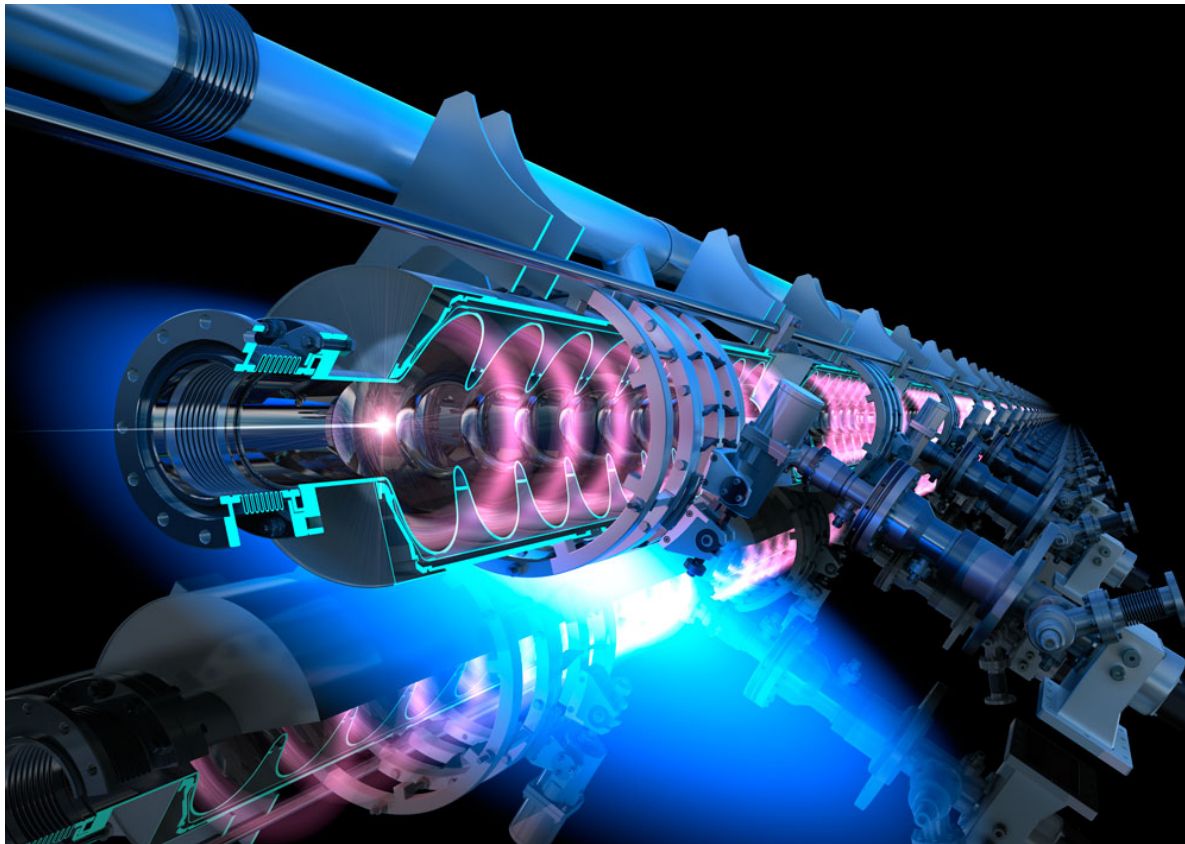


ALCW2015

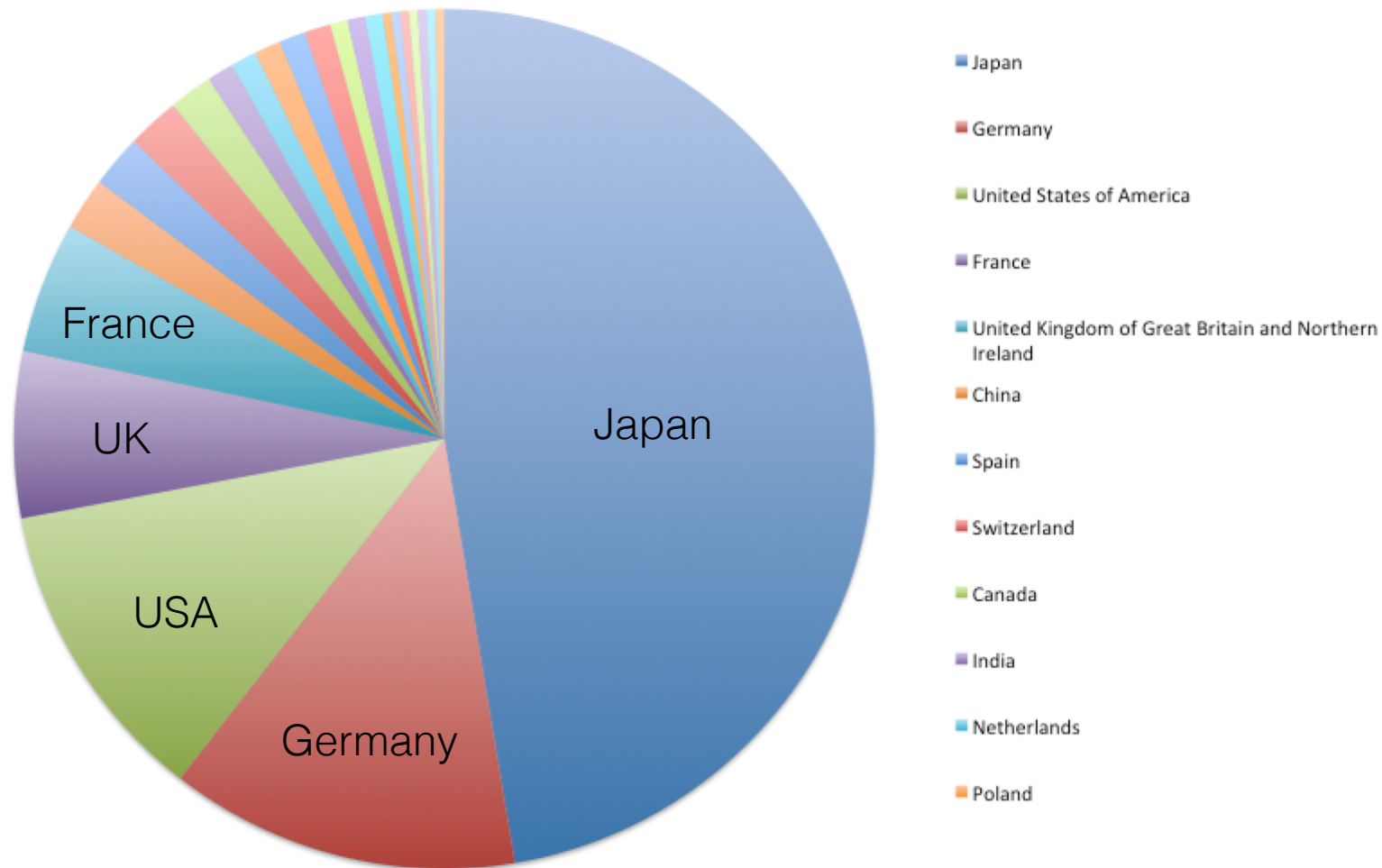
Accelerator (AD&I) highlights



Nick Walker
ILC@DESY Project Meeting
8.05.2015

Participation

304 registered participants



A Plenary Approach


	Monday 20-Apr	Tuesday 21-Apr	Tokyo Event Wednesday 22-Apr	Thursday 23-Apr	Friday 24-Apr	
09:00	Registration	BDS-II: optics	Tokyo Event Wednesday 22-Apr	CFS: ARUP meeting (Tokyo)	SRF I	
09:30	Opening joint	Conveners			Main Linac / BC (TBC)	Convener
10:00	plenary	G. White T. Okugi			conveners N. Solyak K. Kubo A. Latina	H. Hayano ?
10:30	Coffee				Coffee	
11:00	Machine overviews PLENARY Conv. M. Harrison	CR-2 L* Final Review PLENARY Conv. N. Terunuma			Sources (TBC)	SRF II
12:30	Lunch				conveners Wei Gai M. Kuriki	
14:00	BDS I/MDI I Conveners G. White T. Okugi	CR-4 Tunnel Extension PLENARY Conv. V Kuchler			Lunch	SRF III
15:30	Coffee				Central Region PLENARY conv: N. Walker TDR lattice release status	
16:00	CR-3 CIT report PLENARY Conv. N Walker				Change Register Review conv. N Walker	
16:30	MDI-II: Surface & Infr. With CFS Conv. Büser, Tauchi	Joint Plenary ?? (undefined)			Coffee	
18:00				Joint Plenary ?? (undefined)	Joint Closing Plenary	

A Plenary Approach


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18:00			

- Very BDS + MDI centric
- BDS optics work
- CR driven sessions
 - ▶ CR-3 (detector hall) Change Implementation Team report
 - ▶ CR-2 (common L*) Final review
 - ▶ CR-4 (tunnel extension) first public presentation


Monday

IR solenoid compensation*Dr. Glen WHITE* *3rd Bldg. Seminar Room, 3rd Bldg. 1F*

14:00 - 14:20

Sweet Spots, Anti-Solenoids and Space Saving for QD0*Dr. Brett PARKER* *3rd Bldg. Seminar Room, 3rd Bldg. 1F*

14:20 - 14:40

ILC Collimation using BDSIM*Dr. Stewart BOOGERT* *3rd Bldg. Seminar Room, 3rd Bldg. 1F*

14:40 - 15:00

Polarisation Measurements and Spin Tracking in the ILC BDS*Jenny LIST* *3rd Bldg. Seminar Room, 3rd Bldg. 1F*


