



ILC AD&I Status

Nick Walker & Benno List
125th ILC@DESY meeting
28.08.2015

Accelerator Design: Management

Change Management Board (CMB)

ILC Technical Board

Mike Harrison (ILC Dir., chair)

Nick Walker (DESY, ADI)

Hitoshi Hayano (KEK, SRF)

Kirk Yamamoto (KEK, SRF)

Akira Yamamoto (hear of KEK LC-Office)

Nobuhiro Terunuma (KEK, ADI, ATF2)

Nikolay Solyak (FNAL, ADI, SRF)

Marc Ross (SLAC, SRF)

Olivier Napoly (CEA, Saclay, SRF)

Vic Kuchler (FNAL, CFS)

Benno List (DESY, Change Admin.)

Jenny List (DESY, physics rep.)

Tom Markiewicz (SLAC, detectors rep.)

*CM has become
the most central
management tool
for the site
dependent design*



Change Request Register

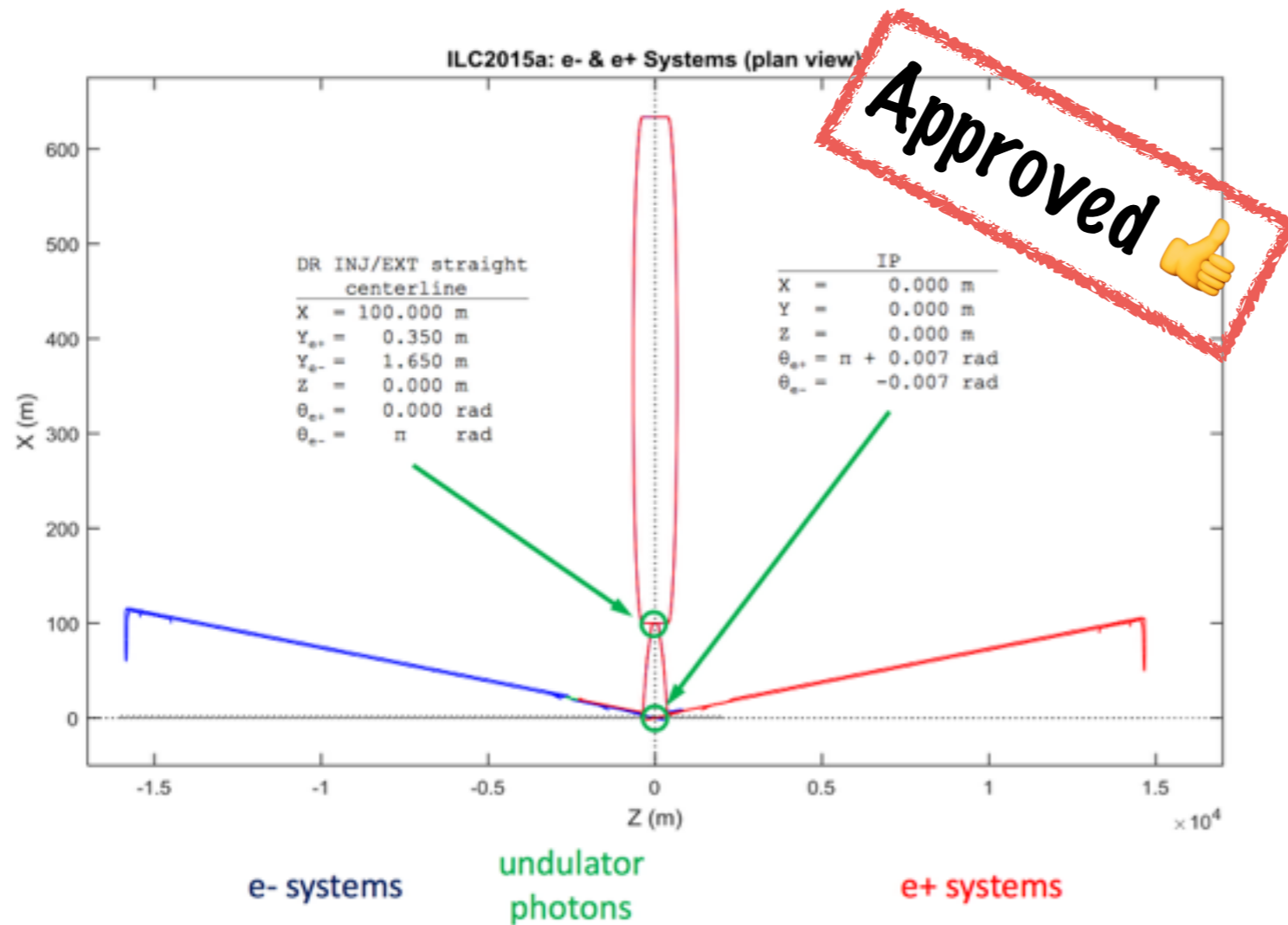
ILC-EDMS D*1056505

No.	Creation Date	Creator	Primary WGs	Title	Description	State	Owner
ILC-CR-0001	01/09/14	K. Yokoya	PS / BDS / RTML	Add return dogleg to target bypass	Add additional lattice to bring BDS beamline on axis with main linac, to accommodate future >1 TeV beam energies.	Rejected	NA
ILC-CR-0002	02/09/14	G. White	BDS / MDI	Adopt equal L* for both detectors	Find solution for single L* value for BDS and both detectors.	Accepted / Implementing	Change Request Implementation Team
ILC-CR-0003	07/10/14	K. Buesser	MDI / CFS	Detector hall with vertical shaft access	Consolidated solution for IR hall / layout which supports surface construction of the detectors.	Accepted / Implementing	Change Request Implementation Team
ILC-CR-0004	18/12/14	N. Walker	ADI	Extension of the electron and positron Main Linac tunnels by about 1.5km	Lengthen Main Linac tunnels by about 1.5km, to (i) fulfill the Global Timing constraint and (ii) add margin for total beam energy as risk mitigation to ensure 500GeV CME.	Accepted / Implementing	Change Management Board
ILC-CR-0005	22/04/15	N. Walker	ADI	Update top-level parameters	Correct errors in reported luminosity for 500 GeV baseline and 1 TeV (b) parameters.	Completed	NA
ILC-CR-0006	12/05/15	G. White	BDS / MDI	Add BPM downstream of QD0	Add a BPMs immediately downstream of the QD0s to facilitate beam capture and construction of a "virtual IP	Accepted / Implementing	Change Request
ILC-CR-0007	11/06/15	M. Harrison	ML	Adoption of the Asian design as sole baseline	Only the Asian version of the TDR designs will be the basis for further developmen; the baseline HLRF distribution scheme will be DKS, the CFS planning will	Accepted / Implementing	Change Management Board
ILC-CR-0008	07/07/15	M. Woodley	Machine-wide	Formal release TDR-2015a lattice	Complete set of matched lattices reflecting TDR design	Accepted / Implementing	Change Administrator
		N. Walker	RTML / ML	Move Bunch Compressor to Main Linac	The Bunch Compressor formally becomes a part of the Main Linac instead of the RTML.	In preparation	Change Requestor

*Process working well, until we get to **implementation!** (Resources!)*

CR-08: TDR Lattice 2015a release

eSource + eDR + eLET + UPT + pSource + pDR + pLET

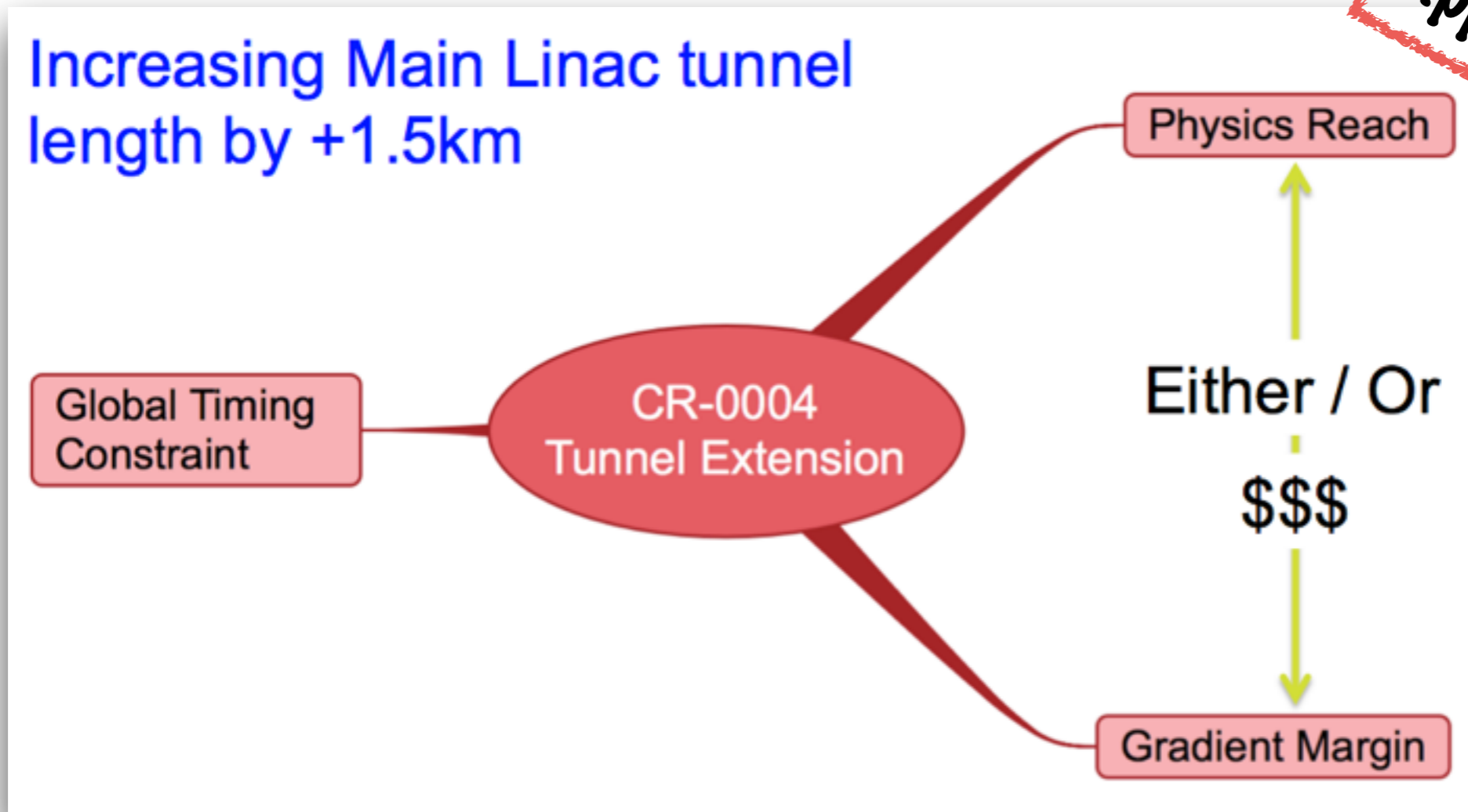


- Lattice integration
- Complete DR->Dump lattice now available
 - ▶ <https://bitbucket.org/whitegr/ilc-lattices/downloads>
- ▶ Is now become "TDR baseline"
 - ▶ base for next iteration of CRs
 - ▶ Still some tidying up
- ▶ Not yet in EDMS
 - ▶ formal implementation (documentation) still to do
- ▶ Basis for CFS site layout
 - ▶ modified for CR-04 (see later)

Baseline: ILC-2015A lattice

- Solid bases for future CRs
 - Already some [approved] work to do:
 - ▶ CR-02 [+06] FFS lattice update for $L^*=4.3$ [+ IR BPM]
 - ▶ CR-04 ML tunnel extension (additional transport lines, see later)
 - Concept of “periodic baseline release”
 - ▶ Implementation of some/all outstanding CRs
 - ▶ Ideally once to twice a year
 - ▶ Depends on lattice design resource availability
-

CR-04: Tunnel Extension



Approved 👍

Caveat: Increased cost (~100 MILC) must be saved elsewhere (→ shield wall?)

