Dump room insertion into ILC tunnel

H. Hayano KEK

Roadmap to fix CFS design

***Utility design shoud be done in parallel**

(1) Reconfigure the lattice of ILC250 (Inj,DR,RTML,BC,ML,BDS)

Create ILC250 lattices from TDR lattice, or by revision

Build several option of positron lattices

***Lattice design is on-going by Beam Dynamics Group**

(2) Reconfigure the tunnel & cavern design of ILC250

Create ILC250 tunnels and caverns from ILC250 lattice revised design

Build shield room design of beam dump and target in the tunnel design

Build access tunnels design specific to the site

***Waiting for Lattice design**

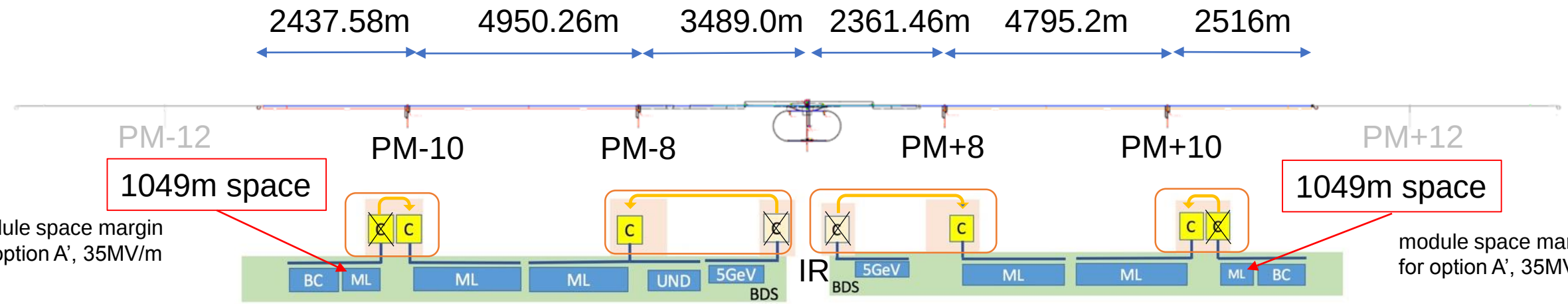
(3) Create 3D CAD design (the reference design) of ILC250

***Waiting for Lattice design**

***In this presentation**

ILC250 configuration review

Option A' **ECM=250GeV** **SRF 35MV/m**



Ecm=250GeV

BC				e+inj		e-inj				BC	
51	90	189	189	24	module space	24	180	189	90	51	
51	4.5	189	189	24	cryomodules	24	180	189	4.5	51	
17	1	42	42	8	RF unit	8	40	42	1	17	
e^- 135.6GeV =10.0	1.4	59.6	59.6	5.0	E gain (GeV)	5.0	56.7	59.6	1.4	10.0	= e^+ 132.7GeV

+6.2%margin

The International Linear Collider
Machine Staging Report 2017
Addendum to the International Linear Collider Technical Design Report published in 2013