15:00 - 15:30

CR-003 CIT report*Mr. Victor KUCHLER* *3rd Bldg. Seminar Room, 3rd Bldg. 1F*


16:00 - 16:30

Underground facilities and access*Mr. Yoshinobu NISHIMOTO**3rd Bldg. Seminar Room, 3rd Bldg. 1F*

16:30 - 17:00

IR surface buildings*Mr. MASANOBU MIYAHARA* *3rd Bldg. Seminar Room, 3rd Bldg. 1F*

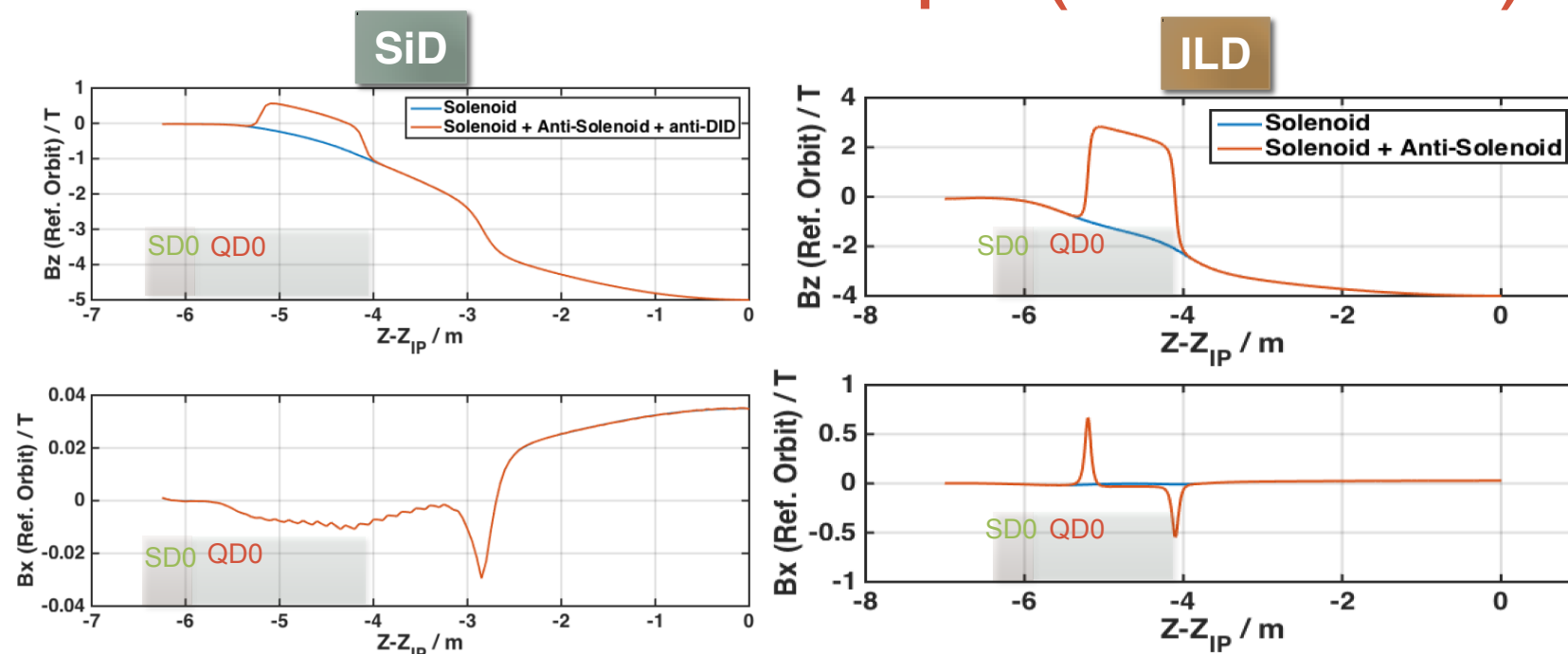
17:00 - 17:30

Local activities wrt MDI/CFS*Tomoyuki SANUKI* *3rd Bldg. Seminar Room, 3rd Bldg. 1F*

17:30 - 18:00

G. White (SLAC) - Compensation of detector solenoid field with $L^* = 4.1\text{m}$

IR Solenoid Field Maps (+ Anti-DID)

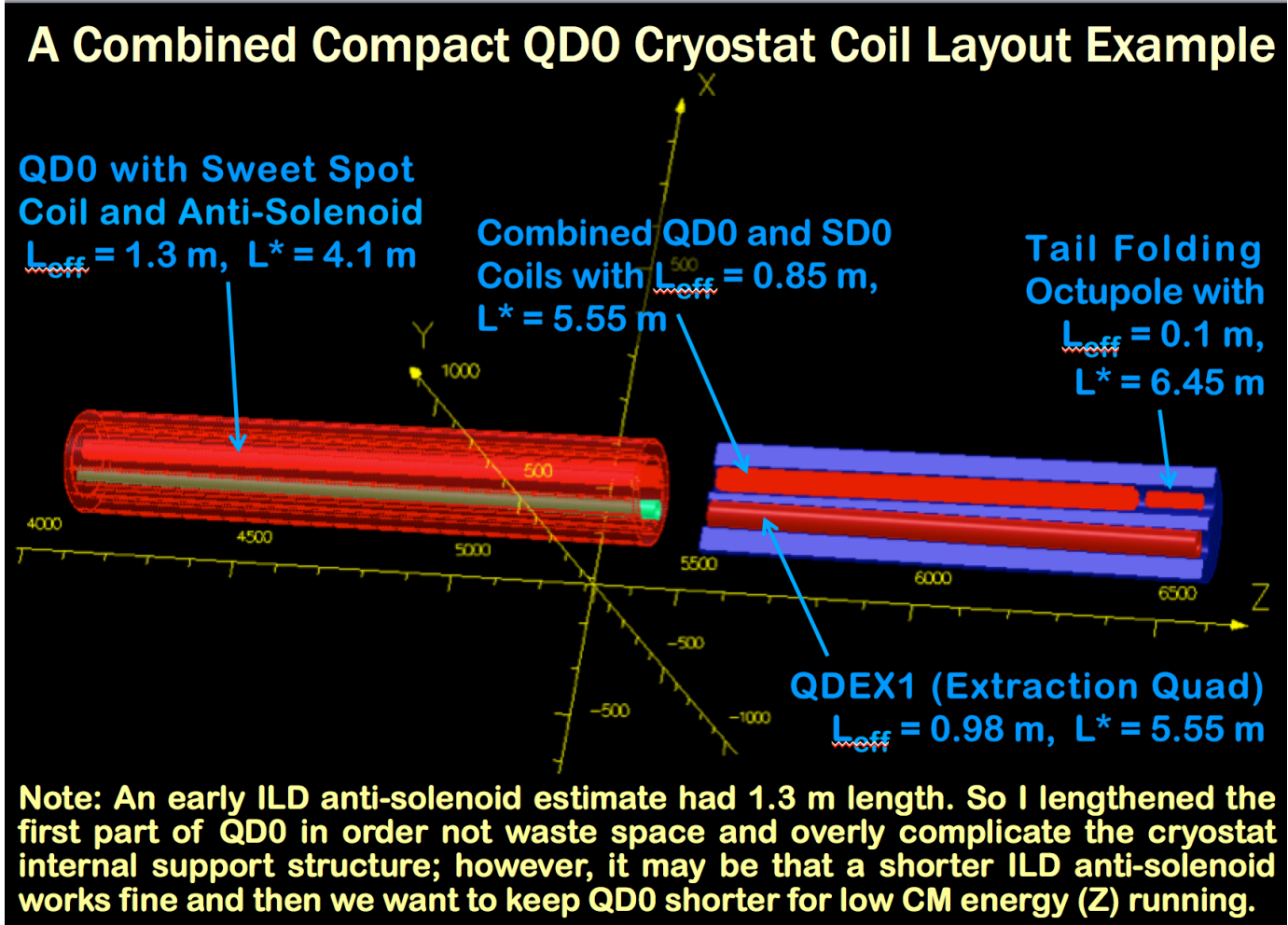


- 3D field maps provided by detector collaborations
- Transform to beam reference frame (14 mrad horizontal x-ing)
- Common $L^*=4.1\text{m}$
- Fields superimposed onto QD0 and SD0 fields (not shown)
 - Also use dipole field windings on QD0 to correct IP trajectory (not shown here).
- ILD has larger impact on beam aberrations due to larger integrated solenoid field overlap with QD0.
 - Using larger field strength option of 4T to assess worse-case scenario

Integrated Solenoid Field

Detector	B_I (T.m)	B_{ED} (T.m) $L^*=4.0\text{m}$ Full QD0, (QD0A)	B_{ED} (T.m) $L^*=4.1\text{m}$ Full QD0, QD0A
SiD	15.7	0.656, 0.589	0.556, 0.507
ILD	17.3	2.380, 1.865	2.158, 1.644