Impact on construction schedule not considered (no available resources)

XFEL $\langle G \rangle \geq 27$ MV/m

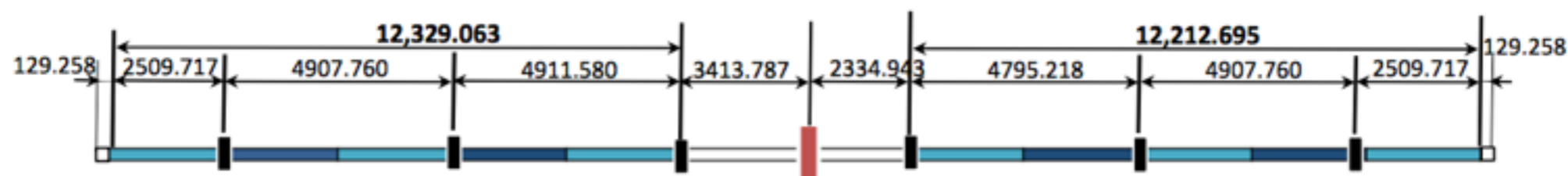
CFS considerations

Extension of the ML Tunnel

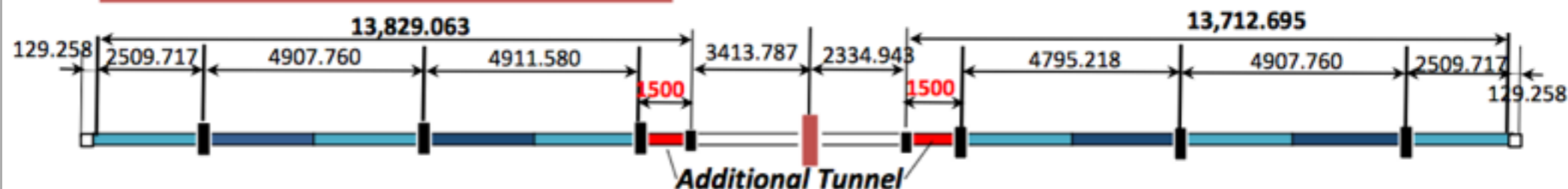
ILC-CR-0004

- Change Review Panel Members: V.Kuchler
- Current Status: Under Discussion Change Implementation Team

TDR Baseline

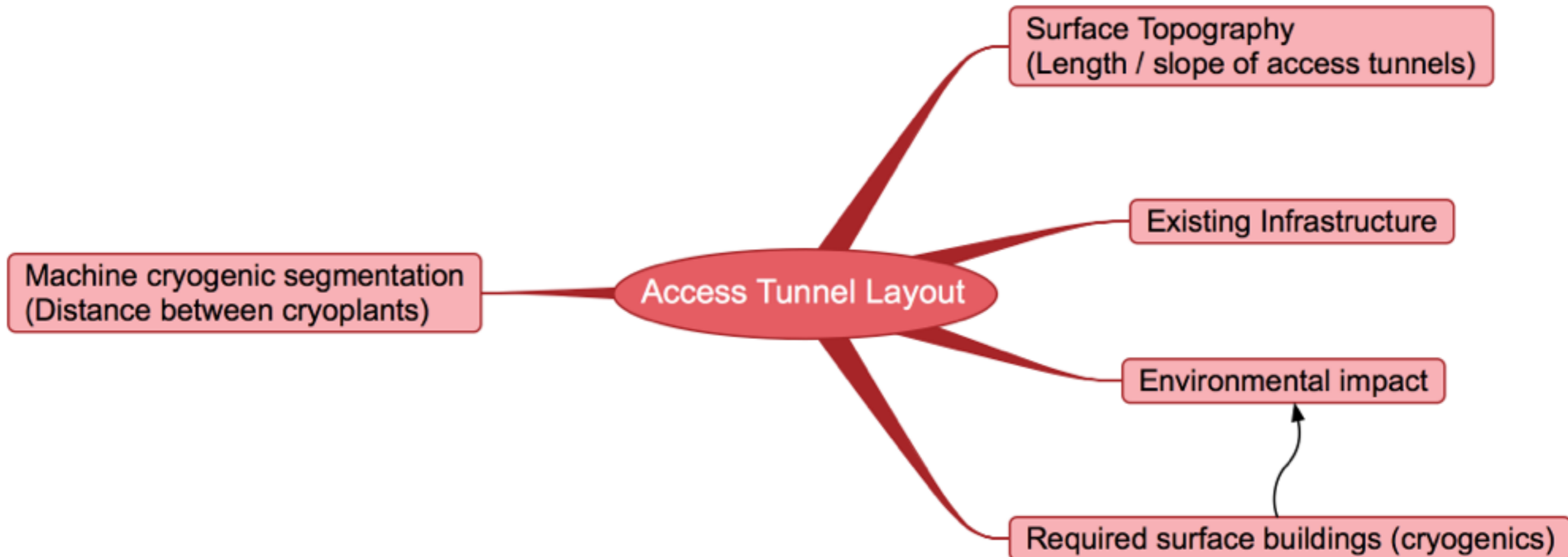
Under Discussion

New Baseline

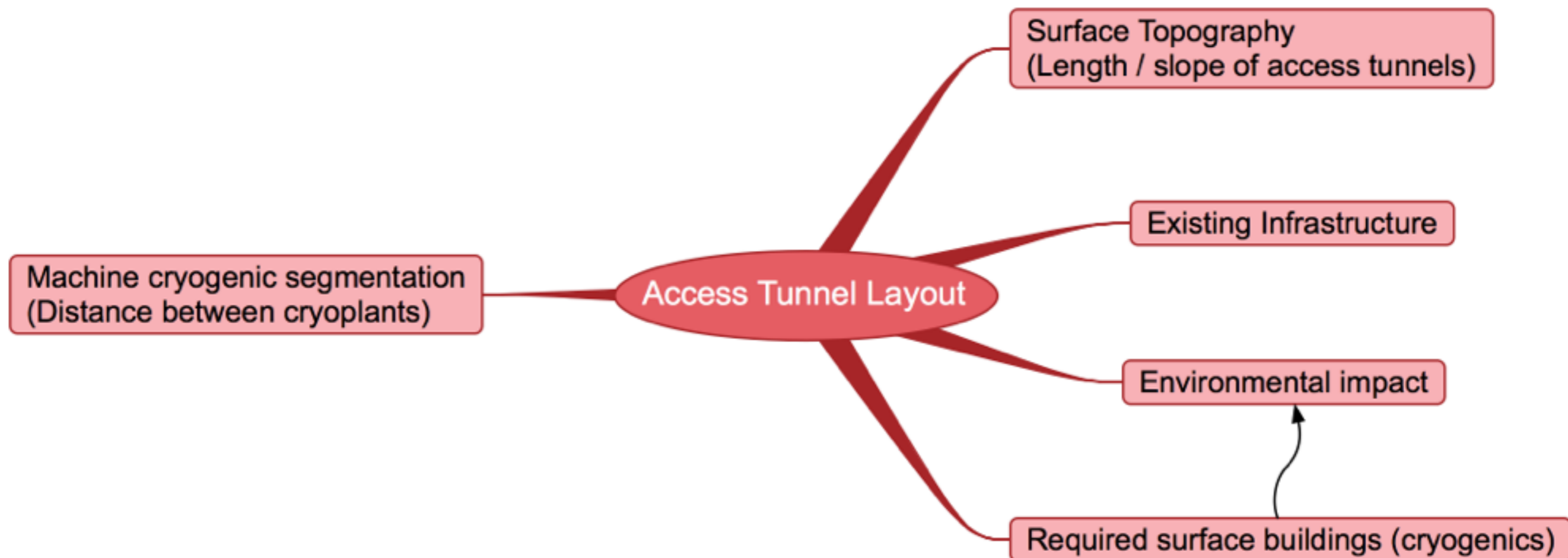


- **BASELINE:** Now we know how long the tunnel is (and where the IP is → CR-3)
- Next step: Figure out where all the access halls go

Considerations and Constraints

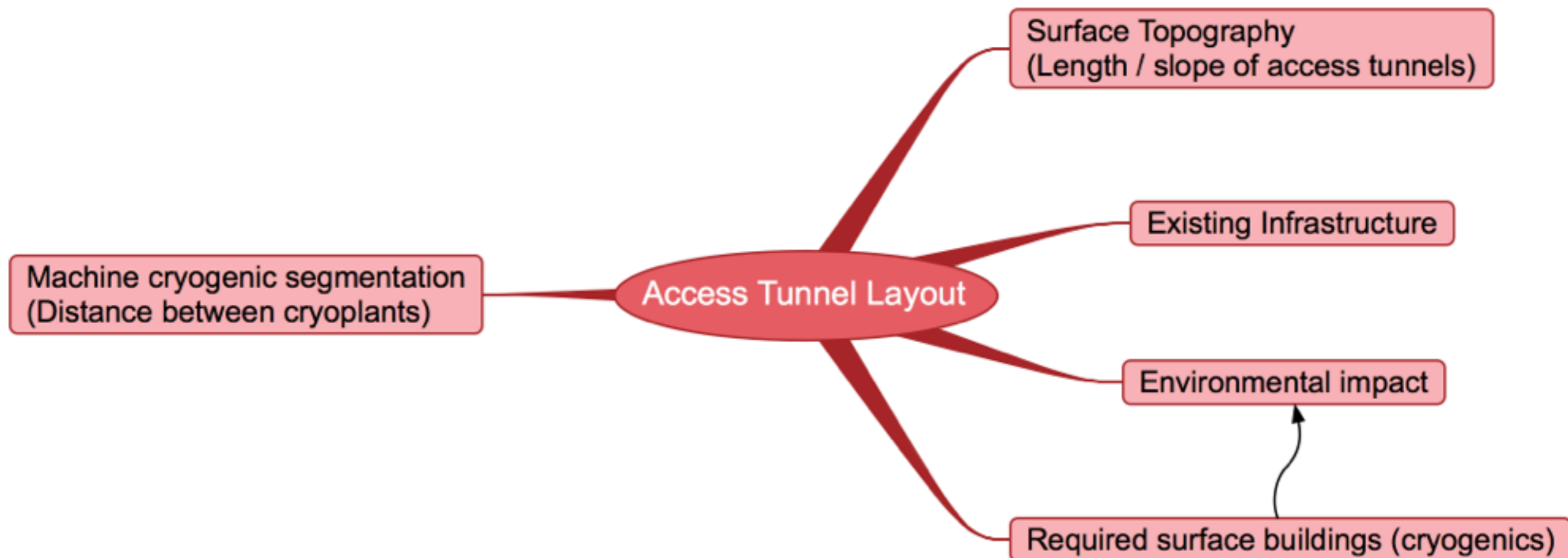


Considerations and Constraints



The Challenge

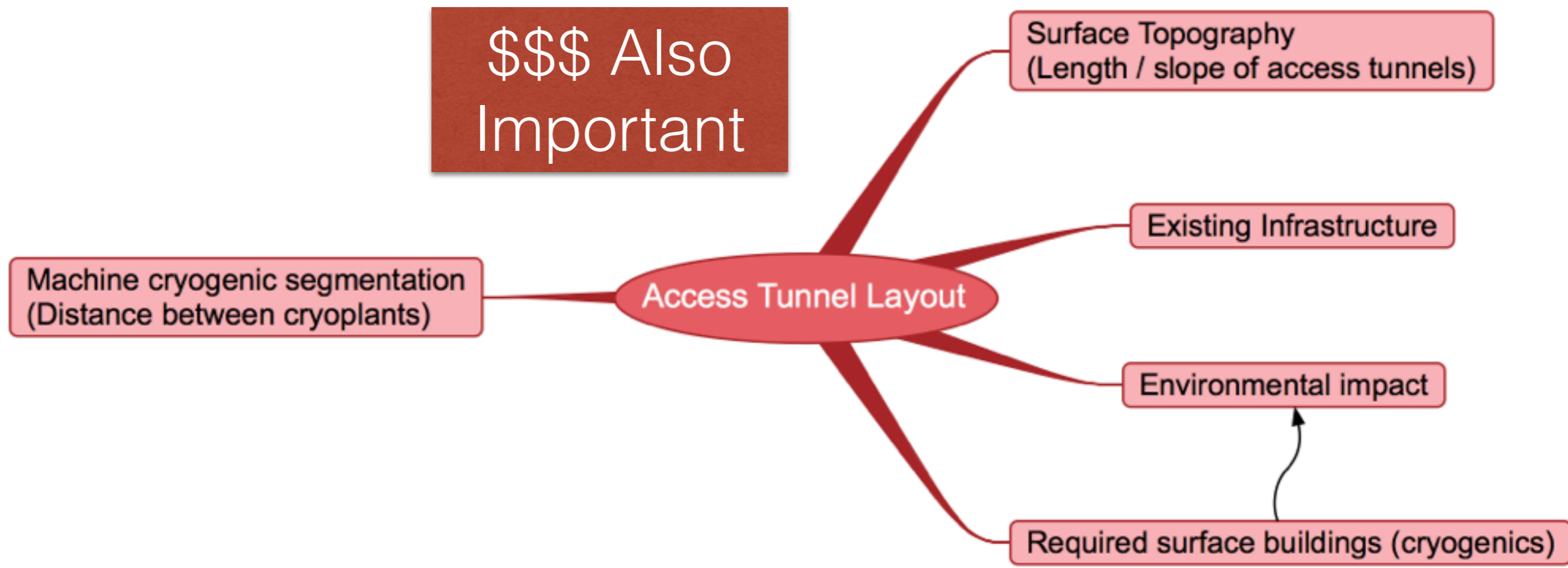
Considerations and Constraints



More flexible
(ADI input)

The Challenge

Considerations and Constraints



More flexible
(ADI input)

The Challenge









CFS & Cryogenics Two Day Workshop at CERN

from Monday, 27 July 2015 at 09:00 to Tuesday, 28 July 2015 at 21:00 (Europe/Zurich)
at CERN (Bldg. 61 Floor 1 Room 009 C)

