

Report from ILC CFS and Cryogenics Workshop

Akira Yamamoto
at CERN, 27-28 July

ILC CFS and Cryogenics Workshop

at CERN, 27 -28 July

- Objectives:
 - ILC Cryogenics layout to be updated,
 - Change Request preparation
 - ILC CFS tunnel/access layout to be optimized
 - Tunnel Optimization Tool (TOT) to be developed in cooperation CERN-KEK-ARUP.

CFS & Cryogenics Two Day Workshop at CERN

from Monday, July 27, 2015 to Tuesday, July 28, 2015

<https://agenda.linearcollider.org/event/6779/>

27 July:

- Introduction
 - V. Kuchler
- CERN-ILCJ Cryogenics systems
 - D. Delikaris
- **ILC Japan Cryo System**
 - H. Nakai
- Cryo Surface Layout due to Local Conditions
 - T. Sanuki
- **Cryo-Change Control Draft/Discussion**
 - H. Nakai, and D. Delikaris
- Demonstration & Lessons and Learnt from TOT-FCC with discussion
 - C. Cook

28 July:

- ILC status in Japan
 - A. Yamamoto
- ILC-CRS activities in Tohoku U.
 - T. Sanuki
- ILC tunnel compared with the longest railway tunnel experienced in Japan
 - M. Miyahara
- **Cryo-layout summary and discussion**
 - ALL
- Summary of Geological data provided by Tohoku U.
 - T. Sanuki
- Accelerator layout provided by LCC/ILC-KEK
 - M. Miyahara
- TOT-ILC: EDMS and data management
 - B. List
- **TOT-ILC status of development and next steps,**
 - Y. Loo
- **Discussion followed by site visit to LHC-P4**
 - All

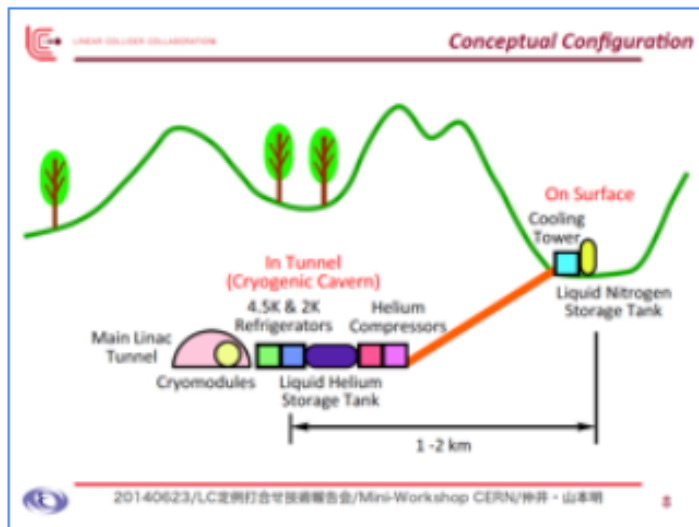
ILC Cryogenics Layout: A draft consensus for the Change Request