“Ideas” for better optimised FD



“Sweet spot” compensation

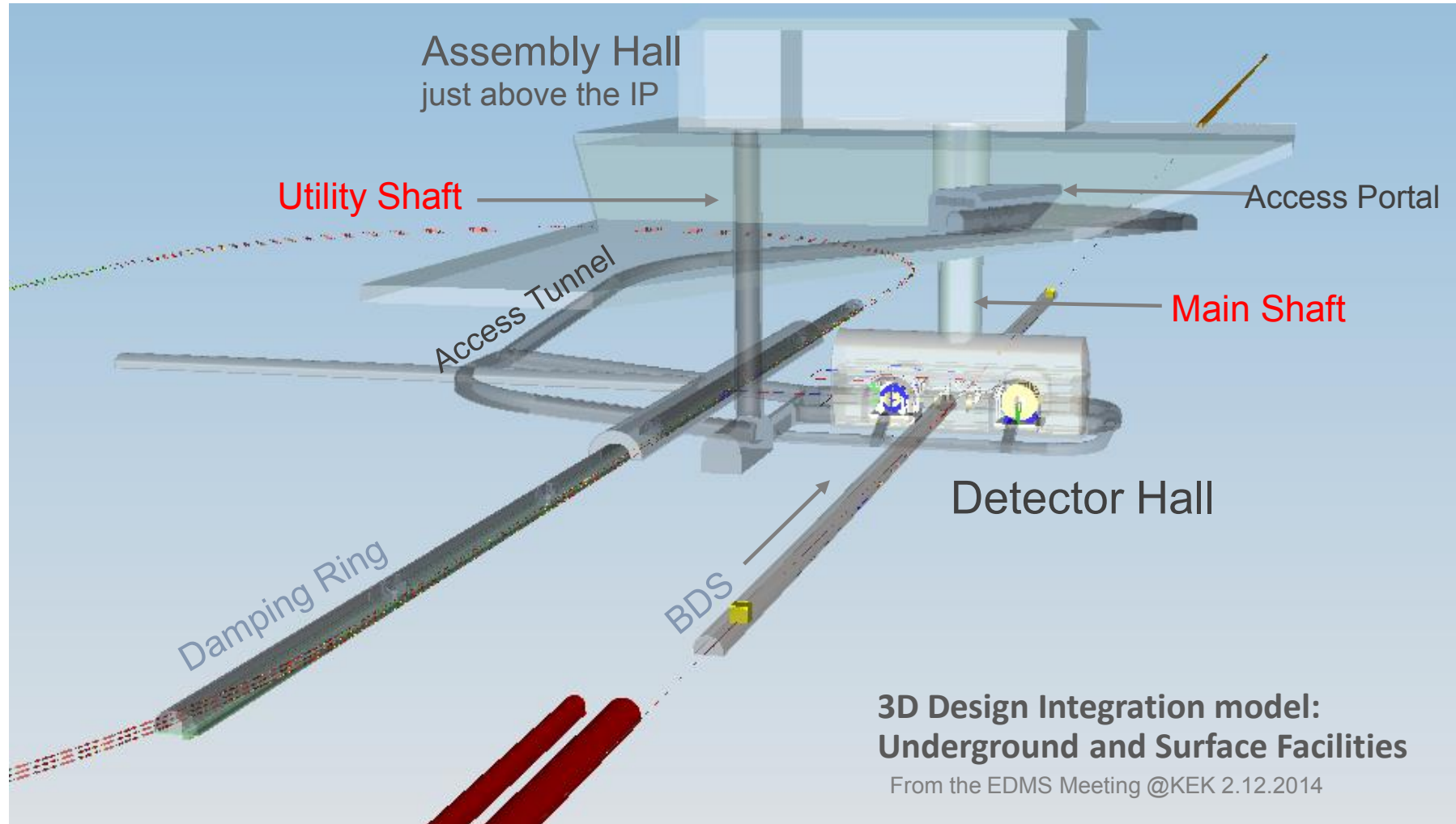
Experience from KEK-B and E-RHIC designs

Ideas for more compact QF1

Brett Parker (BNL)

CR-003 Implementation

DH with Vertical Shaft Access



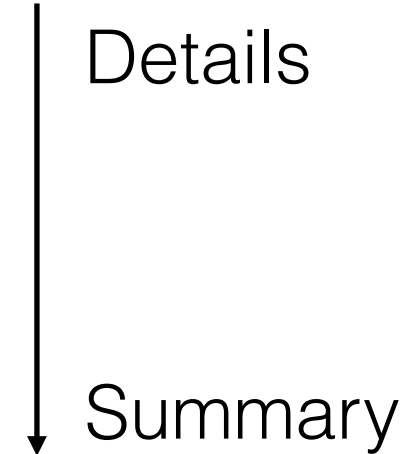
Tuesday AM

BDS tuning and optics studies

Tolerance studies with FFBK (remote)	<i>Min-Huey WANG</i>
<i>3rd Bldg. Seminar Room, 3rd Bldg. 1F</i>	09:00 - 09:15
Tuning optimisation for FFS (remote)	<i>Dr. Eduardo MARIN</i>
<i>3rd Bldg. Seminar Room, 3rd Bldg. 1F</i>	09:15 - 09:45
BDS optics comparisons	<i>Dr. Toshiyuki OKUGI</i>

CR-002 (Common L*) close-out

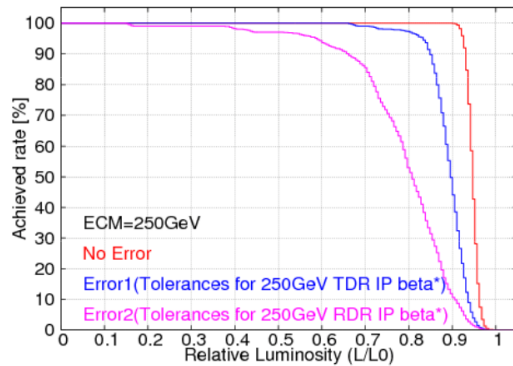
Detector solutions: ILD	<i>Dr. Karsten BUESSER</i>
<i>3rd Bldg. Seminar Room, 3rd Bldg. 1F</i>	11:00 - 11:25
Detector solutions: SiD	<i>Dr. Thomas MARKIEWICZ</i>
<i>3rd Bldg. Seminar Room, 3rd Bldg. 1F</i>	11:25 - 11:50
Baseline lattice, performance, issues	<i>Dr. Glen WHITE</i>
<i>3rd Bldg. Seminar Room, 3rd Bldg. 1F</i>	11:50 - 12:15
CRP close-out / recommendations	<i>Nobuhiro TERUNUMA</i>
<i>3rd Bldg. Seminar Room, 3rd Bldg. 1F</i>	12:15 - 12:30



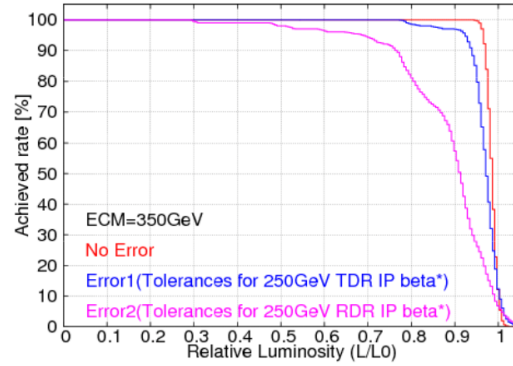
Final Focus Tolerance studies

IP tuning simulation by putting total alignment errors

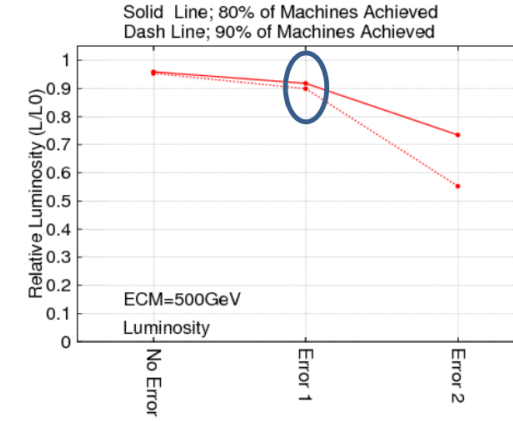
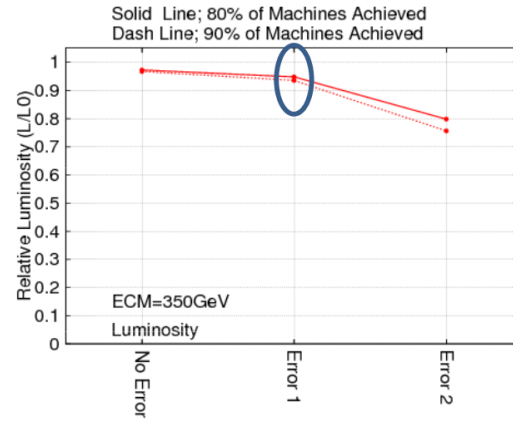
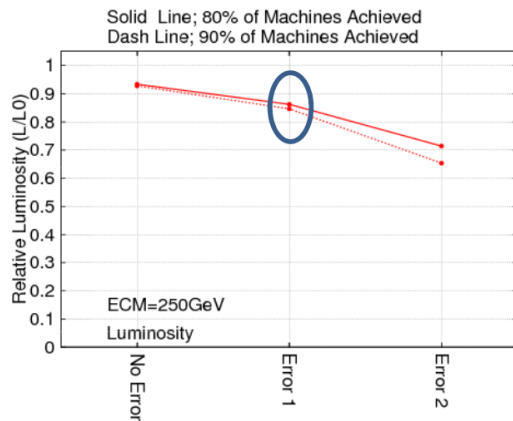
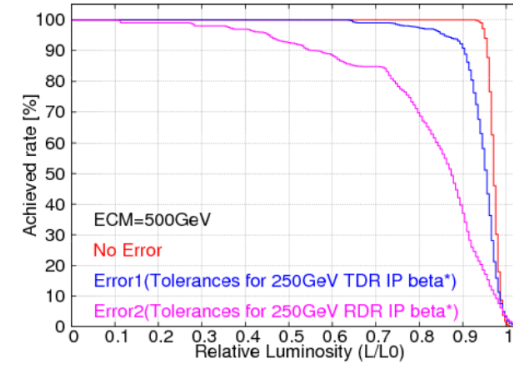
**ECM=250GeV
TDR IP parameter**



**ECM=350GeV
TDR IP parameter**



**ECM=500GeV
TDR IP parameter**



When the alignment error is increased by the factor 1.4/2.0, the achieved luminosity is reduced so much.

