



DØ Calorimeter Task Force Mini-Workshop Status

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October 7, 2002



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Status and Interim Proposal

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Status of production versions

- Major versions of reco used
 - ◆ p10.15 Feb 12
 - ▲ Cal weights corrected for resistor swap
 - ▲ Dynamic NADA in kill mode
 - ◆ p11.09 Jun 1
 - ▲ NLC first applied
 - ▲ ICD ADCtoGeV corrections
 - ▲ ICD addressing corrections
 - ◆ p11.11 Aug 10
 - ▲ "2.5" offline suppression
 - ▲ NLC correctly applied
 - ▲ ICD addressing corrections
 - ◆ p11.12 Sep 14 – now
 - ▲ Single gaussian for noise simulation
- June 26 – changed from 2.5 to 1.5 sigma in the online data taking
- June 18-Aug 15 FPGA code v26+27 mixes events in multi-buffer mode
- Offline suppression in p11.11 has bug
 - ◆ "<" used instead of "<=" in suppressing cells i.e. cut is about 2.0 to 2.4, depending on layer
- L3 NADA tested and runs but not used for any object/MET ID yet
 - ◆ CPU time tends to scale linearly with occupancy (i.e. threshold)
 - ◆ No "offline" suppression at L3 yet
- ICD layer weights still low by at least 35% determined from m.i.p. calibration
- CC massless gap ieta=8 layer weight does not account for "wrong" feedback capacitor on preamps – off by a factor of $10.5/5.5 = 1.9$





Status of MC Production

- Noise simulation file in pileup is low by factor of ~2-3 (<p11.13 and p12.xx)
 - ◆ No resistor swap factor incorporated (32/23 = 1.39 ↓)
 - ◆ No linearity correction applied (1.5-1.7 ↓)
 - ◆ Double gaussian used for noise simulation (1.41 ↑)
 - ▲ this is corrected in p11.12 so actually worse noise simulation
- Calorimeter z_0 offset by 2.9 cm
- ICD layer weights low by at least 35% determined from m.i.p. calibration
- Bug in offline "2.5" sigma cut – same as for p11.11 data
- Noise simulation in pileup in GeV not ADC

Current production at UTA

- D0gstar files generated with p11.10
- Currently have p11.12.01 with two rcp changes
 - ◆ cal_noise.rcp in pileup from RZ
 - ◆ d0sim suppression lowered
 - ▲ PileupEMCut Electromagnetic_cut 0.6
 - ▲ PileupHadrCut Hadronic_cut 0.6
- Also mc_runjob updates
- No/few jet objects being created in d0sim/d0reco step – under investigation
- 10k each of
 - ◆ $Z \rightarrow ee, \tau\tau, \text{QCD } p_T > 20$
- CTF01 – old noise rcp
- CTF02 – new noise rcp
- [CTF04 – test files today]
- Requested
 - ◆ gamma+jet $p_T > 20$, 10k
 - ◆ $W \rightarrow e\nu$, 10k
 - ◆ QCD $p_T > 20$, 10k





Studies needed in next few months

- Get MC samples for all significant samples to study effects
 - Need to fully model response, resolution and identification as function of threshold scheme
 - Understand object finding and identification algorithms sensitivity
 - ◆ jet, MET, electron, photon
 - Explore different suppression schemes – ilayer?, ieta?
 - ◆ Noise in CH and OH is expected to be relatively larger by a factor ~2 compared to the other layers than was the case in Run 1
 - ◆ Eta's in the far forward (>3) region have ~3-4x the occupancy
- Noise samples (single ν)
 - $Z \rightarrow ee, \tau\tau$
 - $W \rightarrow e\nu$
 - QCD $p_T > 10, 20, 40, 80$ GeV
 - Photon + jet
 - B-jets, Top, Higgs, ...





