E – OB

EDOUARD:

On both p.8 and Table 1.1 the HAD section is listed as 20 Xo while on p. 16 it is listed as 18Xo. This needs to be made consistent.

On p. 18 the sentence about the time to process data is 14 hours for 250 central events. What are the units of '14 hours'? Clocktime, CPU processing time, some kind of Spectint 20XX? Perhaps this information isn't needed in the response document.

CARLA

p. 21 Fig 2.6, I suggest adding 'no energy threshold on the hits' to the caption of the figure. I realize that it is already in the body of the text.

DAVE

p. 36 Fig 3.4 I think that a color contour plot would look better here than a lego plot.

CARLA

p. 39 Remember to remove 'Dave is this correct' from the caption of figure 3.7

Axel

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RICH/SKY

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3.15 looks really good, it might need a bit of discussion that you dont
go all the way to central. The figure would be even better if we could
add some theory predictions, but I'm not sure what exists.
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DAVE

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3.7 this figure need some improvement. I think we need one "fancy"
figure that combines 1 and 2 track pi0's - I suggest for one rapidity
selection. It would also be nice to add some theory curves if available.
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ONDREJ

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1.2 again I think this figure needs some improvement. I suggest to
actually cut of the rapidity range at 2.5 not at 2.7 consistent with
the discussion in the caption, maybe the best option is to just drop
the 2.4-2.7 bin. Then I would put the 5 efficiency curves for different
rapidity bins into one figure using different symbols. I addition I
would add a second panel with the same curves for pp.
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Yasuyuki

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EDOUARD

1) I think the document claims that you can separate a “single track pi0” and a photon statistically based on the shower shape measured by the Si strips. I think this can be possible, but I could not find a plot that demonstrate this separation. Figure 3.5 shows the probability that a single track pi0 is recongnized as pi0 and a photon is recognized (i.e. mis-identified) as pi0. But I don’t find a plot of distribution that backs up these efficiency or that demonstrate pi0/photon separation. I suppose that these efficiency is

after you apply some cuts on a discrimination variable (or variables), which is calculated from the data of Si strips. I think you should include a plot of the distribution of discrimination variable --- distribution for photon and distribution for pi0 overlaid, with arrow indicating the cut position to discriminate them. I think it is very important to have such a plot. Without such a plot or plots, it is hard to convince a skeptical reviewer that you can separate pi0 and photon. It is also important to have such plot as function of centrality.

DAVE/EDOUARD

2) A related point. Figure 3.5 shows efficiency of a pi0 and a single photon to be recognized as a pi0. This plot is fine for pi0 measurement. But for direct photon measurement, you need a plot of efficiency that a pi0 and a single photon to be recognized as a photon. In this case, you probably want to show the expected purity of real single photon in a single photon enriched sample after the cuts.

TAKAO

3) In page 3-27, you wrote
"Prompt electrons which we expect be tagged by the FVTX." I don't understand this sentence. What do you mean by prompt electrons here?

TAKAO

4) Figure 3.8. I see a few problem on this plot
    a. It is confusing that this is plotted as R-1 although the main text always discuss it R. The caption said simply double ratio, which usually mean R=(gamma/pi0)data/(gamma/pi0)Mc. At least the label fo the plot should include R-1. In the label, "blgd" should be "bkgd".
    b. At first glance, this plot appears to be inconsistent with Figure 3.1, where cross section of pi0 and direct photon is shown. In Figure 3.1, pi0 and direct photon crosses at 10 GeV/c for 0-10% Au+Au. Then a reader may naively expect that R-1 = 1 at 10 GeV/c. But in Figure 3.8, R-1=3. The reason of the apparent difference is decay kinematics (gamma_background/pi0) is 1/3 – ¼. But this could be confusing. Some explicit explanation may be needed.
    c. In the pT range shown in this plot, pi0 is basically merged and appears as "single track pi0". Then, this plot, although traditional way to show the S/B, is not necessarily very meaningful. I suspect that what you will measure is a double ratio ("single photon"/"single track pi0")data/("single photon"/"single track pi0")bkgd.

