Summary of Comments on petes\_thesis\_March2013\_wt.pdf

Page: ii

Author: william Subject: Comment on Text Date: 13-03-26 3:31:20 PM -04'00'

Really. I thought CDF went to eta=3.5. Maybe he'll claim that he's talking about 3.5 to 4.8 here...

Author: william Subject: Comment on Text Date: 13-03-26 3:31:58 PM -04'00'

Is there not something more quantitative that you can include in your abstract?

Page: 3

Author: william Subject: Comment on Text Date: 13-03-26 3:34:42 PM -04'00'

what happened in 1978? Top quark came in 1995... W and Z in 1984...

Author: william Subject: Comment on Text Date: 13-03-26 3:35:29 PM -04'00'

Precise? 10%?

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Author: william Subject: Sticky Note Date: 13-03-26 3:37:42 PM -04'00'

sig fig, no decimal point... ;)

Page: 11

Author: william Subject: Sticky Note Date: 13-03-26 3:45:40 PM -04'00'

Why do you choose to plot this at 1 TeV?

Page: 12

Author: william Subject: Sticky Note Date: 13-04-07 4:58:44 AM -04'00'

Can you sketch what this looks like at, say 10 GeV, or 1 GeV?

Author: william Subject: Comment on Text Date: 13-03-26 3:46:37 PM -04'00'

Did you define NLO?

Page: 14

Author: william Subject: Comment on Text Date: 13-04-07 5:00:33 AM -04'00'

Should you clarify that these are \*not\* multiple parton interactions, but truly independent protons colliding?

Author: william Subject: Inserted Text Date: 13-03-26 3:49:52 PM -04'00'

the 2010 data-taking period. By the end of 2010 (ie. Dec 31) there were no collisions in the LHC...

Page: 18

Author: william Subject: Comment on Text Date: 13-04-06 11:04:57 PM -04'00'

Really, where does it come as close as 45m underground? Or are you including the injectors in this statement? (but then it would be even closer to the surface in some places)

Page: 19

Author: william Subject: Comment on Text Date: 13-04-06 11:07:58 PM -04'00'

I think this second "It" could be ambiguous and may be mistaken as referring back to CMS. I guess it really should be clear from context, but "CMS" is the nearest possibility in the text... and most of what you say in this sentence applies to them too...

Page: 21

Author: william Subject: Sticky Note Date: 13-04-06 11:10:11 PM -04'00'

No, no, wait. Why use eta all if there is a one-to-one correspondence with theta... You never really say that eta is (almost) lorentz invariant. This is the real point. Also see for example page 53 and comment there.

Page: 22

Author: william Subject: Sticky Note Date: 13-04-06 11:11:59 PM -04'00'

This is strictly only true in the barrel configuration. Measure eta and r in the end caps...

Author: william Subject: Sticky Note Date: 13-04-06 11:12:34 PM -04'00'

\*and\* correlating the hits from single tracks between the two sensors!

Page: 24

Author: william Subject: Sticky Note Date: 13-04-06 11:14:57 PM -04'00'

Can you explain this extrapolation and/or why it appears not to meet the design?

Page: 25

Author: william Subject: Comment on Text Date: 13-04-06 11:15:52 PM -04'00'

I don't believe this precision...

Page: 28

Author: william Subject: Sticky Note Date: 13-04-07 12:09:44 AM -04'00'

can you explain where 9/7 comes from?

Page: 31

Author: william Subject: Sticky Note Date: 13-04-07 12:14:08 AM -04'00'

Why do you invert the order of discussing the three terms? Shouldn't this paragraph come last?

Page: 32

Author: william Subject: Comment on Text Date: 13-04-07 12:15:34 AM -04'00'

Yeah, but do you ever explain why they have this distinctive accordion shape? Do you know?

Page: 34

Author: william Subject: Sticky Note Date: 13-04-07 12:16:57 AM -04'00'

Can you explain what we're looking at here? I guess they are, somehow the EM towers, but what are the salient design choices? Otherwise why put such a detailed picture?

Page: 36

Author: william Subject: Sticky Note Date: 13-04-07 12:20:08 AM -04'00'

I don't think the text actually explains what units the two numbers in each box of this table are in... In the caption and the text it just says these are the "granularities", but are then in "cm", degrees, radians (sort of) .... you should probably explain the units.

Page: 37

Author: william Subject: Sticky Note Date: 13-04-07 12:21:57 AM -04'00'

I'm not even sure I know why the 'electrostatic transformer' approach is used. Is it just because the signal pad can be at ground? You never really explain what voltages the various pieces in figure 3.11 are at...

