Time Projection Chamber Preliminary Design Review
February 2, 1993
Report of the Committee

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Introduction

On February 2, 1993, a committee of seven engineers and physicists held a review of the STAR Time Projection Chamber (TPC). Viewgraphs from the presentations are contained in a binder in the STAR Project office. The binder is titled TPC Preliminary Design Review, dated February 2, 1993. Approximately fifty action items were generated during the review; these were given to TPC management for disposition. The original action items are available from Joan Tarzian in the STAR Project Management office at LBL. The following is the report from the committee.

Overview

A lot of careful thought and hard work has gone into the TPC design thus far. The group is making good progress towards its goal of beginning fabrication of several major components very shortly. The design of the sectors is on schedule with many details already in hand and many drawings already completed. The design of the OFC and its associated tooling are much less well defined. A more concentrated effort is needed here to keep the OFC on schedule. Another PDR in a few months for the OFC is essential. The TPC group ought to firm up design of OFC and its process tooling, and initiate a program of prototyping as soon as possible. The existing plans for small diameter prototyping are fine but should be supplemented with full diameter prototypes as well. The central membrane design was also not well defined at the time of the PDR. Questions arose during the PDR, which were not satisfactorily answered, as to the support condition at the inner radius and the membrane thickness.

Some specific concerns of the committee follow:

Global Issues

Documentation: none of the drawings shown at the review had drawing numbers. LBL drawing numbers should be assigned. A STAR note on drawing category codes exists. A STAR note on drawing standards is forthcoming.

There is a need for a formal, controlled, requirements document for the TPC, especially with all the institutions involved: LBL, Davis, BNL and others. It is suggested that the TPC section of the STAR Parameters Notebook be expanded to include more of the physics and engineering requirements.

An overall QA plan for design, fabrication, assembly and test of the TPC is needed. With so many institutions and steps involved; how else do you ensure uniformity, consistency, and know what you have, through the process of fabrication, assembly and test?

There was not much discussion of test plans in this review. Prior to PDR, these plans should be at least outlined to make sure there is a suitable method and it does not impact the delivery schedule. It is recommended that the test plan be documented, distributed and discussed with the institutions involved in testing.

<u>OFC Issues</u>

The committee expressed its concern on the process of handling the 13 foot diameter OFC tube, i.e. withdrawing the mandrel from the OFC without it being damaged. A more general concern, however, is that the process of manufacturing the OFC is complex in nature and will be problematic enough to warrant an early start to work out these "bugs". The committee recommends that a systematic prototyping program be developed, using the production tooling, starting small and working up to full diameter partial length (or even full scale prototype) OFC models. This should be undertaken early so that there will be plenty of time to work out process problems.

There is a need for at least an informal PDR specifically on the OFC design and process equipment when you are ready (suggest about 2-3 months).

At earlier reviews of the TPC, you were often asked to borrow as much as possible from the ALEPH TPC design, not to "reinvent the wheel". This committee developed the perception that there has been too much reliance on the ALEPH design without really understanding the pitfalls, the reasons for the design, bad experiences and lessons learned. (Chairman's note: this could very likely be an incorrect perception - you should do your own self assessment to determine which is true.)

If the schedule is tight (especially when you add another PDR), additional engineering effort could be warranted for a limited time.

100 KV or 30 KV? The operation & test voltages for the OFC should be specified. Make sure that everyone involved knows these operations and test voltages.

The clean room cost estimate, design and time for construction seems optimistic. Determine real requirements and start discussions with plant engineering and the LBL Fire Chief sooner, rather than later.

Attachments: TPC PDR Committee Charge
TPC PDR Agenda
TPC PDR Action Items (will follow upon completion)

To: STAR Time Projection Chamber (TPC) PDR Committee
From: Bill Edwards
Subject: Charge to the Committee

The objective of this preliminary design review is to ensure the eventual production of a technically feasible, maintainable, safe and cost effective TPC system that meets all scientific and technical requirements. The preliminary design review provides a mechanism for obtaining input from many sources concerning the credibility of the proposed design. By receiving this input early, it is hoped that the probability of major changes coming late in the design process will be reduced.

The charge to this committee is therefore to assess the ability of the proposed design to meet the stated scientific and technical goals and to assess its design and manufacturing feasibility and cost effectiveness. The committee is made up of physicists, engineers and technical people with previous TPC experience or with other relevant experiences which will help bring breadth of knowledge to the committee. The list of committee members follows:

Bill Edwards (LBL, chair)
Fred Goozen (LBL)
Yousef Makdisi (BNL)
Ron Madaras (LBL)
Ken Mirk (LBL)
Alan Paterson (LBL)
Mike Ronan (LBL)

The tentative agenda for the review is attached. In an effort to minimize the time required of the committee, we are squeezing the review into one day. It will be tight, and my biggest job as chairman will be to keep us on schedule while still allowing pertinent discussions to occur. Action item forms will be used and I ask that any questions not sufficiently answered during the review be written down and handed in. We will discuss and edit these at lunch and at the afternoon committee sessions; then, they will be handed over to Howard Weiman and Roger Stone at the close–out session. The committee report will be brief – a summary of our major concerns with action items and responses added as an appendix.

Thank you for agreeing to serve on this committee. If you have any comments or concerns please don't hesitate to contact me.

cc: H. Wieman
R. Stone

Tentative
TPC Preliminary Design Review
February 2, 1993
Building 2, 100B

8:15	Review committee meets	
8:30	Physics and technical overview	Howard Wieman
9:00	Outer field cage–Design	Derek Shuman
	Outer field cage–Fabrication	Derek Shuman
10:00	Central membrane/IFC	Derek Shuman
10:20	Break	
10:30	Sectors–Design	John Bercovitz
	Annode Bias Distr.Board Dsgn	Jim Hunter
	Sectors–Assembly	John Bercovitz
12:10	LUNCH	
	(working lunch for the committee – provided)	
1:10	Wheel	Roger Stone
1:30	Laser/gas	Howard Wieman
2:00	Cooling	Roger Stone
2:15	Subsystem integration	Roger Stone
2:45	Break	
3:00	Assembly and test	Roger Stone
3:30	Overall schedule and costs	Roger Stone
3:50	Committee session	
5:00	Close–out & action items (all)	
5:30	End	