RICH/SKY

5) Figure 3.14. Chic mass spectrum. The S/B in pp seems to be too good. What is the chi_c fraction do you assume here? In the central arm, the S/B is small and we could only set upper limit (R_chi < 40%). It is hard to understand why S/B in the forward direction is much higher.

RICH/SKY

6) Figure 3.15. (chi_c RAA). The error bar seems to be too small. The statistical accuracy of the data is better than that of J/PSI in RUN7 preliminary. What is the S/B of chi_c in central Au+Au? How many J/Psi do you assume in this calculation?

Barbara 1
RICH

Executive summaries usually serve to summarize all the important ingredients and conclusions of the report. So, we need to have a paragraph on each of the physics observables, explaining what they are, why they are compelling to measure, and how well (i.e. with what sensitivity) the NCC will make the required measurement - give numbers in the executive summary.
These two new paragraphs should follow the description of what simulation was done, incoporating and expanding on the penultimate paragraph in the Feb 25 draft's executive summary.
If we are going to say something about the A_LL measurement, then there should be a brief paragraph in the executive summary on that also. A new final paragraph should recap that we have done full simulations of p+p all the way through central Au+Au of the detector response to signal and backgrounds. We have demonstrated that the NCC will make the compelling pi^0 and chi_C R_AA measurements with precision of XXX%.

Executive summaries usually don't include plots, so I think that this one shouldn't either. The paragraph about the tracking should include sufficient description in words about how the tracking is done so that figure 1.1 doesn't need to be invoked in the executive summary. I think the paragraph includes most of what is needed, but a sentence explaining how the hits are joined into tracks should be added. For example, is the first tracking step done before any clustering of hits together, or is there a first clustering step done first?

The reference to figure 1.2 in the executive summary should be replaced by a sentence describing the efficiency of finding showers, listing some values and summarizing the ET dependence in words.
It would be better to put this sentence after the description of clustering "tracks" into showers. Using the same word when talking about tracks and showers is too confusing and will cause us massive trouble. The review committee is simply not going to get it! I am sure that it will be less painful to fix that throughout the document now than to deal with their confusion later.

Barbara 2
RICH

sections 1.1 and 1.2 seem to have not quite the right balance for an executive summary. They have maybe too much detail on the analysis approach and not enough high level concluding information on the results of the simulation study. The most important summary is what performance the NCC will deliver. Also, for this committee, the first time any symbol or jargon is used in the report, it needs to be defined. I KNOW from the FVTX report that some of them get upset when that is not the case.

page 1-1:
RICH

“for shower separation located at depths of 2 X_0(radiation lengths) and

3 X_0 in the tower." What is the difference between the two? Isn't the depth in EM1 equivalent to the depth in the tower>

page 1-3
RICH

in caption of fig 1-1, the plot doesn't actually illustrate the technique. It just shows a result. So I suggest replacing "Illustrated is the technique used to reconstruct showers in a tracking calorimeter, thereby circumventing the necessity for a projective geometry" by "Linking the center of gravity in each section provides tracking information without projective geometry, as illustrated."

at the bottom, we should state what energy asymmetry and opening angle cut were used.

page 1-4
RICH

"the technique described previously using the strip detectors is used to form the invariant mass" huh? in the executive summary? Please give a sentence describing the technique that is used.

