Report from CRP

ILC-CR-0002:

Baseline optics to provide for a single L* optics configuration

N.Terunuma (KEK)

Change Review Panel for ILC-CR-0002

- **Nobuhiro Terunuma (chair, CMB/TB)**
- **Karsten Büßer (MDI leader)**
- **Tom Markiewicz (CMB)**
- **Nick Walker (CMB/TB)**
- **Glen White (BDS leader)**

Minutes of the 1st CMB meeting (Sep.25)

2. ILC-CR-0002: Baseline optics to provide for a single L* optics configuration

2.1. The proposal to go for a common L* value for both detectors is generally accepted

2.2. A common L* value of 4m, with a range of 3.5 to 4.5m for the final value, is considered a reasonable value for further studies (pending feasibility studies by ILD)

2.3. A Change Review Panel (CRP) will be set up to work out a common solution between BDS, ILD and SiD

2.4. The CRP will be chaired by NT, with Karsten Büßer (KB), TM, NW and GW as further members

2.5. The CRP will report back to the CMB during the LCWS in Belgrade

L* (3.5~4.5m) related talks in BDS sessions

BDS:

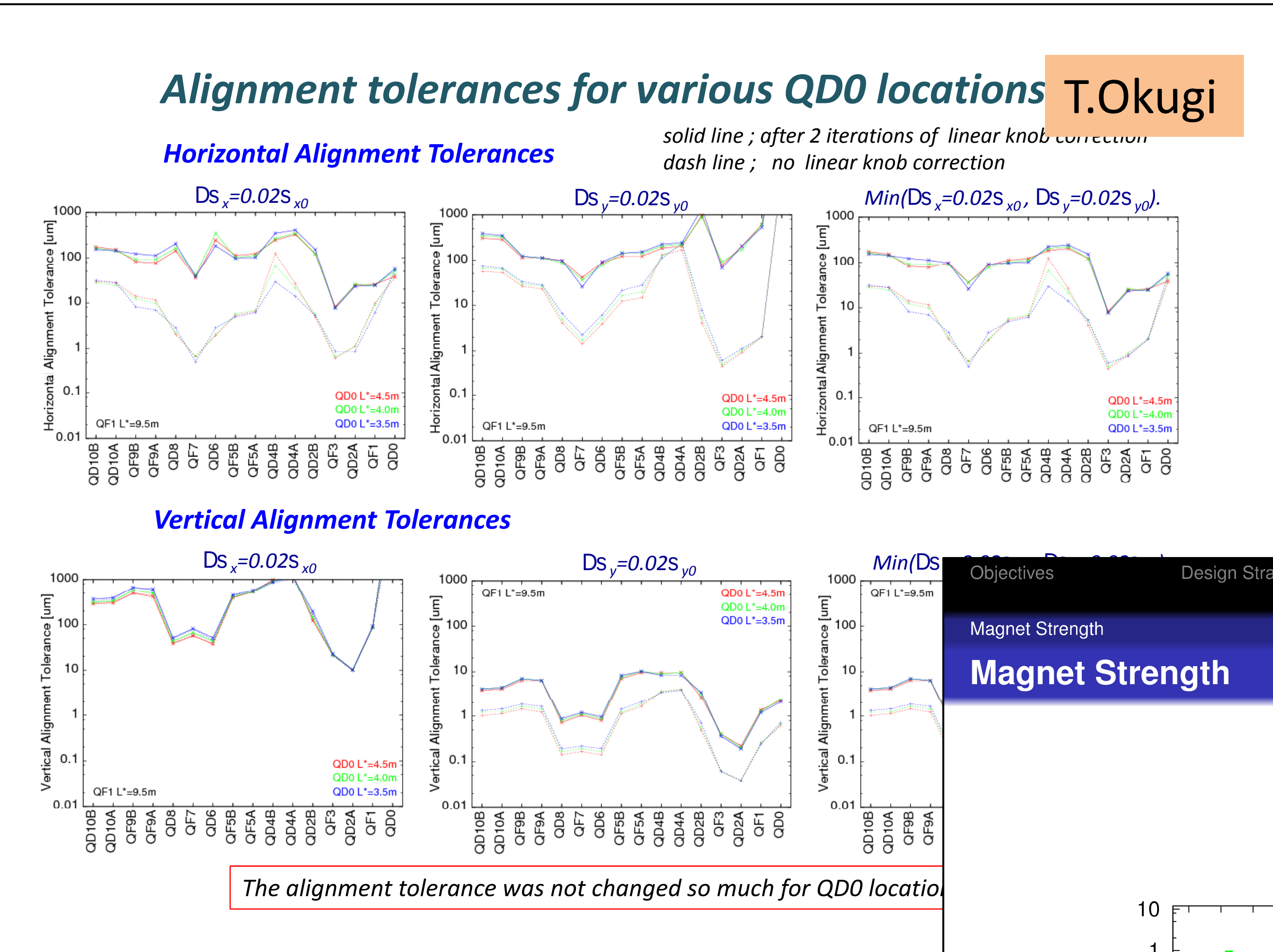
- FFS Optics (T.Okugi)
- ILC BDS Collimation (G.White)
- Optics (E.Marin)
- Main Dump Line (Y.Nosochkov)
- ILC IP parameter optimization (T.Okugi)