Manage ▾

Go to day ▾

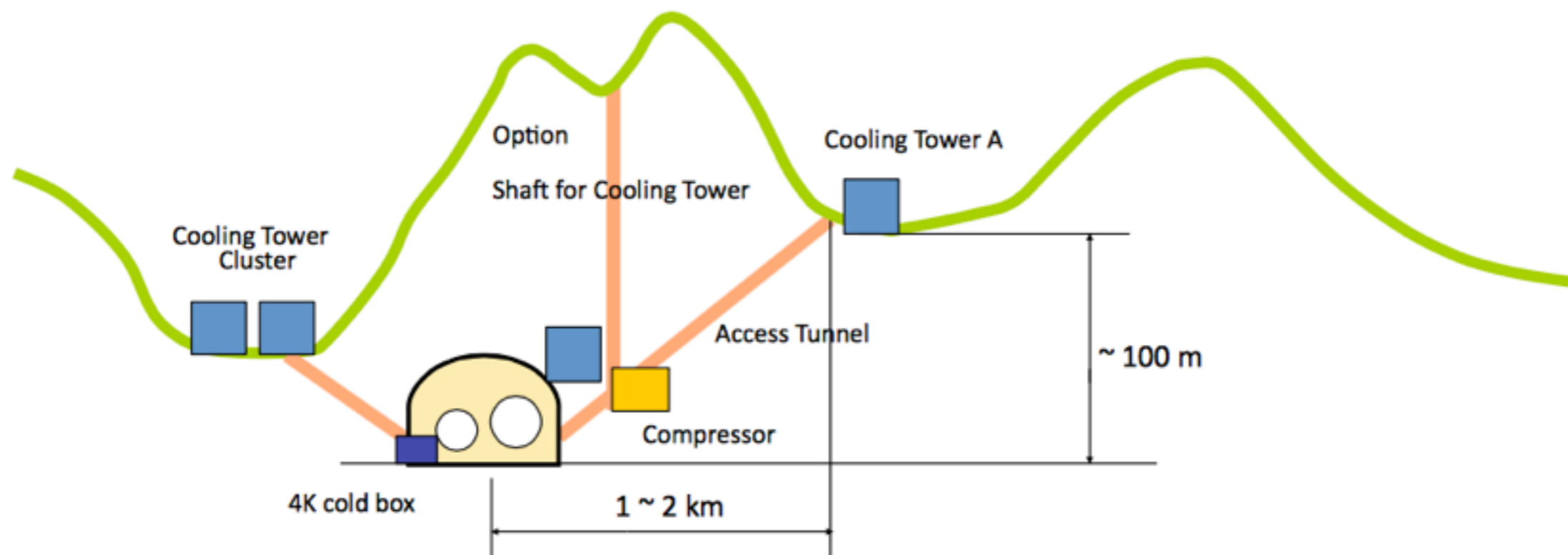
Monday, 27 July 2015

- 09:30 - 10:00 **Introduction and Workshop Objectives 30'** ▾
Speaker: Mr. Victor Kuchler (Fermilab)
Material: **Slides**  
- 10:00 - 11:00 **CERN v ILC Japan Cryo Systems 1h0'** ▾
Storage, distribution, length of lines
Speaker: Dr. Dimitri Delikaris (CERN)
Material: **Slides**  
- 11:00 - 11:20 **Coffee Break**
- 11:20 - 12:00 **ILC Japan Cryo system 40'** ▾
Speaker: Prof. Hirotaka NAKAI (KEK)
Material: **Slides** 
- 12:00 - 12:30 **Cryo Surface Layout due to Local Conditions 30'** ▾
Speaker: Tomoyuki Sanuki (Tohoku University)
Material: **Slides** 
- 12:30 - 14:00 **Lunch (Restaurant A)**

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

Cryogenics - TDR solution (Asian)

Everything Underground

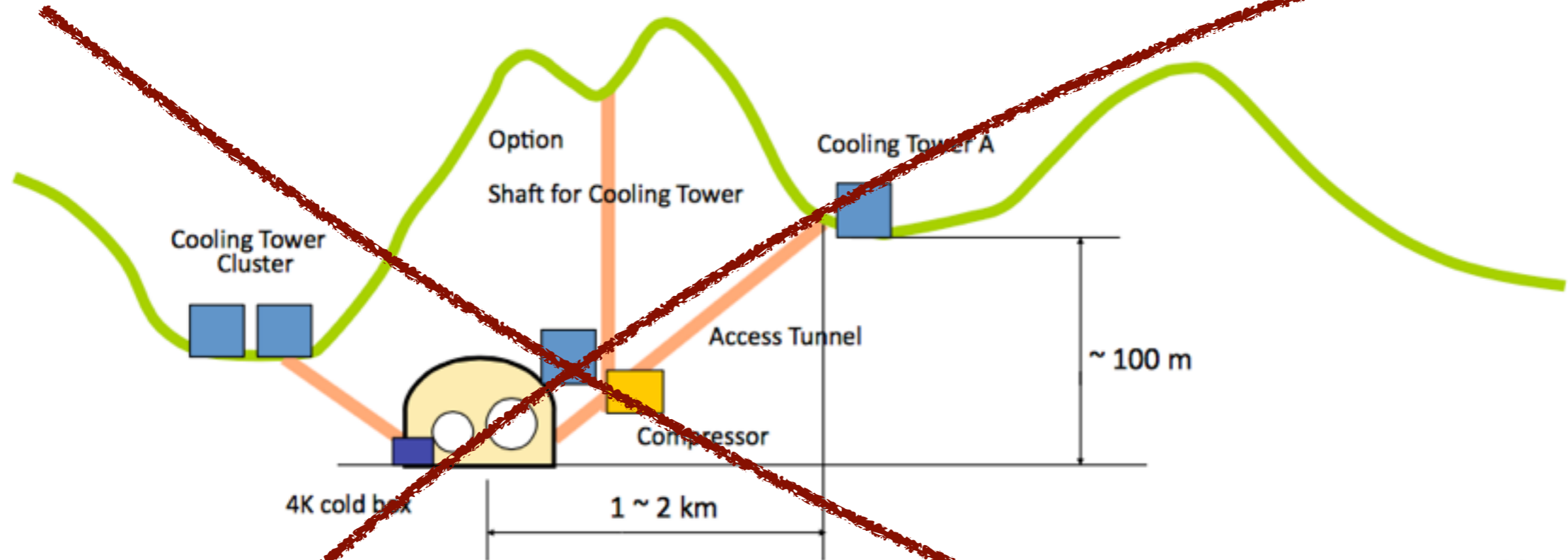


K. Hosoyama, 2010

- Only cooling towers on surface for effective heat removal, and others underground
- Do noise and water vapor from cooling towers may affect environment?

Cryogenics - TDR solution (Asian)

Everything Underground — Doesn't Work!

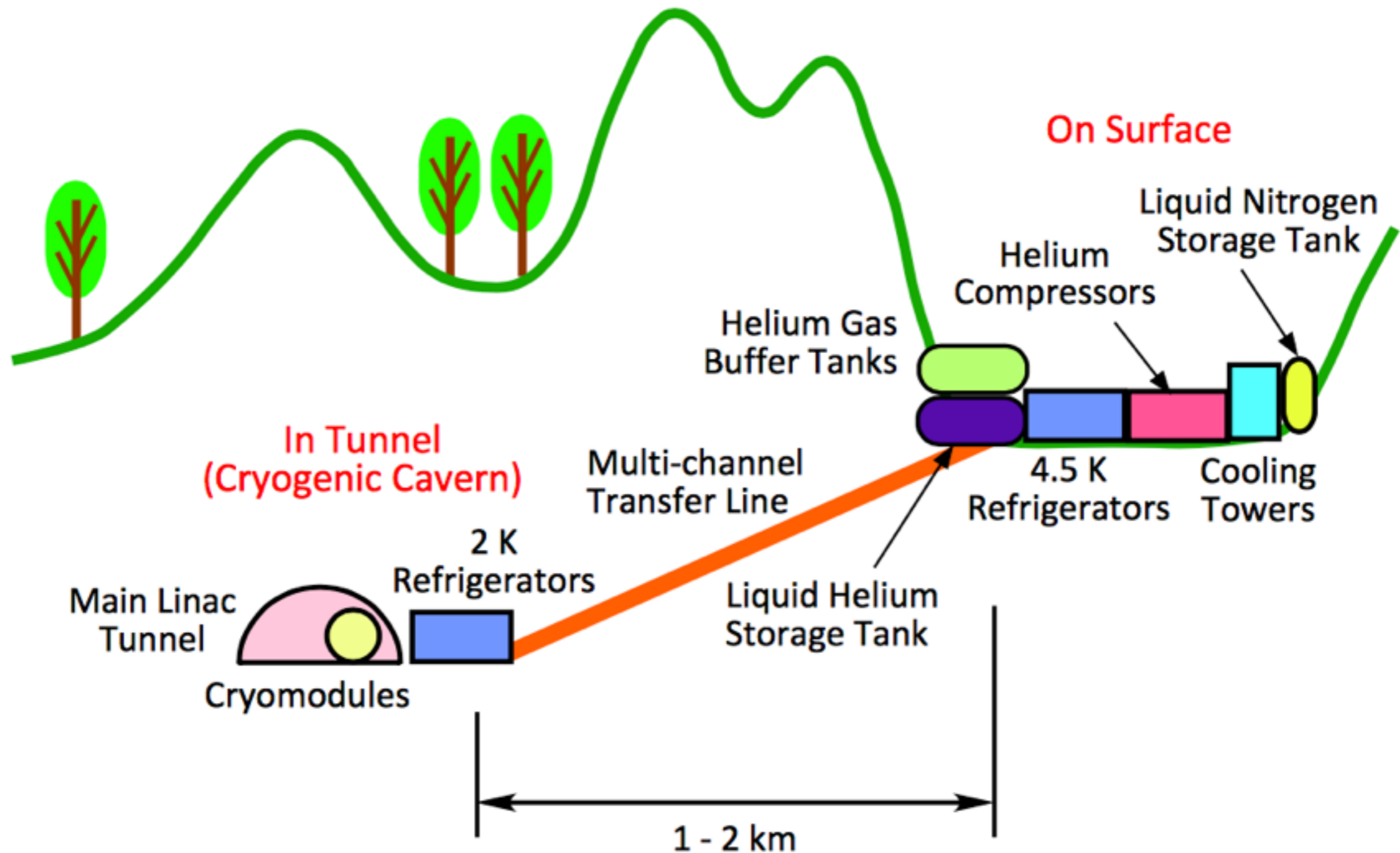


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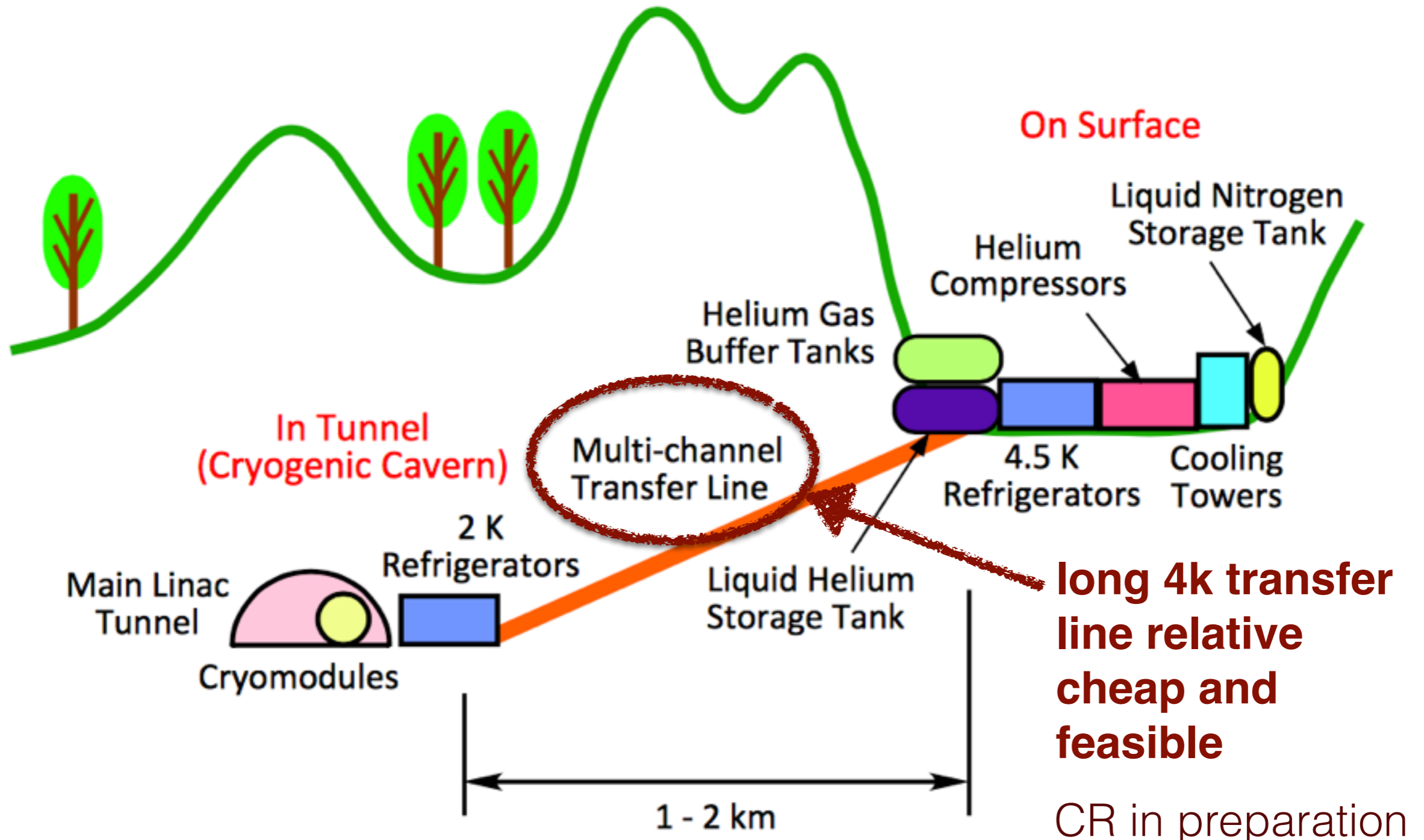
Cryogenics: Proposed solution