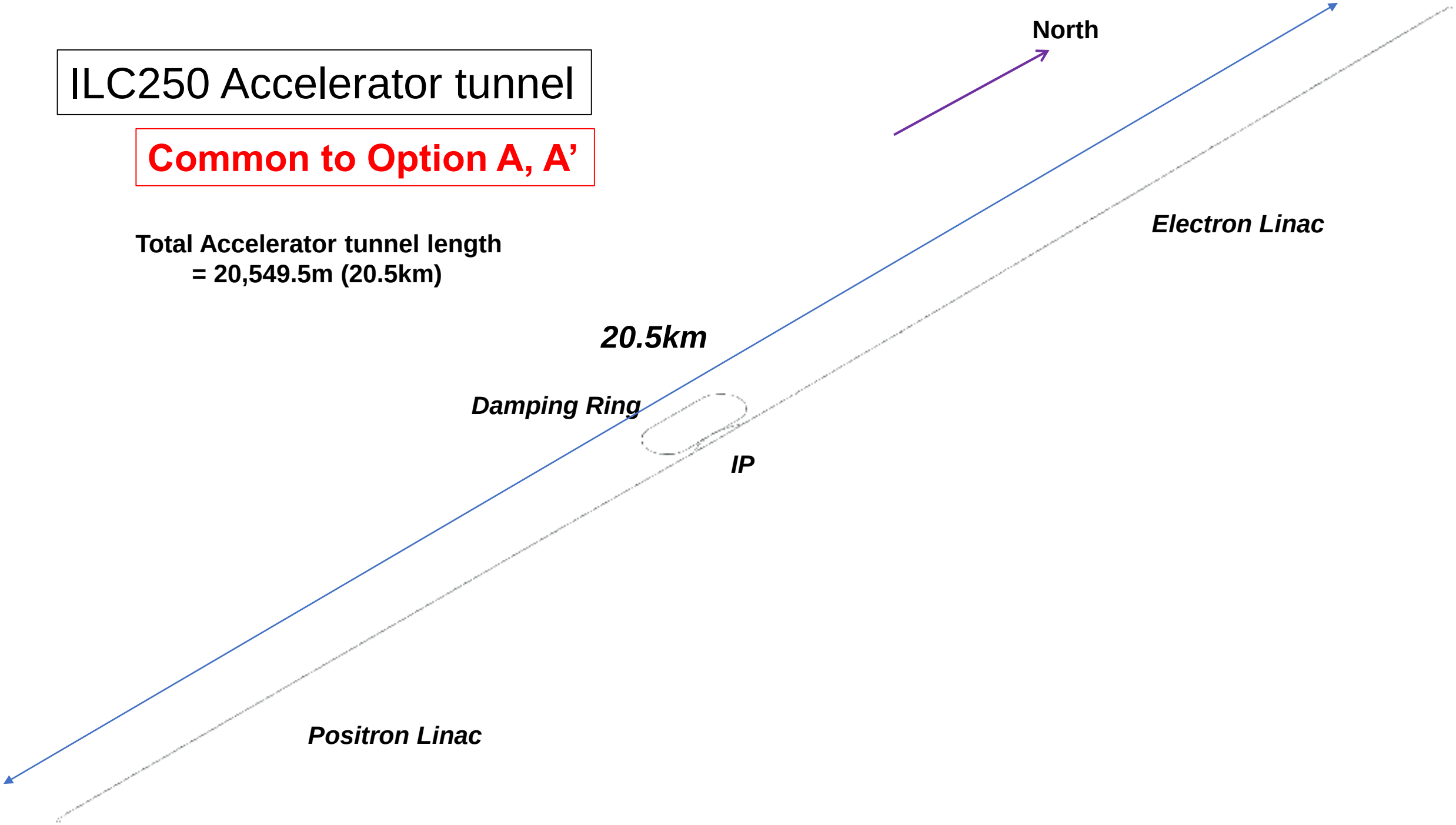
Linear Collider Collaboration / October, 2017
Editors:Lyn Evans and Shinichiro Michizono

Total tunnel length = 20549.5m
(20.5km)

ILC250 Accelerator tunnel

Common to Option A, A’

