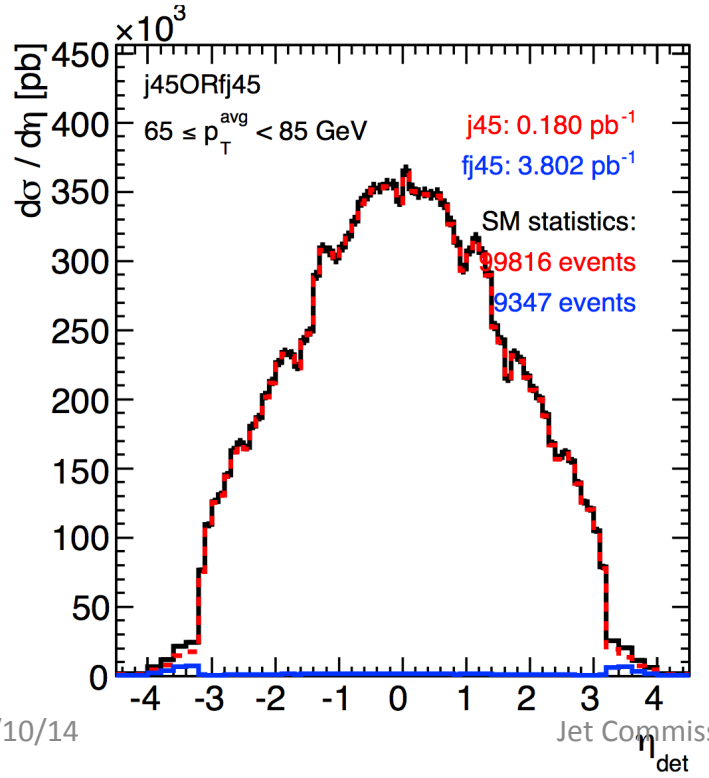

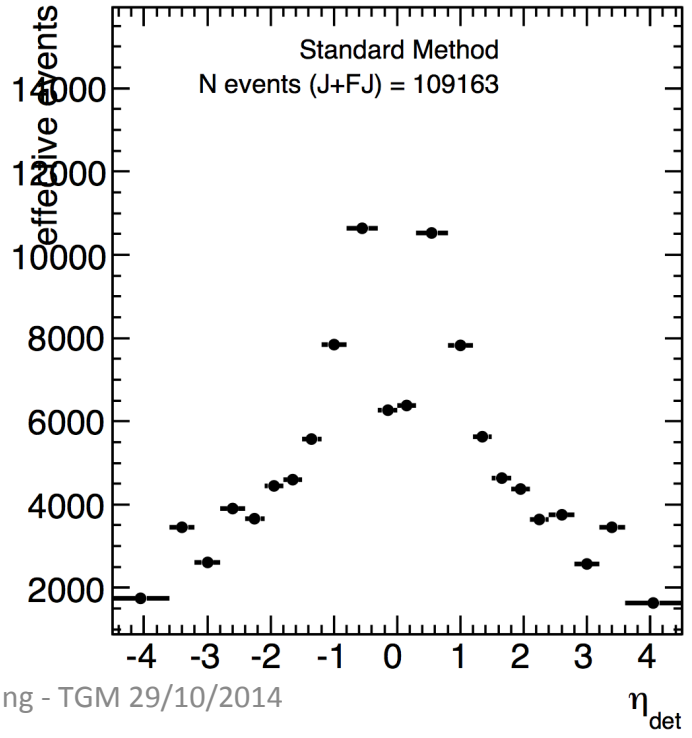

Questions from Kunihiro:

- Strategy to validate the Run2 Jet in-situ
  - How much luminosity (time) do you expect to need for it?
  - **Needs to be worked out**
  - Which default jet setting, e.g. calibration (LCW,HAD,etc), FS or PS, to start with for 50ns data?
  - **Need all useful combinations! Focus on FS but keep PS as plan B.**
  - Plan to optimize the PS parameters (seed, hypo, RoI size)? Plan to commission with 50ns data and possibly change them at 25ns run start?
  - **Start with MC studies: parameter choice already reasonably clear**
  - Commissioning triggers, or backup triggers (with different methods)?
  - **First ideas in previous slides but nee to be firmed up**

- Strategy to commission L1Topo triggers
  - **First ideas in previous slides but nee to be firmed up**
- How to validate/optimize w.r.t. pile-up?
  - It is a bit hard situation that we have higher pile-up - at beginning (50ns) - what is your plan, and how is the situation on performance/timing as long as MC predicts?
  - **Use higher 50ns pileup as a rehearsal for 25ns: note this is likely to be initial physics data**

- Progress in Lisbon WS action items:
  - #13: Comment on need for LCW – **needed!**
  - #14: Report on studies on particle flow in trigger – **to start**
  - #15: Report on use cases for track trigger – **under discussion**
  - #21: Groomed jet, re-clustered narrow jets, boson tagging, jet eta range for inclusive trigger – **starting but no results**
  - #25: Report on E/p trigger for jet – **planned but no results**