Move everything except 2K fridge to surface



Cryogenics: Proposed solution

Move everything except 2K fridge to surface



Kitakami: The Challenge



behind the trees



T. Sanuki (Tohoku U.)

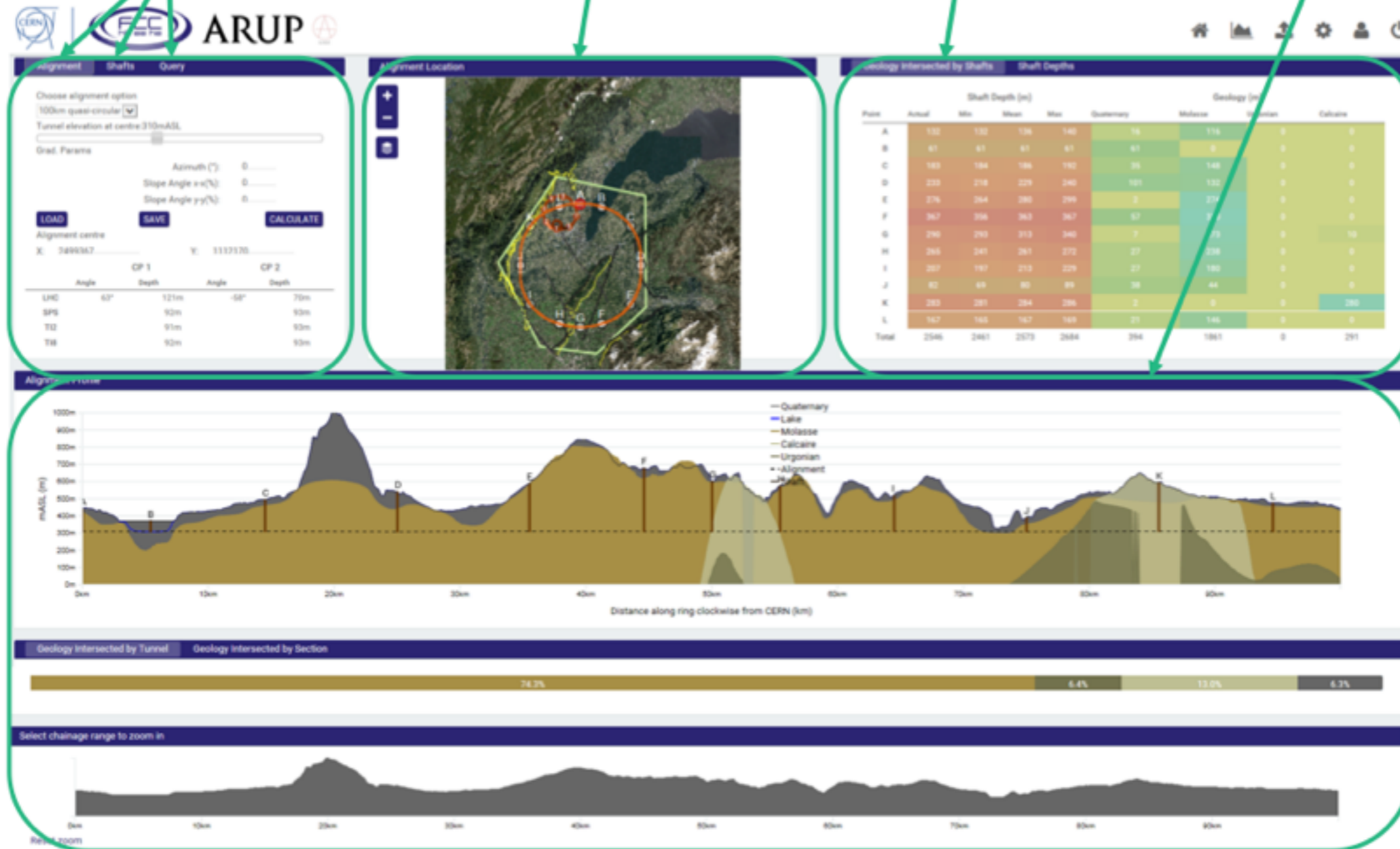
ARUP study - where to put the access tunnels

Input data with three main areas: alignment, shafts and query about constraints

Aerial plan view with area of study, FCC and shaft locations, with possibility of moving them manually

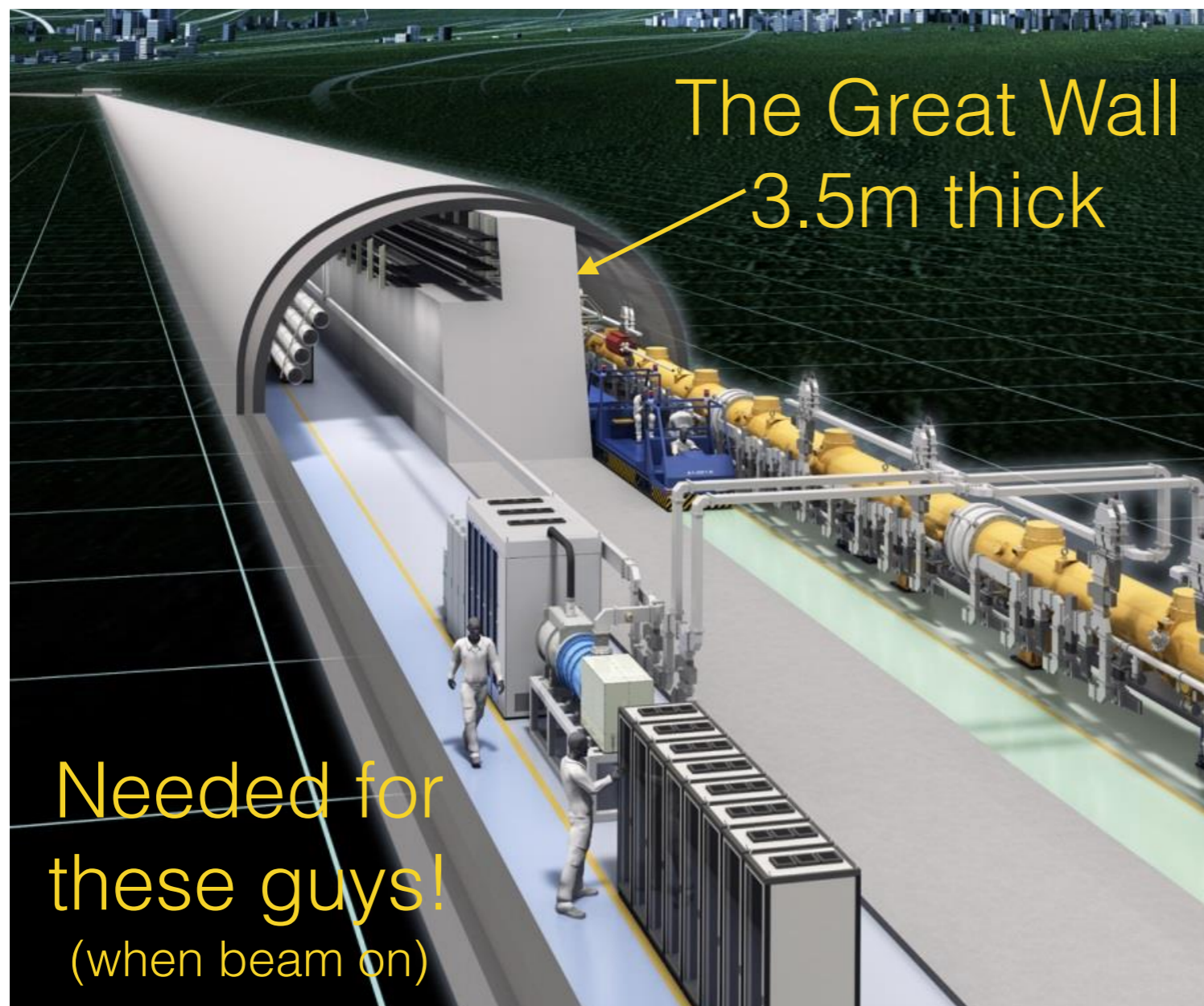
Results table in term of shaft depth and geology

Visual output in term of geology and DEM, with possibility to zoom



Tool developed for CERN (FCC)

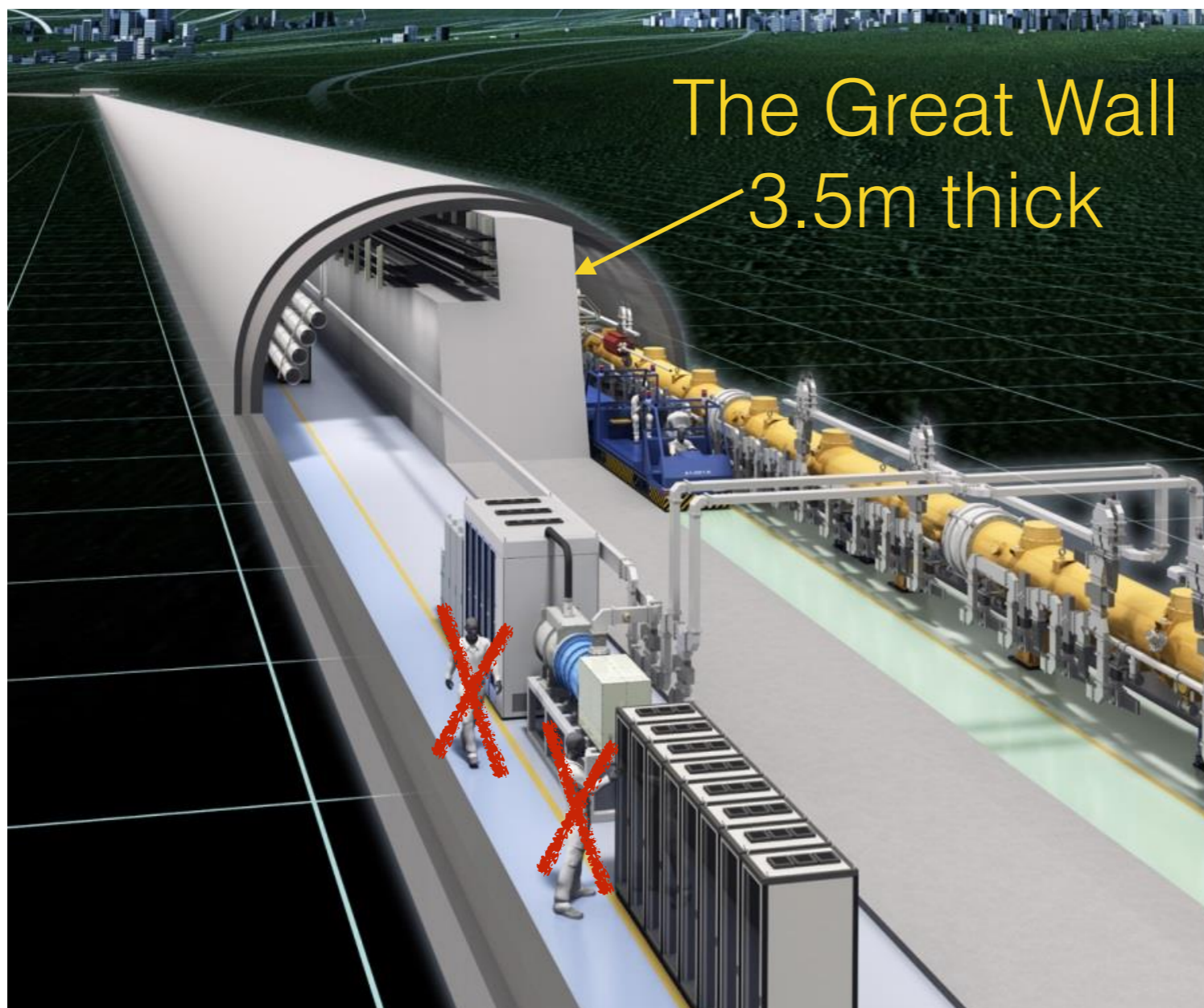
Main Linac Tunnel Cross-Section



Based on “SLAC”
“worst conceivable
accident” criteria

18MW continuous
power deposition
into a single “point”

Main Linac Tunnel Cross-Section



Best Safety
Solution:

Don't let them in!

Shielding still needed to
protect equipment in
service tunnel side and
allow RF commissioning
without beam.

(dark current and x-rays)

ML Shield wall thickness impact

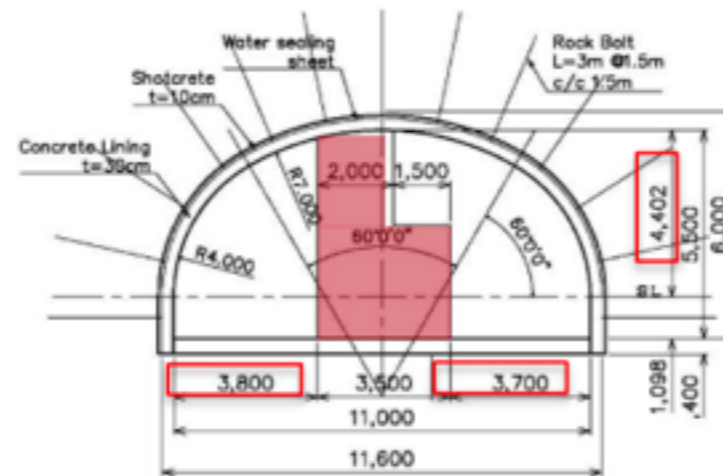
Pre-study

- Radiation shield issue will be decided by necessity of person's access
- Scheme change depends on the management scenario of beam operation.