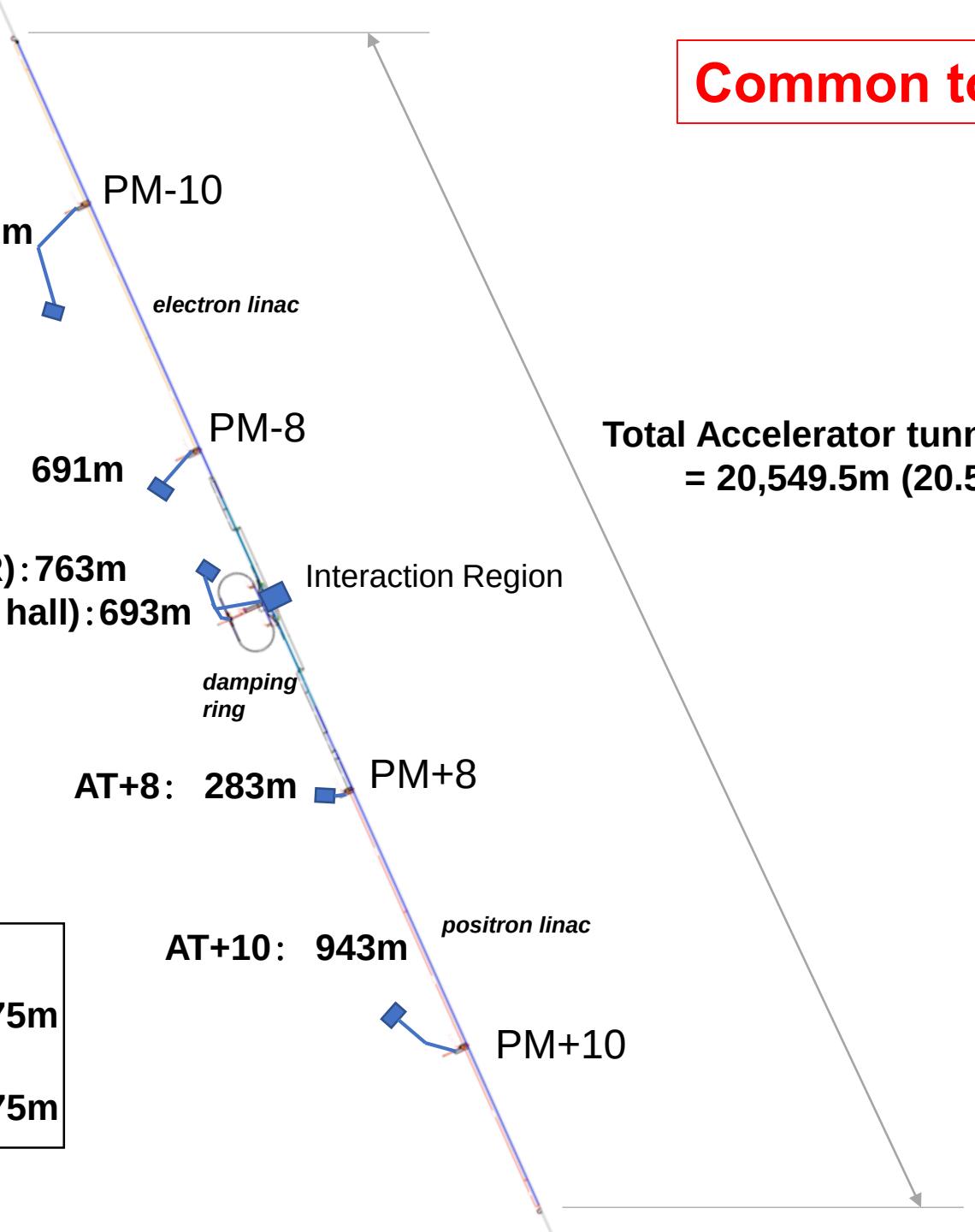
Total Accelerator tunnel length
= 20,549.5m (20.5km)



Access Tunnels

Site-specific design of
Access tunnels

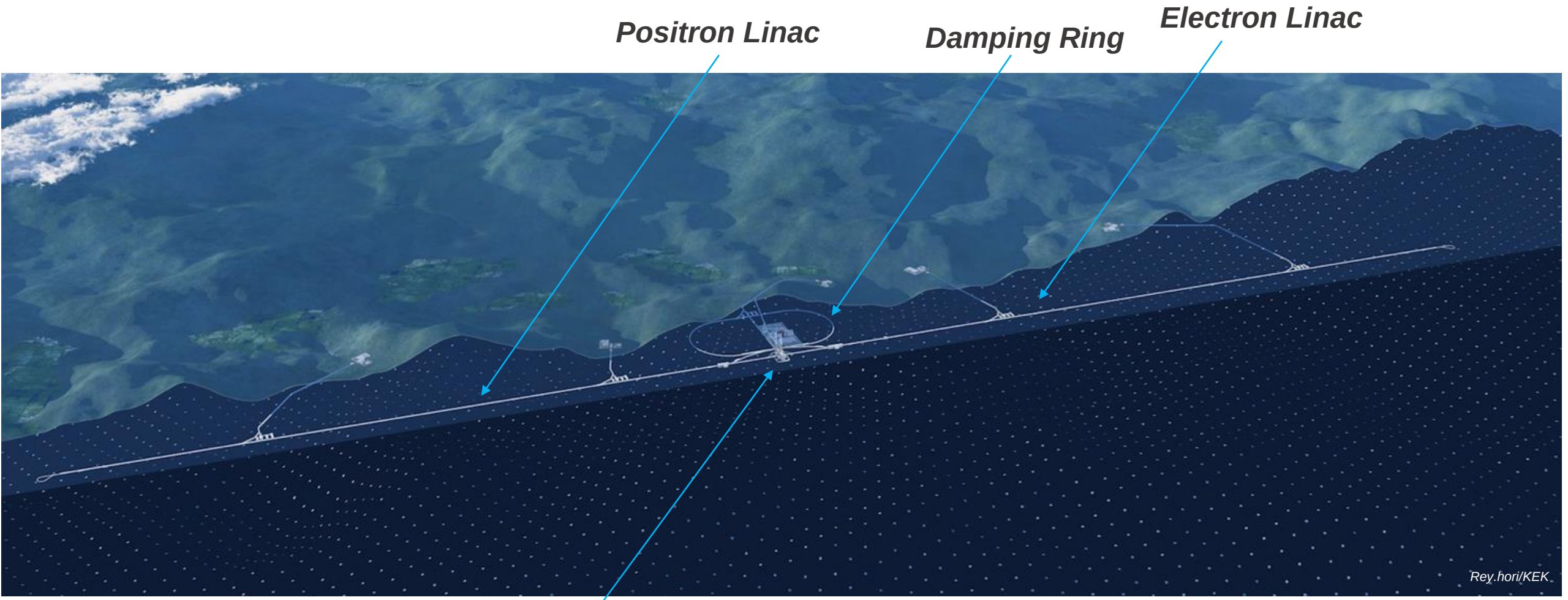
Common to Option A, A'



