

2006/12/22

To: Files  
From: Nobu Toge  
Subject: Minutes of the CCB Hearing on RTML CCR (CCR#23) Cost Implications

Date: Friday, 2006/12/15

Venue: WebEx

Time: 14:00-1540 GST

Present: N.Toge, C.Pagani, A.Seryi, D.Angal-Kalinin, T.Raubenheimer, D.Schulte, K.Kubo, W.Bialowons, K.Yokoya, P.Garbincius, T.Markiewicz, T.Shidara, G.Blair, B.Barish, J.Brau, F.Richard, S.Mishra, H. Yamamoto

#### 1. Opening

- Toge welcomed the participants, and noted that the purpose of this hearing is for CCB to understand the costing implications and the current status of design development concerning the BDS baseline configuration change request (CCR#23) that was submitted on 2006/11/28.
- Garbincius added F.Richard to the members who are under GDE costing NDA.

#### 2. Presentation by A.Seryi

- Seryi's presentation file has been distributed separately (For CCB's internal archive, it is [CCB-1042] at <http://lcdev.kek.jp/ML/CCB/msg01037.html> , and is attached to this memo (Appendix B).
- The first half of presentation (Slides 2 – 16) has been prepared in the form of response to the CCB inquiry which had been sent to BDS AG leaders on Dec. 8, 2006 (Appendix A1). The second half (Slides 17 – 20) concerned the cost impacts of CCR#23 (Related CCB communication of Dec.2, 2006, is reproduced in Appendix A2).

#### 3. Cost impacts

- Seryi explained the cost changes associated with this CCR.
  - a) The cost impact of this CCR is a substantial reduction and it amount to approximately 31-32% of the BDS cost as of Valencia meeting (i.e. 14mrad/14mrad two-IR version of BDS).
  - b) Hardware equipment to accomplish rapid switch-over of two detectors would incur some cost increase, however. Seryi explained that additional cost for detectors for purposes in this are currently estimated to be below 10% of the savings above.
- Based on the magnitude of the cost impacts, CCB determined that this CCR is to be classified as Class-2.

#### 4. Discussion

- Q (?): On Slide 7, what is the motivation behind “Z-calibration”?
- A: Operation with colliding beams is needed to establish the alignment of the detector relative to the beam and the internal alignment of the detector facility. The Z-pole is considered adequate because of the large cross section, particle multiplicity and other reasons. The operation period (quoted to be 1 – 0.1 days) required for this “Z-calibration” after each detector switch-over is still under examination.
- C: Z calibration was deemed necessary during LEP2 ( $E_{cm}=200$  GeV) to provide well known tracks (muons electrons with a given energy) and jets for purpose of calibration/alignment. This point was re-discussed at the end and it was said that such a calibration would also be needed for a switch over between the 2 IR.
- Q (?): On Slide 8-9, depending on the amount of plumbing work and prospects for other challenges on the hardware design around the detector facility, the time it might take to

- compete a physical switch-over is quoted to be somewhere between 1 day and 1 week, according to the experts. Is this the current understanding?
- A: Yes, and if one adds another week for calibration, when agreed necessary, the worst case estimate is about two weeks.
  - Q(?): On Slide 8, what does it mean to state "... In this case it may be reasonable to perform only about two exchanges of detectors in a year – one during summer shutdown and one in mid-winter".
  - When ILC will start to reach high lumi, say 100 fb-1/y, a yearly switch over could create some frustration in the detector community.
  - A: That subitem is trying to point out the consequence in case of a switch-over each taking 2 weeks. It is not necessarily meant to mean that this is the optimum operation arrangement for ILC with two detectors push-pull.
  - C: Would like to express a concern on discussion over rather short turn-around times for switch-over. We cannot sacrifice reliability of the switch-over procedure for the sake of speed. Proper engineering work is mandatory.
  - C: Naturally one cannot call switch-over to be fast if some hardware pieces become broken or an inordinate amount of tuning time results. It is a matter of proper use of the word "fast" or "quick".
  - C: Concerning the CCB inquiry (Appendix A1) the items 3-E and 3-F should be treated as issues of different categories. [This remark was greeted with general concurrence of those who were attending.]
  - C: Concerning the CCB inquiry (Appendix A1, again) the item 3-G may well be treated separately, also. In the 1-IR push/pull, while beam tuning is necessary with another set of QF-QD, the rest of BDS should be basically ready as is. In the 2-IR case, the entire BDS may have to be retuned depending on the duration of the hibernation time.
  - C (Toge): Obviously the CCB inquiry around items 1/2/3 need rephrasing to better qualify the questions that are being asked. I will give a try shortly (see Appendix C).
  - Q: What actually is the rationale for ILC's having to support two detectors rather than one?
  - A: This question is outside the current scope of CCB's mandate.
  - C: Some details of the cost numbers quoted by Seryi require reconfirmation with hardware groups and cost engineers.
  - C: In as much as the fluctuation of the cost numbers would not fundamentally affect the Classification of CCR, CCB is happy to leave the matter to the BDS AG leaders and GDE cost engineers.
  - Q (Toge): Any further remarks on the adequate amount of switch-over time, in case of 1-IR/push-pull to consider from engineering or physics standpoint?
  - C: A range has been shown for the switch-over time.
  - C: It appears difficult to commit to a number (# of days, weeks) at this stage of design development, and feel against making an easy decision under the assumption of very short switch-over.
  - C: The goal ought to be to achieve less than 1 week switch-over, with less than 10% of the integrated luminosity lost.
  - C (Toge): One of the colleagues, in a private communication, emphasized the importance of handling this CCR in ways to facilitate stronger participation of HE physicists into the future of ILC. While I cannot say what CCB would state in its recommendation, I think CCB will certainly pay attention to it. I would appreciate hearing further comments on CCB inquiry 1/2/3 which will be rephrased and be circulated shortly.