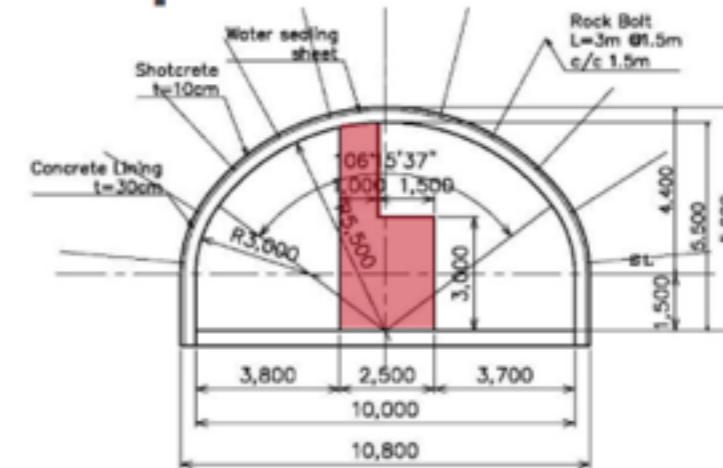
Common Dimensions

- Beam line :
Width 3.8m
- Klystron gallery:
Width 3.7m
- Tunnel Inner height :
5.5m

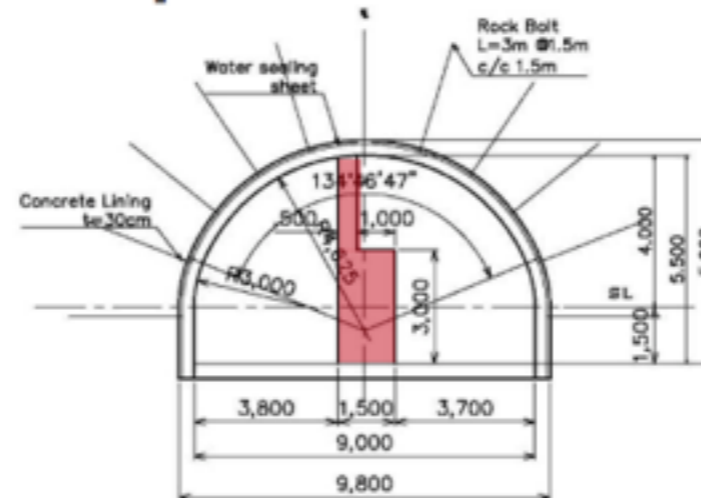
Baseline SW3.5m



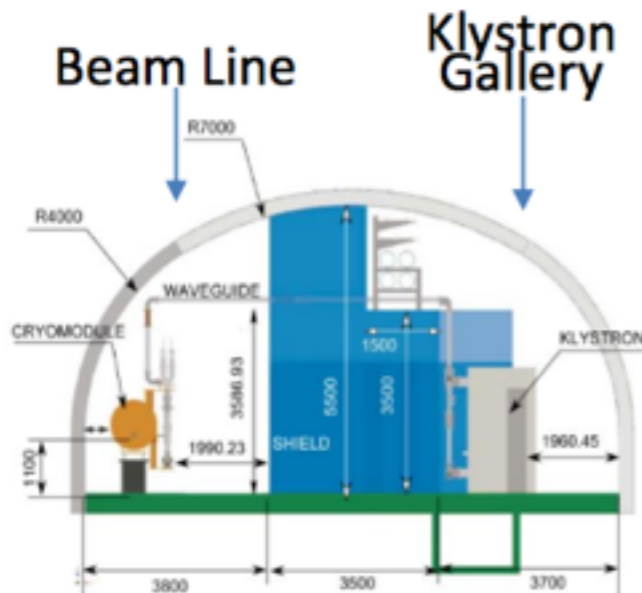
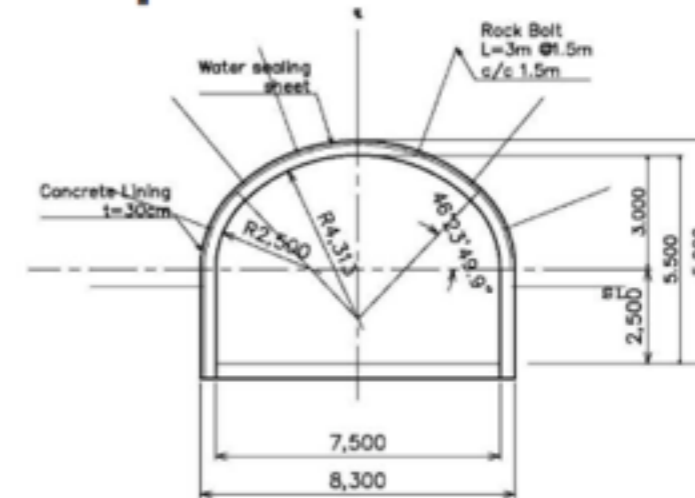
Option-1 SW2.5m



Option-2 SW1.5m



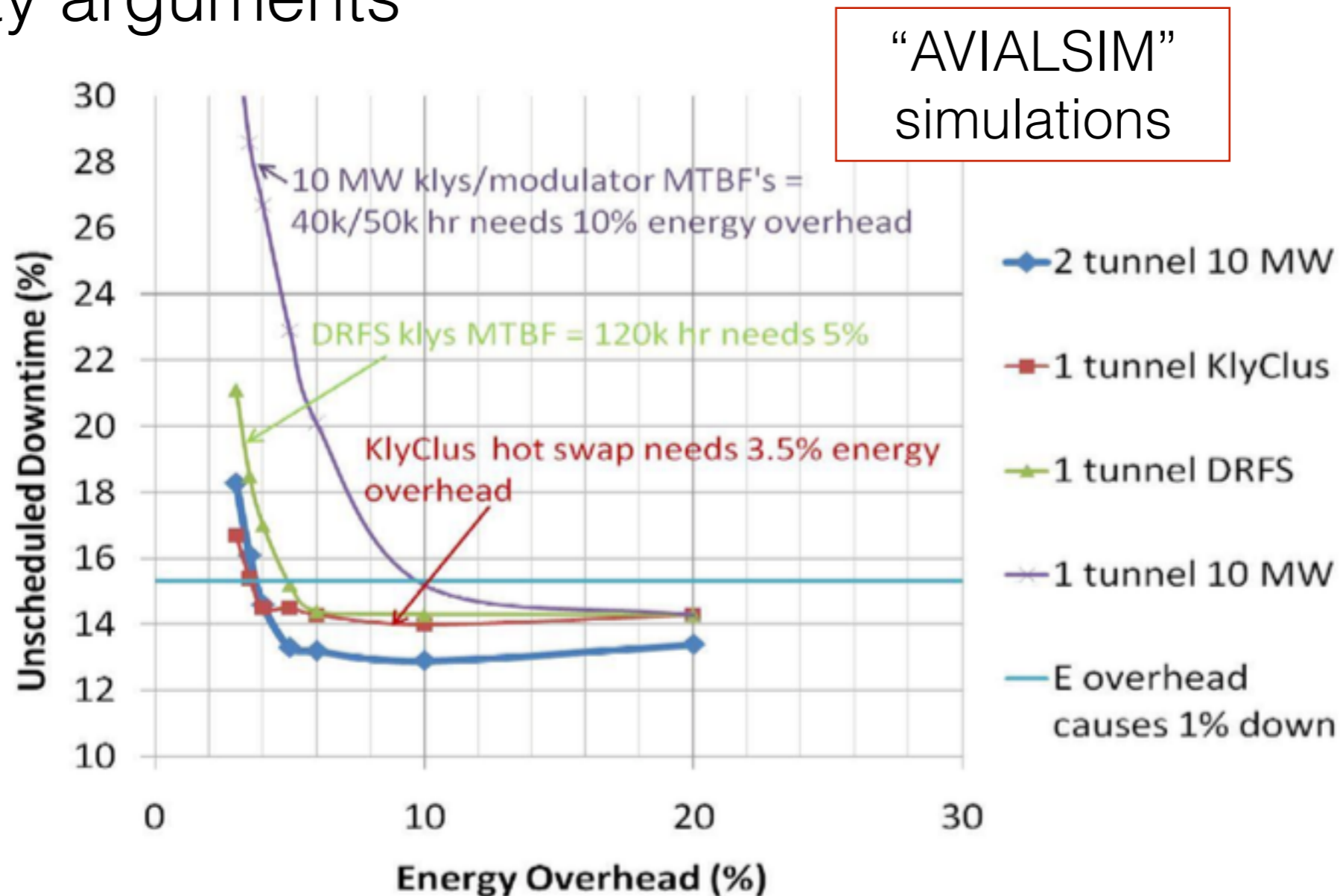
Option-3 No SW



Tending to option 2 ⇒ \$\$\$ reduction (offset CR-04 😊)

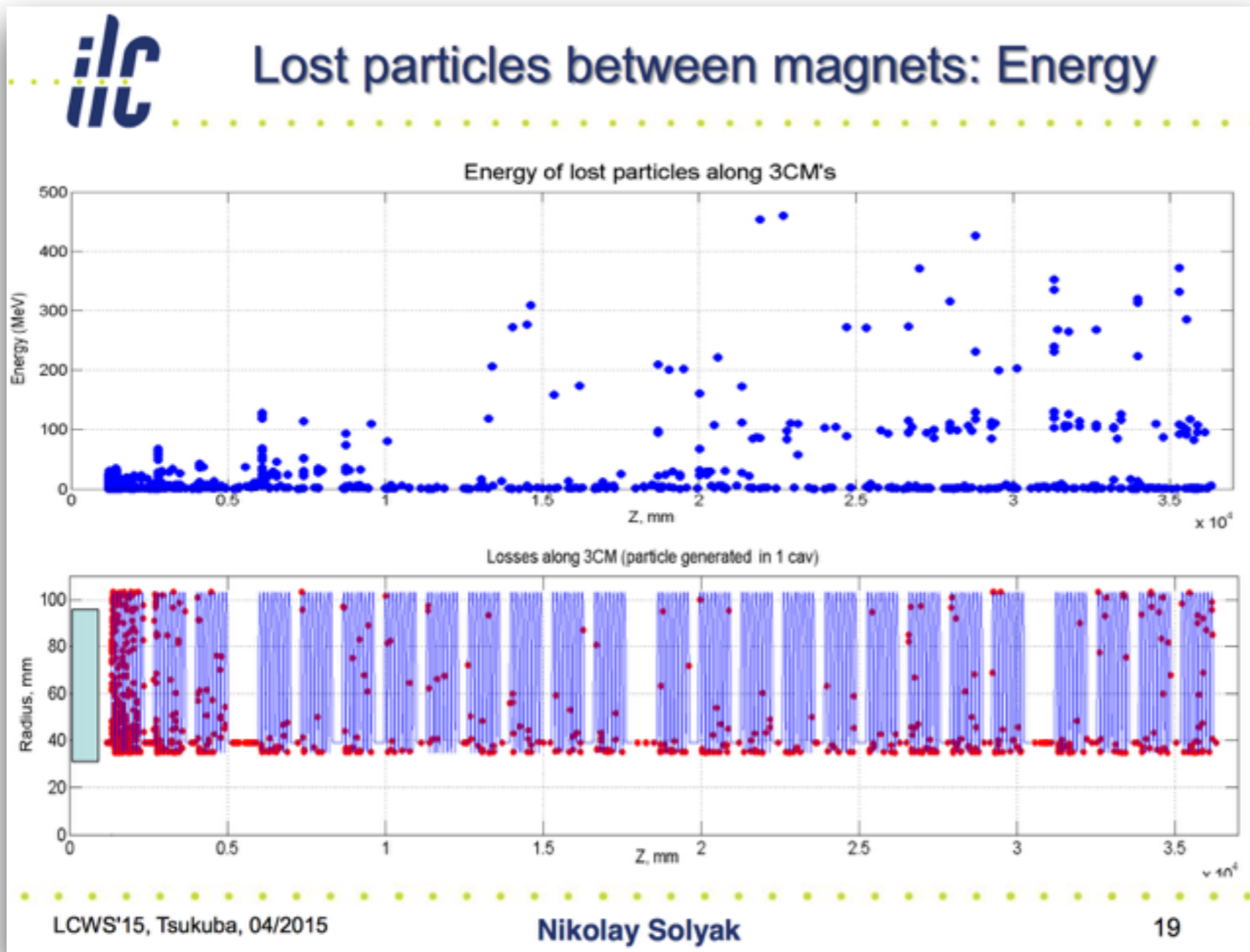
Why let them in in the first place?

Availability arguments

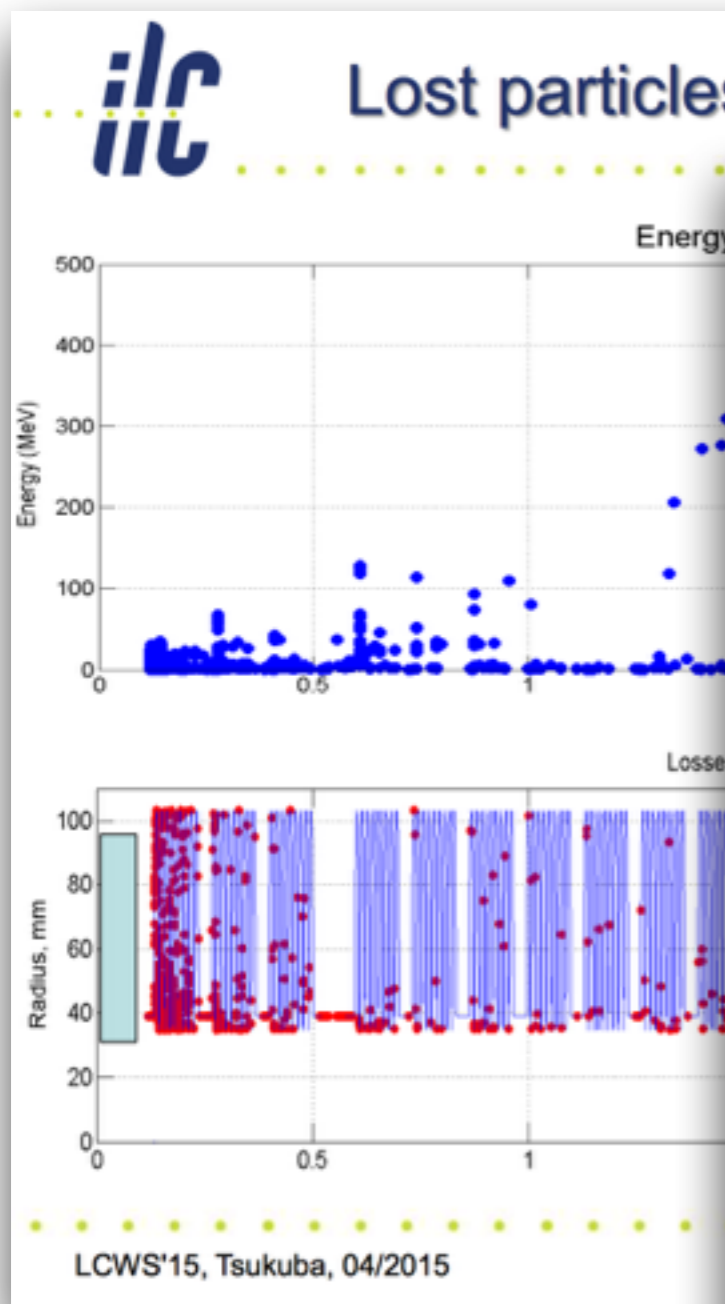


RDR/TDR: “two tunnels” cheaper than additional required linac overhead
Klystron+modulator lifetimes now expected to be much higher (100k vs 40k hours)

