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

Two meetings related to the single L* were held.

- BDS meeting(Fuze), Dec 4. https://agenda.linearcollider.org/event/6577/
- SiD workshop(SLAC), Jan 14. https://agenda.linearcollider.org/event/6522/

Optics Design and Beam Dynamics Modeling Status

Thursday, December 4, 2014 from **06:00** to **08:00** (GMT)

Description Review status of FFS optics and beam dynamics simulations for ILC BDS in co
of optimal FFS configuration (QF1, QD0 configuration and L*), collimation requ
Review status and plans of alternative designs for FFS: long-L*, alternatives to

Thursday, December 4, 2014

06:00 - 06:30 L*=4m Baseline Optics & Collimation *30'*
Speaker: Dr. Eduardo Marin (SLAC)

06:30 - 06:40 FD Jitter Tolerance Study *10'*
Speaker: Dr. Min-Huey Wang (SLAC)

06:40 - 07:10 Optimal L* & QD0/QF1 Configuration *30'*
Speaker: Dr. Toshiyuki Okugi (KEK)

07:10 - 07:40 Long L* / Alternate FFS Configuration Status and Plans
Speaker: Mr. Fabien Plassard (IPSA - Polytechnic Institute of Adv

SiD Workshop January 2015

chaired by Andy White (University of Texas at Arlington), Marcel Stanitzki (DESY)

from Tuesday, 13 January 2015 at **01:00** to Thursday, 15 January 2015 at **07:00** (Japan)
at **SLAC (Building 48 Redwood C/D)**

Joint Session with MDI/CFS

Convener: Dr. Thomas Markiewicz (SLAC)

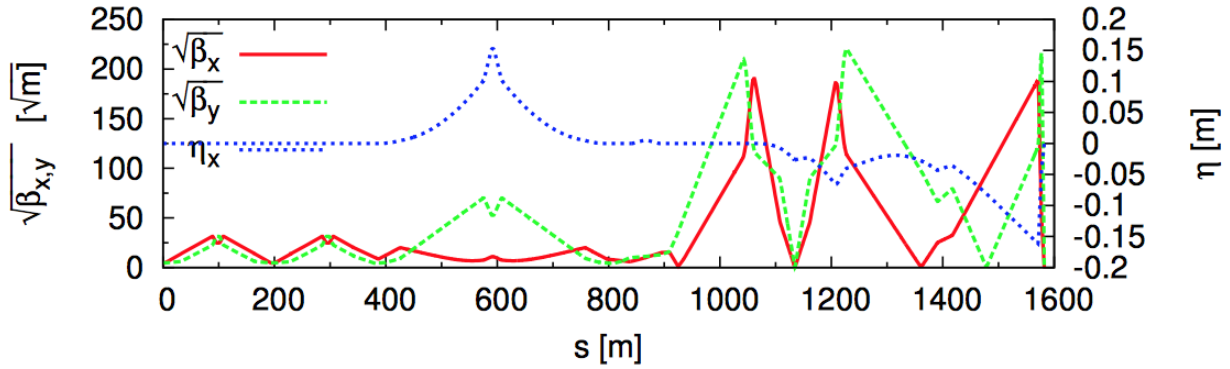
09:00 **4.1/9.1m L* Optics & Performance** *20'*
Speaker: Dr. Glen White (SLAC)
Material: **Slides**

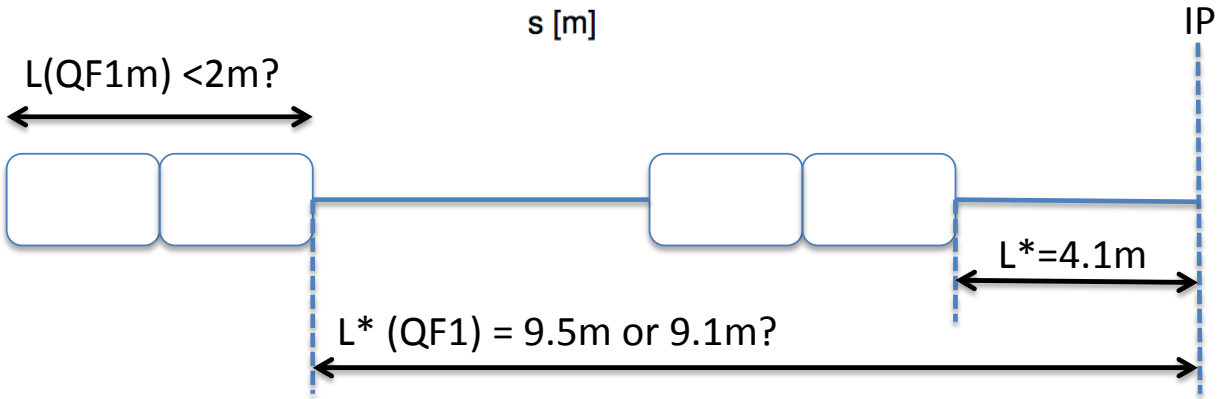
09:20 **ILD L* Studies** *20'*
Speaker: Dr. Karsten Buesser (DESY)
Material: **Slides**