It is essential that the 2IR option be kept alive for a transition period, to allow for a fall back solution in case the Push Pull scheme appears impractical. This change, unlike many others, will have a strong impact in the HEP community and we may lose some support unless we do not close too soon the 2 IR scheme.

**END**

## Appendix A1

CCB inquires with regards to CCR#23 that was transmitted to BDS AG leaders on Dec. 8,2006 is reproduced below, together with the cover text of the email:

- 
- *Subject:* [CCB-1007] CCB Inquiry Sheet / Work Sheet for CCR#23 and Hearing
  - *From:* N.Toge
  - *Date:* Fri, 08 Dec 2006 13:36:38 +0900 (JST)

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Dear BDS AG Leaders,

Attached please find a CCB inquiry sheet / work sheet for CCR#23 (single IR, push/pull). It contains descriptions on several issues that CCB feel it has to chew on, and for which your responses, remarks, comments are greatly appreciated.

I hope you can give your reactions to some of these during the CCB hearing for CCR#23.

I am aware that Heuer Committee's report that is quoted in this week's ILC newslines

<http://www.linearcollider.org/cms/?pid=1000352>

also should be put into context, yet the present CCB inquiry sheet / work sheet has not completed the desirable integration of CCB's thought process with it. So please bear with us if some of our inquiries seem apparently already answered by Heuer. Your comments are always welcome.

I am also attaching the connection information for the CCB hearing on CCR#23 next Friday (exactly one week and a half day from now).

Sincerely,

- Nobu Toge

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December 7, 2006

To: Proponents for CCR#23 (single IR, push/pull) and CCB Files  
From: CCB  
Subject: Question / Worksheet for CCR#23

### Questions or Requests for Comments :

- 1) CCB feels that it might be preferable to replace the term "complementary detectors" with just "two detectors" in BCD, since it is somewhat unclear if the two detectors are desired to satisfy the needs of complementarity or others. Comments?
- 2) One critical technical question (likely the only real critical technical question, since others being mostly engineering or regulation-type issues) is that of the relative alignment of the

QD0 and QF1 components of the final doublet, in terms of ensuring the beam collision, and thus, the luminosity delivery. What is our current knowledge on the level of required alignment, and their reproducibility after each detector roll-in? Comments?

