

# Noise Cuts

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# Outline

- Other business:
  - D3PD Production
  - FCAL23 Mapping
- Noise cuts
  - Re-running L1Calo
  - Efficiency and rates
- Conclusions

# D3PD Production

## p449 panda tag

- This tag is running automatically for all stable beam runs:
  - DESD\_CALJET
  - DESDM\_EGAMMA
  - DESD\_MBIAS
- Hope to keep this tag for a long time
- Behind the scenes changes:
  - Up-to-date interface with Reco\_trf.py and ProdSys
  - Disabled Towers has replaced Dead Channels
  - TT Cells  $E$  ( $E_T$ ) by layer and receiver
  - LAr and Tile problematic HV info

## Mapping of FCAL23 Trigger Towers

- FCAL23 trigger towers have either 16,8 or 7 Calo Cells
- FCAL23 trigger towers have 2 receivers
- Trigger tower  $\leftrightarrow$  Calo Cell mapping is known
- Trigger tower  $\leftrightarrow$  receiver mapping is known
- **Receiver  $\leftrightarrow$  Calo Cell mapping is unknown**
  - Documentation doesn't easily correspond to Athena
  - We have educated guesses - but I don't trust them
- Technical stop plans:
  - Thorough systematic study with only 1 cell and 1 receiver per TT enabled per run. Total of 32 runs.
  - Even if I trusted the docs - I would still want the tests
  - Once this is solved - it's solved until the upgrade

# Noise cuts - Motivation

## Optimize the L1Calo noise cuts

- Now using the new LUT (Look Up Table) strategy
  - Reduces rounding uncertainties
  - Noise cut accounts for slope, so cut is same for each tower
  - Reduces LUT “droop” at low  $E_T$
- Noise cut of 4000 for each tower - Can we optimize this?
- Re-run L1Calo with different noise cuts (Alan Watson)
  - Can we improve the efficiencies?
  - Can we reduce the overall rate?
- Need to consider : EM, Taus, Jets, XE, XS
- We can't optimize one at the expense of another

# Datasets and Variations

## Datasets and setup

- Run 177965, DESD\_MBIAS, Athena 16.6.2.5
- Sundays overnight run
- No magnetic field - Does not effect L1Calo
- Event selection : Require mbts trigger

## Noise cuts considered

- 3500, 3600, 3700, 3800, 3900, 4000(Nominal), 4100, 4200
- 4300, 4400, 4500, 4600, 4700, 4800, 4900, 5000
- Efficiency and rates studies for EM, Taus, Jets, XE, XS

## Important caveats

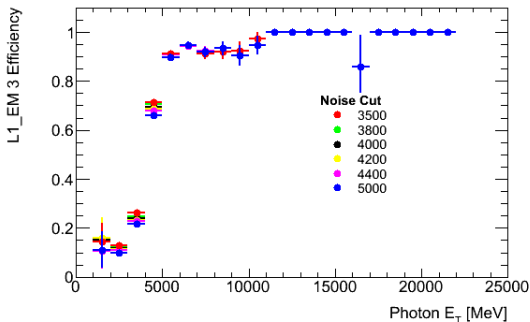
### Important caveats - Efficiency

- Do not consider the efficiencies to be “good”
- I’m certain I’m not doing this 100% correct
- This study is not about extracting exact efficiencies
- It is designed to see the effect of the L1Calo noise cut
- Look at the difference between efficiencies, not the efficiencies themselves

### Important caveats - Rates

- Rates are normalised to *atlas-runquery* numbers from web
- Run 177965 LB 142 - 2<sup>nd</sup> LB with high TAV rates
  - TAV = Trigger After Veto
- Using TBP (Trigger Before Prescale) rates
- All offline events in the run included in calculation
  - Done to maximize statistics
  - Does not account for decreasing Inst. Lumi. over fill
  - Does not account for decreasing pile-up (XE)

## L1\_EM 3 : efficiency and rates



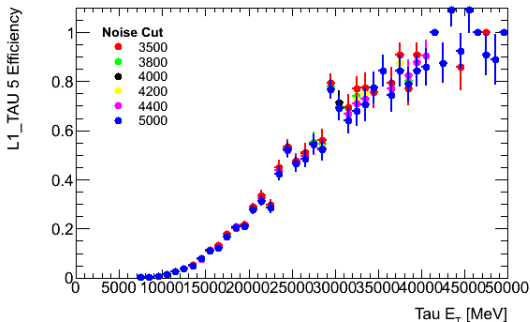
Noise Cut	Rate (KHz)
3500	142.5
3600	141.2
3700	139.7
3800	138.1
3900	136.0
4000	134.3
4100	133.1
4200	131.8
4300	130.8
4400	129.8
4500	128.9
4600	128.1
4700	127.3
4800	126.4
4900	125.3
5000	124.0