RICH

same paragraph:
"An invariant mass cut is applied to preferably select pi_$_0$ candidates. These were called \single-track" _$_0$s. There is background from photons where the invariant mass is consistent with a _$_0$ mass. A weight is assigned to each \single-track" _$_0$ which is essentially the probability that the track was a _$_0$. For both \single-track" and \two-track" _$_0$s spectra were formed and a yield calculated assuming the RHIC II luminosities and a 10 week run. R_{AA} plots then can be made in which we assume some value of R_{AA} and use the present simulation to place error bars on the plots." is confusing. How about
"An invariant mass cut of XX is applied to the resulting mass to select pi^0 candidates; these are referred to as "single track pi^0s. Each candidate is assigned a weight giving the probability it is a pi^0. Spectra and nuclear modification factors, R_AA, are made for both \single track and \two-track pi^0s, under the assumption of RHIC-II luminosity for a 10 week run. The simulation study is used to calculate error bars, which are plotted on an assumed R_AA value to illustrate the sensitivity of the measurement."

RICH

p 1-6:
1) specify the precision of the pi-0 measurement rather than referring the reader forward to figure 3.7.
2) remove the sub-bullet about photon-jet correlations from the executive summary, as it is bloody red meat for Lanny Ray. When this point is made in the body of the report, specify the expected accuracy, and explain why it is good enough to yield good tag of the

jet energy. Then, rewrite the existing sentence “photon-jet measurements will be attainable via the use of correlations between the direct photon measured in the NCC and high momentum particles measured in other detectors such as the barrel VTX detector”

as “PHENIX will measure correlations between the resulting direct photons in the NCC and high momentum particles measured in other detectors such as the barrel VTX detector. Analysis of the spectrum of associated particles will allow differentiation between different models describing the medium modification of jet fragmentation.”

RICH
3) on the chi_c, again give numbers about the quality of the measurement and by how many sigma models can be differentiated.

EDOUARD
somewhere in section 2, we need to explain what a stripixel is and show a figure of it. Otherwise the committee members will not know what to think about the resolution.

CARLA
p 2-1: add “high resolution” before “electromagnetic” in “a larger coverage with electromagnetic calorimetry,”

CARLA
2) The following sentence needs to include the chi_c: “Our prime motivation is to provide precision measurements of direct photons, pi_0s and jets over an extended range of rapidity in A+A, (p)d+A, and polarized p+p collisions.”

EDOUARD/ONREJ
p 2-2: figure 2.1 should include also a plot of the shower of a 10 GeV pion or a 40 GeV electron to facilitate direct comparison by the committee.

CARLA
p.2-3: in EM2 and EM2 together are, the first should read EM1. Also, this paragraph should give the Moliere Radius for this calorimeter.

EDOUARD/CARLA
2) this sentence “Extensive modifications were also made to the pattern recognition algorithms to improve energy and position resolution, and efficiency and sensitivity to shower shape measurements.” makes what was shown in the TDR sound worse than it actually was. Suggest to rephrase as “The pattern recognition algorithms were further refined to optimize energy and position resolution, along with efficiency and sensitivity of the shower shape measurements.” I would also suggest to remove “recently published” before the NCC TDR, and to reiterate the basic performance measures in this document so that it can stand entirely on its own.

CARLA
p 2-4: This is confusing: “The NCC is optimized for electromagnetic showers being totally extinct by the third readout layer…”. How about “Electromagnetic showers are totally extinct by the third reader layer of the hadronic segment, consequently the increased aspect ratio has no deleterious effect on tracking electromagnetic particles.”
EDOUARD
2) the next sentence should state what the occupancy of our current central arm calorimeters is for central Au+Au. I am sure that the occupancy question is a major sticking point for the STAR reviewers, who are used to a coarse calorimeter with very high tower occupancy.
CARLA
p 2-5: I strongly urge you to remove the last paragraph of section 2.2 and replace it with two sentences as follows: The analysis code will be optimized for performance and speed while the NCC construction is underway. Cuts and calibrations will be retuned, based upon the real observed performance of the detector.

RICH
p.2-6: two-track and single-track pi-zero should be defined in this section, even if the definition is in the executive summary. And it does make sense for the executive summary to state that we measure pi-zeros via the two methods.