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Interim Proposal

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Charge to the CTF

- The task force will determine the zero-suppression threshold for the calorimeter readout. In order to fully understand the consequences of the zero-suppression threshold the Monte Carlo should be tuned to observed calorimeter energy and multiplicity distributions. Simulated data and collider data should be used to optimize the reconstruction and properties of physics objects as a function of threshold. Selection of the threshold will also require an understanding of the L3 processing time and the data set size at L3 and off-line all as a function of threshold. Specifically, the task force should:
 1. Characterize the calorimeter performance on the cell level.
 2. Characterize particle identification (such as energy response and resolution) as a function of threshold.
 3. Tune the Monte-Carlo to the data at the cell and physics object levels.
 4. Understand the consequences of the threshold level on L3 computing and data size and offline data size.
 5. Recommend a zero-suppression threshold.
- The task force will report to the spokespersons. A preliminary recommendation should be available by October 15th and a final report by January 15, 2003.





Interim Proposal for Data

Produce a p11.13+ release for the farms

- Keep 1.5 sigma threshold online
- Correct bug in 2.5 sigma offline suppression
- Incorporate Robert Zitoun's pedestal width distribution for offline suppression
- Apply the same suppression at L3
 - ◆ this will affect L3 trigger objects dramatically – improve rejection
 - ◆ Will introduce a second data set
- Turn on L3 NADA for MET and jet objects (and electrons?)
- Correct ICD layer weight based on m.i.p. measurements (discuss Wed)
 - ◆ 0.0000694 → 0.0000936 GeV/ADC
- Correct CC MG layer weight for feedback cap. gain factor (1.9)
- Reprocess all p11.xx data after June 26th (ignore the mixed event data for now — July through Aug 15)
- Modify jet algorithms to protect against effects of CH noise (through, e.g., restriction on jet seeds)

Processed so far (Mevents)

<u>Version</u>	<u>Raw</u>	<u>Processed</u>	<u>Month</u>	<u>Raw</u>	<u>Processed</u>
◆ p10.15	75	55.0	◆ Jun	5.2	2.2
◆ p11.09	11	9.9	◆ Jul	22.0	9.7
◆ p11.11	85	11.6	◆ Aug	23.0	10.2
◆ p11.12.01	19	6.1	◆ Sep	31.7	11.0
			◆ Oct	2.4	0





Interim Proposal for MC

- Two options for noise simulation:
 - ◆ Use the phi averaged noise file (in GeV) in pileup → p11.13
 - ▲ Exists already, should see MC files soon
 - ◆ If new pileup code is ready, can apply cell-by-cell noise measurement in linearized ADC
 - ▲ → the preferred method
 - ▲ Still needs to be released and verified → p12.xx?
- Correct offline “2.5” bug and layer weights in ICR (same as for data)
- Use RZ individual channel raw ADC noise file for suppression in d0sim
- Can we get z_0 moved in p11.xx – if not, should we move to p12?
 - ◆ All the above corrections would apply.
- No new zero-suppression schemes in production version yet

Unfortunately, no MC files yet to truly state that we know the noise performance more closely matches the current data...





Expected Future Proposals

Expected changes for final report (01/15/03)

- **Raise online threshold slightly**
 - ◆ Readout times become more of an issue at higher DAQ rates (~1 kHz) to reduce FEB
 - ◆ Data size reduction translates directly to saving in storage media costs
- **These could have layer and eta dependencies**
 - ◆ Readout time determined by the crate with highest occupancy
 - ▲ Suppressing forward regions can help a lot with little effect on ET
 - ◆ 1.5 → 1.7-1.8?
- **Similarly, drop the offline thresholds somewhat at least in some layers and maybe some etas**
 - ◆ 2.5 → 2.0?
- **Utilize the calibrated pedestal widths for the actual run both at L3 and offline from the database**
 - ◆ Requires significant infrastructure work to calunpdata
- **Use unsuppressed zero-bias data for min-bias overlays**





Life beyond the CTF

- ...or “son of CTF”, “CTF the sequel” ...
- Need to strengthen the effort in the calorimeter software and other ID groups
 - ◆ Cleanup and consolidate simulation and reconstruction code, especially for all the conversions in `cal_tables` and `cal_weights`
 - ▲ Need new active authors
- Many things will still need to be studied longer term
 - ◆ Evaluate robustness of algorithms at high luminosity
 - ◆ Readjust layer weights, or apply layer corrections for energy lost due to zero suppression on the object level
 - ◆ Reevaluate the use of negative energy cells and towers