Tolerances for ECM=350GeV, 500GeV are easier than ECM=250GeV.

T. Okugi (KEK)

Recommendations CR-002 N. Terunuma

Common L^* of 4.1 m

- Taking all currently available information, the CRP recommends that CR-002 being accepted as baseline, with an agreed-upon common L^* of 4.1 m.
 - As a further corollary to this study, the CRP also recommends that **QF1 L^* be left at the TDR value of 9.5 m.**
 - With QD0 L^* set at 4.1m, the BDS performance was evaluated for a range of QF1 L^* values. A weak dependence is observed when lowering the QF1 L^* from 9.5 m, whereas the collimation depth calculations show a preference for an L^* of around the TDR design value of 9.5 m.
 - Shorter QF1 L^* leads redesign of QF1 support structure and Packman both on SiD and ILD.
-

Recommendations (cont.) CR-002 N. Terunuma

The CRP also makes note of the following related issues that merit further study:

QF1 length:

The BDS studies show the more tangible improvements evident for a **shorter QF1 of 1 m** as opposed to 2 m which they strongly recommend if feasible.


IPBPM:

A BPM located just downstream of QD0 will help the recovery of the beam after the push-pull of detectors and that of after long shutdown, as well as aiding the IP FFBK system.

Tuesday PM

CR-004 Tunnel Extension (public presentation)

Presentation of proposal

Nicholas WALKER 

3rd Bldg. Seminar Room, 3rd Bldg. 1F

14:00 - 14:20

Impact on tunnel and access layout

Tomoyuki SANUKI 

3rd Bldg. Seminar Room, 3rd Bldg. 1F

14:20 - 14:35

Schedule implications

Martin GASTAL

3rd Bldg. Seminar Room, 3rd Bldg. 1F

14:35 - 14:50

Next steps / discussion

ALL (VIC KUCHLER)

3rd Bldg. Seminar Room, 3rd Bldg. 1F

14:50 - 15:00

Ideas on reduction of shield wall thickness

Dr. Mike HARRISON

3rd Bldg. Seminar Room, 3rd Bldg. 1F

15:00 - 15:15

Discussion

3rd Bldg. Seminar Room, 3rd Bldg. 1F

15:15 - 15:25

Proposal summary (NJW)

- CR-004 proposes to extend ML tunnels by ~ 1.5 km
 - Primary rationale
 - ▶ Risk mitigation for energy margin
 - ▶ I.e. reduce gradient and/or higher energy reach
 - Choice of length set by
 - ▶ Fixing global timing constraint
 - Strong (?) physics case at ≥ 500 GeV
 - ▶ Changes our attitude to *guaranteeing 500 GeV cm?*
 - Note: this CR does not give you the energy margin
 - ▶ Filling the tunnels with more linac does! \$\$\$
-

Impact on horizontal access (T. Sanuki)

	TDR	CR-003	CR-004
	Horizontal T@DH	Vertical shaft@DH	Vertical shaft@DH +1.5km / linac
PM-17	550	910	540
PM-16	680	820	880
PM-14	810	1,230	1,470
PM-13	1,150	1,270	1,140
PM-12	1,730	2,380	1,270
PM-10	1,300	1,300	2,450
PM-8	440	550	1,210
PM+8	650	990	990
PM+10	1,300	1,300	1,300
PM+12	720	1,160	1,160
PM+13	1,160	1,220	1,150
PM+14	1,250	1,480	1,470
PM+16	1,340	1,770	1,900
PM+17	600	500	630
Total (31km)	8,450	10,170	10,670
Total (50km)	13,680	16,880	17,560

Shield wall thickness

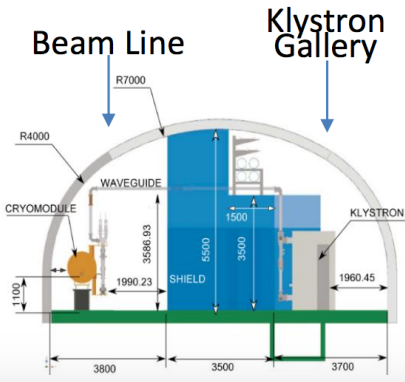
CFS Work for the future CR

ML Shield wall thickness impact Pre-study

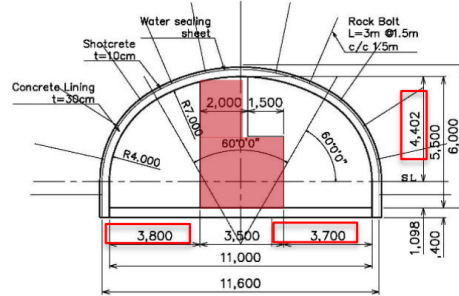
- Radiation shield issue will be decided by necessity of person's access
- Scheme change depends on the management scenario of beam operation.

Common Dimensions

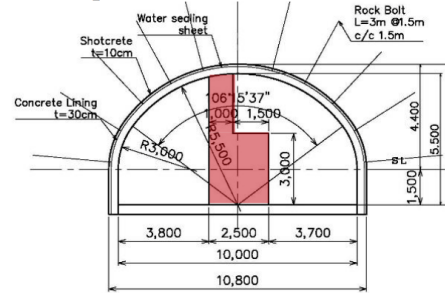
- Beam line :
Width 3.8m
- Klystron gallery:
Width 3.7m
- Tunnel Inner height :
5.5m



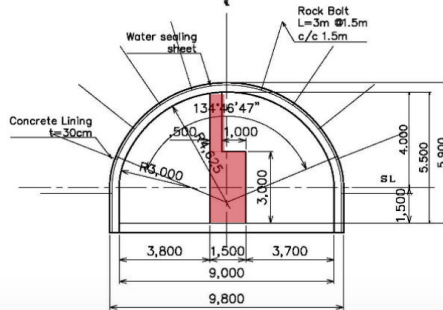
Baseline SW3.5m



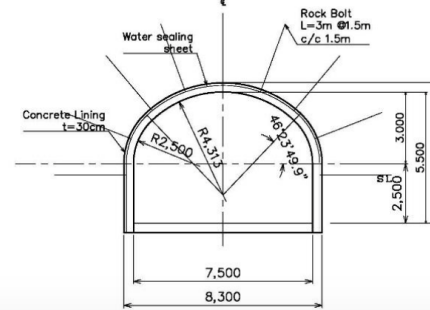
Option-1 SW2.5m



Option-2 SW1.5m



Option-3 No SW



Option-2 would save ~100 MILCU




Get around “rad safety” by asserting no beam-on access to service side of tunnel

RDR availability arguments revisited!

A future CR

A Plenary Approach

Main Linac / Bunch Compressor

PLACET Simulations in the ILC Bunch Compressors	<i>Yanliang HAN et al.</i>
<i>3rd Bldg. Seminar Room, 3rd Bldg. 1F</i>	09:00 - 09:15
Beam losses and shielding issues in ML tunnel	<i>Toshiya SANAMI</i>
<i>3rd Bldg. Seminar Room, 3rd Bldg. 1F</i>	09:15 - 09:40
Status of Dark Current modeling in ML	<i>Dr. Nikolay SOLYAK</i> 
<i>3rd Bldg. Seminar Room, 3rd Bldg. 1F</i>	09:40 - 09:55
Failure modes studies in BC and ML	<i>Dr. Arun SAINI</i> 
<i>3rd Bldg. Seminar Room, 3rd Bldg. 1F</i>	09:55 - 10:20
Overview of Dark current studies for LCLS-II	<i>Chris ADOLPHSEN</i> 
<i>3rd Bldg. Seminar Room, 3rd Bldg. 1F</i>	10:20 - 10:40

Focus on evaluating impact of shield wall thickness

Estimations of beam loss during nominal operations

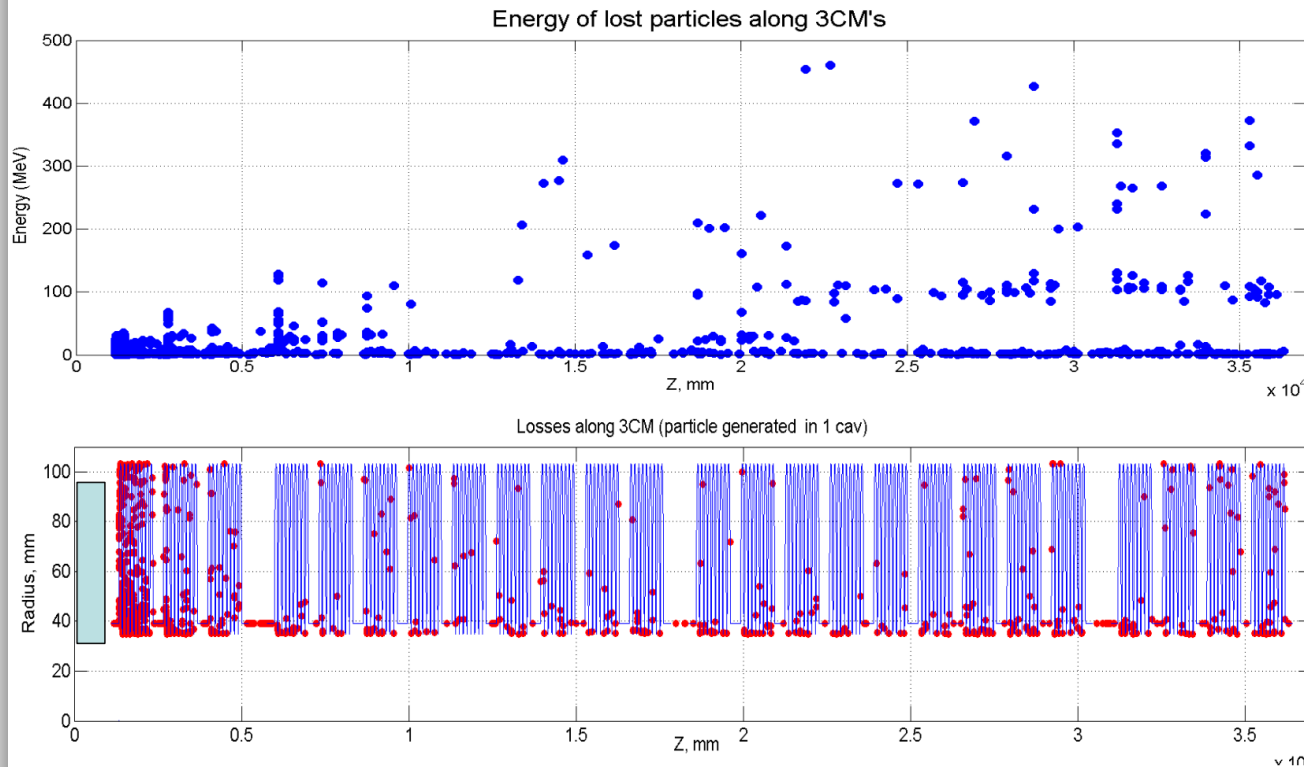
(Quite a bit of reinventing wheels)