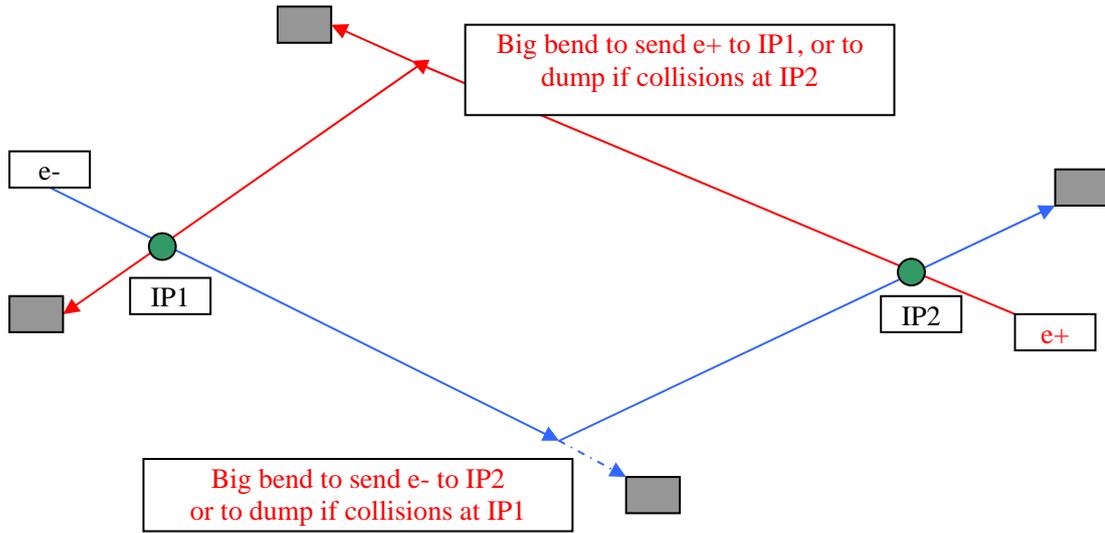
- 3) CCR#23 offers best case time estimates for a detector exchange. What is the worst case one can anticipate? Issues to look into include:
- a. Time to remove shielding
  - b. Deactivation of detector SC solenoid & final doublet
  - c. Detector move
  - d. Reactivation of detector SC solenoid & final doublet
  - e. Replace shielding
  - f. Retune ILC for Z-pole calibration run
  - g. Z-pole run time
  - h. Retune for physics running at desired energy

Comments?

- 4) Some CCB members heard (private) remarks that plumbing work (and associated certification work) of Helium transfer tubes for the detector solenoids could mean a major undertaking that may turn out to be incompatible with the time scale of the switch-over scenario quoted by Breidenbach and Richter. Comments?
- 5) CCB would like to learn if the physics folks are concurring (if they do) to this CCR from the standpoint of considering BOTH these upper and lower limits of the time that it takes to do the detector switch-over, as per 3), or possibly together with 4), above. Any known remarks from the physics folks? <sup>1</sup>
- 6) CCB would also like to understand that whatever switch-over time physics and accelerator sides decide to consider reasonable, this “consensus” is likely to become a part of a “phys-acc treaty”, in as much as physics folks won’t give up on the idea of two detectors, complementary or alternating. In other words, it can mean a “need for commitment” that GDE should try to abide by. Any remarks from physics folks and/or the BDS AG?
- 7) Is there not any “escape hatch” to a 2-IP design once we go forward with this CR? Our guess is that there is not. If realignment, etc. begins to take too long, the only direction one has to retreat to is that of longer (year-long?) runs with one detector at the IP at a time. Comments?
- 8) There has been at least one suggestion (from J.Jaros) of a geometry based on two fixed detectors, a BDS that uses “90%” of its length to service them both, and a post IP big bend to the other IP. Disrupted beam from one IP (IP1) is dumped and not sent to the 2<sup>nd</sup> IP (IP2). If IP2 happens to be the designated interaction point at that time, the beam will pass through IP1 without being focused, and so on. Is there any other solution? It is clear that the concepts definitely prefer stable conditions and are acquiescing to this CR (to the extent that they are) under duress. See a simple cartoon below. Any comments?

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<sup>1</sup> This is an inquiry which had better be directed to WWS. We might spend some time on it if the time allows during the CCB hearing.



## Appendix A2

Piece of email communication concerning CCB inquiry on cost impacts of CCR#23 is reproduced below:

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- *Subject:* [CCB-982] CCR#23 - Scheduling CCB hearing (Need a bit more inputs)
  - *From:* N.Toge
  - *Date:* Sat, 02 Dec 2006 08:55:24 +0900 (JST)
- 

Dear Colleagues,

...

Another topic.

Peter G pointed out that there are three categories of cost issues. According to him:

1. Beamline component issues - easy, already in Andrei's spreadsheets.
2. CF&S costs - Andrei has numbers, but not vetted through CF&S. Andrei + Co. won't have their new estimates until at least December 8.
3. Additional costs to easily move detectors, shielding, and utilities (cryogenics, FF quads, beamline) - which need engineering and therefore, I would not think that a cost estimate would be available on this timescale.

So I understand that 1 is fine. CCB is not a super accurate costing review body, so I think only approximate number for 2 will be fine, too.

But,

Uncertainties over 3, if they are huge, are a potential problem for CCB. What I want to think is that 3, at most, won't cost more than say 10~20M\$, for instance, so that its impact will be well within the error bar, etc. If CCB can hear that kind of informed guess, that helps. So, try to give CCB your informed guess (just some upper limit numbers will do), really, please.