## Photons

- Please do not consider this a good quality efficiency analysis
- $|\eta| < 2.47$  excluding crack region. Author == photon
- $\Delta R < 0.15$  between photon and RoI
- Noise cut does not significantly effect efficiency
- Turn-on is slightly faster for lower noise cut
- $\geq 5$  GeV there is not much difference
- $\text{Rate} \propto \frac{1}{\text{Noise cut}}$



## L1\_TAU 5 : efficiency and rates

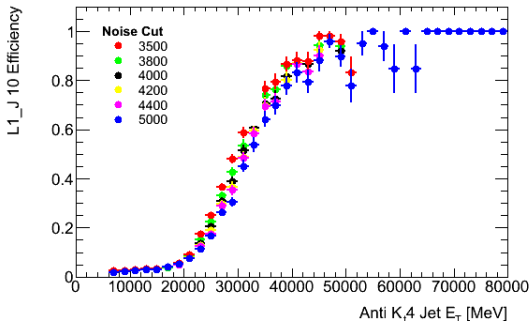


Noise Cut	Rate (KHz)
3500	46.8
3600	46.3
3700	45.8
3800	45.3
3900	44.8
4000	44.1
4100	43.7
4200	43.2
4300	43.0
4400	42.8
4500	42.5
4600	42.3
4700	42.1
4800	41.8
4900	41.5
5000	41.1

## Taus

- Please do not consider this a good quality efficiency analysis
- No magnetic field - this will effect Offline Tau reconstruction
- $|\eta| < 2.47$  excluding crack
- $\Delta R < 0.15$  between tau and RoI
- Noise cut does not effect efficiency
- $\text{Rate} \propto \frac{1}{\text{Noise cut}}$

## L1\_J 10 : efficiency and rates

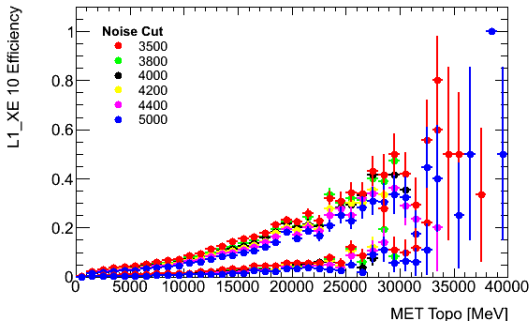


Noise Cut	Rate (KHz)
3500	26.5
3600	25.5
3700	24.6
3800	23.2
3900	22.0
4000	21.0
4100	20.4
4200	19.6
4300	18.7
4400	18.1
4500	17.7
4600	17.1
4700	16.7
4800	16.2
4900	15.7
5000	15.3

## Jets

- Please do not consider this a good quality efficiency analysis
- Only keep good jets
- $\Delta R < 0.3$  between photon and RoI
- Noise cut does not significantly effect efficiency
- Turn-on slightly is faster for lower noise cut
- $\text{Rate} \propto \frac{1}{\text{Noise cut}}$

## L1\_XE 10 : efficiency and rates

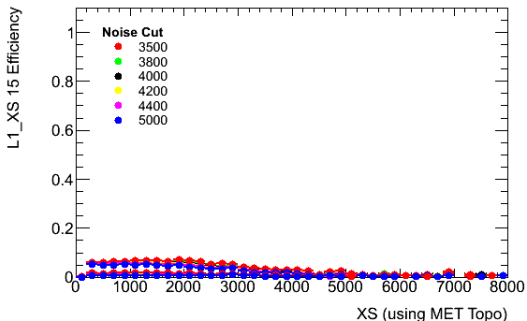


Noise Cut	Rate (KHz)
3500	137.5(30.8)
3600	131.9(27.9)
3700	128.6(25.4)
3800	123.5(23.4)
3900	117.8(21.3)
4000	114.0(19.8)
4100	111.4(18.6)
4200	109.0(18.1)
4300	104.8(17.4)
4400	101.2(16.9)
4500	99.4(16.2)
4600	97.3(15.8)
4700	96.1(15.5)
4800	93.1(14.9)
4900	90.4(14.6)
5000	88.9(13.9)