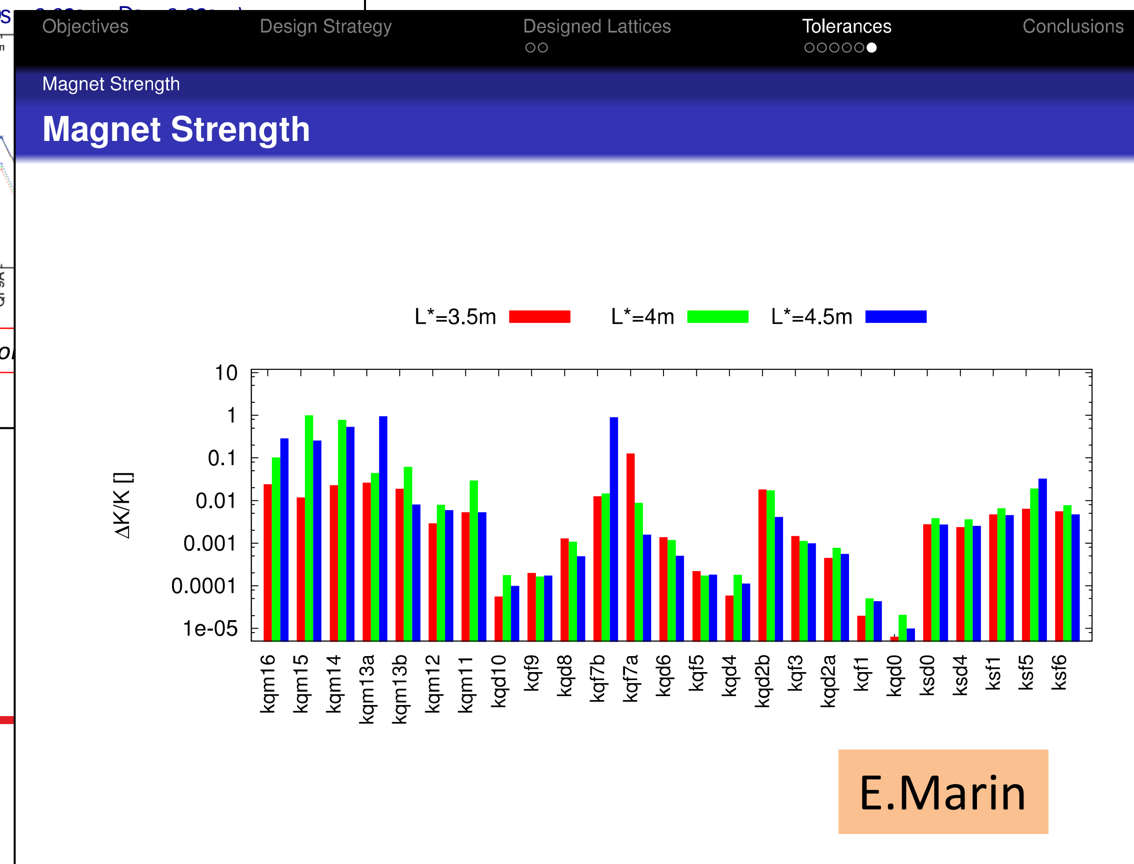
Joint with MDI:

- Single L* CR –MDI design issue (K.Buesser)
- IR Vacuum Pressure Level (T.Tauchi)
- Advanced IR Magnet Designs for the ILC in Japan (B.Parker)

Tolerance studies (alignment, field error)

T.Okugi





E.Marin

Collimation studies…

10/7/2014 G. White, SLAC 8

Required Collimator Spoiler Apertures

Name	L*=3.5m		L*=4.0m		L*=4.5m	
	X	Y	X / mm ($N\sigma_x$)	Y / mm ($N\sigma_x$)	X / mm ($N\sigma_x$)	Y / mm ($N\sigma_x$)
SP1	-	-	-	-	-	-
SP2	-	-	0.43 (3.9)	0.2 (24)	0.48 (4.3)	0.2 (24)
SP3	-	-	0.6 (30)	0.2 (200)	0.4 (21)	0.21 (203)
SP4	-	-	0.43 (3.9)	0.2 (24)	0.48 (4.3)	0.2 (24)
SP5	-	-	-	-	-	-

- Requirement: collimators should be set to allow NO POSSIBLE SR HITS IN IR
- "-" = no collimation needed at this location to prevent IR SR hits.
  - (L*=3.5m optics completely shielded by magnet apertures)
- TDR calls for 1-2E-5 main beam loss (>4.25σ)
  - (Max with all muon spoiler space filled = 1E-3 beam loss => 3.3σ)
- **Tightest L*=4.0m aperture = SP2/SP4 = 3.9σ = 9.6E-5**
  - *Need to refine collimation phase-advances & design EXT optics*
- **Tightest L*=4.5m aperture = SP2/SP4 = 4.3σ = 1.7E-5**

G.White, LCWS14 BDS

Collimation depths for various QF1 locations

Collimation depth was calculated for ECM=500GeV.

(QD0 L*) = 4.0m
(Half aperture of SPEX) = 1.60 mm (Dp/p = 1%)

QF1 L*	QF1 Length	Collimator Half Aperture (SP2/SP4)	
		X collimator	Y collimator
L*=9.5m	L=2.0m	0.62mm (4.4 s)	0.59mm (70 s)
L*=9.0m	L=2.0m	0.66mm (4.7 s)	0.57mm (68 s)
L*=9.5m	L=1.0m	0.67mm (4.7 s)	0.58mm (68 s)

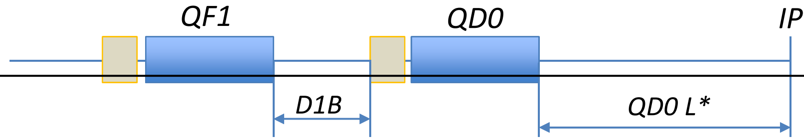
Horizontal collimation depth will be wider, when the QF1 L is decreased.*

We had better to keep the large horizontal collimation depth especially for small energy.
Short QF1 is same effect to make QF1 close to IP.

T.Okugi, LCWS14 BDS

Introduction

Presented at BDS meeting at 2014/09/04 by T.Okugi



Summary

- *We must consider the L* issue not only about QD0, but also combination of QF1.*

QD0 location

- *Most of the tolerances for QD0 L*=3.5-4.5m is comparable, when we set to QF1 L*=9.5m.*
- *It is better to set L*=4.5m to make large horizontal collimation depth.*

QF1 location

- *QF1 should be set as close as possible to IP to make better tolerances and horizontal collimation depth (more effective than QD0 location).*
- *Short QF1 magnet is same effect to make QF1 close to IP.*
- *Since I only investigate only QD0 L*=4.0m, I will check QD0 L*=4.5m after LCWS14.*

QF1 prefers closer to IP

Low energy operation (E_{CM}=250GeV)

- *When we operate only with QD0A or QD0B, the momentum bandwidths are smaller than original optics.*
- *When we operate only with QD0B (upstream; longer QD0 L*), the horizontal collimation depth is increased a little bit..*
- *It seems difficult to use the split QD0 option at least QD0 L*=4.0m*
- *I will check the low energy optics for QD0 L*=4.5m after LCWS14.*

Need study on 250GeV for L* choice (agreed by Glen, Okugi)

Questions to detector group

Can we move QF1 to be close to IP (closer than 9.5m) ?