Best regards,

- Nobu Toge

## **Appendix B**

Presentation material (with all cost numbers substituted by fractions) shown by A.Seryi during the hearing is reproduced below:



# For CCB hearing on CCR #23

December 15, 2006

BDS area leaders

Deepa Angal-Kalinin, Andrei Seryi, Hitoshi Yamamoto

cost numbers removed



- This talk contain
  - **answers to CCB questionnaire**
  - **cost information**
- More materials has been supplied earlier in
  - **CCR text and references therein**
- Also available are
  - **Statements from Concepts, WWS and MDI panel**



# CCB question 1

- *CCB feels that it might be preferable to replace the term "complementary detectors" with just "two detectors" in BCD, since it is somewhat unclear if the two detectors are desired to satisfy the needs of complementarity or others.  
Comments?*

*CCB questions are in italic*

- **The “complementary detectors” is what also written in WWS cover letter.**
- **We leave this is up to WWS, and agree to change it in BCD to “two detectors” if WWS would recommend that**
- **However, a qualifier seems necessary. For example “two identical detectors” certainly is not what we are trying to say**



## CCB question 2

- *One critical technical question (likely the only real critical technical question, since others being mostly engineering or regulation-type issues) is that of the relative alignment of the QD0 and QF1 components of the final doublet, in terms of ensuring the beam collision, and thus, the luminosity delivery. What is our current knowledge on the level of required alignment, and their reproducibility after each detector roll-in? Comments?*

- Needed alignment correction after the move may be about a mm
- QD0 and QF1 cryostats have movers capable to align them to better than a micron
- Alignment system (e.g. interferometer network between cryostats and tunnel) should be able to make initial alignment to better than 100microns with respect to other FD and beamline, and better than 10micron between neighboring cryostats of FD
- Beam based alignment can cope with such errors of FD position as shown in simulations ( <http://ilcagenda.cern.ch/conferenceDisplay.py?confId=1289> )
- Corrector coils in each magnet of FD can correct for the remaining misalignments of magnetic centers
- What hardware is different than in non-push-pull case? Only the alignment (perhaps interferometer) network between QD0 and QF1 cryostats. All other systems should exist anyway

- *CCR#23 offers best case time estimates for a detector exchange. What is the worst case one can anticipate?*  
*Issues to look into include*
  - *Time to remove shielding*
  - *Deactivation of detector SC solenoid & final doublet*
  - *Detector move*
  - *Reactivation of detector SC solenoid & final doublet*
  - *Replace shielding*
  - *Retune ILC for Z-pole calibration run*
  - *Z-pole run time*
  - *Retune for physics running at desired energy*





# CCB question 3

## III.A.2.g Z0 pole calibration

<http://hep.uchicago.edu/~oreglia/siddod.pdf>

We have not yet given this issue real study, but expect that a very large number of tracks will be required to align the tracking detectors and perhaps to cross calibrate the calorimeters. If Z calibration runs are utilized then the data should be collected at full field. Experience from SLD shows that of order 500k Zs was just about sufficient to align a system of 96 CCDs including non-planar shape corrections for the sensors in the vertex detector. We think that the trackers need to be designed with an alignment friendly awareness - nice overlap regions and lever-arms and preferably a high degree of symmetry. We have not thought much about aligning the endcap yet. That could require more data.

- If Z pole calibration to be redone and assuming that will require 1E6 Zs, at (conservative )  $L \sim 1E32$  ( $1E4$  Z/hr) will need 100hrs or  $\sim 4$  days
- **However:** With regard to whether or not dedicated Z calibration runs are required, we note that there are actually more charged hadrons, electrons, muons, photons and neutral hadrons produced at  $E_{cm}=500$  GeV than at  $E_{cm}=M_Z$  assuming an integrated luminosity ratio of 100:1 for the two energies. This is true for all particle energies and angles, and is due to high cross-section processes such as  $e^+e^- \rightarrow e\nu W$ ,  $eeZ$ ,  $\gamma Z$  and  $\gamma e \rightarrow \nu W$ ,  $eZ$ . Figure

Missing at  $E_{cm}=500$  GeV is the large number of 45 GeV monochromatic back-to-back quark jets and leptons. This will make some calibration tasks more complicated if only  $E_{cm}=500$  GeV data is used. However, many charged track pairs at  $E_{cm}=500$  GeV will be back-to-back in  $r-\phi$ , and the knowledge of the Z and W masses along with precise cross-section calculations can probably be used to obtain excellent energy scale calibrations using  $E_{cm}=500$  GeV only. We conclude that further studies are called for in order to determine if Z calibration runs are necessary.

This is a topic where there are differences in opinions in four concepts



# CCB question 3

<http://www.ilcldc.org/documents/dod/outline.pdf>

The basic calibration of the TPC can be done with Z decays accumulated by running the accelerator at 91 GeV. Extrapolating from LEP experience about 10/pb of data at the Z peak will be sufficient during commissioning to initially calibrate the TPC, and typically 1/pb during the year may be needed depending on the background and energy of the ILC machine, in order to track changes in the calibration.