Page: 38

Author: william Subject: Sticky Note Date: 13-04-07 12:22:59 AM -04'00'

Have you been doing this for other LAr systems discussed up to now?

Page: 39

Author: william Subject: Replacement Text Date: 13-04-07 12:23:17 AM -04'00'

U

Author: william Subject: Comment on Text Date: 13-04-07 12:24:37 AM -04'00'

2.62 - 2.35 mm = 270 microns. How do you get from there to 267? I guess it is in the tolerances, but then you should explain that. No?

Author: william Subject: Comment on Text Date: 13-04-07 12:26:18 AM -04'00'

Author: william Subject: Inserted Text Date: 13-04-07 12:26:46 AM -04'00'

Have there been any tests of this? FEA calculations are notoriously difficult to get right at a factor of two...

Page: 40

Author: william Subject: Comment on Text Date: 13-04-07 3:22:51 AM -04'00'

3% non-Tungsten lowers the density by 5%? What is the density of the iron and nickel used negative? :)

Author: william Subject: Comment on Text Date: 13-04-07 3:23:56 AM -04'00'

Isn't this the kind of number that should have an uncertainty? Are they really different for FCal2 and FCal3? I know the gaps are larger but does this make a significant difference?

Page: 41

Author: william Subject: Comment on Text Date: 13-04-07 3:27:58 AM -04'00'

Don't you at least need the sampling fraction of the calorimeter to relate this back to the actual energy of the particle that initiated the shower in the calorimeter? Not sure why you chose to include partial information like this. What can the reader do with this number in isolation?

Page: 42

Author: william Subject: Sticky Note Date: 13-04-07 3:28:43 AM -04'00'

Wait that's not a photo of a real FCAL endplate is it? Where do we have four isolated tube groups like this?

Page: 43

Author: william Subject: Inserted Text Date: 13-04-07 3:30:27 AM -04'00'

by multiplying by 4/3 (?) Or is it more complicated than this?

Page: 45

Author: william Subject: Sticky Note Date: 13-04-07 3:34:56 AM -04'00'

Shouldn't you show a longer time slice of the pulse? None of these pulses have returned to baseline yet -- as you point out in the text ... "the start of"

Author: william Subject: Comment on Text Date: 13-04-07 3:35:34 AM -04'00'

Author: william Subject: Sticky Note Date: 13-04-07 3:35:58 AM -04'00'

Should you show more/all of this negative lobe in your figure?

Page: 46

Author: william Subject: Sticky Note Date: 13-04-07 3:40:41 AM -04'00'

I thought I understood how ADCs work, but now I'm not so sure.... Or at least I worry that something non-standard is done in the LAr digitisation after reading this page. I thought the output of an ADC was 12 digital bits. I'm not quite sure what a "discretised voltage capable of taking on 4096 levels" really is. It also sounds vagely magical that on a pulse-by-pulse basis some intelligence can choose the gain to select for digitisation. What happens if you've only got pile up in one 50ns window and then you've got a 3 TeV jet 50 (or even 400) ns later? Does a gain selector switch. And then this offset, that corresponds to 1000 counts. I guess that is part of the pre data-taking calibration that these are set? The way it is written here it almost sounds like the voltage level is chosen event-by-event (or at least more frequently than once per calibration) but I guess that is not the case.

Author: william Subject: Sticky Note Date: 13-04-07 3:41:23 AM -04'00'

But how can you know that there hasn't been a pile-up event before the "first sampling"?

Page: 47

Author: william Subject: Comment on Text Date: 13-04-07 3:43:18 AM -04'00'

Again, this will only be true if the pedestals are really zero. How does pile-up affect this?

Page: 48

Author: william Subject: Sticky Note Date: 13-04-07 3:44:28 AM -04'00'

But then you assume the shape doesn't change when you got to smaller and eventually to 'piling up' signals in ATLAS?

Author: william Subject: Comment on Text Date: 13-04-07 3:46:33 AM -04'00'

Right, this is what I was missing when you just quoted the ionisation energy of LAr. I guess this factor has both the intrinsic ionsiation energy (quoted in that footnote a few pages ago) \*and\* the sampling fraciton. Oh, right, there it is E\_ion... ah and there is another factor --- oh right a time constant to convert current. OK. I just think putting that footnote before you get to this discussion is getting ahead of yourself.

Page: 49

Author: william Subject: Comment on Text Date: 13-04-07 3:46:49 AM -04'00'

again... :)

Page: 50

Author: william Subject: Replacement Text Date: 13-04-07 3:50:18 AM -04'00'

intervals (?)

Page: 52

Author: william Subject: Sticky Note Date: 13-04-07 3:56:02 AM -04'00'

And the BCM :)

Yes, since the beginning of ATLAS running and yes we were measuring Lumi in 2010. We just became the default in 2011...