09:40 **SiD L* Status** *15'*
Speaker: Dr. Thomas Markiewicz (SLAC)
Material: **Slides**

L*=4.1m Optics

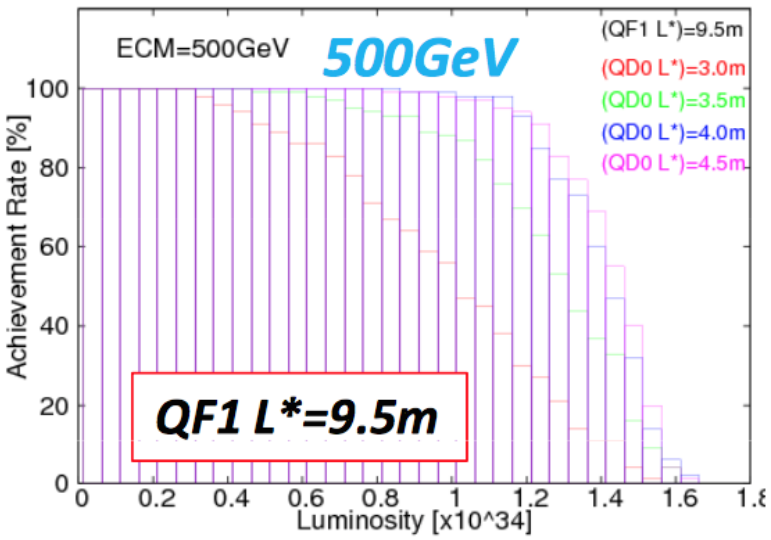
Tools: *MADX, MAPCLASS, SAD, Lucretia*

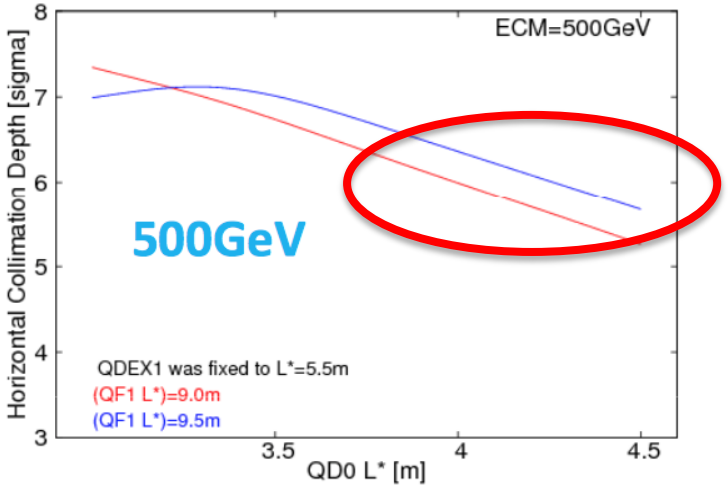


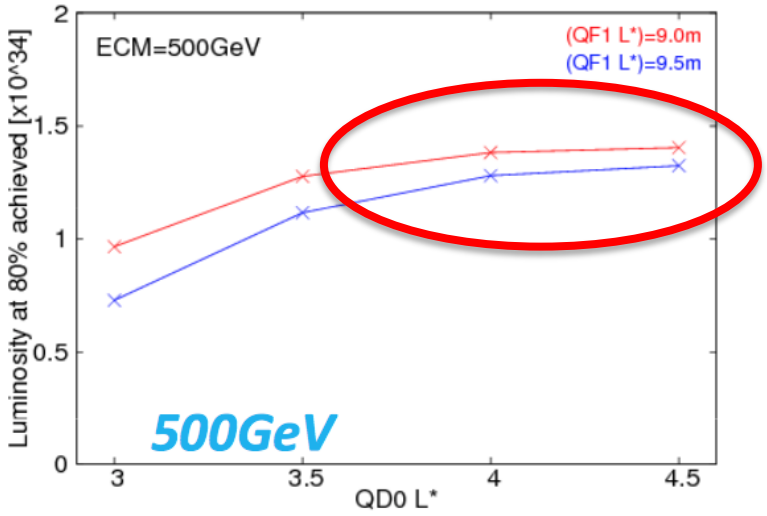


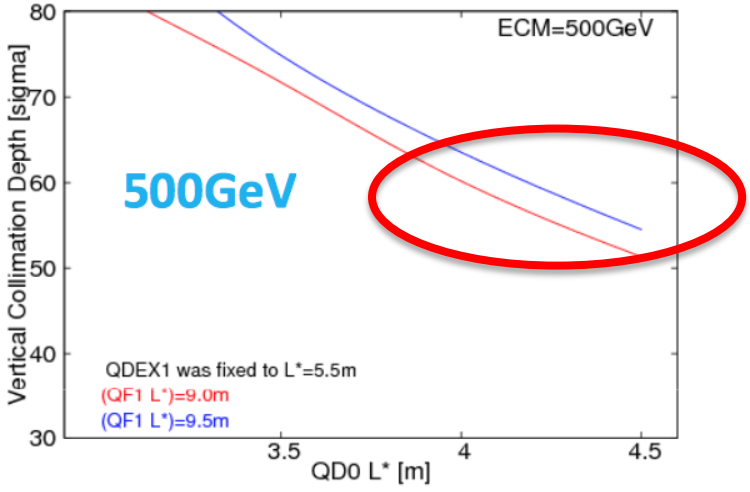
- Have optics solutions for E_{CM} = 250 GeV with improved collimation performance by powering front halves of QF1 & QD0 magnets only.
- Tuning performance driven by QD0->QF1 distance
  - Prefer QF1 closer to QD0, also shorter QF1