<http://ilcphys.kek.jp/gld/documents/dod/gliddod.pdf>

The tools for solving this issue are Z peak running, the laser system, the B-field map, a matrix of hall plates and NMR probes and the silicon layers outside the TPC. In general about 10/pb of data at the Z peak will be sufficient during commissioning to master this task, and typically 1/pb during the year may be needed depending on the background and energy of the ILC machine. A laser calibration system will be foreseen which can be used to

- With same conservative  $L \sim 1E32$  at Z, this is 1E5sec initially or 1e4sec during the year (or order of 1 and 0.1days)



# CCB question 3

- The hardware can be designed to be compatible with a ~one day move, and this can be a design goal
  - **Need to study cost and reliability versus the move duration**
  - **Need to study regulations in each regions**
- A.Yamamoto-san presented a scheme (which includes warming-up the cold-box and disconnecting room T lines) and give an estimation of one week (many other tasks can be done in parallel with cryo work), which can serve as conservative boundary of the range
- With another week for calibration, if it is needed, the worst case estimate is about two weeks
  - **In this case it may be reasonable to perform only about two exchanges of detectors in a year – one during summer shutdown and one in mid-winter**



# CCB question 4

- *Some CCB members heard (private) remarks that plumbing work (and associated certification work) of Helium transfer tubes for the detector solenoids could mean a major undertaking that may turn out to be incompatible with the time scale of the switch-over scenario quoted by Breidenbach and Richter. Comments?*
  - **The note by A.Yamamoto presented a scheme where the main difference in assumptions is warming-up the cold box and disconnecting the room T high pressure He lines, which lengthen the move schedule to about a week**
  - **According to Tom Peterson, it is possible to make long flexible room T supply/return lines, and avoid the need to disconnect them, which allow to have much faster exchange. Also, if a system is designed to allow disconnect, there is no need for recertification after such procedure.**
  - **In discussion on Dec.14, A.Yamamoto confirmed that scheme as assumed by Tom P. can be build, but at this early stage A.Y. is more comfortable with the conservative scheme**



# CCB question 5 (to WWS)

- *CCB would like to learn if the physics folks are concurring (if they do) to this CCR from the standpoint of considering BOTH these upper and lower limits of the time that it takes to do the detector switch-over, as per 3), or possibly together with 4), above. Any known remarks from the physics folks?*
  - **It appears that several days to one-two weeks time scale were mentioned a lot by physics colleagues which may mean that this range is acceptable (WWS may need to clarify this)**