But OK, we weren't used for lumi to compare to your jet cross-secitions, so you don't need to add BCM because of MBTS. But we are ever bit as much there as Lucid or ALFA...

Page: 53

Author: william Subject: Sticky Note Date: 13-04-07 4:00:11 AM -04'00'

But this figure doesn't even show the FCAL range. So you are suggesting the reader accept that it remains 'roughly constant' beyond the end of the region shown. This is a bit unusual. I realise we don't measure tracks, but we have other reasons to believe the flux is uniform in eta. Maybe just show a MC plot?

Author: william Subject: Sticky Note Date: 13-04-07 3:57:33 AM -04'00'

OK, now I really have to ask you to explain why we choose eta as a variable then -- because it is lortenz invariant. This is one of the more obscure ways I've seen to \*not\* explain that.

Page: 57

Author: william Subject: Sticky Note Date: 13-04-07 4:34:52 AM -04'00'

I got about 15 pages past here before I realised I wasn't really sure which of the 6 testbeams (1993, 1995, 2003, 2004, ...) you are actually analysing. I was pretty sure it wasn't one of the ones in the 1990's. Coming back to this now I infer that everything that follows is for the 2003 configuration? Maybe you could just add a sentence that spells that out explicitly at the ne of this paragraph?

Page: 61

Author: william Subject: Sticky Note Date: 13-04-07 4:11:50 AM -04'00'

Do you want to say that this pump is for the LHC machine vacuum and not the FCAL? Maybe that is overkill.

Author: william Subject: Comment on Text Date: 13-04-07 4:13:53 AM -04'00'

How is this a vacuum in ATLAS? Isn't it filled with Air? RohaCell is also a good approximation for Air I suppose.

Or maybe I don't understand where this is in the ATLAS layout in Fig 3.12. Do we really a 'vacuum' somewhere in there... Maybe I'm wrong. Maybe the pump is for evacuating part of the forward cryostat?

Page: 64

Author: william Subject: Sticky Note Date: 13-04-07 4:17:58 AM -04'00'

But what about when the get the master ATLAS clock off by 2-3 ns? (which has happened more than once over the years)? Do you try to use different OFCs for ATLAS data then, or do you just throw this data away? It has sometimes taken a few days or a week to 'notice' these shifts after machine stops. Maybe it doesn't correspond to all that much data.

Author: william Subject: Sticky Note Date: 13-04-07 4:18:46 AM -04'00'

Did you already describe what "Athena" is earlier? Now I can't remember...

Page: 67

Author: william Subject: Comment on Text Date: 13-04-07 4:22:12 AM -04'00'

Surely this is 'wrong' in ATLAS. If you fixed it in the testbeam, why wasn't that fix just ported over to the ATLAS simulation?

Page: 73

Author: william Subject: Sticky Note Date: 13-04-07 4:27:48 AM -04'00'

How often does this happen? Do you have any record from the beam chambers of what two tracks look like in the scintillators? I guess the beam was tuned to almost all single particles?

Author: william Subject: Sticky Note Date: 13-04-07 4:28:53 AM -04'00'

But wouldn't you also see particles at two separate positions in the BPCs? They had some 100s of micron position resolution over a 50mm diameter beam spot right? So if there were two, it would be very unlikely that they would be within a mm of each other. Wouldn't it?

Page: 74

Author: william Subject: Comment on Text Date: 13-04-07 4:30:07 AM -04'00'

Where does this come from? The Chi-squared track fits mentioned at the top of this page?

Page: 75

Author: william Subject: Sticky Note Date: 13-04-07 4:31:22 AM -04'00'

Did these three 1ns windows, over a ~50ns window correspond to a 6% loss of beam particles?

Author: william Subject: Sticky Note Date: 13-04-07 4:35:29 AM -04'00'

This is for the 2003 configuration, right?

Author: william Subject: Sticky Note Date: 13-04-07 4:32:23 AM -04'00'

What is the expected leakage into FCal2 for a 50 GeV electron? Maybe you'll come back to that later in the lineary analysis?

Page: 88

Author: william Subject: Sticky Note Date: 13-04-09 2:39:07 AM -04'00'

Really should have the scales large enough to show all the datapoints and their associated uncertainties.

Page: 89

Author: william Subject: Comment on Text Date: 13-04-09 2:39:38 AM -04'00'

Did you describe the beam momentum determination and its associated systematic uncertainties? I thought I was looking for it, but I don't remember seeing it.