Collimation depth & beam tuning simulation For different L* *(T. Okugi, KEK)*







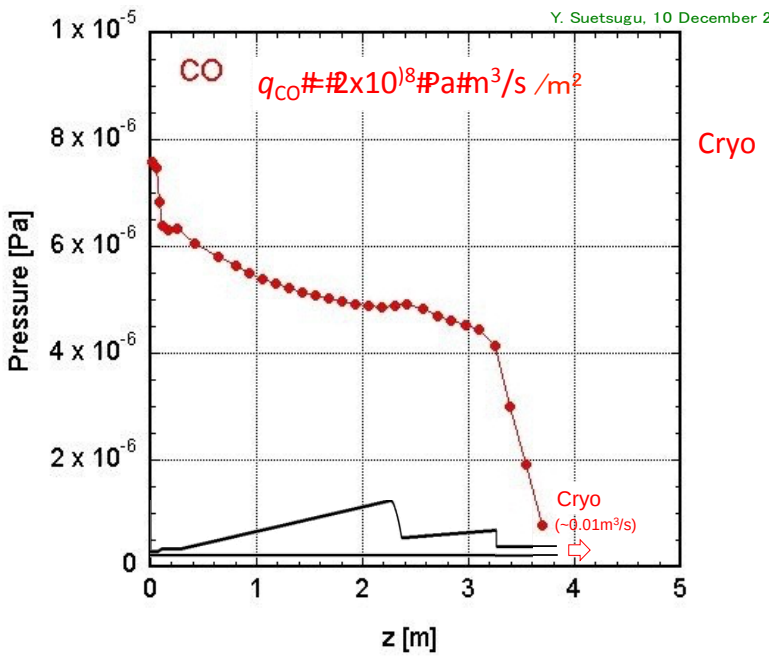


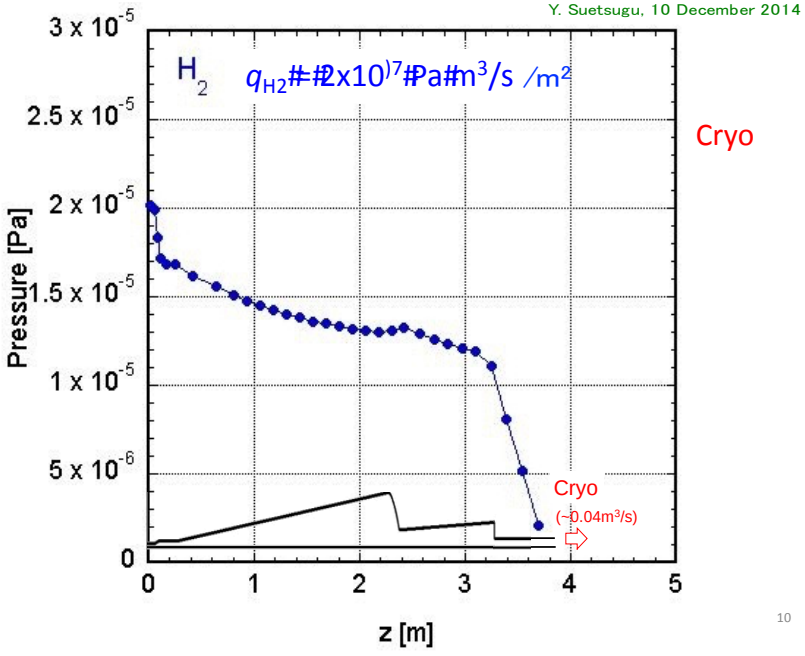
Summary

- FD configuration studies
  - Smaller L* better for vertical collimation depth
  - Larger L* (smaller QF1-QD0 distance) better for tolerances and lumi tuning performance
  - L* ~ 4m seems optimal, 4.1m proposed
  - Prefer smaller QF1-QD0 distance, and shorter QF1 magnet would also be benefical
    - Proposed QF1 L*=9.1m (0.4m closer to IP than baseline)
  - http://atf.kek.jp/twiki/bin/view/Main/ILCBDSOpticsStorage
- More work required on tuning algorithms to realize design luminosity
- IP diagnostics, FB kicker
  - Happy with FB kicker location between QF1 & QD0
  - Still would like to consider BPM option d/s QD0 for IP position information.
- New software tools for backgrounds & IR studies
  - Work started to specify collimation configuration & study backgrounds.