Total Accelerator tunnel length
= 20,549.5m (20.5km)

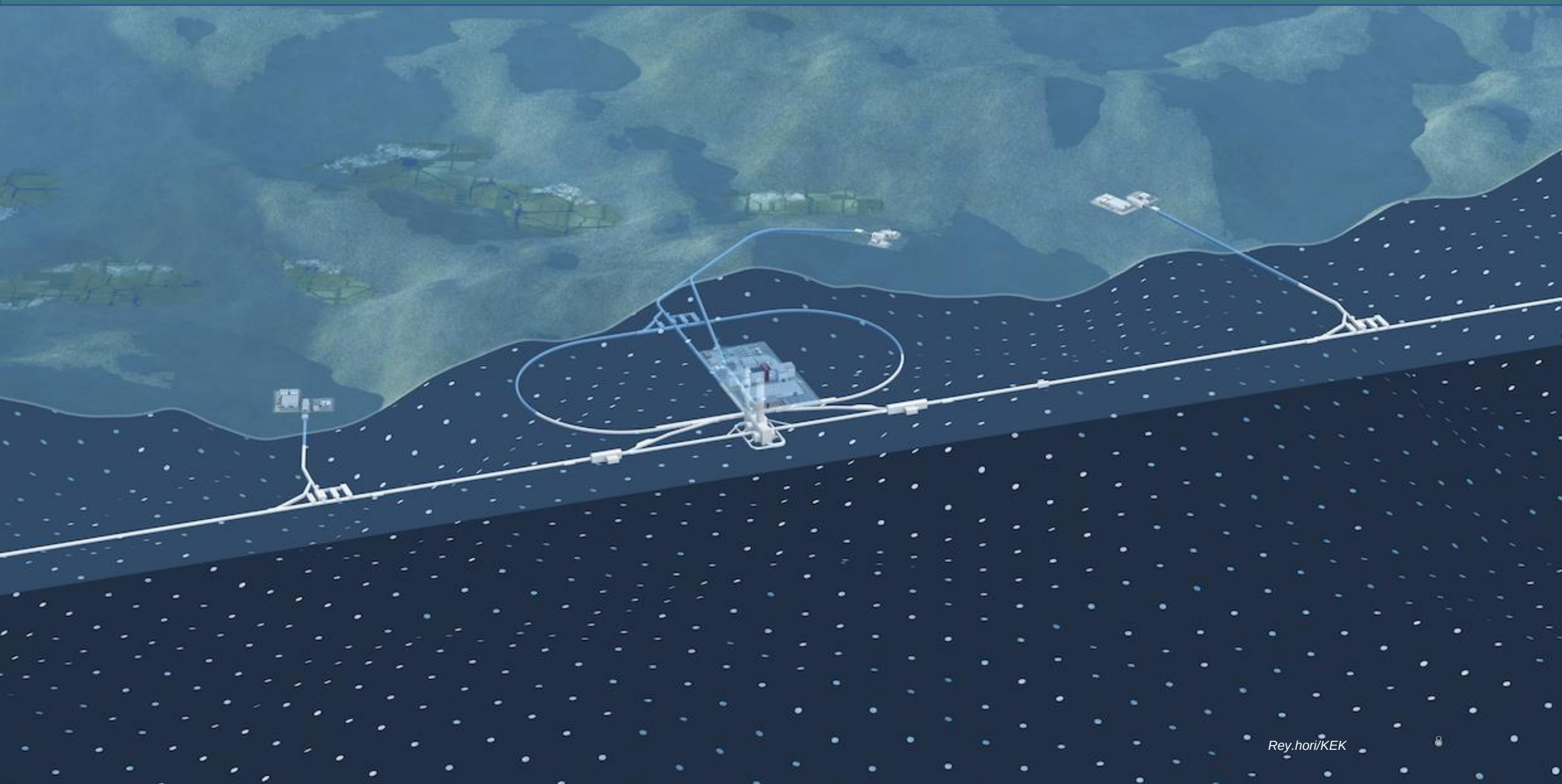
access tunnels 5 **Detector shaft 1**
total length 4876m **φ18m depth 75m**
Utility shaft 1
φ10m depth 75m