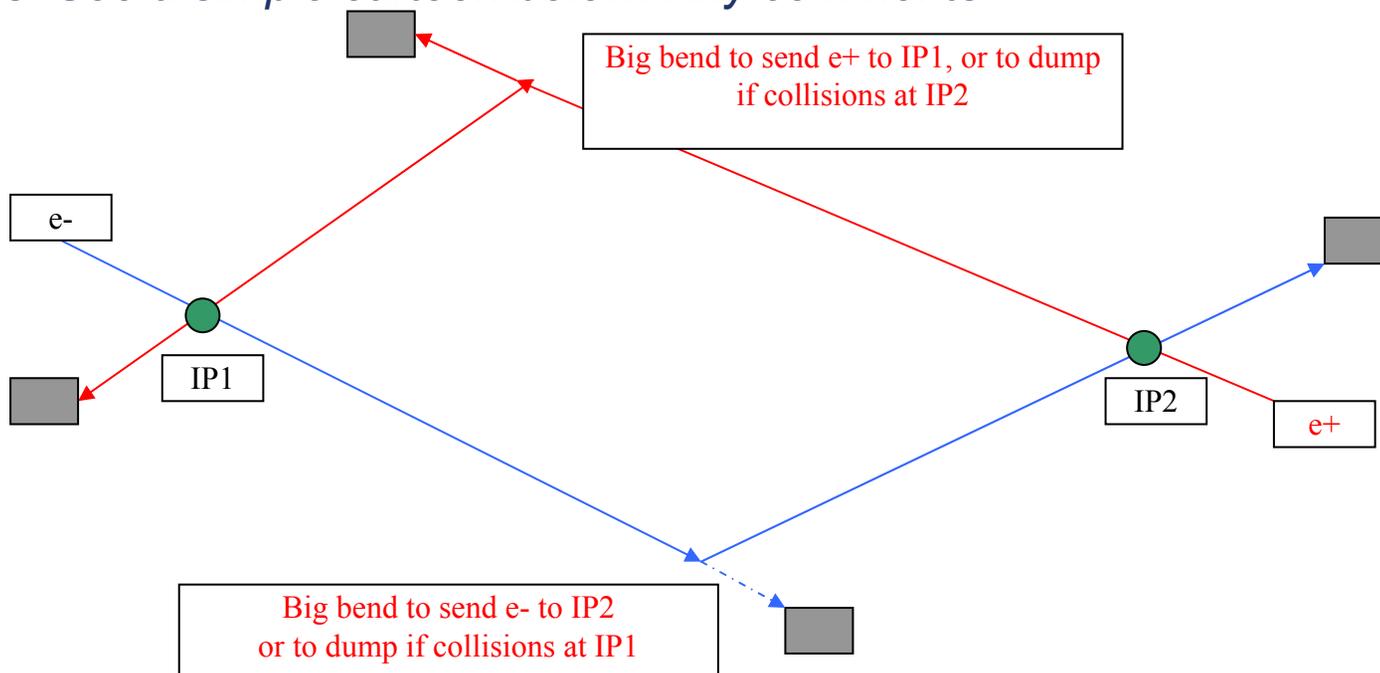


## CCB question 6

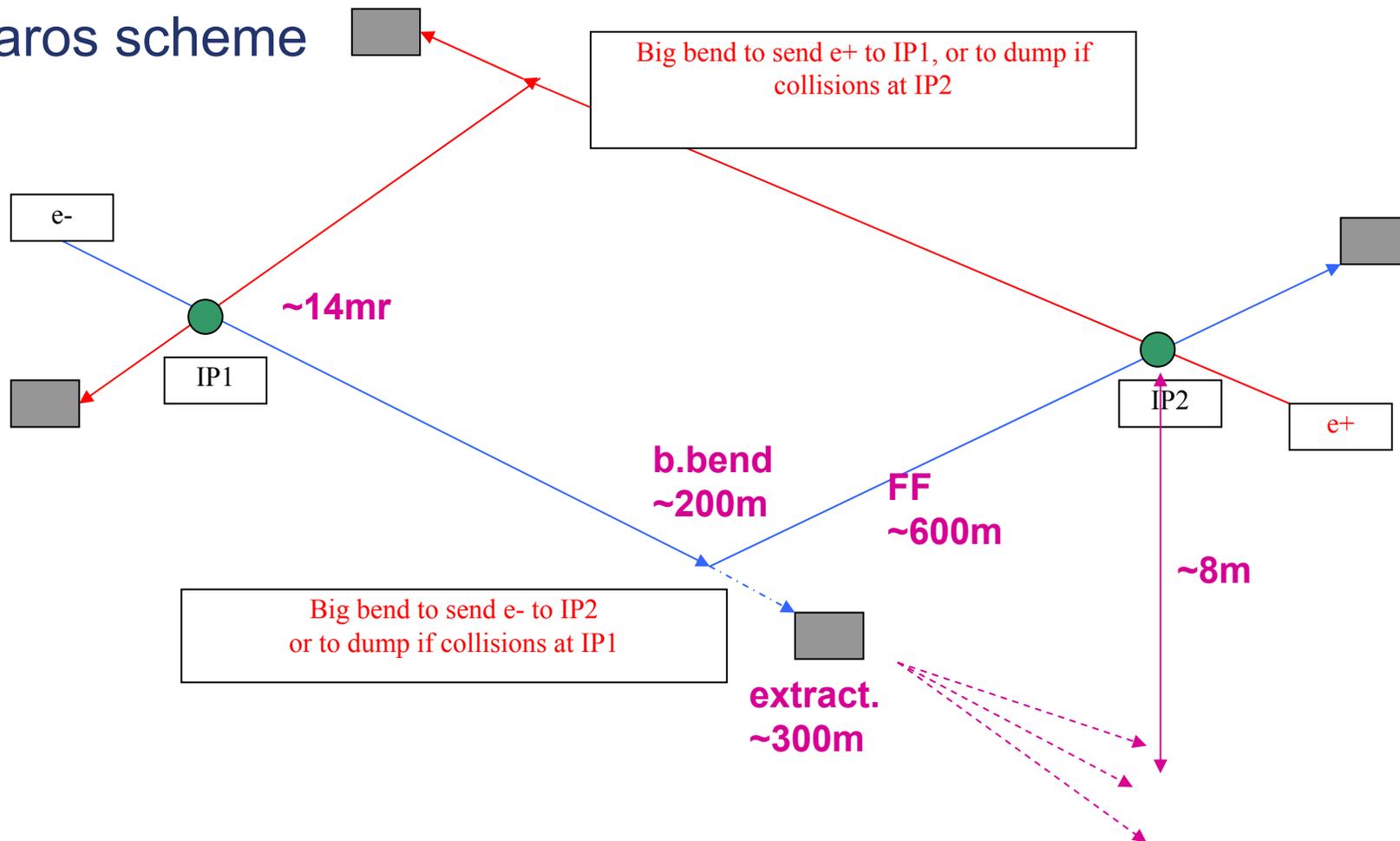
- *CCB would also like to understand that whatever switch-over time physics and accelerator sides decide to consider reasonable, this “consensus” is likely to become a part of a “phys-acc treaty”, in as much as physics folks won’t give up on the idea of two detectors, complementary or alternating. In other words, it can mean a “need for commitment” that GDE should try to abide by. Any remarks from physics folks and/or the BDS AG*
  - **From BDS side, one may consider studying the range between one day and one week and optimizing the design versus cost, performance, reliability, etc.**