Understanding dark current losses



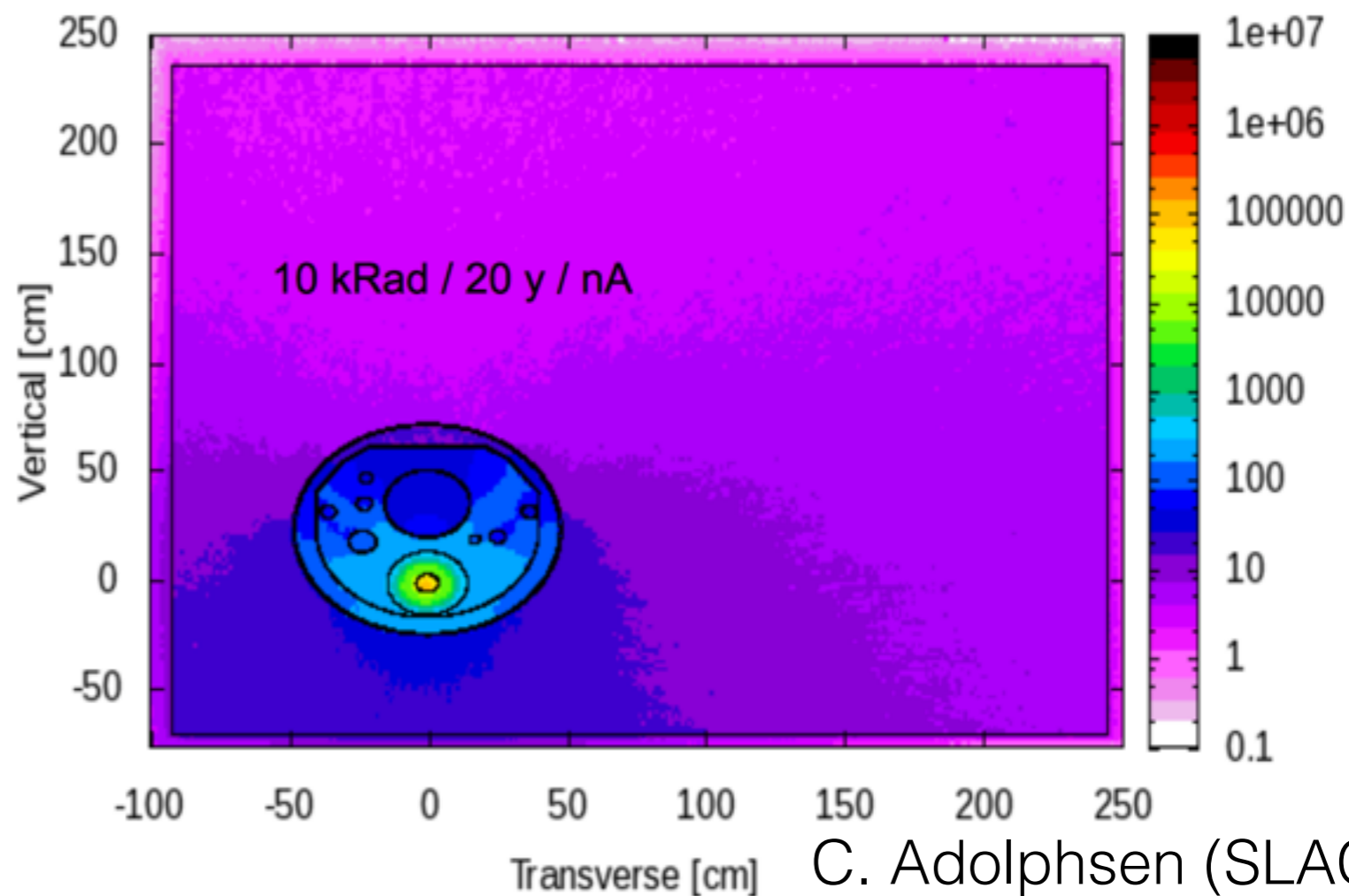
Understanding dark current losses



End View – Lower Radiation Levels above CM

LCLS-2

Dose equivalent in silicon electronics [Gy/y/nA]



C. Adolphsen (SLAC)

Central Region: Positron Source

- Work being undertaken by KEK ADI team
 - Focus now on
 - ▶ Systems layout for undulator source
 - ▶ Systems layout (integration) of proposed 300-Hz electron-driven source
 - Priority: CFS layout (required underground volume)
 - Goal: CR for CFS central region
 - ▶ which could support both sources in parallel
 - ▶ (Nick's understanding)
 - ▶ Time scale: LCWS
-

Undulator source considerations:

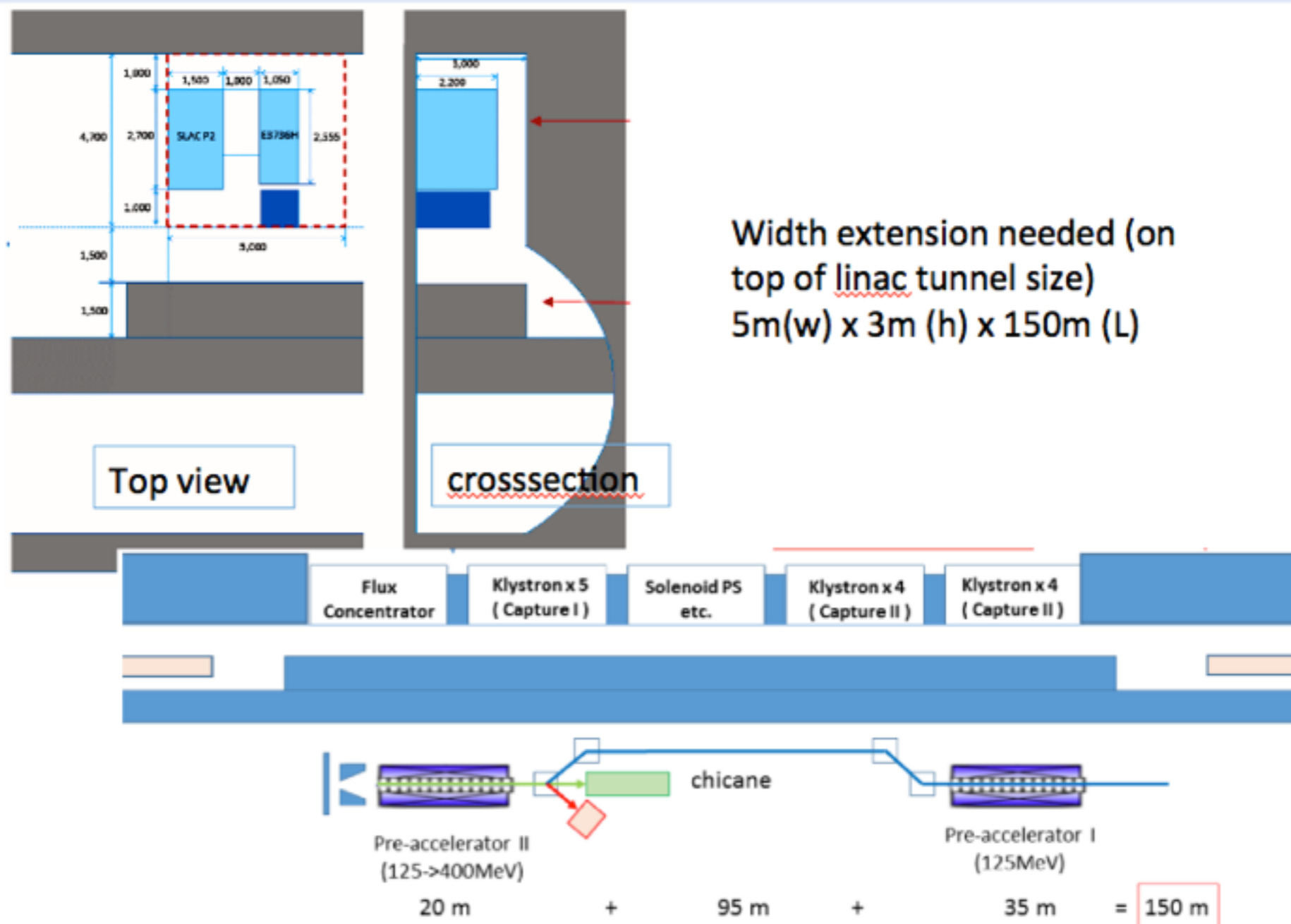
- Linac hardware (NC, SC and quads) based on TDR
- Tunnel in NC linac region
- Distribution of refrigerator
- Optics in undulator region with quads
- Optics and loading compensation of energy compressor
- Chicane for timing adjustment

“Before studying the possible tunnel layout for the conventional source, the tunnel for the undulator source must be discussed in some more detail than in the TDR.” -K. Yokoya

CFS for NC RF region

Note:
Also now
assuming
Kamaboko-style
tunnel for central
region

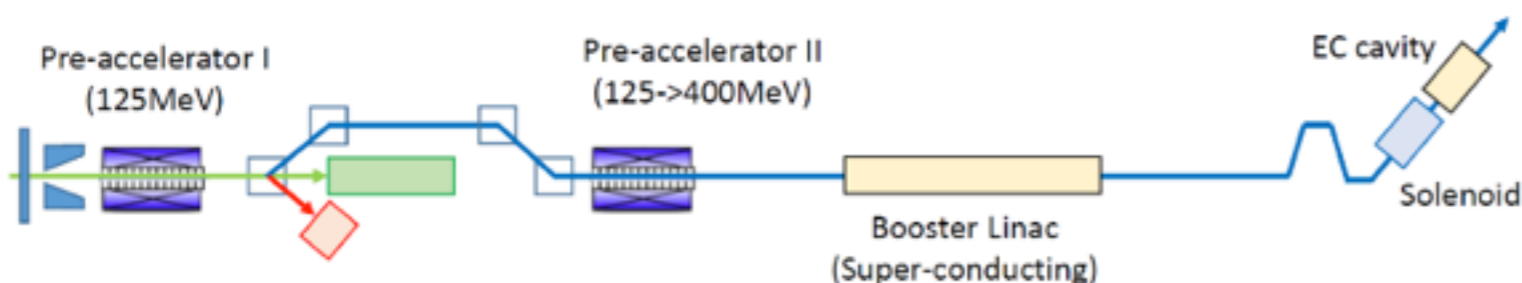
Suggestion for the tunnel in NC linac region



Other (undulator-source) proposals

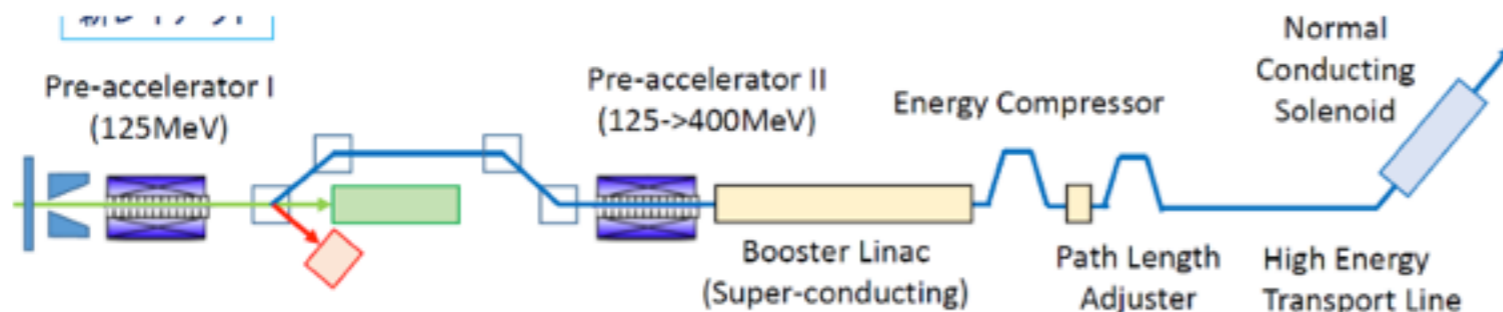
Layout Summary

- TDR



- Possible revision

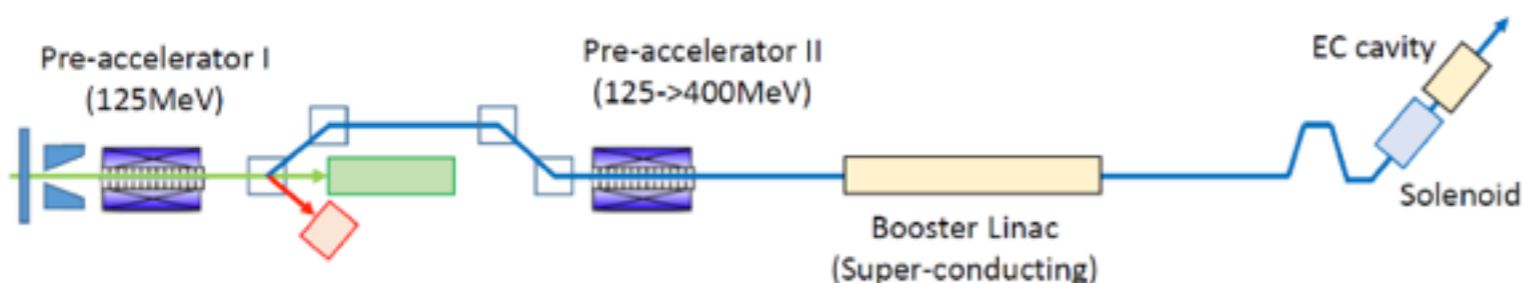
- “High Energy Transport Line” is, perhaps, long enough to accommodate e-Driven source.