  - Study muon flux and consider more compact collimation system
  - Tools constructed to design IR solenoid compensation system
- More detailed report on these activities @ Asian LC workshop in April (KEK).

Revisited Vacuum Studies at KEK

- Y. Suetsugu checked impact of cryogenic QD0
  - Vacuum levels without pump but with cold QD0:

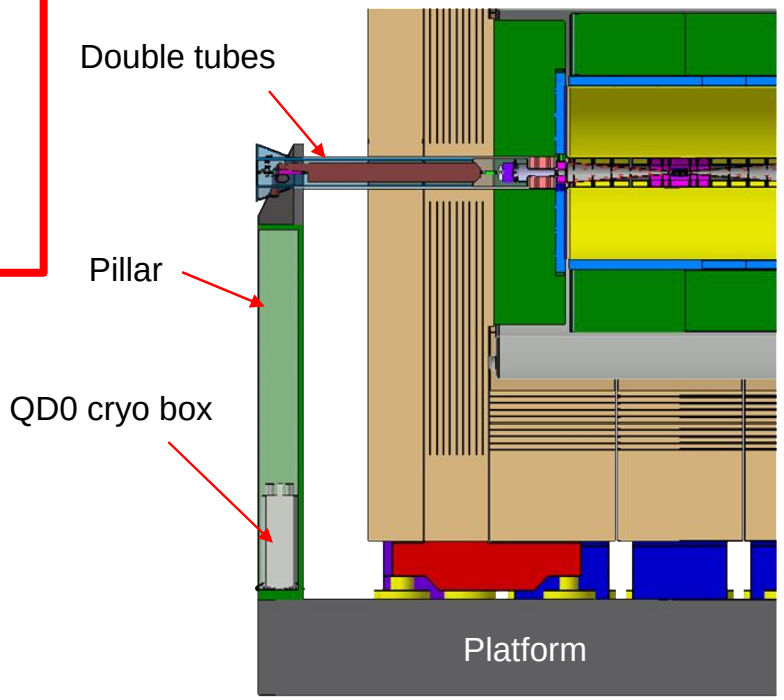




  - CO: 6.8E-6 Pa (50 nTorr); factor 10 above DBD value
  - H_2: 2E-5 Pa (150 nTorr); factor 20 above DBD value

ILD and QF1 L*

- If QF1 comes closer and the QD0 support pillar eventually moves closer to the endcap, the current opening scheme needs to be modified
- Need to re-think the QD0 support using a pillar
- Maybe a temporary QD0 support in the garage position is needed
  - has impact on cryo supplies…
- Would abandon the possibility to open the detector on the beam line
  - anyhow rarely needed in push-pull scenario