Day	Thursday 23-Apr	Friday 24-Apr	
Plenary			
	CFS: ARUP meeting (Tokyo)	Main Linac / BC (TBC) convener N. Solyak K. Kubo A. Latina	SRF I Convener H. Hayano ?
		<i>Coffee</i>	
		Sources (TBC) convener Wei Gai M. Kuriki	SRF II
		<i>Lunch</i>	
	14:45	Central Region PLENARY conv: N. Walker TDR lattice release status	SRF III
		Change Register Review conv. N Walker	
		<i>Coffee</i>	
		Joint Plenary ?? (undefined)	Joint Closing Plenary

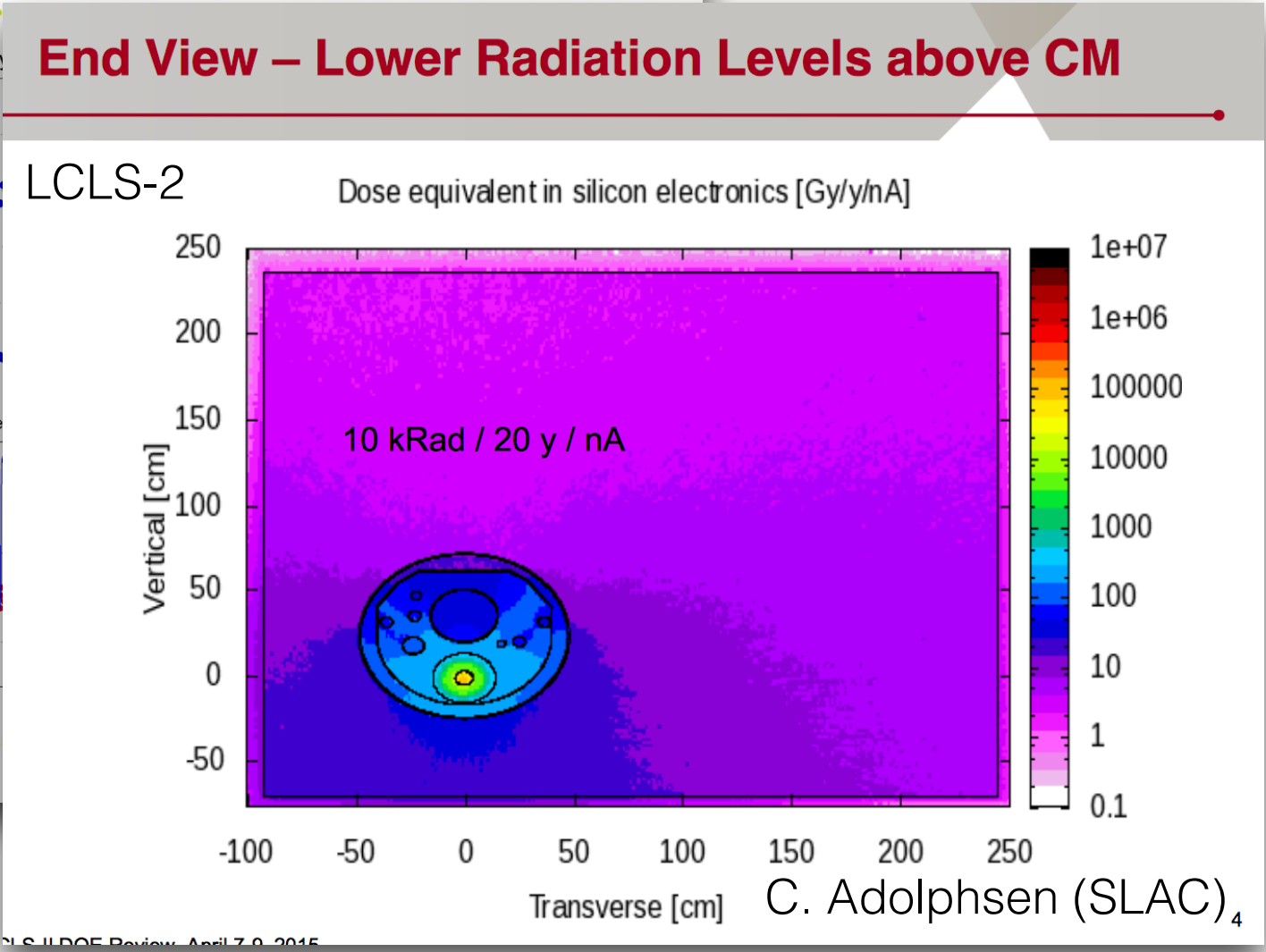
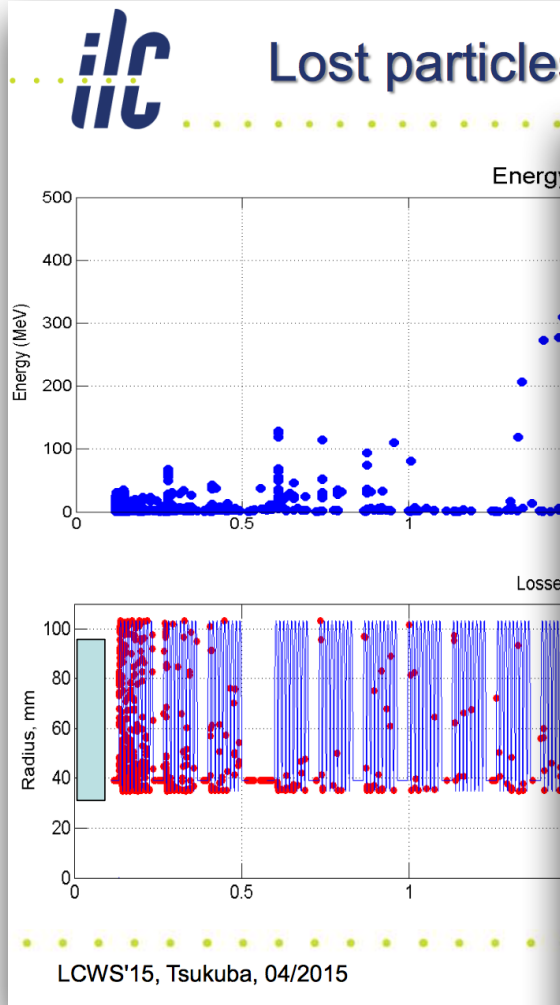
Understanding dark current losses



Lost particles between magnets: Energy



Understanding dark current losses



A Plenary Approach

Sources

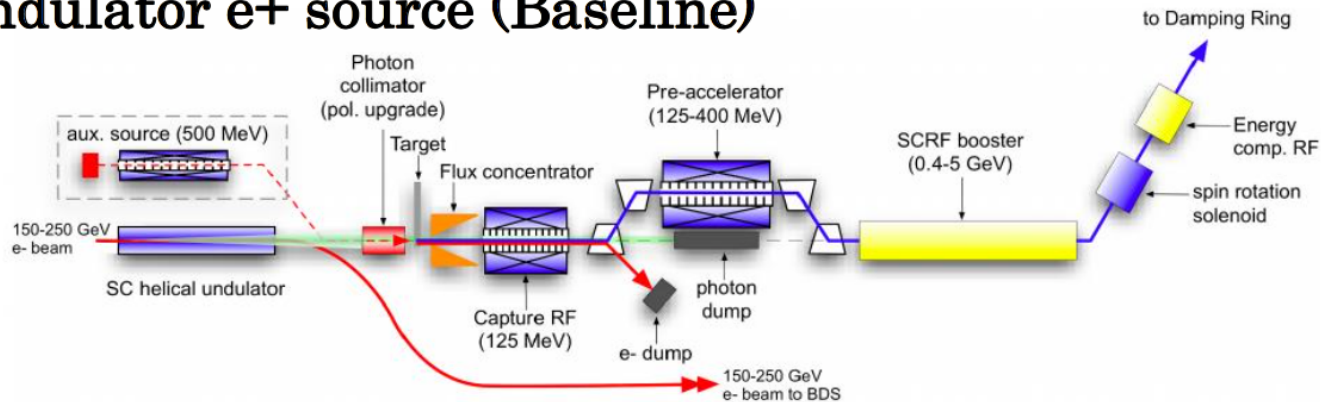
High quantum efficiency and high spin-polarization photocathode using a GaAs/GaAsP strain-compensated superlattice	<i>Dr. Xiuguang JIN et al.</i>
Positron source general update	<i>Dr. Masao KURIKI</i>
<i>Room 1, Kenkyu Honkan 1F</i>	11:15 - 11:35
Footprint compatibility on the positron source	<i>Dr. tsunehiko OMORI</i>
<i>Room 1, Kenkyu Honkan 1F</i>	11:35 - 11:55
Undulator positron source R&D in US	<i>Wei GAI</i>
<i>Room 1, Kenkyu Honkan 1F</i>	11:55 - 12:15
Discussion	
<i>Room 1, Kenkyu Honkan 1F</i>	12:15 - 12:30

nt	Thursday 23-Apr	Friday 24-Apr
	BC (TBC)	SRF I Convener H. Hayano ?
		SRF II
		SRF III
14:45	PLENARY conv: N. Walker TDR lattive release status	
	Change Register Review conv. N Walker	
	<i>Coffee</i>	
	Joint Plenary ?? (undefined)	Joint Closeing Plenary