CFS and Cryogenics Two-days
Workshop at CERN
27 and 28, July, 2015

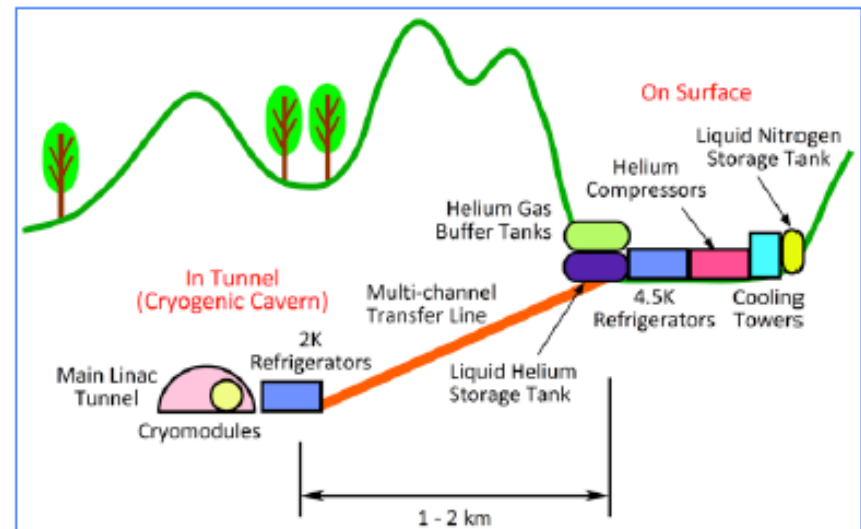
Change Request, to be submitted

Main Cryogenics Layout on Surface

ILC-TDR Baseline



New Baseline to be proposed to CMB



Some Comparisons

ILC – TDR Baseline

Main components **underground**

Features:

- Scenic preservation on surface
- No major cryo-transfer-line
- Lower cryogenic operational cost because of no 1 km transfer line.
- A cost driver: Cover:
13m(w) x 180m (l) x 10m(h)
=23,000 m³

New Baseline in preparation

May components **on surface**

Features:

- Safety
- Accessibility in daily operation
- No concern for MC vibration
- He storage flexibility
- Smaller access tunnel size because of no installation of 4.5 K Cryo-plant Under G.
- A cost drivers:
- Saving caver cost:
 - 23,000m³x 0.5 = ~ 11,500 m³
 - 200 CHF/m³ x 2.30E4 = 2.3 MCHF
- Additional transfer line cost:
 - 2 kCHF/m x 1,000 m = 2 MCHF



- All cryogenic components except 2 K refrigerators and distribution boxes will be installed on surface
- Cryogenic components on surface and underground will be connected with multi-channel transfer lines
- Consideration of scenic preservation for cryogenic components on surface is necessary
- Cost can be reduced by constructing 10 identical cryogenic plants for main linacs
- Distribution boxes of two adjacent cryogenic plants may be interconnected for redundancy (but higher cost)
- Number of cryo strings for 1 cryo unit should be fixed to 21
- Total length of multi-channel transfer lines differs according to location
- Construction cost should be re-evaluated as cryogenic configuration change

Conclusion

- It has been a consensus to propose a new baseline cryogenics layout with major components located on surface,
- Cost balance is basically neutral (and to be further investigated,
- The Change Request can be submitted before LCWS2015.
 - Note: further quantitative evaluation of the transfer line and the thermal balance etc. shall be well evaluated.

Summary of CFS discussions and homework

ILC CFS Cryogenics workshop at CERN

28 July, 2015

Discussions and homework

- Minimum Access tunnel size
 - Size of 2-K Cold Box (to be checked)
 - Two way traffic during tunnel work at least a few points with alcove structure
- Tunnel layout with access cavern side (to be confirmed)
 - SRF CM at west-side, and utility at east-side
 - Access cavern at east-side, (at this moment)
 - Damping ring at east site,
 - ILC campus most likely west side (Ichinoseki-side)

Discussions and homework

- Access tunnel approach at both cavern and portal
 - ~ 30 m long, straight
 - Curvature of tunnel to allow 15 m long and 1.5 m wide CM.
 - Access tunnel can cross over the ML tunnel by using the difference of cavern to portal point of ~ 100 m difference.

A short-term goal for LCWS2015

- Fix the IP point (to be informed by Tomo)
- Fix the ILC accelerator option with 34 km including 2 x 1.5 km extension at the high energy ends, (to be given by Benno)
- Focus on the access portal point on surface to be investigated by using TOT
 - It can be started with 25 candidate portal site (to be given by Tomo)
- Try to show the progress in a plenary talk at LCWS based on the above study, and develop further in the CFS sessions.
- Comment: Future could include, for example, 50 km option as well as IP point changes and others.