EDOUARD
p2-8: I stared for a long time at figure 2.6. Is it possible to make a version of this for hits above one of the thresholds and a corresponding energy cut on the track count? That would illustrate the assertion that the efficiency loss for high energy particles is low, and relieve us of having to hear from the committee members that they don’t believe this to be the case.
EDOUARD
p2-9: the first sentence states that the digitization (the effect of which the committee was so worried about) was not used at all in the study of tracking efficiency. Is this true? That is certainly not the impression I got from the sections before. If it IS true, then we MUST add some words and at least one figure supporting that the digitization effect is so small that this approach is warranted, without tainting the results.
RICH
2) the paragraph describing fig 2.7 refers to the wrong sub-parts of the figure (b, c, etc.) Figure 1.2 should be moved to appear in this section as fig.2.7.
EDOUARD
p 2-10: It would be good to give some context for the nice study of pointing resolution. Is a resolution of 0.1 radian good or not good? What impact does it have on background rejection? What about the 45 degree incidence angle case? How much worse is that for calorimeter performance?
RICH
2) at the bottom of this page is an incidence where the double use of “tracks” is confusing. The section header refers to tracks, while the text says showers. Which is it? Did I miss the description of a second clustering step that collects (or split) tracks into showers?

EDOUARD
p 2-12: I wonder whether it might not be useful to add some red vertical lines to fig.2.10 to indicate above which pT we don't simply treat the measured photon pT as the real photon pT and proceed to do two-track pi-zero analysis.

DAVE
The single-track pi-zero explanation is really nice and clear. However, we might get a question about how the decay asymmetry is used, since that may not be obvious to the non-expert. It could be "belt and suspenders" useful to add another sentence or two to explain this more fully.

RICH
p3-16: Does "full simulation" include the digitization step?

GABOR
2) I suggest replacing "ionization-type energy loss models" by "energy loss models including ionization of correlated parton pairs" and to replace "consistent with a Bremsstrahlung-type, constant fraction Delta pT /pT energy loss" by "consistent with a constant fraction Delta pT /pT energy loss dominated by Bremsstrahlung"

GABOR
3) "appears to happen at and above 15-20 GeV…" sounds confusing to me. How about "appears only above 15 GeV, a region…"

CARLA
p 3-17: The following statement is not fully true: "it will be important in these instances as well to know the initial energy of the scattered parton, which requires both extracting the direct photons and doing jet measurements." I suggest instead to write ""it will be important to tag the initial energy of the scattered parton, which requires extracting direct photons and measuring associated hadrons." We really DON'T want to say that getting the physics answer requires "jet measurements" because certain committee members will interpret this to mean jet reconstruction. We don't simulate how well we will do this, nor is it necessary for differentiating among energy loss mechanisms.
DAVE/GABOR
2) the first bullet should include d+Au to pin down the initial state PDF modifications.
DAVE/GABOR
3) in the second bullet, remove "in photon-jet events". The meaning is unchanged but the red meat of jet reconstruction is removed.
DAVE/GABOR
4) high pT charged pions in the last paragraph of 3.1.1 should read "high pT charged particles" since we won't identify them as pions.
RICH
p 3-18: invert the last two sentences of 3.1. Should we maybe quote binding energy or radius of the states to compare J/psi and chi_C instead of (or in addition to) the model dependent and possibly less

