

Notes and Statement of Work from the Split Quadrupole Review held 2 March 2010 at Fermilab.

Attendees included Akira Yamamoto, Marc Ross, Mike Harrison, Bob Kephart, Nikolay Solyak, Vladimir Kashikhin, Nikolai Andreev, Mike Lamm, and Jim Kerby.

Talks are posted:

<http://ilcagenda.linearcollider.org/conferenceDisplay.py?confId=4465>

Discussion notes and comments from the review:

Functional Requirements:

- The corrector requirements of  $\pm 40\text{A}$  comes from BDS matching in a few downstream elements. Does this make sense for all the correctors? This is a vertical corrector issue only due to the small vertical emittance.
- The horizontal correctors nominally run at 0A which makes any kind of feedback very difficult due to zero crossing regulation issues. Some input from an appropriate electrical engineer should be sought.
- Nikolai should evaluate with the other main linac technical designers whether a weak/strong corrector design with a location specific corrector package is preferred to the present concept of a standard package with all strong correctors.
- A concern was mentioned about vertical stability during the 1ms beam pulse. Does the cryostat "ring like a bell" when the beam and RF hits it?
- Will an offset beam induce currents in the magnet package.

Magnet Design:

- Given the requirements the dipole corrector performance should be measured at low currents ( $<5\text{A}$ ).
- What is the required quadrupole center stability?
- The support of the magnet package from the 300mm pipe needs to be re-analyzed with respect to:
  - The clamping of the magnet halves, and the conduction cooling path from the heat sink.
  - The use of an aluminum shell should be re-evaluated and a clamping mechanism more similar to conventional magnets utilized; this would also simplify the support system as the transition from Aluminum shell to SS HGRP would not need to be dealt with in the design.
  - The mechanical alignment is not clear, and analysis of the cryomodule mechanical tolerances is needed. The conduction cooling path should be flexible enough to not affect the alignment.
- The use of active or passive quench protection system should be evaluated.
- HTS leads should be incorporated in the cryomodule design.

Program:

- The first magnet should proceed as designed (with the shell/clamping re-evaluated) and plans made for testing in VMTF.
- The second magnet should be designed consistent with the weak quad specification, with weak horizontal and weak vertical correctors in the same package.
- Tentatively the 2<sup>nd</sup> magnet would be tested in VMTF and then installed in CM4.
- The measurements proposed for a test stand should be detailed, and compared to those possible in the VMTF / CM4 combination such that modifications can be made or at least the measurements that are not possible are known and understood.
- Subsequent discussions revealed that NML optics require a doublet. The weak quadrupole specification should be compared with the NML requirements.

Statement of Work for FY2010:

Fermilab will

1. Complete the specifications and design of a 'strong' split quadrupole as shown at this review.
2. Procure parts for such a quadrupole, assemble it, and prepare it for test in early FY2011 in VMTF.
3. Develop a split design for a split quadrupole / weak horizontal corrector / weak vertical corrector consistent with:
  - a. The 'weak' quad / corrector requirements developed for ILC
  - b. Installation in a cryomodule which would utilize HTS leads and other comments in the review, and not require major modifications to the current quad mounting scheme off of the HGRP.
4. Develop an initial comparison of the tests that can be done in VMTF, a new Horizontal Test stand (or a rebuilt SLAC cryostat), and those possible in a Cryomodule.
5. Hold a review of items 3 and 4 in late summer / early autumn.

A decision on the FY2011 program will be made at the time of the 2<sup>nd</sup> magnet review.

FY2010 Total cost = 560k\$ as shown on slide 12 of Jim Kerby's presentation at the review. As the ART had already advanced Fermilab 200k\$, the incremental cost for the remainder of the work is 360k\$.

With this document the request for these additional funds is transmitted to Bob Kephart, Fermilab-ILC Program Director.