Other (undulator-source) proposals

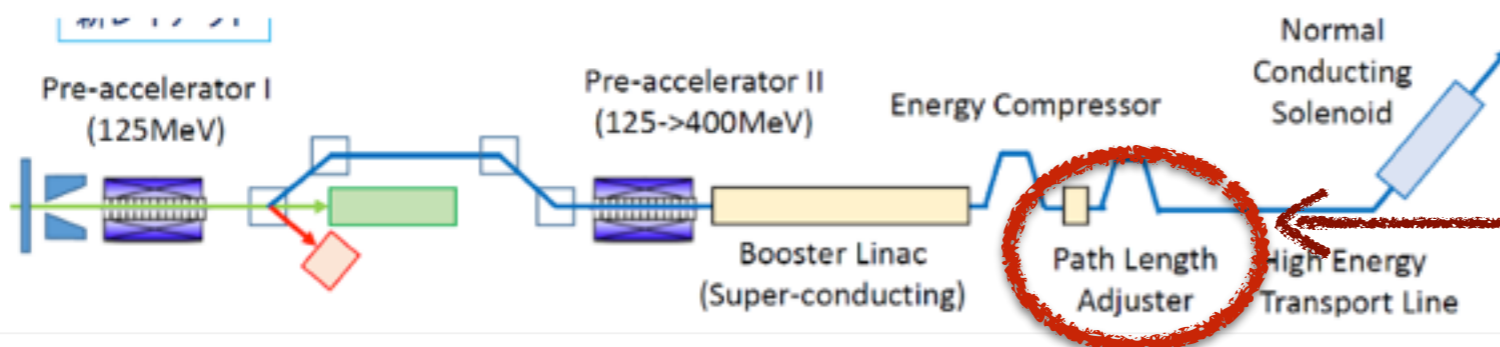
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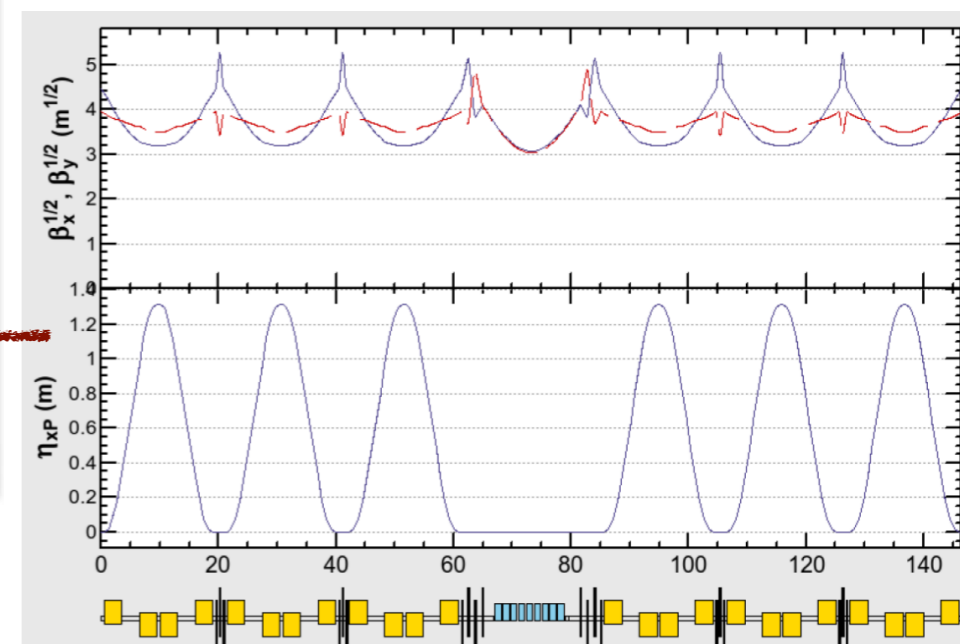


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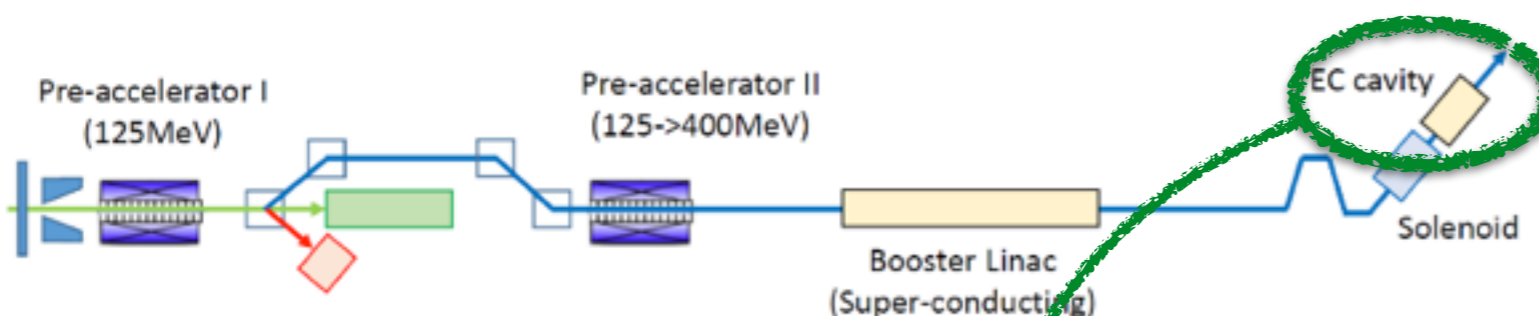
Inclusion of path-length (timing) adjustment (0-68 cm)



Other (undulator-source) proposals

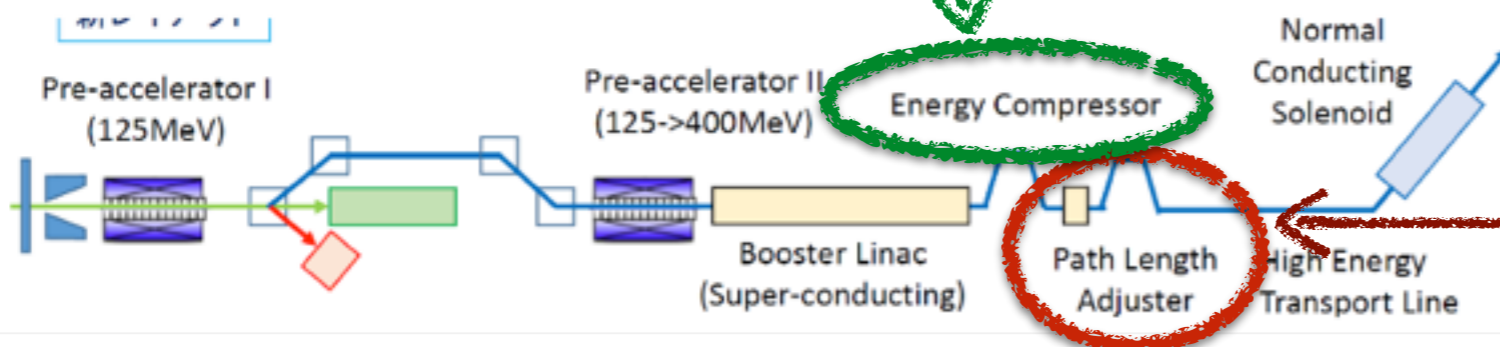
Layout Summary

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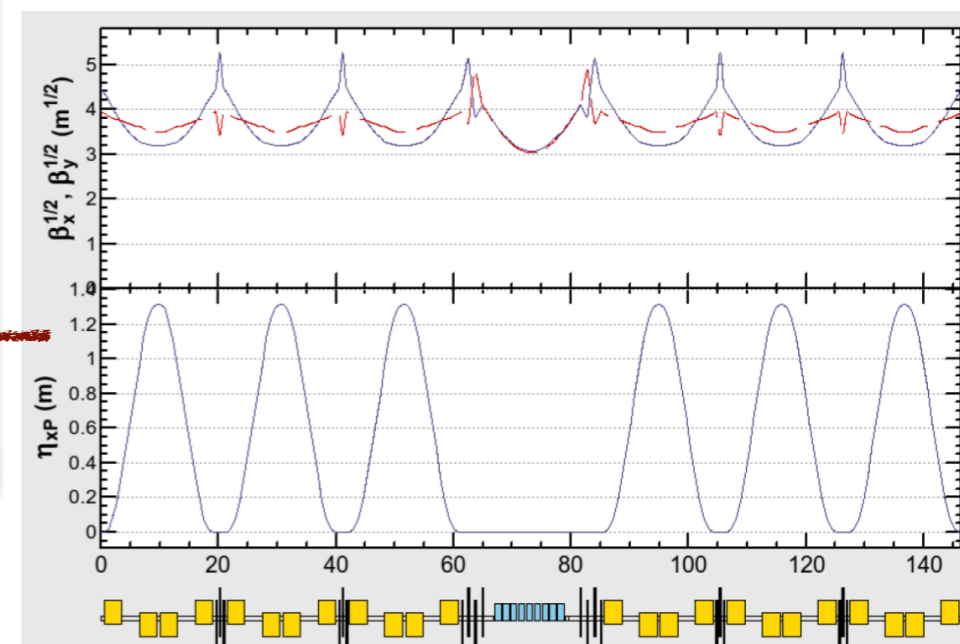
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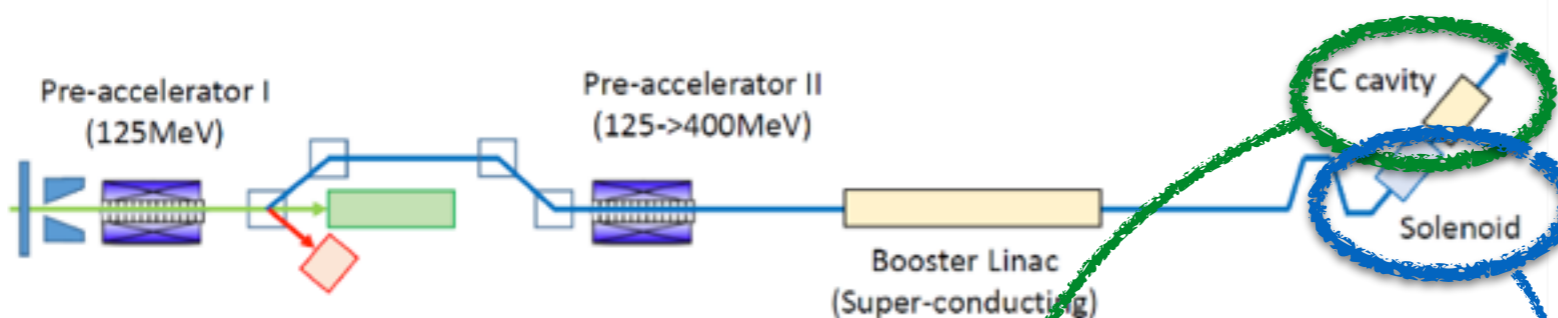
Move energy compressor RF