When QF1 or QD0 will be moved to be close to IP, is the IP vacuum level acceptable to measure the small luminosity for beam tuning ?

T.Okugi, LCWS14 BDS

MAIN DUMP LINE: BEAM LOSS SIMULATIONS WITH THE TDR PARAMETERS

Y. Nosochkov
E. Marin, G. White (SLAC)

LCWS14 Workshop, Belgrade

SLAC

Dump line L* options

Three L* configurations have been previously designed for the dump line. Free space downstream of IP in these cases is L_{ex}* = 5.5 m, 5.95 m, 6.3 m corresponding to the FF L* = 3.51 m, 4.0 m, 4.5 m. Only QDEX1 changes position in these dump line options. This study is performed for the dump line option with L_{ex}* = 6.3 m (L* = 4.5 m).

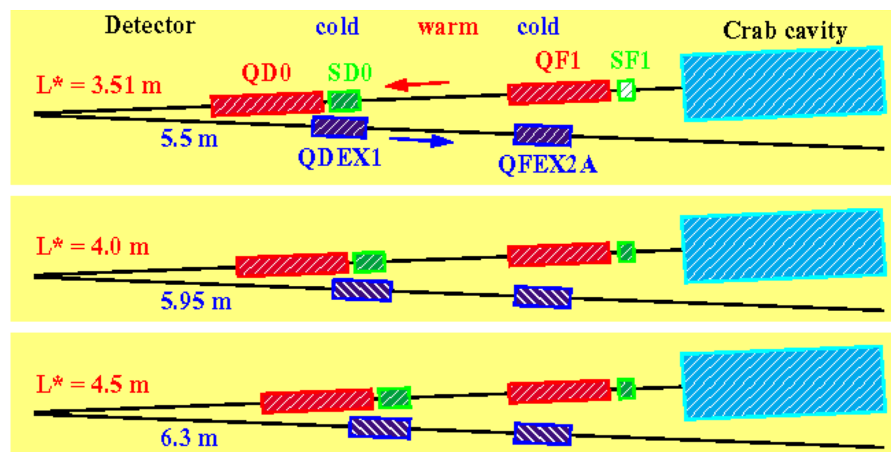
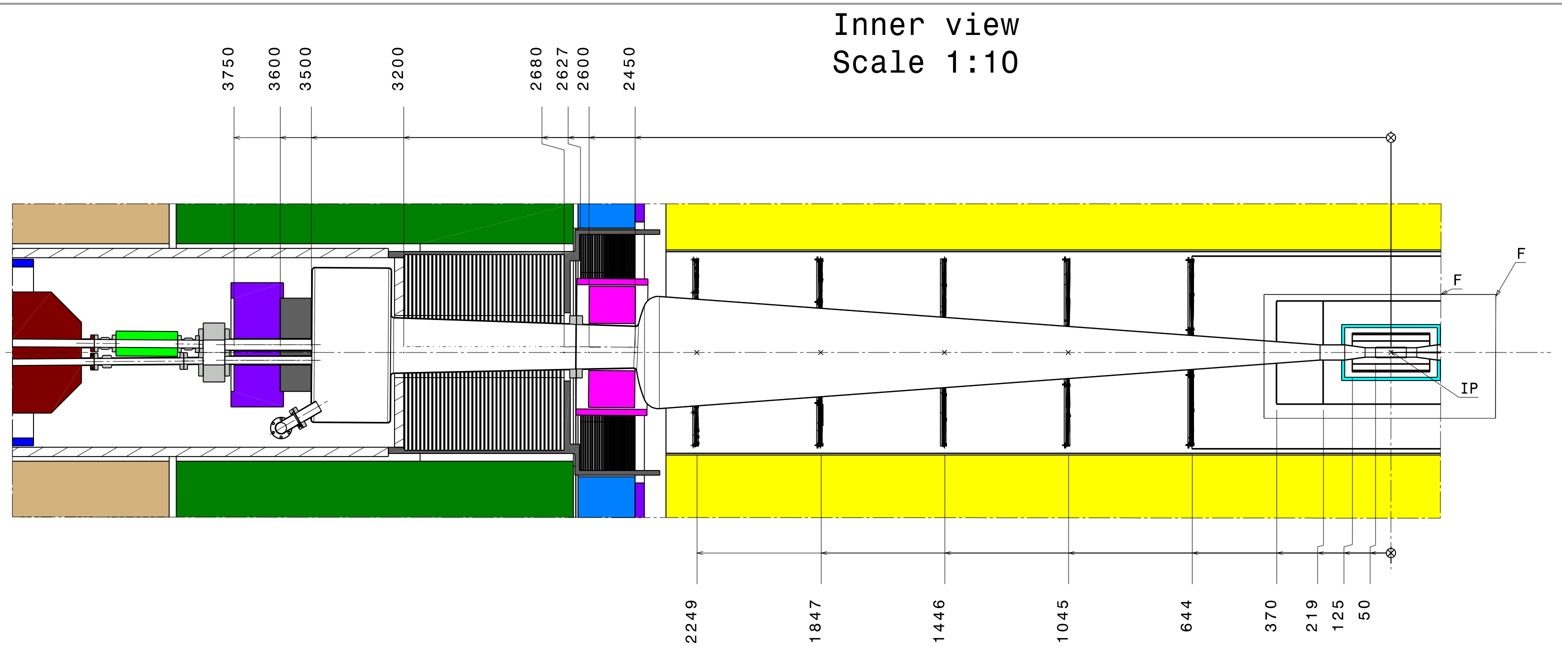


