

D0 Responses
to the recommendations in the
Department of Energy Review Committee Report
on the
Technical, Cost, Schedule, and Management Review
held on
June 17-18, 1999

2.1 Silicon Vertex Detector

Recommendations:

1. The silicon group should maintain the close cooperation they have established with Micron, even if Micron achieves the desired sensor delivery rate. The silicon system managers should work with project and lab management to ensure that technical assistance is provided to Micron as appropriate to minimize delays resulting from any future problems.

We have continued our close contacts with Micron and expect to keep this effort up until the last sensor is delivered. There are one or two D0 people at Micron full time. We are now confident that Micron will deliver the two degree and F wedge detectors with no schedule impact. We continue to be concerned about the delivery of the 90 degree double metal detectors and are keeping close contact with the company and project engineers.

2. The silicon group should further develop contingency plans for the SMT in the event that the delivery of F wedges or 90-degree sensors suffers further delays. A date should be chosen for a decision whether to implement the fallback plan, and a schedule formulated to evaluate the impact of the fallback plan on the D0 roll-in date. This date should become an M3 level milestone.

F Wedges - We have 100 of 125 detectors ordered from Micron in hand. Production at Micron appears to be proceeding well. The Eurisys order is scheduled to be delivered in December and January. We consider three scenarios:

- a) ***Micron Fails – At this point the shortfall would be less than 25 detectors. This could be made up with detectors from Eurisys.***
- b) ***Eurisys Fails – We can continue the order from Micron to make up some of the shortfall. At this point it is unlikely that the new wafer starts would arrive on time. If the current wafers have reasonably high yields, we could get the detectors we need from wafers in process along with judicious lowering of our acceptance standards to complete the order from existing Micron stocks.***
- c) ***Both fail or partial delivery - We have a modular design which permits us to install elements independently. This allows us to decide on the final configuration very close to completion. Our initial fallback would be to a six disk configuration which drops the interspersed disks and one of the end disks. If more devices are available we would be able to install pairs of interspersed disks. The exact plan would depend on the details of the failures and the numbers of devices delivered.***

Because of our flexibility we see no need to develop contingency plans for the F wedges which need to be implemented by a specific date. Decisions on how to deploy wedges can be made close to barrel installation.

DSDM (90 degree) – We have 40 of 144 six chip DSDM detectors at Fermilab. Our goal is delivery of >20 devices/month. Micron deliveries to date have been closer to 15/month. We have begun production of these ladders at the rate of 4/week which will soon increase to 10/week. Any fallback to a simpler ladder should be in units of two barrels. We expect to complete two barrels (72 detectors) worth of DSDM ladders in January 2000. In order to keep the schedule we need to make a decision around January 1. The most straightforward fallback would be to use 90 degree detectors in process as single sided. Detectors that fail the double metal process could be used and the processing simplified. We could use 4 fixtures

(including single sided fixtures) to produce 4 ladders/day. The major delay would be the procurement and assembly of single sided HDIs. We will add a January 10 M3 milestone to this effect.

2.2 Fiber Tracker (WBS 1.1.2)

Recommendations:

1) Move promptly into full production of both the fiber-tracker and the cassettes.

Implemented.

2) Provide sufficient resources to set up two shifts for the fiber ribbon and cassette production.

We asked for and received from the laboratory the additional manpower required to operate two shifts.

3) Establish milestones so that production can be monitored by the D0 management.

We have added an additional 8 milestones to the fiber tracker and VLPC schedules, for a total of 41 milestones in those projects.

4) A full-scale effort to test and debug the cylinder mounting system should be carried out by September.

We have followed recommendation 4 as aggressively as possible, but engineering difficulties have prevented us from meeting the September deadline. We now anticipate starting the tests mentioned in the recommendation in November and completing the tests in two to three weeks.

2.3 Muon System

Recommendations:

1. Establish completion of MDTs as a new Laboratory-level (M2) milestone;

We have implemented this recommendation and the date is 3/10/00.

2. Increase the rate of pixel and MDT octant production, in order to provide some schedule contingency

We increased the pixel octant assembly rate during the summer months, but that rate slowed down due to a lack of parts from the vendors. We will continue to run at an assembly rate which is limited by the parts supply and testing, however we will recover delays using overtime and additional tech help when needed. As for MDTs, we are still on the learning curve for production, and have not yet verified the actual production rate.

3. Continue to provide local financial support for Russian physicists who are crucial to octant production and QC, and DAQ software development.

Fermilab is currently providing what is needed. There are no schedule delays due to lack of visitors. We expect this will continue until the roll in and commissioning of the detector.

2.4 Installation and Commissioning

Recommendations:

1. Reevaluate the DAQ and trigger installation schedule to ensure that the installation sequence is compatible with commissioning needs.