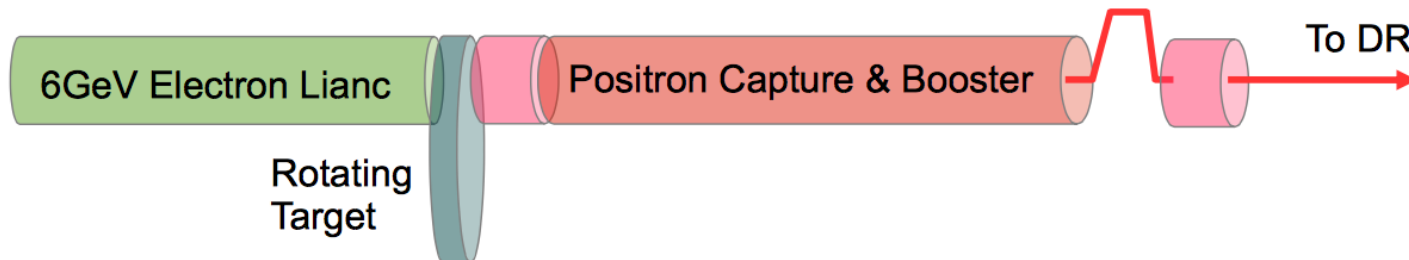
Electron vs Photon driven source

ILC Positron Source

Undulator e+ source (Baseline)



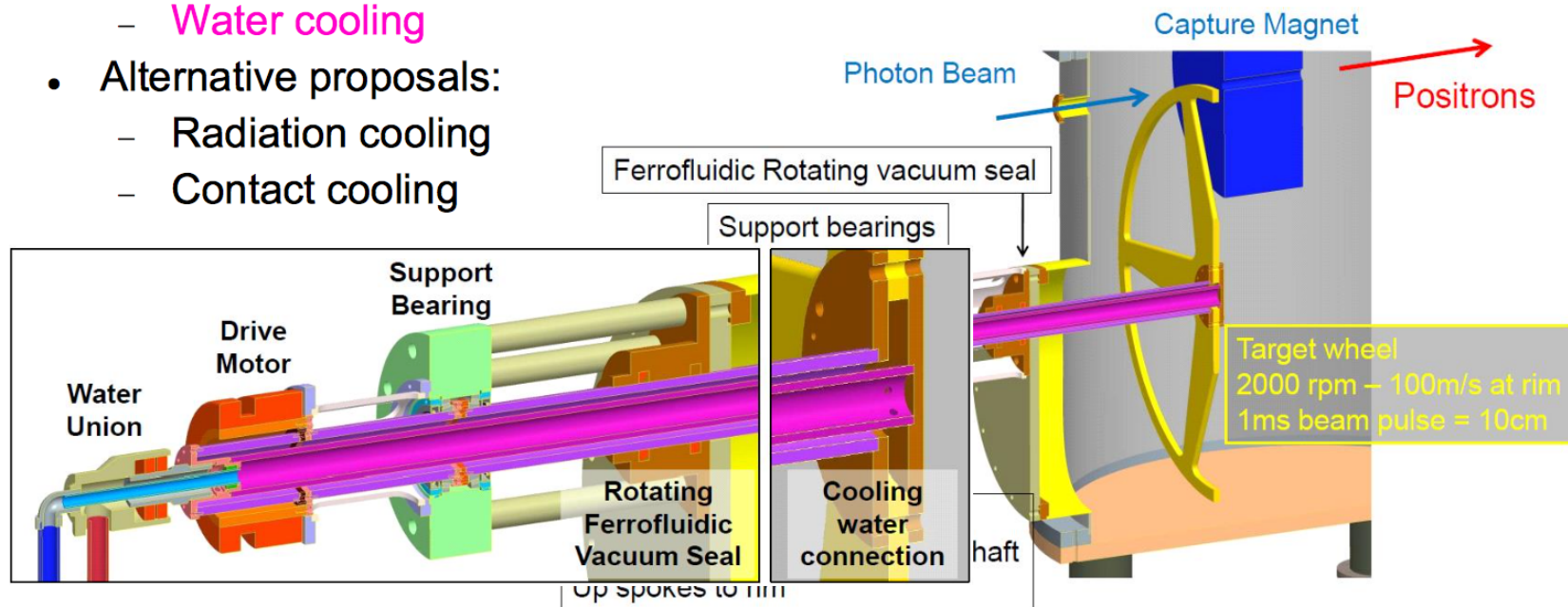
E-driven e+ source (Technical backup)



Electron vs Photon driven source

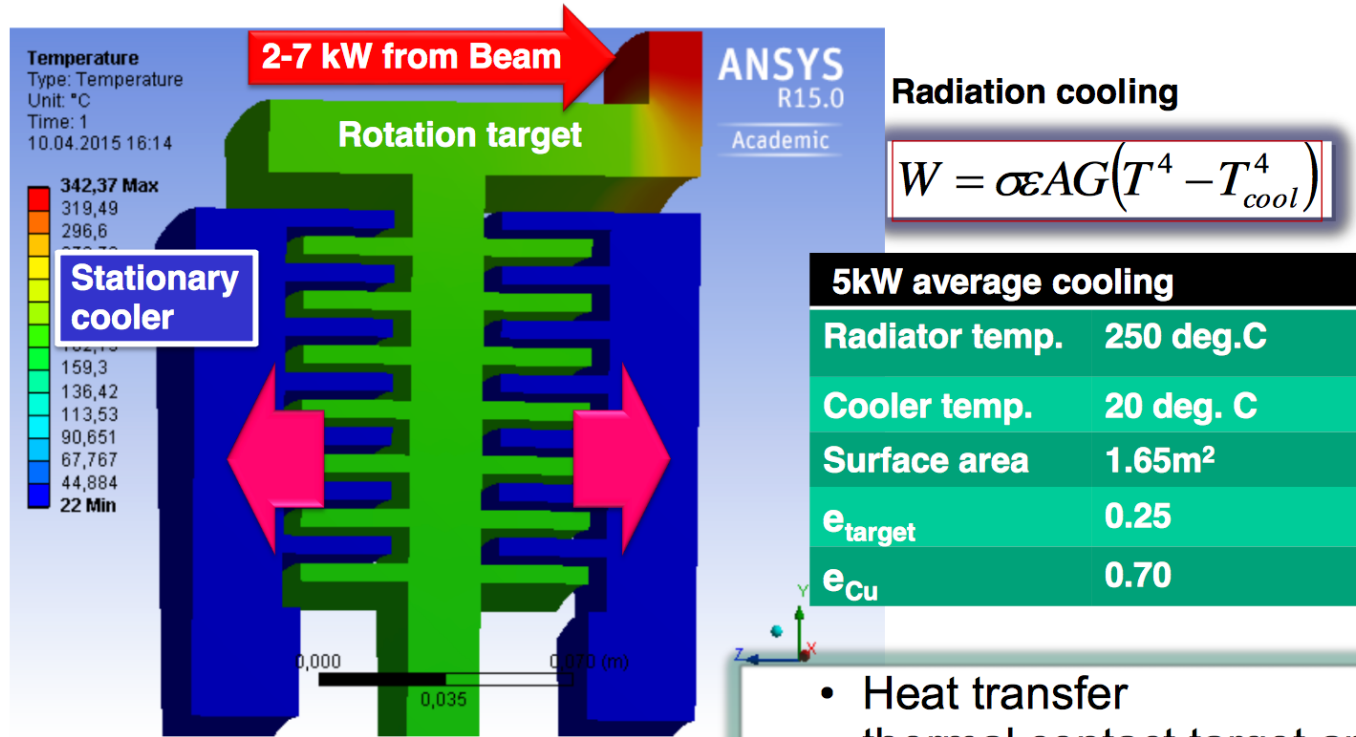
Target Prototype (Undulator)

- High speed rotation (2000rpm) with 1m radius makes 100 m/s.
- The water-cooled high-speed rotating wheel in a high vacuum is not fully technically demonstrated.
- Ferro-fluidic seal test is not very successful in LLNL.
- **Need a full scale prototype:**
 - Same weight
 - Water cooling
- Alternative proposals:
 - Radiation cooling
 - Contact cooling



Alternative targets for undulator source

Radiation cooling for Undulator e+ source

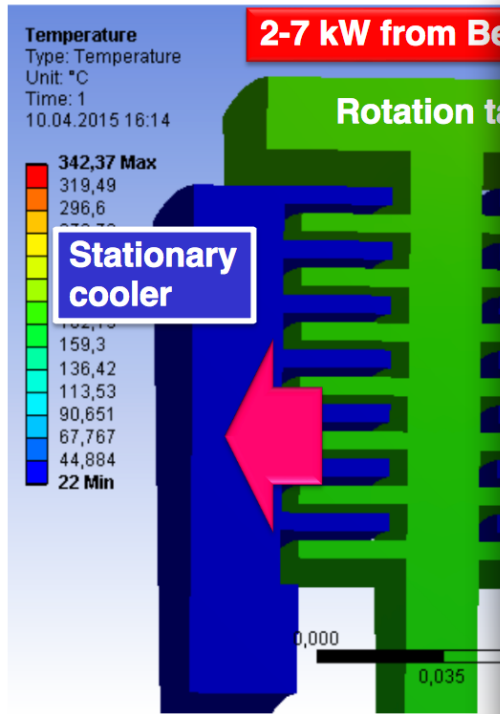


P. Sievers, S. Riemann,
A. Ushakov ,and F. Dietrich

- Heat transfer
- thermal contact target and radiator material
- Mechanical stability of the system.

