Fermilab

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Do not go gentle into that good night.
Rage, rage against the dying of the light.

Report of the Production Readiness Review for the DØ Layer 0 Upgrade Silicon Sensors

We, the PRR panel (composed of N. Bacchetta, A. Juste, P. Rapidis, and M. Weber), met on January 23, 2004 and heard the presentations by R. Lipton, M. Demarteau, and R. McCarthy. We also reviewed the material given to us.

Overall we had a very favorable impression of the Layer 0 Silicon Sensor design, QA program, cost, and schedule. We do believe that production can commence in the very near future. We would like to raise the following points that were of some concern and should be addressed before production is initiated. The recommendations are indicated by the underlined text.

1. The required depletion voltage range as specified is huge. *We believe it would be better to specify a desired value, possibly the largest one can hope for, and a modest band of allowed deviations referenced to the desired value*.

   Along the same line of thought, even though it is not directly related to the sensors as such, we would like to draw D0's attention to the issues raised by the maximum attainable voltage given the present distribution system for the bias voltage (e.g. the interface boards, the breakout boxes etc.) which is rated for at most 300 V. Even though calculated doses indicate that 300 V bias should be adequate for the projected integrated luminosity, one should consider the possibility of excess radiation due to beam mishaps or asymmetric dose patterns due to beam displacement with respect to the detector centerline. In such a case a higher bias voltage will be required. This effect will also be exacerbated by the low signal to noise ratio expected for the high incidence particles at the edges of the detector dictated by the L0 geometry. *A larger bias voltage should be accommodated by appropriate changes of the design of the bias voltage distribution system at an early stage, i.e. now!* The suggested approach that one could modify the system at a future time, as needed and in the middle of a running period, is fraught with potential problems.

2. The low signal to noise ratio for large angles of incidence and for high radiation dose is of some concern. We realize that sensible design choices were made and given the present six-fold azimuthal segmentation not much could be done. *Nevertheless this low value underlines the need for radiation damage studies with all alacrity once the sensors are received.*

3. The testing and 'accounting' of the intermediate (i.e. non-readout) strips was not fully fleshed out. Issues we note are:

a. Are defects of intermediate strips counted towards the defect count used to reject sensors? It was not clear from the material shown to us. We believe that *intermediate strip defects should indeed be included in the count* - as was done in the case of the CDF sensors.

b. What are the tests for these intermediate strips? *A more comprehensive and detailed testing procedure should be developed.*

4. The sensor is intimately coupled to the ceramic pitch adaptor. We wish to emphasize that *the pitch adaptor design and its relationship to the sensors should be thoroughly reviewed before proceeding with sensor or pitch adaptor production.*

5. Beware of the interstrip resistance! Problems of low interstrip resistance have plagued earlier sensor production (both at CDF and at DØ for example and also for detectors from various vendors). *Proper testing should be done to identify any potential interstrip resistance problems on the sensors as they are received*. (This item is closely related to item 3 above).

6. Who approves the design of the sensors, and who approves the acceptance of the sensors. *The approver (s) should be clearly identified*.

If the above points are properly addressed - something that is not very hard to do in a few days' time, and some of which (e.g. testing procedures) do not need to be done immediately - production can proceed.

Fermilab, January 28, 2004

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