Bird's eye view of ILC in Kitakami candidate site



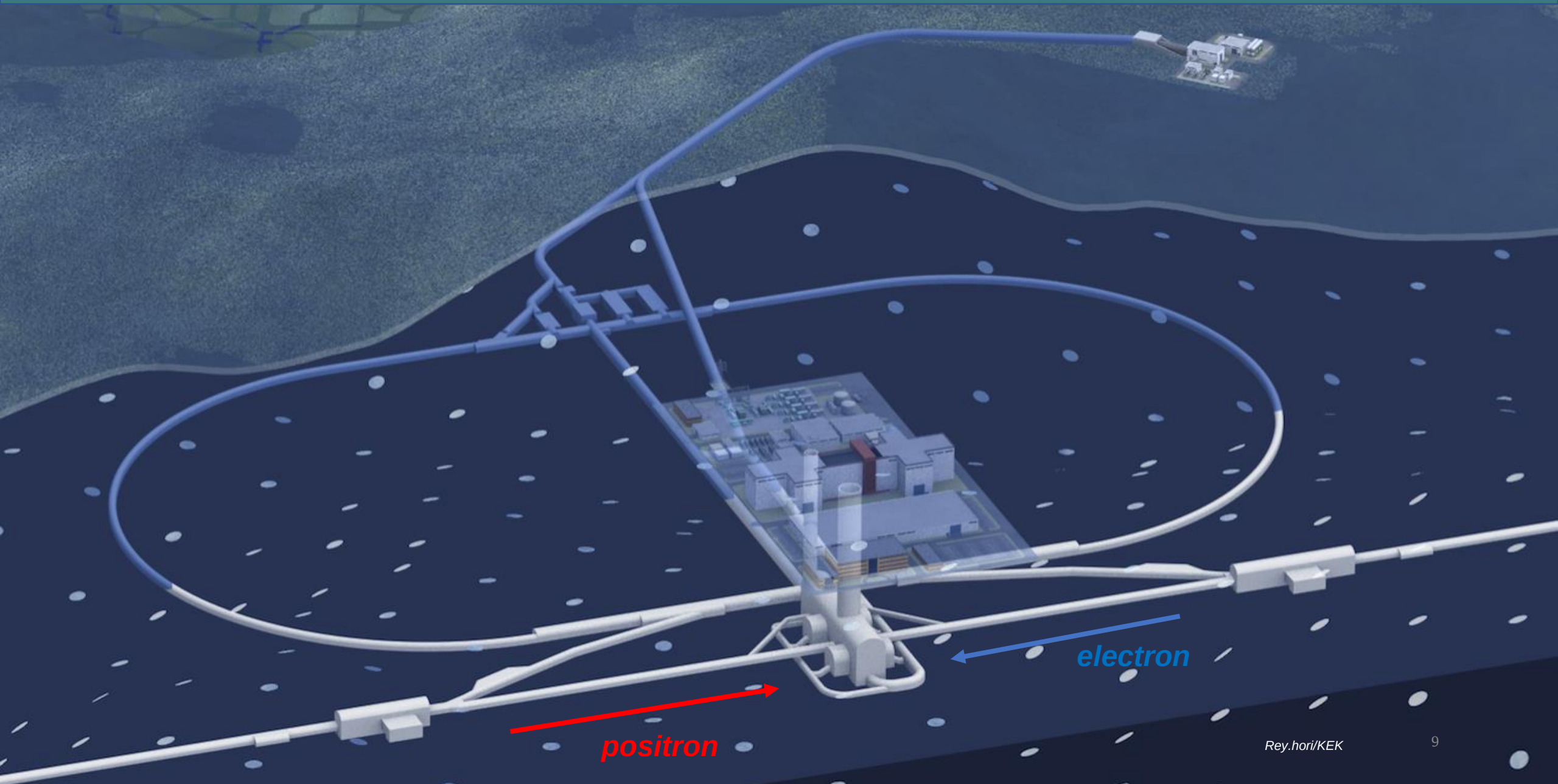
Tunnel design for Kitakami Candidate Site (ILC250GeV 20.5km)