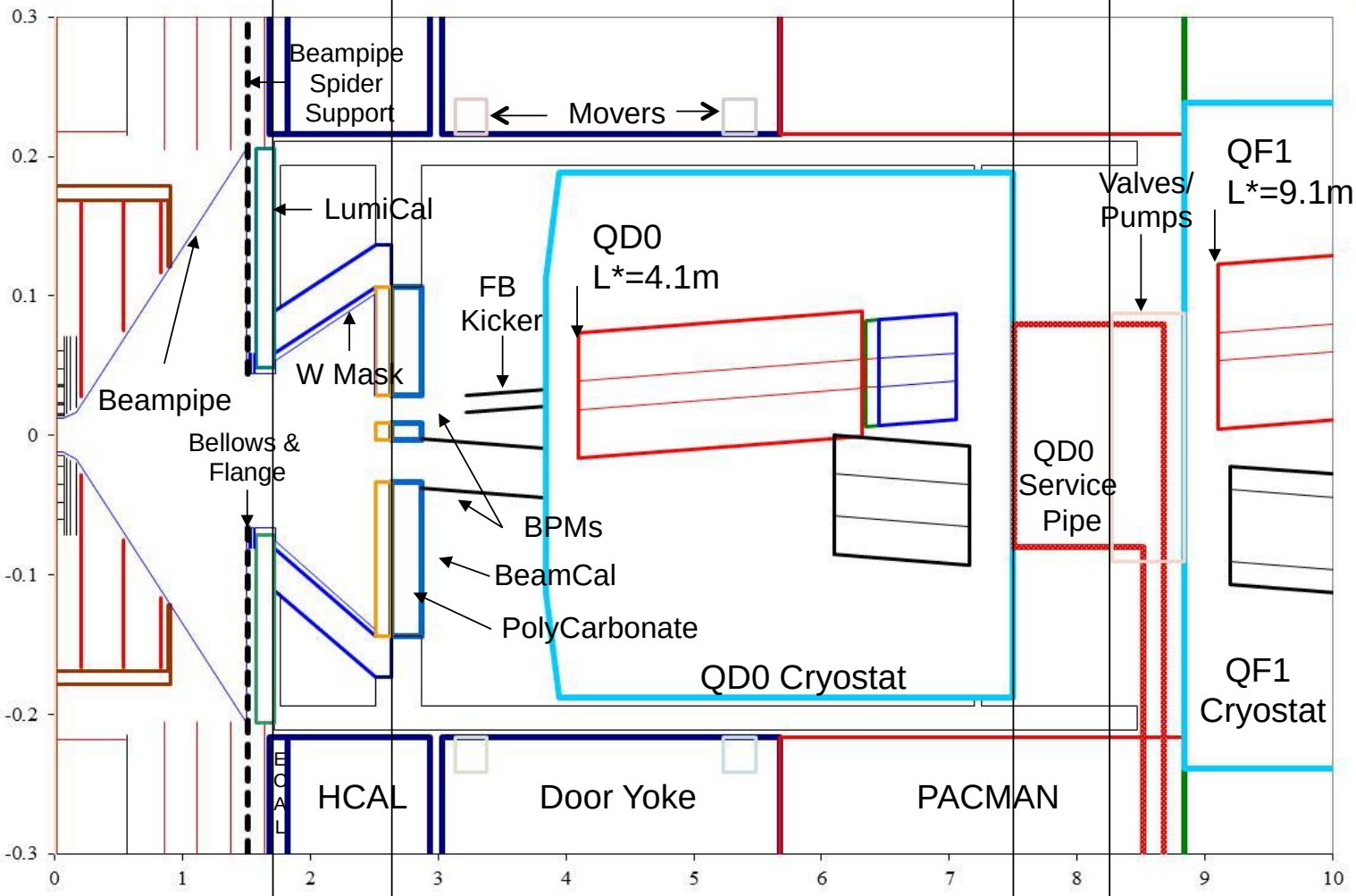


Summary and Outlook

- ILD has started an effort to adapt to a reduction of QD0 L*
- Removal of the vacuum pump in front of QD0 seems a possible way to gain ~40 cm of space
- Vacuum studies under way at LAL, KEK, DESY
- Vacuum levels could increase by factors of ~10-20
  - LAL group has started a study on a distributed vacuum system that could recover the previous levels
  - all vacuum experts are concerned more by dynamic conditions
    - though, their main experience comes from storage rings, not linear colliders
  - ILD is about to start a beam-gas background study
- QF1 L* has also implications on ILD engineering design
- Time line: have informations at hand for a conceptual decision by April

SiD 4.1/9.1m FD

(Door Closed)



Summary

- SiD can accommodate a L* between 2.6-4.5m
  - **Minimum L* probably dictated by QD0 technology, not SiD**
- Minimum and maximum L* in SiD are a function of
  - **Z where endcap ECAL begins**
  - **Length of QD0 cryostat**
  - **L* of QF1 (9.5m) and space required for disconnect valves, flanges, pump outs and the feedback kicker**
- More work needed to evaluate engineering stresses and backgrounds if L* changes