Missing  $E_T$  : XE

- We want this to be low as this is fake-MET
- Top set of plots - FCAL included in XE - default setting
- Bottom set of plots - FCAL removed from XE
- Noise cut does not significantly effect efficiency
- Rates shown with(without) FCAL
- Rate  $\propto \frac{1}{\text{Noise cut}}$

## XS 15 : efficiency and rates



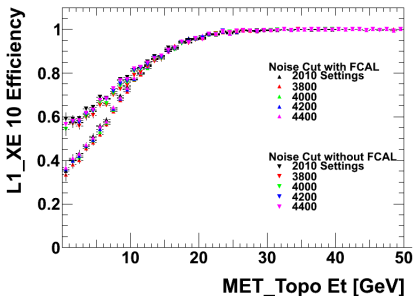
Noise Cut	Rate (KHz)
3500	146.7(90.7)
3600	142.5(84.0)
3700	140.9(78.3)
3800	137.3(73.6)
3900	132.6(69.0)
4000	129.5(64.8)
4100	127.7(61.6)
4200	125.6(60.3)
4300	120.8(58.1)
4400	117.5(56.6)
4500	115.7(54.4)
4600	113.7(53.1)
4700	112.4(51.9)
4800	109.4(49.6)
4900	106.5(48.9)
5000	105.3(46.3)

Missing  $E_T$  Significance : XS

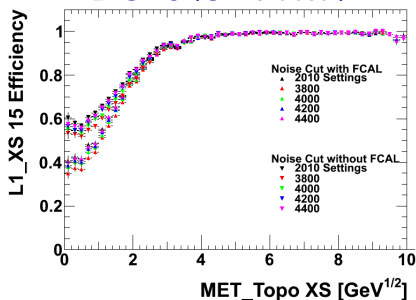
- We want this to be low as this is fake-MET
- Efficiency is lower than XE - this is what we want
- Top set of plots - FCAL included in XE - default setting
- Bottom set of plots - FCAL removed from XE
- Noise cut does not significantly effect efficiency
- Rates shown with(without) FCAL
- $\text{Rate} \propto \frac{1}{\text{Noise cut}}$

Looking at 2010  $W \rightarrow e\nu$  data

L1\_XE 10



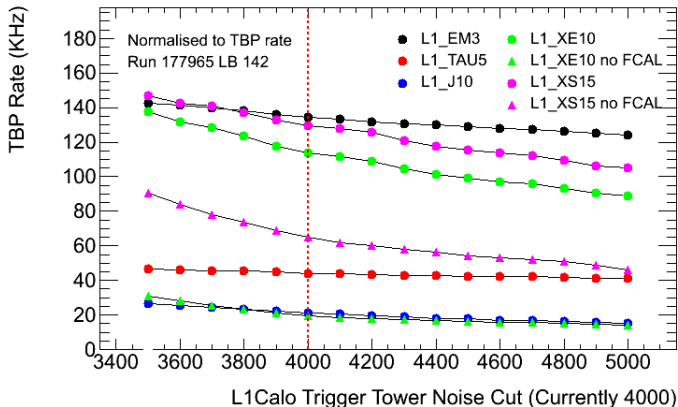
L1\_XS 15 (Simulated)



XE and XS are very efficient for signal

- Run 167776, DESD\_SGLEL, Loose  $W \rightarrow e\nu$  selection
- XE and XS perform very well
- XE and XS turn-on faster if FCAL is removed
- With or without FCAL - rate is the same for XE and XS

## Rate prediction



All rates normalised to Run 177165 TBP at LB 142

- I guess we need to pick a noise cut
- 4000 looks OK to me. Discuss. Whats your opinion?
- Where do we stand on removing FCAL from XE and XS?

# Conclusions

## Noise cut

- Noise cut does not have significant effect on efficiencies
  - Would get better turn-ons with a better energy calibration
- Noise cut does effect rate
- Need to choose a noise cut
  - No obvious *winner*
  - 4000 looks OK
  - Need to consult with rates and menu group

## FCAL in XE and XS

- Removing FCAL from XE and XS → drop in rate
- Signal appears to be unaffected
- Needs consultation with physics groups
- I have an AlgTool which people can use to see the effect on their analysis