

June 1, 2006

To: Distribution
From: GDE Change Control Board
Subject: Response to the Change Request for the BCD BDS section

Preamble

This is the CCB response to the proposed change on the BDS section of the April 23, 2006 version of GDE ILC Baseline Configuration Document [1]. CCB received the change request from A. Seryi on May 16, 2006 [2]. This change request was classified as Class-1. G. Blair and T. Markiewicz were assigned as the CCB reviewers. At the request by CCB, H. Yamamoto (WWS) [3], F. Richard [4], A. Enomoto (CF/S) [5] and J.-L. Baldy (CF/S) [6] contributed their remarks.

Change Request

This change request notes that a section of the BDS part of the BCD labeled “Upgrade to Gamma-Gamma” was left blank in the April 23, 2006 version. The change request seeks to provide the GDE team with guidance on what might be a logical path for this operational changeover while recognizing that much more work is required before a realizable, cost-able design is available. The expected outcome of this includes a notion that the gamma-gamma option be not excluded by the BCD while deferring any actual gamma-gamma compatibility design work to the future TDR time frame.

It is stated that gamma-gamma running requires a minimum crossing angle of 25mrad and a 250m long gas/water beam dump that is not compatible with e+e- beam dump requirements. It is stated that if it is desired to be able to return to e+e- running from gamma-gamma running, then a configuration must be found that allows for the simultaneous presence of both these dumps. The author suggests that either the baseline crossing angle of 20 mrad or the alternative configuration crossing angle of 14 mrad could allow future civil modifications to the tunnel geometry that, with relatively modest and reversible changes to beamline and detector position, would permit an extraction line dedicated to gamma-gamma at 25mrad. Modifying the 2mrad baseline crossing angle layout is dismissed as being akin to digging a new (3rd?) interaction region. Beamline layouts and a list of required R&D topics for future study are provided.

Discussion from the Scientific and Technical Standpoint

CCB examined documents on the gamma-gamma option at ILC that have been produced in the past. The reference [7] (Snowmass Summary Report) provides an outline of the gamma-gamma scheme that mainly relates to production of high-energy photons through the laser-beam interactions. It is apparent that more systematic and thorough evaluations and design proposals are necessary in the areas of beam parameters, beam sources (if they are affected by gamma-gamma specific requirements), operation mode, hardware

equipment related to high-power laser, and others. Obviously, this Change Request is the first of the gamma-gamma-related request which attempts to bring in substantial inputs to BCD.

H.Yamamoto and F.Richard contributed remark stating that while discussion on the gamma-gamma option has not yet been done extensively, the proposed description of the BDS upgrade for gamma-gamma would be very useful for forming a consensus on how to consider the gamma-gamma option.

A.Enomoto contributed remarks which offered a rough evaluation of the size of the gamma-gamma beam dump together with his assessment on the required tunneling work. It was indicated that the cost impact in terms of CF/S work for the additional gamma-gamma dumps is consistent with a Class-1-type configuration change. However, this estimate does not yet include the work associated with installation of beamline equipment and any other work that may be required in other areas of ILC, nor studies on the schedule implications of e+e- vs gamma-gamma change overs.

Discussion from the Change-Control Standpoint

An issue has been raised within CCB as to in which exact context this change request be evaluated.

First, with the given focus of GDE efforts on the Reference Design Report and the first-round costing associated with it, this Change Request ought to be flagged as “an entry for future discussion for the upgrade/alternative-type issues”. CCB finds that it is its duty to reorganize and improve its scheme of classifying incoming Change Requests, and to more adequately treat and tag similar cases in the near future [7].

Second, CCB notes the fact that while a reference has been made on the desirability of gamma-gamma option by the “Parameter Subcommittee Report” [8] submitted to ILCSC in 2003, little progress has been made on studies of the gamma-gamma case at LC from a system integration viewpoint. As mentioned earlier, no discussion exists in the present BCD for the operating parameters with gamma-gamma, for instance, whether as a Baseline or an Alternative configuration. Therefore, this Change Request submitted by the Leaders of the BDS Area Group is in an unfortunate position where it has to stand out without the backup of substantial supporting design materials in other parts of BCD.

Conclusion

1. The CCB expresses its whole-hearted gratitude to the Leaders of the BDS Area Group, Andrei Seryi and his colleagues, for their attempt at examining the gamma-gamma implications to BDS and for offering possible scenarios for revising the BDS to accommodate gamma-gamma running.
2. However, CCB notes the fact that an outline description does not yet exist for the design studies of the gamma-gamma option within the present BCD. The text offered by the requesters is an important part of it, but, naturally, it does not discuss the full impact of maintaining the gamma-gamma option

on the whole of the ILC project. Nor, as is recognized with the R&D to-do list, does it include adequate input from the relevant technical systems for even the BDS specific portion.

3. In this situation, the CCB cannot accept the proposal, as submitted, into the baseline. It is not appropriate that technical discussion which is part of a major system upgrade with significant changes to facility capability be made unilaterally when the full impact of the change on the rest of the project is not fully known.
4. Therefore, while again gratefully noting the submission, we hereby return it to the submitters while awaiting further developments on the topic, made in cooperation with the other Area, Global and Technical groups at the appropriate time. CCB suggests that such a taskgroup, under guidance of GDE Executive Committee, could be formed in the TDR timescale.
5. CCB also recommends the WWS group to more systematically survey the gamma-gamma upgrade option, including detector integration, possible impact on the interaction region and other related issues, thereby providing GDE with inputs to consider from the physics and detector perspectives. It would be highly desirable if a rough timetable for addressing these issues is made available by the time when RDR becomes finalized.
6. CCB acknowledges the need for reorganizing its scheme for adequately classifying incoming Change Requests on Alternative Configurations or System Upgrade Scenarios.