Author: william Subject: Sticky Note Date: 13-04-09 2:41:25 AM -04'00'

How do pulse shape mismatches in the MC change the overall calibration? I guess I can imagine that they \*do\*, but is the direction of the change understood by the changes of shape? The magnitude? Can you expand on this a little?

Page: 91

Author: william Subject: Sticky Note Date: 13-04-09 2:43:43 AM -04'00'

Why plot these from 0-20% when the lowest points are near 4 and the highest ones near 12? Just makes it harder to see your data points.

Page: 92

Author: william Subject: Sticky Note Date: 13-04-09 2:48:55 AM -04'00'

How is this normalised? Looked like 193 GeV is not the average of the black points, or are my eyes being mislead? Is there some kind of r^2 dr effect that means there are many fewer showers for R<2mm?

Author: william Subject: Sticky Note Date: 13-04-09 2:47:30 AM -04'00'

Neither of these MCs seem to capture the shape of the data ... flatter a low r and more peaked at the largest r...

Page: 93

Author: william Subject: Sticky Note Date: 13-04-09 2:49:46 AM -04'00'

Uncertainty is OK, but how did you find the centre of the first tube to get things to line up?

Page: 95

Author: william Subject: Comment on Text Date: 13-04-09 2:52:41 AM -04'00'

why two brackets here (and earlier on this line)?

Page: 97

Author: william Subject: Highlight Date: 13-04-09 2:54:26 AM -04'00'

Page: 98

Author: william Subject: Comment on Text Date: 13-04-09 2:59:01 AM -04'00'

I'm not sure I can fully understand the implications of this statement. If you had continuous functions (g\_i(x); i=1,2,3) from testbeam and then you got the three

FCAL layer energies from ATLAS couldn't you interpolate to get a best fit energy for a shower observed in ATLAS based on these testbeam calibrations?

Page: 99

Author: william Subject: Comment on Text Date: 13-04-09 3:00:21 AM -04'00'

right, but if testbeam data and MC agree, then why not use the testbeam data to calibration ATLAS?

Page: 102

Author: william Subject: Sticky Note Date: 13-04-09 3:02:14 AM -04'00'

Did you comment in the text on what these tails/peaks at E=0 are in the hadron testbeam data? Looks like they could be biasing your fits low.

Page: 106

Author: william Subject: Inserted Text Date: 13-04-09 3:06:04 AM -04'00'

put some space in here?

Author: william Subject: Comment on Text Date: 13-04-09 3:07:33 AM -04'00'

88 is a significant improvement over 94? But really, isn't it more like the 4H resolution that counts 'cause in ATLAS there is quite some dead material in front of the FCal. So even the 94% number is kind of academic. In practice 110-120%/root(E) is probably what counts when doing hadronic physics with the FCal. No?

Page: 108

Author: william Subject: Sticky Note Date: 13-04-09 3:11:34 AM -04'00'

I would have put some (or even most) of what is in 4.6.1 into just the introduction to section 4.6. It is usually a sign of bad organisation if you have two section headings (or a section heading and a sub-section heading) right next to each other with no text in between. In this case you should be introducing topoclusters right after 4.6, then subsections could be on electron analysis with topo-clusters and hadron analysis...

Page: 113

Author: william Subject: Sticky Note Date: 13-04-09 3:13:19 AM -04'00'

Wow, theses sure don't look all that different to me than for the cylindrical clusters. Are you sure you got the right plots in the right place?

Page: 115

Author: william Subject: Comment on Text Date: 13-04-09 3:14:36 AM -04'00'

Why this choice and not 520, or 421, or something else?

Page: 118

Author: william Subject: Sticky Note Date: 13-04-09 3:16:50 AM -04'00'

Should really explain the differences between figures a, b, c, etc. in the caption and not force the reader to scan the figures to find the (tiny) g\_1 , g\_2, g\_3 and 4L and 4H markings...

Page: 127

Author: william Subject: Highlight Date: 13-04-09 3:21:39 AM -04'00'

Page: 132

Author: william Subject: Sticky Note Date: 13-04-09 3:24:36 AM -04'00'

How can 2003 be final if additional combined tests were done in 2004. Were none of those ever analysed? If that's what you mean you should say it. But you should probably say something explicit.

Author: william Subject: Comment on Text Date: 13-04-09 3:23:36 AM -04'00'

Page: 133

Author: william Subject: Comment on Text Date: 13-04-09 3:25:37 AM -04'00'

? Isn't this the only method that remains in use in ATLAS now?

Page: 135

Author: william Subject: Sticky Note Date: 13-04-09 3:26:25 AM -04'00'

Sorry Pete, ran out of time to read this.

To be honest I would have been happy with a thesis that just stopped after this very nice work in chapter 4.