We have and continue to refine the installation and commissioning schedule. The installation of the trigger elements occurs prior to the time they will be needed for readout of the calorimeter and the trackers. The muon trigger elements will be interleaved with the commissioning of the central and forward muon systems. The DAQ system was used to read out a central muon crate with much of the Run 2 functionality in August 1999, and is ready for read out of the sub-detectors as they arrive. Readout of multiple crates will begin in November 1999, and is not expected to be an issue for commissioning.

2. Reevaluate the personnel needs for installation and commissioning to ensure that delays due to manpower shortages do not result.

The manpower needs for installation are explicitly accounted for in the installation portion of the schedule. Additional manpower is accounted for in the schedule of the individual sub-projects themselves; the technicians building the sub-detectors will move to DZero Assembly Hall with the completed detectors, and will be involved in the installation, hook-up, and commissioning of the sub-detectors. Most of the commissioning manpower will necessarily come from physicists within the collaboration; peripheral cabling and other hook-up tasks come under the umbrella of installation, and are accounted for as described above.

3.0 Cost

Recommendations:

None

4.1. Schedule

Recommendations:

1. Reevaluate the schedule and the final detector delivery date.

This has been completed. The new schedule indicates the detector installed in the collision hall and ready for beam on Feb. 2, 2001. A detailed schedule is available.

2. Develop, in consultation with DOE, a series of new milestones which track progress toward completion of the detector. These should reflect rate of progress on key systems.

This has been completed. A number of extra milestones have been added such that the total number between now and the end of the project exceeds 200. In consultation a subset of slightly less than 100 of these have been identified as "Reportable" milestones, in consultation with the Chairman of the Program

Management Group, Ken Stanfield and Jack Ritchie of DOE-HEP, Germantown. Many but not all had previously been identified as M1, M2 or M3 milestones. In future, the Monthly Reports will make use of these milestones.

3. Maintain continuous and comprehensive surveillance of all critical processes at vendor sites where schedule-pacing items are being fabricated.

This has been pursued aggressively. Examples include visits to Micron, regular visits to PROMEX, MAX LEVY and COMPUNETICS, all related to critical flex circuit and HDI fabrication. In addition, the Project Manager and the relevant Level 3 Project Manager visited DUBNA where production of MDTs is critical to the muon system completion. This is potentially hampered since the beginning of the fiscal year by restrictions on DOE and Contractor travel.

4. Develop fallback plans to react to potential delivery shortfalls of key components.

Response: As described at the mid-year review, measures had already been taken with respect to the F wedge silicon detector to identify and develop an alternative vendor (see responses to Silicon recommendations in Section 2.1). A possible fallback plan has been developed for the 90 degree double metal silicon detectors as discussed in Section 2.1. With respect to flexible circuits, we have been in a continuous process of identifying and qualifying vendors indeed this has been the only way we have survived the volatility of corporate capability in that area. One of the key procedures in the completion of the High Density Interconnects is the wirebonding of components to the flexible circuits. Because of worries about our vendor of choice, PROMEX and concern that the distance (to California) is hampering progress, we have identified a second vendor close to FNAL and we are attempting to qualify that vendor. Concerns about the conditions in Russia and the consequent risk to the muon system are by now quite subdued. The counter production in ITEP, Moscow has been complete for some time, the pixel counter production in IHEP, Protvino is complete and the counters delivered. At Dubna the production and testing of the MiniDriftTubes has passed the 2/3 mark, one complete layer is at FNAL, a second is en route and production has started on the third.

5. Work with the Laboratory to fully staff schedule-critical production efforts.

Response: This is being done. During the months of August and September, several areas of relevance were identified where the injection of technical effort could help the project. In particular, the muon system, the fiber tracker and the silicon system have been addressed. A total of approximately 15 technician hires were approved on the muon, fiber and calorimeter systems. The silicon production needs have been addressed by developing a hiring plan and by a reorganization of the Silicon Detector Facility management in an attempt to directly address the technical effort needs. Physicist needs were also identified and the collaboration has succeeded in injecting two new groups and several individuals into the silicon effort. Further physicists have been identified and will start in that area in the next few weeks.

4.2. Funding

Recommendations:

None.

5. Management

Recommendations:

1. Review and continually update all resource plans for completing the detector. ***This is being done. As described in the response to Recommendations on Schedule (4.1.3) the staffing situation in all critical systems has been reviewed and where indicated, remedial action has been taken. As far as the Cost versus Funding balance is concerned a few of the actions with respect to providing alternative options in component manufacture, has led to pressure and liens on the contingency. This has necessitated a close control on the cost increases.***