- *Is there not any “escape hatch” to a 2-IP design once we go forward with this CR? Our guess is that there is not. If realignment, etc. begins to take too long, the only direction one has to retreat to is that of longer (year-long?) runs with one detector at the IP at a time. Comments?*
  - **With single beamline and push-pull IR, if unforeseen problems like those mentioned would be encountered very late, one would**
    - start with longer runs
    - and try to fix the hardware (including the detector internal alignment system) to allow faster switch and shorter runs

- There has been at least one suggestion (from J.Jaros) of a geometry based on two fixed detectors, a BDS that uses “90%” of its length to service them both, and a post IP big bend to the other IP. Disrupted beam from one IP (IP1) is dumped and not sent to the 2nd IP (IP2). If IP2 is happens to be the designated interaction point at that time, the beam will pass through IP1 without being focused, and so on. Is there any other solution? It is clear that the concepts definitely prefer stable conditions and are acquiescing to this CR (to the extent that they are) under duress. See a simple cartoon below. Any comments?*



J.Jaros scheme





# CCB question 8

- Collimation and/or diagnostics outside, FF has to be inside, after big bend => scale large, ~1km between IPs
- Two more dumps
- Muons from dump go through detector
- Both detector see beam always (cannot access one detector while other is taking data)
- All beamlines have big bend – limit of energy reach
- Big bend aperture need to accommodate ~1mr beamstrahlung photon cone (~0.5m aperture!) => high power consumption. Or intermediate photon collimator/dumps
- Detector solenoid field before FF couples the beam
- May require larger vertex radius
- Crab kick need to be separate for IP1 & IP2, require complicated compensation
  
- With these issues, the scheme neither viable nor cheaper



- Reported to CCB on Aug.25
  - **wbs.1.6 baseline 20/2: xxx or 162.2%**
  - **estimation of 14/14 IR: xxx or 136.8%**
- Since then: implemented short muon spoilers, on-surface assembly, redesigned FD, TFO, vacuum, redesigned CFS tunnels, changed design of water and air cooling systems, decimated bends, removed any spares and overheads, scrutinized all tech area costs, etc.
- Valencia wbs1.8
  - **baseline 14/14: xxx or 100%**
  - **estimate for single p-p IR: xxx or 69.1%**
- Since then: updates on several systems (still some updates are not received) wbs1.9:
  - **single p-p IR: xxx or 67.6%**
- Estimation of saving, in Value cost, is xxx-xxx or 31-32% of BDS cost



# CCB question on cost

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- *3) Additional costs to easily move detectors, shielding, and utilities (cryogenics, FF quads, beamline) - which need engineering and therefore, I would not think that a cost estimate would be available on this timescale.*
- *Uncertainties over 3, if they are huge, are a potential problem for CCB. What I want to think is that 3, at most, won't cost more than say 10~20M\$, for instance.. so that its impact will be well within the error bar, etc. If CCB can hear that kind of informed guess, that helps. So, try to give CCB your informed guess (just some upper limit numbers will do), really, please.*

- Included in the wbs1.9 cost as provision for push-pull:
  - **FD design is push pull compatible – QD0 cryostats is duplicated, amounts to minus xxx**
  - **increased length (+10m) and height (+2m) of collider hall to account for platform under detector (which may or may not be needed), amounts to about xxx**
  - **steel plates (for compatibility with air-pads) covering 20\*80m amounts to about xxx**
    - For this one it could be argued that this is needed regardless of push-pull, for detector assembly



# Additional cost info

- Shielding wall needed anyway. The difference is due to arrangements to make it movable
  - **J.L-Baldy: “included is movable shielding: cost difference is in the order of 50%, which gives a total of xxx for the one piece fixed wall.”**