References

- [1] http://www.linearcollider.org/wiki/doku.php?id=bcd:bcd_home.
- [2] <http://lcdev.kek.jp/ML/PubCCB/msg00056.html>
- [3] Appendix A
- [4] Appendix B
- [5] Appendix C
- [6] Appendix D
- [7] CCB, in preparation.
- [8] http://www.fnal.gov/directorate/icfa/LC_parameters.pdf

END MAIN TEXT.

Appendix A.

Subject: Re: ILC BCD Change Request on BDS - May 17, 2006

From: Hitoshi Yamamoto

To: Nobu Toge

Cc: D. Angal-Kalinin, CCB, J. Brau, R. Richard, S.Seryi

Date: Mon, 22 May 2006 18:39:11 +0900

Dear Nobu,

The gamma-gamma option has not been discussed enough by general ILC people to form a consensus on how to realize it. On the other hand, it is endorsed by the scope document, and the general ILC public more or less agree that we have to think seriously about the gamma-gamma option.

Probably, the gamma-gamma session at Bangalore was the first occasion for general accelerator and detector people to discuss the gamma-gamma option together, and we have not settled down on realistic scenario of gamma-gamma upgrade. Such scenarios, when we figure them out, may have serious constraints on BCD such as the design of BDS tunnels.

I believe placing the description of gamma-gamma upgrade in BCD, as submitted by Andrei, would be very useful for helping to form a consensus on how to upgrade to gamma-gamma. The situation about gamma-gamma option is far from satisfactory, but the change-control submitted would be one of the efforts in right direction.

Appendix B.

Date: mardi 23 mai 2006 18:07 +0200

From: F. Richard

To: N.Toge, H.Yamamoto

Cc: CCB, D.Angal-Kalinin, J.Brau, A.Seryi, D.Miller

Subject: Re: [CCB-392] Re: ILC BCD Change Request on BDS - May 17, 2006

Toge san,

Sorry for not replying sooner but I had an email problem. I fully acknowledge the positive aspect of giving official recognition to the gam-gam option in the GDE. In Bangalore, worries were expressed that IR choices were not taking fully into account gam-gam constraints. For this reason I have added in my email D. Miller, our expert on gam-gam physics in the WWS/OC, for an opinion. Personally, I would worry that the extra bending needed for the 20/14 mrad options may have some implications on backgrounds in the detectors. Is this proposal compatible with running at 1 TeV?

Best regards,

Francois

Appendix C.

Subject: Re: [CCB-389] ILC BCD Change Request on BDS - May 17, 2006

From: A. Enomoto

To: N.Toge, P.Garbincius

Cc: V.Kuchler, A.Seryi, D.Angal-Kalinin, CCB, J.-L.Baldy, S.Ban

Date: Tue, 23 May 2006 13:08:43 +0900

Dear, Nobu and Peter

I would like to roughly comment on this issue as a member of Asian CFS group.

If we use 20mrad beam dump line, at the dump position (400m downstream of the IR), 25mrad lines are apart from 20mrad lines by $400\text{m} \times 0.0025 = 1\text{m}$ each on both sides. This seems 20 mrad beam dump tunnels also accept 25 mrad beams and extra tunnels are not necessary.

We heard the beam dump has a cylinder shape of 1.5m diameter. So both electron (positron) and photon dumps are installed together if the dump hall is expanded to the beam direction.

According to the Dump Meeting on May 3-5 at SLAC, the dump area is estimated 700m² x 4m high (2800m³).

[Discussion on specific cost guess-timate deleted by CCB for public circulation purposes]

Later expansion should be a discussion for radiation safety persons.

Atsushi

Appendix D.

Subject: RE: [CCB-389] ILC BCD Change Request on BDS - May 17, 2006
From: J.-L. Baldy
To: N.Toge, A.Enomoto
Cc: CCB, P.Garbincius, V.Kuchler, A.Seryi, D.Angal-Kalinin, S.Ban, A.Enomoto, M.Poehler, J.-P.Delahaye
Date: Tue, 23 May 2006 16:36:03 +0200

Dear Nobu,

Not being an accelerator physicist, it was difficult for me to figure out what are the implications in terms of CF of the proposed change from the data given for the gamma-gamma facility. Without going into details, I would consider two aspects :

- implications on beam line (25 mrad instead of 20 mrad for baseline): I agree on what is mentioned by Atsushi Enomoto in his mail of today: one meter difference would be accommodated in the same tunnel with very limited cost increases, if any. On the other hand, I do not see why there should be cost increases in the Detector hall itself apart from supporting, access platforms etc.
- As far as the new Beam Dumps are concerned, I based a quick calculation on 150m of 6m diameter tunnel (gas pipe) plus a small cavern at the end (water tank). A very rough cost estimate of two of these, including All civil engineering and "normal" Conventional Facilities gave me a total of xx.x M Swiss Francs, which is very close to yy M US Dollars.

Hoping this will help (To my knowledge, Vic is away from Fermilab these days).

Best regards

Jean-Luc

Subject: RE: [CCB-389] ILC BCD Change Request on BDS - May 17, 2006
From: Seryi, Andrei
To: A.Enomoto, N.Toge, P.Garbincius
Cc: CCB, V.Kuchler, D.Angal-Kalinin, J.-L. Baldy, S.Ban, A.Enomoto
Date: Tue, 23 May 2006 13:50:36 -0700

Dear Atsushi and all,

Please note that in scenario which was described in the submitted change request the change from 20mrad to 25mrad also involve moving the IP and detector by 1.8m. So, 400m downstream the beamlines are 2.8m apart. This probably change some of your numbers for the cost. There are certainly a lot of open questions for the gg upgrade that we need to solve.

Best regards

Andrei