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On December 8, 2005 a review of the PHENIX Forward Silicon Vertex (FVTX) and Nose Cone Calorimeter (NCC) proposals was conducted at BNL by the PHENIX Detector Council and Executive Council. The report from the review committee, chaired by John Haggerty, is attached. The purpose of this letter is to outline, for the FVTX, the issues raised by the review and our responses to them – with pointers to the body of the full FVTX proposal where these issues are discussed. The issues will be listed here (in italics) in the same order as in the report, with our responses in normal text:

*1) The NCC and FVTX are being pursued in isolation from each other, and from the forward muon RPC system which is being funded by an NSF grant to the University of Illinois. Although PHENIX detectors must be able to work by themselves, PHENIX upgrades must together address linking tracks between detectors and triggering. Detecting forward direct photons in the NCC, for example, will require a charged particle veto, which could be provided by the FVTX, but this review did not address issues which couple the detectors. Since the upgrades are proposed and funded separately, the only context for evaluating the forward upgrades together is within the PHENIX collaboration.*
**As the FVTX proposal needs to stand on its own, rather than add relationships to other subsystems or proposed upgrade subsystems throughout the text, we have added Appendix D which discusses these relationships all together. Also the discussion of triggering in Appendix B highlights triggering schemes where several forward subsystems will be combined for effective cooperative triggers.**

*2) The physics case for the FVTX is based on separating b and c decays on the basis of decay length. It is crucial that a credible case including the expected Distance of Closest Approach (DCA) resolution and realistic luminosity be made.*
**Details of the expected performance of the FVTX for various DCA cuts are discussed in Section 3.3.1 and 3.4 of the proposal. The $B \rightarrow J/\psi$ measurement will provide an exclusive measurement of the B's that can be used to decompose the single-muon spectra into D's and B's. Also we can look for the steep slope of the neutral $D^0$'s ($c\tau$ = 124 μm), compared to that from $D^{\pm}$ (315 μm) and B(480 μm). But the latter remains a concept at this point which will be worked out in more detail later. However once one determined the $D^0$'s, then the total D spectrum could be determined assuming equal numbers of $D^{\pm}$ integrated over all $p_T$.**

*3) At the time of the review, there was work going on to show that muon tracks in the MUTR can be connected the FVTX; it is important this work be carried forward, to determine how well tracks can be connected in Au+Au collisions.*
**See section 3.7 where initial results from Kalman filter fits to the silicon and muon tracker hits are shown. These studies already indicate that in central Au+Au collisions, with the chisq from the Kalman fit, the correct track match can be made 93% of the time (for a 9 GeV total**

**momentum muon), 83% (for 6 GeV) and 75% (for 3 GeV). Matching will, of course, be even better for minimum-bias Au+Au, d+Au and p+p collisions. The Kalman filter fitter is still under development.**

*4) The conceptual design of the readout of the FPIX or PHX ASIC's must be complete at the time of the proposal. Some of the possibilities would result in a very large mass of cables, and the advantages and risks of various approached must be considered. The readout should be consistent with readout of the present PHENIX detector.*
**The conceptual design of the readout chip is under R&D. An integration concept has been developed by the engineers that would allow either fiber or copper output of the data. This concept will be further developed over the next several months, but is a complex integration scheme that involves multiple PHENIX upgrades. The digital backend of the FEE is already defined and in use in laboratory tests both at LANL and Nevis and is very close to being ready for integration into the PHENIX DAQ. Chi and the Columbia group believe that it can be done.**

*5) The design was shown with 200$\mu$ thick silicon sensors, which are not necessary for this detector, and lead to additional cost and handling difficulty.*
**The thickness has been changed to 300μm throughout the proposal. If the eventual vendor has a different standard which is more cost effective, the thickness can in the end be somewhat different since the sensor itself only contributes about ~1/3 of the radiation length of the total material budget.**

*6) A strong group was in evidence behind the FVTX proposal, but the absence of a lead electronic engineer on a project with a great deal of electronic complexity is a concern.*
**Eric Mannel from Columbia University, who is also lead engineer for the VTX electronics, has been identified as lead engineer for the FVTX electronics.**

*Recommendations:*

7) *NCC and FVTX should show Monte Carlo estimates of how the detectors would perform and what physics capabilities they would have in central Au-Au collisions.*
**See #3 above**
8) *NCC and FVTX should present a table of rate estimates based on planned RHIC II luminosity.*
**Appendix C has been added with realistic rate estimates for all processes.**
9) *Triggering in the forward direction must be addressed, although perhaps not in the context of these proposals, as discussed in the comments.*
**Appendix B has been added and discusses the global forward triggering issues.**
10) *The costs of electronics outside the PHENIX IR (DCM's, for example) should be estimated and either included in the cost of the upgrades or a plan should be made to fund it separately. Similarly, the cost of support electronics (power supplies, for example) should be clearly shown.*
**The costs for the DCM's, LV & HV power supplies, and cabling were already included in the FVTX cost estimates.**

*FVTX:*

11) *It must be verified that muon tracks can be connected to tracks in the FVTX in Au+Au collisions.*
**See #3 above**
12) *The resolution on the upsilon states should be shown with a reasonable RHIC II integrated luminosity.*
**The expected Upsilon mass resolution is shown in Fig. 64 with the three Upsilon states superimposed. Since the Upsilon mass resolution in the muon arms is dominated by tracking**

**resolution in the muon tracking chambers, the FVTX is not expected to significantly improve this resolution, but will reduce backgrounds underneath the mass peaks.**

13) *The statistical significance of the $\psi'$ in Au+Au collisions with a reasonable RHIC II luminosity should be shown.*

**Figures 62 and 63 show the J/ψ and ψ' peaks before subtraction of combinatoric background for 10 week of running for p+p and Au+Au collisions.**

14) *The separation of b and c decays based on decay length with reasonable RHIC II luminosity should be shown.*

**See #2 above.**

15) *The sensors should use standard thickness silicon.*

**See #5 above.**

16) *A lead electronic engineer who will be available to he project for its duration should be identified.*

**See #6 above.**

Sincerely,

David M. Lee
Deputy Project Leader for the FVTX/PHENIX upgrade