# Additional cost for detectors

- Shielding (pacman) cost –needed anyway
- Additional for moving the detector
  - **M.B.: at most xxx**
  - **J.Amann: xxx**
- Quad alignment –needed anyway, add interferometer between cryostats – less than xxx
- Solenoid power supply on detector (as opposed to on floor), M.B: less than xxx (delta cost).
- Solenoid cryogenics on detector (instead of floor)
  - **M.B: less than xxx**
  - **A.Yamamoto: less than xxx, at most xxx**
- Detector internal alignment – needed anyway
- Arrangements to ensure magnetic map is invariant to move from the measurement place to IP – needed anyway
- So, the total additional cost for detectors may be in the range of xxx-xxx (was stated that this is below 10% of the savings)



# Summary

- Using single p-p IR saves about one third of BDS cost, or in other words the two IR BDS is by about 50% more expensive than single p-p IR BDS
- Engineering design need to be developed during EDR time

## Appendix C

Part of post-hearing communication concerning CCR#23 is reproduced below, with slight editing to improve readability:

- 
- *Subject:* [CCB-1038] CCR#23 - Rephrased Q5
  - *From:* N.Toge
  - *Date:* Sat, 16 Dec 2006 01:38:46 +0900 (JST)

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Dear CCB Colleagues,

With regards to CCB inquires on CCR#23 that is reproduced in Appendix A1, it became apparent during the CCB hearing today (Dec.15, 2006) the Question 5 needs more qualification in order for the exchanges of remarks to be more coherent and useful.

So, here are my several qualifying statements in the hope of sharpening the discussion:

- a) The “recovery time from a detector switch-over” in question is in the context of this discussion is the time that it takes us to recover reasonably stable beam collisions to start serious beam tuning. The time that it takes to do full tuning of the luminosity, background and "detector calibration" are to be added to it (i.e. I am separating out 3-f,g,h). I am afraid that latter items are even less quantified in terms of beam time at present, although some attempts are made (ref: Appendix B).
- b) The “recovery time” in question naturally means “reliable recovery”. If some HW components become broken during the switch-over process, the resultant down time will have to be part of “recovery time”.

Let us not get confused by concerns like “fast but unreliable switch-over”; things like that just are a kind of “long switch-over”.

- c) The “recovery time” is likely to vary, as function of experience accumulated by the team, both accelerator and detectors.

If the “ultimate recovery time” is deemed 1 day (week), for instance, in the first trial it might take 3 days (weeks). Then it would become gradually shorter, as the teams repeat the exercise. Whether the said "recovery time" is acceptable, etc has to take such possibility into account.

- d) To further on point c) above, in an early stage of ILC operation, not only physics colleagues but also the accelerator team will be under a big pressure to debug the hardware, calibrate the equipment, learn what is wrong, develop consistent and coherent operational procedures, improve them, etc. Obviously it is a complex issue which also demands taking a look at annual operation plan including the maintenance down time and so on (imagine any start up experience at a major colliding beam experiment).

The question on “acceptable” needs to be looked at in that context, which simply means that “beams are not necessarily yours all the time, just because you are there, and the beams are there, up to a certain stage”.

I would appreciate hearing remarks from any concerned parties, with considerations on these (and maybe other) aspects.

- 
- *Subject:* [CCB-1040] Re: CCR#23 - Rephrased Q5
  - *From:* Francois Richard
  - *Date:* Fri, 15 Dec 2006 17:57:17 +0100
- 

Dear Nobu,

For some items, let me try to respond:

As pointed out very rightly by Barry(?) items F to G are also entering the 2IR scheme. All other items are relevant to push-pull. Therefore a fair comparison would be: how does this time, A to E, compares to switching from the 2IR (assuming that, in the latter, detectors will also need re-calibration at the Z pole)? In my view this constitutes the main issue.

- 
- *Subject:* [CCB-1041] Re: CCR#23 - Rephrased Q5
  - *From:* Jim Brau
  - *Date:* Fri, 15 Dec 2006 10:05:15 -0800
- 

Dear Nobu,

Thank you for this summary of the meeting this morning.

I concur with Francois' comment (as was also noted by Barry this morning) that we should not confuse the time needed for calibration (3 f-g) with the time associated with the push-pull operation.

I have heard it said that there may even be an advantage in terms of restoring beams for the push-pull relative to the 2 IR case, since you are mostly using the same beamline instrumentation. Do you agree with this?

Finally, I want to say that it is completely understandable that there will be a learning curve on this, and we would hope the time required would decrease over time. I think we can say our goal is to achieve less than 1 week switch-over, with less than 10% of the integrated luminosity lost. If we can ultimately achieve a fraction of a week, as some expect, that would be a bonus.

Best regards,  
Jim