STEFAN/DAVE
p 3-19: define L-hat used in equation 3.1 and 3.2
STEFAN/DAVE
p3-20: Table 3.4 needs more explanation – what are the quantities and how are they evaluated. For the gamma-jet acceptance, what detectors are used for the gamma and what are the particles and detectors used for the jet? Presumably this is actually gamma-hadron rather than fully reconstructed jet? What do the columns mean? Explain why the number of pi-zeros is given at the same energy as the gamma energy (presumably to give background from single track pi-zeros, but is that with or without the selection using the strip detectors)?
TAKAO
2) what pi-zero R_AA is assumed for the central Au+Au curve shown in fig.3.1? This should be written down specifically.
DAVE – A general fix needed for the picture
p 3-26: The caption to figure 3.7 is messed up. It talks about two track pi-zeros but the right hand side only starts at 4 GeV/c pT where the two track pions no longer work. Also the description of the error bars is made twice.
TAKAO
2) These two sentences should be clarified: "We estimate a _10% systematic error on the reconstruction, by taking the full difference of 100% and 90% above. We assume here that _ 15 _ 40% (depending on centrality) of single photons misidentified as single track pi_0 can be corrected for by a simulation study." What does the first sentence mean? What 100% and 90% above?? Why is the assumption in the second sentence justified? The assumptions in the rest of this paragraph could use some justifications, too.
TAKAO
All of section 3.3.4 seems like it is written in shorthand. The description and discussion would benefit from being fleshed out with a bit more explanation, justification and detail. Otherwise, our committee is likely to not understand it.
TAKAO (kill the word "realistic")
p 3-27: why is figure 3.8 labeled everywhere as realistic case? Aren't ALL the figures in the report for a realistic case of whatever they depict??
MICKEY/EDOUARD
p. 3-28: Section 3.3.5 needs to be expanded to make things more clear. The performance for jet energy measurement in fig.3.11 needs to be quantified – cuts in one dimension and projections on the other, for example, would allow quoting a resolution. The discussion of fig 3.11 implies two modes/comparisons, but only one is given. The second paragraph appears to begin discussing photon-jet coincidences, while the first is about jet reconstruction. Definitely some transition is needed, as well as explanation of the kinematics – are both the direct photon and the jet going to be measured in the NCC? What will be learned from this measurement and why is it important? I can guess that this is about reconstructing the kinematics of the parton scattering, but I am pretty sure that the two most vocal of our committee members will not figure out what to make of this section without more guidance.

CARLA
p 3-31: the last sentence ends too early. A formatting problem in tex?

KEN

2) for figure 3.13, what is the assumption for one RHIC year for spin? Is it the same as for Au+Au in terms of weeks? That should probably be (re)stated at the beginning of the section on the A_LL performance. It also seems that some discussion of this figure is needed in the text. How well will we do? What will be the impact of the measurement that can be done in one year? The current text looks like we are just tossing this out there without completing the point.

RICH

p.3-32: why is the summary 3.3.7 only about pi-0? Have we not also shown the performance for direct photons? Why not include those in the summary too?
Is there something missing from the study that causes us to hold back on claims based on the direct photon plots in the report?

RICH

2) Does the PISA simulation for the chi_c include the digitization step? It is important to state explicitly. If the digitization isn't included, then we should state what kind of smearing was done to simulate the resolution loss due to the number of bits in the ADC.

CARLA

2) the entire chi_c section has quite a few typos and could benefit from a careful proof reading.

RICH

p 3-33: maybe I'm just getting tired, but it wasn't clear to me what signal to background ratio was assumed when embedding chi_c's into the HIJING background events. That should be stated very clearly.

SKY

p 3-34: the labels on each plot in fig. 3.14 are illegible. That makes it difficult to compare the performance in different systems because it's hard to remember from the caption which picture is what. Please add some labels!

RICH

p 3-35: actually the lattice results don't indicate that the J/psi remains intact above Tc, but rather that a correlation survives giving a broadened J/psi.

SKY

p 3-36: Why are the error bars and bands on fig.3.16 identical? The caption doesn't define the bands at all, so I couldn't tell whether they are supposed to be the same. This could confuse the committee members.

RICH

2) remove "to constrain these effects" in the first sentence of the last paragraph. It is redundant with the first phrase of the paragraph. These last two paragraphs seem like they belong into the introduction section for the chi_c (since they justify the measurement). Should they be moved there, with the last paragraph ending on a statement of how well the scenarios can be differentiated with a year's run?