Table 1: Quadrupole gradient (T/m), length (m) and aperture radius (mm) at 500 GeV CM.

Name	Qty	L* = 3.51 m			L* = 4.0 m			L* = 4.5 m		
		B′	L	R	B′	L	R	B′	L	R
QDEX1 (SC)	1	98.00	1.060	15	89.41	1.150	17	86.39	1.190	18
QFEX2A (SC)	1	31.33	1.100	30	33.67	1.100	30	36.00	1.100	30
QFEX2 (B,C,D)	3	11.12	1.904	44	11.27	1.904	44	11.36	1.904	44
QDEX3 (A,B,C)	3	11.39	2.083	44	11.37	2.083	44	11.36	2.083	44
QDEX3D	1	9.82	2.083	51	9.81	2.083	51	9.80	2.083	51
QDEX3E	1	8.21	2.083	61	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
QFEX4A	1	7.05	1.955	71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
QFEX4 (B,C,D,E)	4	5.89	1.955	85	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

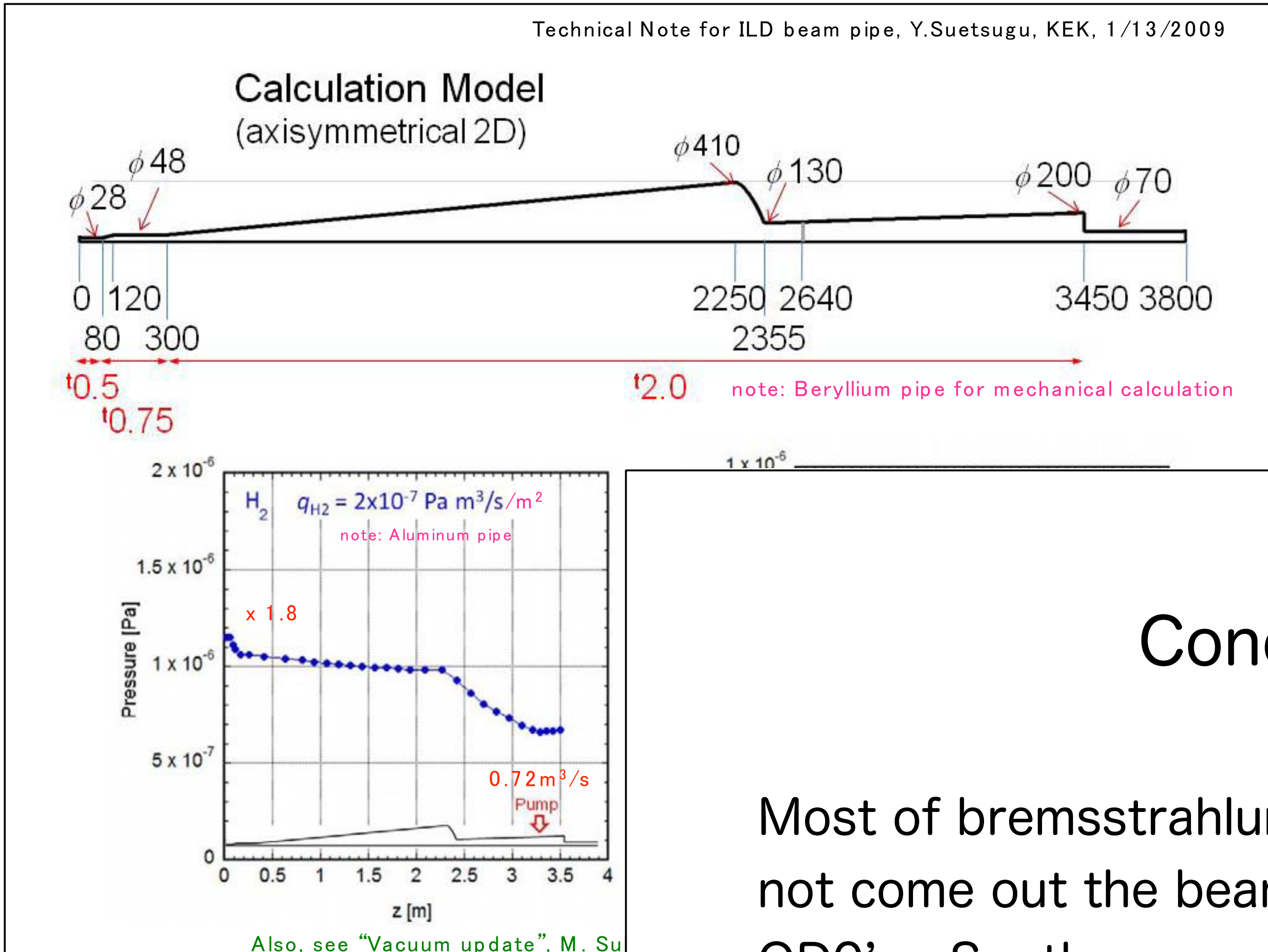
Y.Nosochkov, LCWS14 BDS/MDI

ILD: Discussion Items



- What needs to be done to go to L* of 4m?
  - Is the pump needed at this location?
    - revisit vacuum requirements and conditions
    - impact on cold QD0?
  - Revisit FCAL design
- Discussions have started at this LCWS

BDS/MDI joint session by K.Buesser



Vacuum pressure evaluation (2009) with pump in front of QD0

Conclusion

Most of bremsstrahlung background would not come out the beam pipe between the two QD0's. So, the vacuum pressure could be higher than 10nTorr ($1x10^{-6}$Pa).

For ILD, need a simulation study especially by taking account of X ray background in the VTX and TPC.

T.Tauchi, LCWS14 BDS/MDI

Plan of the CRP-002

- **Targeting to establish a conclusion within about a half year, for exam, the AWLC 2015.**
- **Meeting will be held by fuze, every 1~2 month or when update of L* evaluation arise from BDS**

- GW will organize the BDS meeting in the coming month(s) to try and reach some accelerator-based conclusion on an optimal L* choice.

- ILD will follow up two routes: a further investigation in the vacuum situation at the IP and a review of the design of the forward calorimeters. Both have the potential to find the missing space to go towards an L* of 4m.