Other (undulator-source) proposals

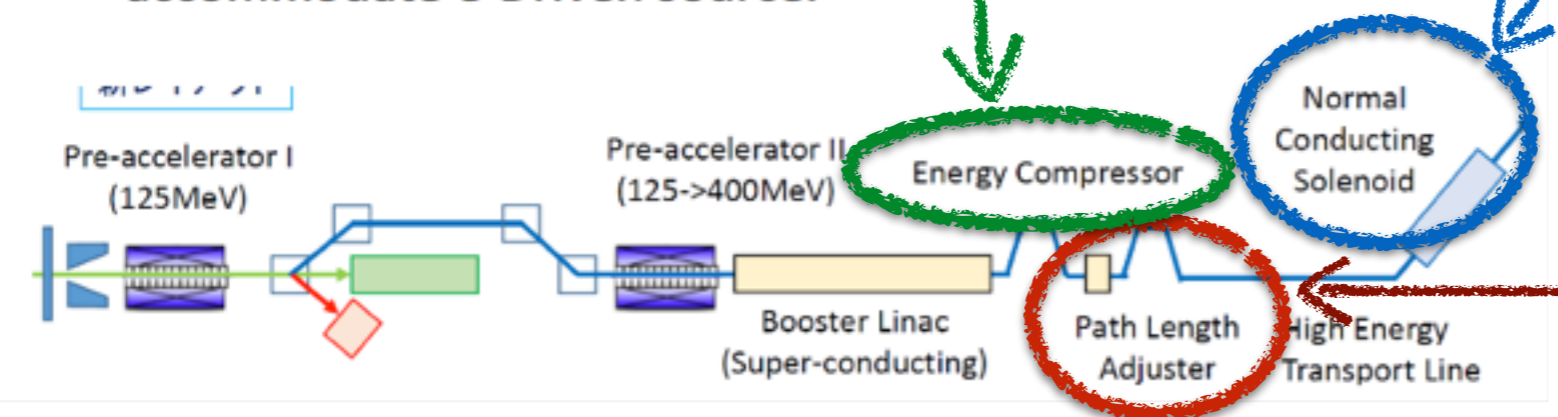
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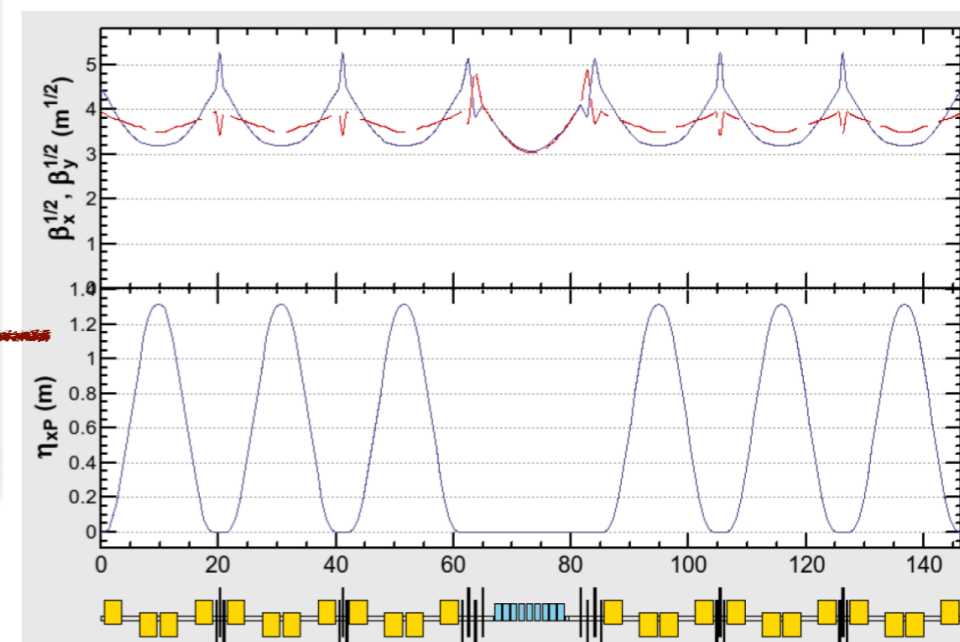
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Inclusion of path-length (timing) adjustment (0-68 cm)

Move energy compressor RF

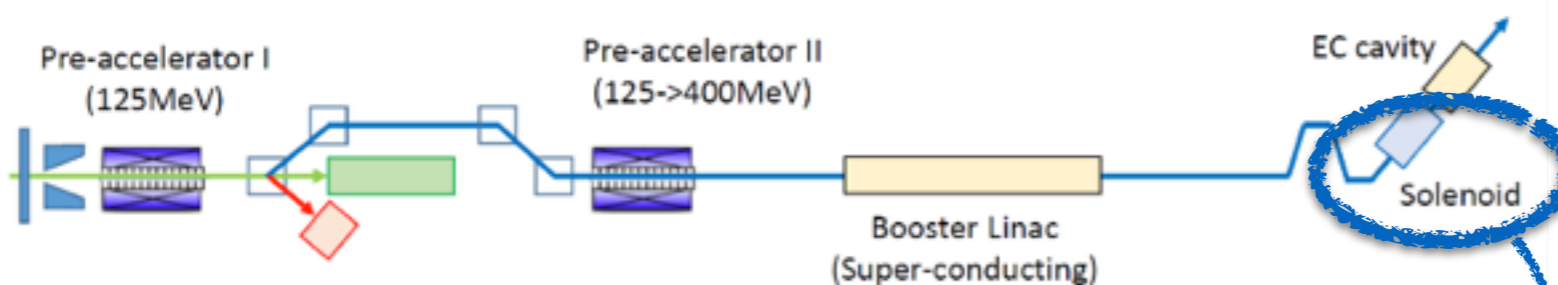
40m NC rather than 5m SC rotator solenoid (cryo consideration)



Other (undulator-source) proposals

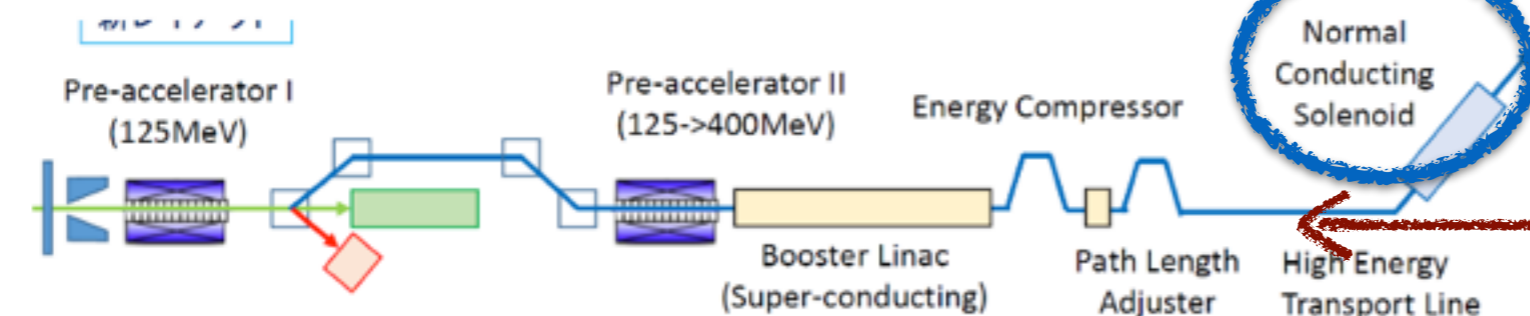
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Question:

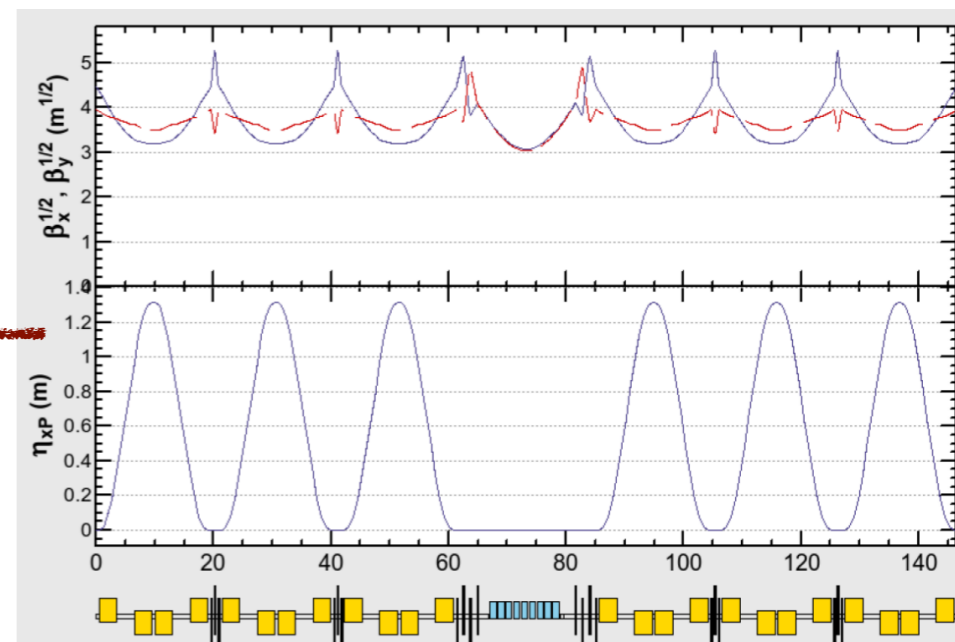
spin-flip for polarised positron

Parallel solenoid line needed?

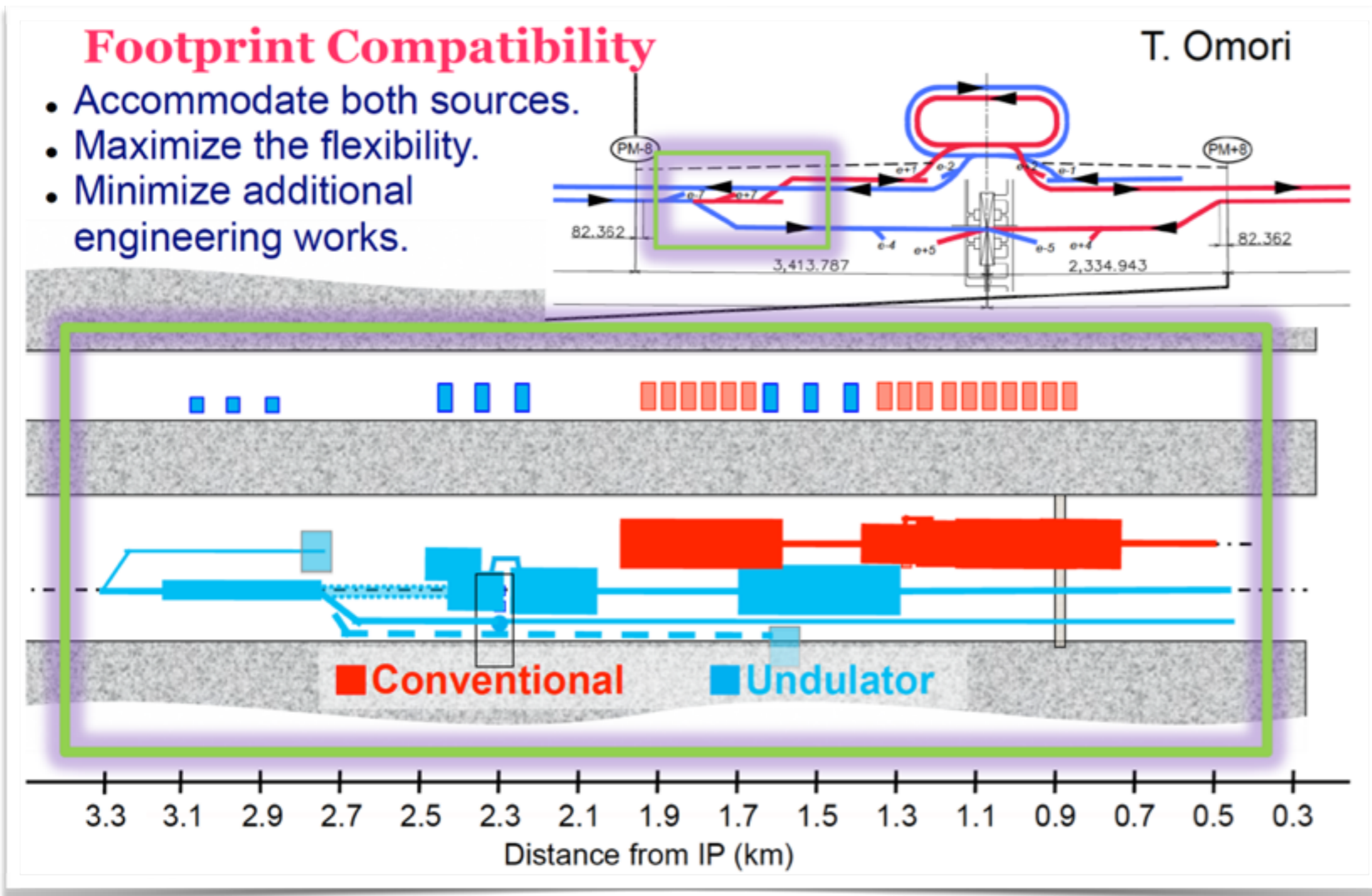
No description in TDR

[K. Yokoya]

40m NC rather than 5m SC rotator solenoid
(cryo consideration)



300-Hz electron-drive source



5GeV s-band (NC) linac design still needs work
More at POSIPOL 15 (Daresbury next week)

Damping Rings

- Happy to report activity at Cornell Univ.
 - ▶ Dave Rubin and Jim Shanks
 - Current focus: updating/consolidation DR parameters
 - Inclusion of 10-Hz 2625 bunch operation for high luminosity
 - ▶ not a formal TDR mode considered
 - ▶ CR in progress
 - Future studies
 - ▶ Lattice layout
 - ▶ Further beam dynamics and tuning studies
 - ▶ Spin tracking (is this needed?)
 - ▶ Injection / extraction studies (losses, stability)
-

Expected upcoming CRs

- New surface cryogenic layout next CMB
- ML tunnel cross-section reduction LCWS15?
 - ▶ shield wall, no personnel access etc.
- Central region CFS changes LCWS15?
 - ▶ to accommodate new source layouts
 - ▶ including possible 300-Hz e-driven source

More?

Watch this space

ADI Plenary sessions @ LCWS 2015

ILC Plenaries Strawman

	Tues 3/11	Wed 4/11	Thurs 5/11
13.30 -> 15.30	ILC plenary; ML Tunnel X-section	LC Future directions (with LC school) (40 mins slot) SRF – Hasan Padamsee ?, NCRF – Walter Wuench Novel technologies for future LC's - Herman	ILC plenary; ?
15.30 -> 16.00	BREAK	BREAK	BREAK
16.00 -> 18.00	ILC plenary; Positrons	LC Future directions (with LC school) (40 min slot) Plasmas (lasers) Wim Leemans ? Plasmas (particles) – AWAKE ? LC requirements – Daniel Schulte	ILC plenary; Change Management Board

Last thoughts (for today)

- Site dependent design moving forward
 - ▶ despite ridiculously low international resources
 - ▶ KEK team playing a central design role
 - CM keeping is all honest, involved and informed
 - ▶ Now our “primary” project management tool
 - Several major CRs on their way
 - Implementation phase is “lagging”
 - ▶ again due to resources
 - ▶ BUT the baseline *decisions* are important
-