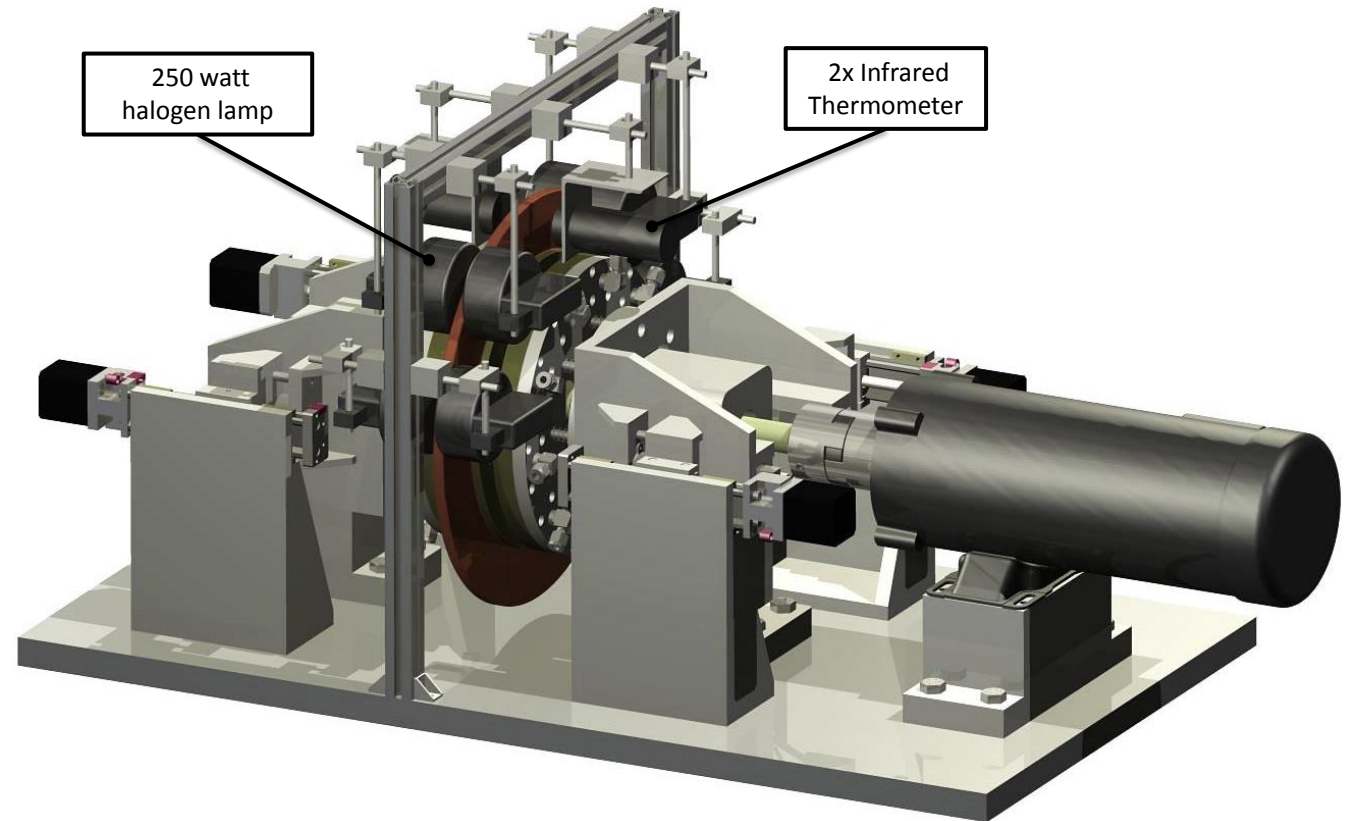
Alternative targets for undulator source

Radiation cooling for Undulator e+ source



P. Sievers, S. Riemann,
A. Ushakov, and F. Dietl

Sliding Contact Cooling

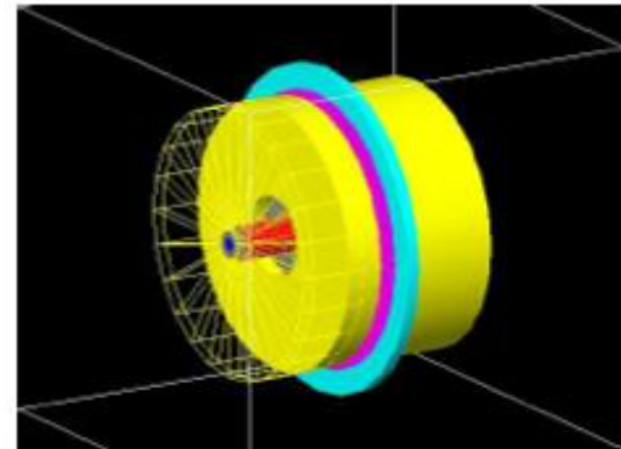
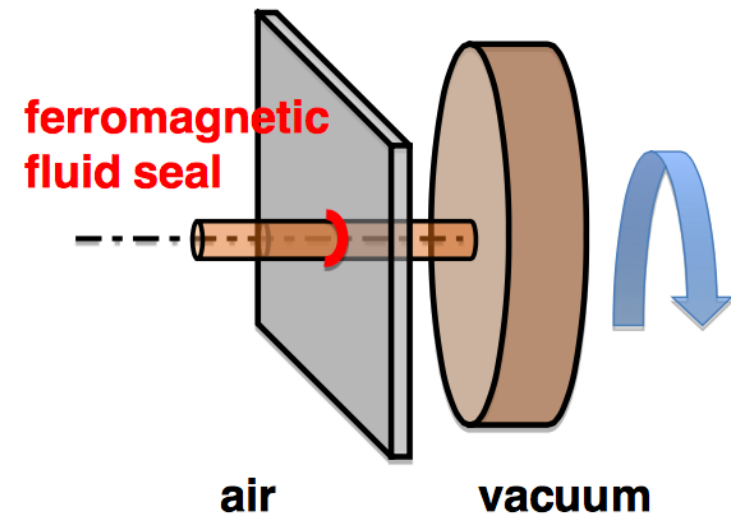


Sliding Contact Cooling Heat Transfer Demonstration –
Argonne Lab proposal

Wei Gai (ANL)

Target R&D (300Hz e-driven)

- A seal running test of 1 week at 417rpm: **No problem at all.**
- Another test of the seal after 3.2 MGy irradiation: Viscosity is changed, but no vacuum problem.
- Expected radiation dose at the seal is **1.5 MGy/year.**
- With a carefully designed shield, the radiation damage on the seal is manageable .
- The prototype which is reasonably compatible to the real one, will be manufactured in two years.

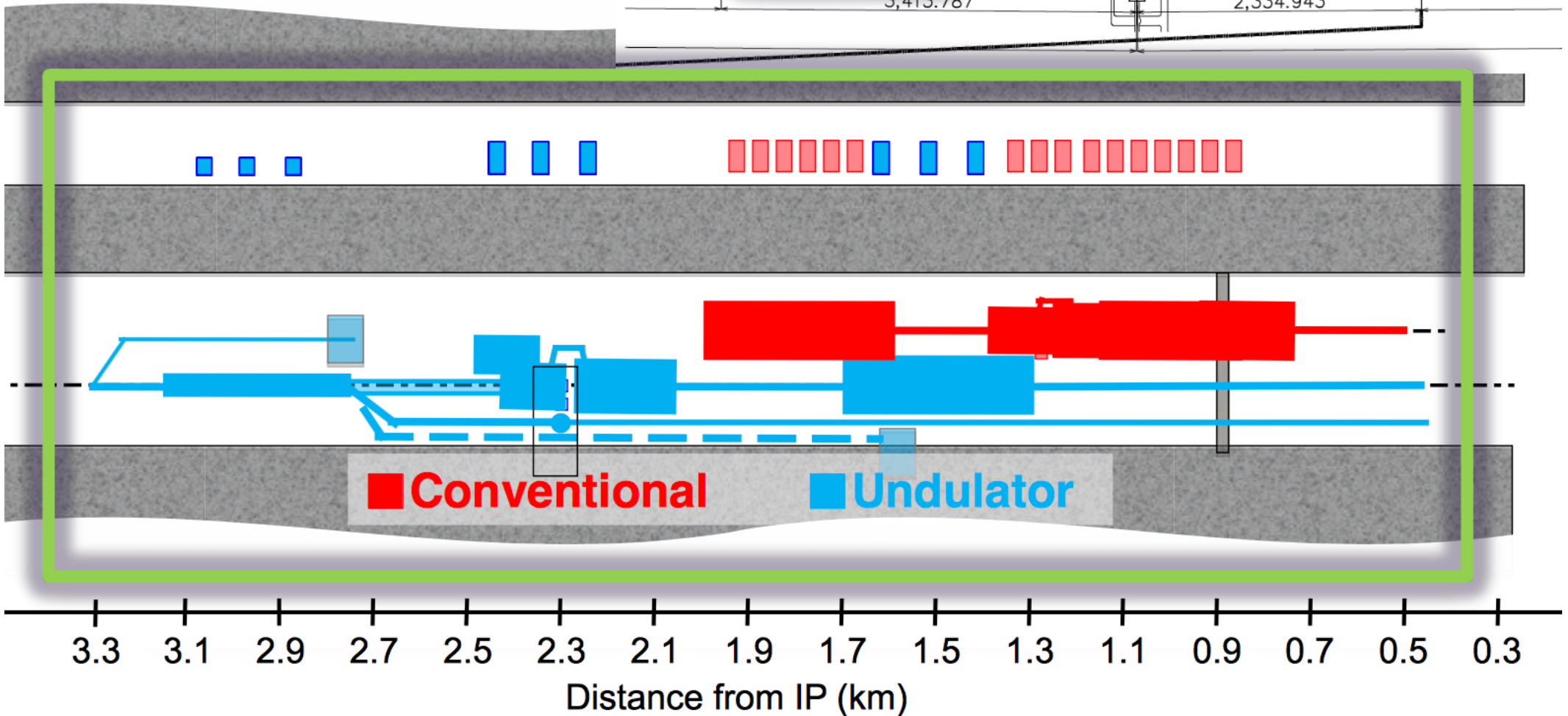
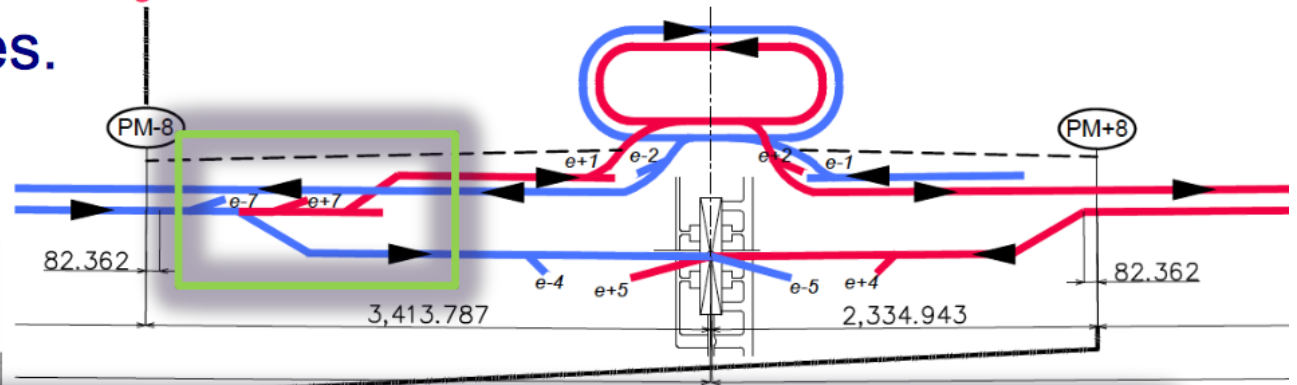


T. Omori, T. Takahashi

Footprint Compatibility

T. Omori

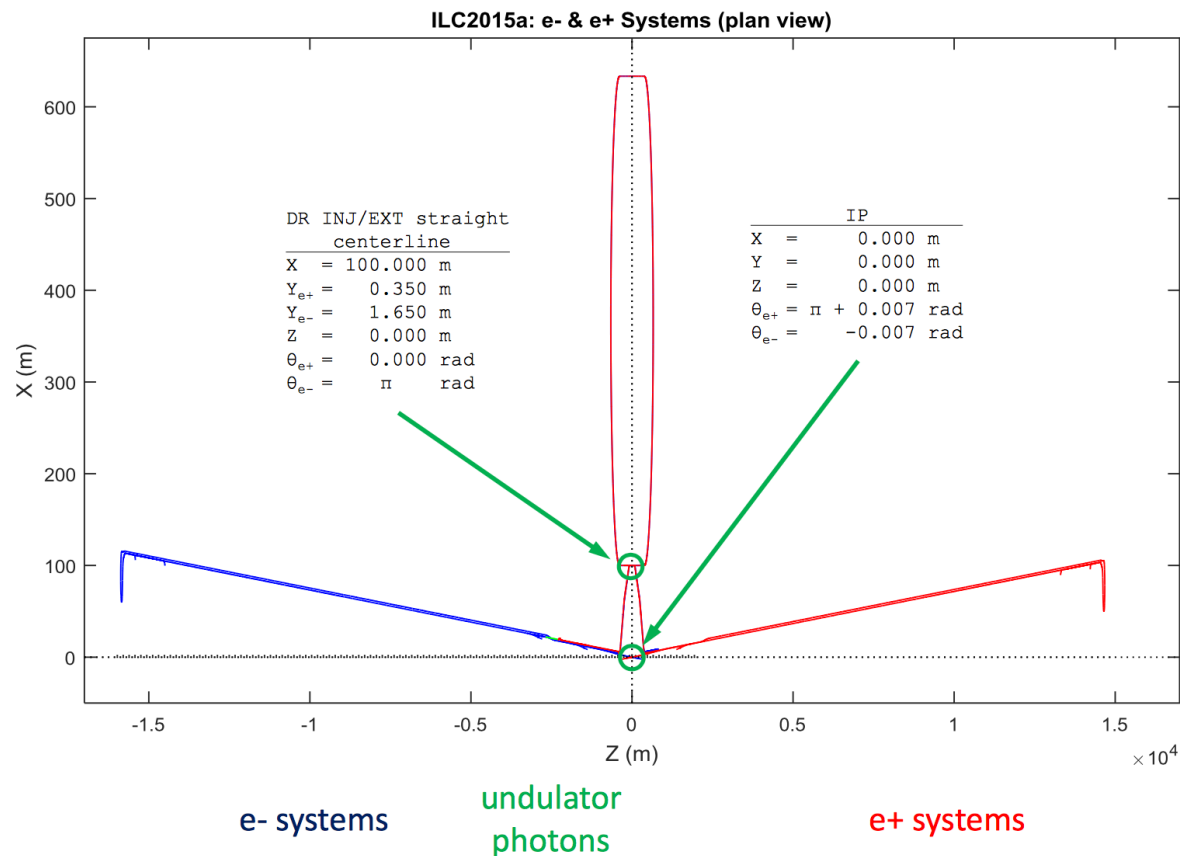
- Accommodate both sources.
- Maximize the flexibility.
- Minimize additional engineering works.



TDR Lattice 2015a release

M. Woodley (SLAC)

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



- Lattice integration
- Complete DR->Dump lattice now available
 - ▶ <https://bitbucket.org/whitegr/ilc-lattices/downloads>
- Will now become “TDR baseline”
 - ▶ base for next iteration of CRs
- Next steps
 - ▶ Still some tidying up
 - ▶ Formal CR (documents)
 - ▶ Begin to plan changes due to CR-002
 - ▶ Look towards other possible modifications (central region consolidation)

Central Region (± 2.5 km from IP)

- Likely to be the next area of focus for AD&I effort (and CFS)
 - Complex and very full of accelerator beam lines
 - ▶ Sources | Beam Delivery System | RTML | Numerous dump lines
 - Current CFS configuration still uses two-separate tunnel solution
 - ▶ Hang-over from RDR
 - Proposal to assess moving to a continuation of the ML “Kamaboko” tunnel.
 - ▶ Rumour has it this will be cheaper
 - Getting this right is difficult
 - ▶ Many conflicting requirements
 - ▶ Overlapping areas of responsibility (many stakeholders)
 - Progress will be slow but we made a start
-

General (final) comments

- Meeting was well organised and well attended
 - ▶ Non-parallel approach was good
 - ▶ But reflected how “little” is going on
 - Heavy focus on BDS (MDI) and sources
 - ▶ Where there are resources.
 - Work on ML dark current also showing good results
 - ▶ Sponsored by LCLS2
 - ▶ But likely to just come to the same conclusions from work now 10 years old
 - Sources remain.... sources
 - ▶ Expecting a change request for the 300-Hz source within the year
 - ▶ Not clear as yet what the “scope” of this request will be
 - ▶ (For our KEK colleagues) the key to the polarised source is fully operational target prototype (but they expect the US to fund this)
 - In general, where there is progress things are looking good
 - ▶ But there are still so many areas where there is no progress at all
 - CFS “site-dependent” design work still key priority
 - ▶ Progress and activity driven by the CRs
- Now time to take stock and start planning for LCWS2015**

Summary

Response to the Change Requests

- Finalizing study of the ML tunnel length issue (CR0004)
- Revision of ML tunnel configuration (Shield-wall thickness)
- Revision of the BDS Tunnel configuration
- Studies related to Cryogenics scheme change

CFS Plans for work over the Upcoming 6 months

- Optimization of Horizontal Access Tunnels (CR-03 & 04)
- Geological Investigation at IP area in new baseline
 - with in-kind regional contribution by Tohoku Univ. and Iwate Prefecture
- CFS Workshop in July 2015 (London or Geneva)
 - Collaboration study with ARUP work of the “development of BIM-TOT (Tunnel Optimization Tool)”.
 - Global discussion of Cryogenics scheme change



CR – ?? Cryogenic Concept