Bird's eye view of ILC in Kitakami candidate site



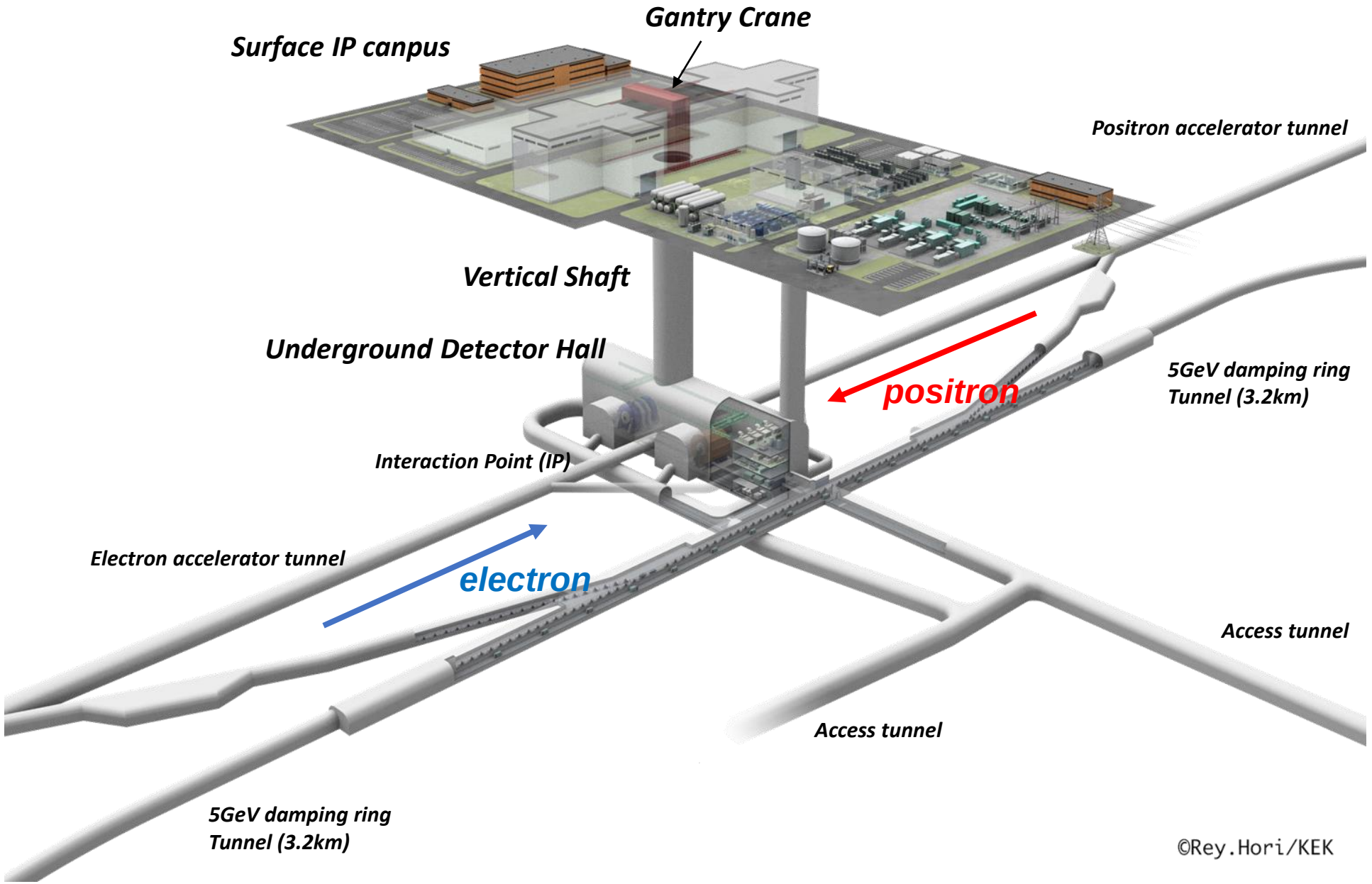
Rey.hori/KEK

Bird's eye view of ILC in Kitakami candidate site



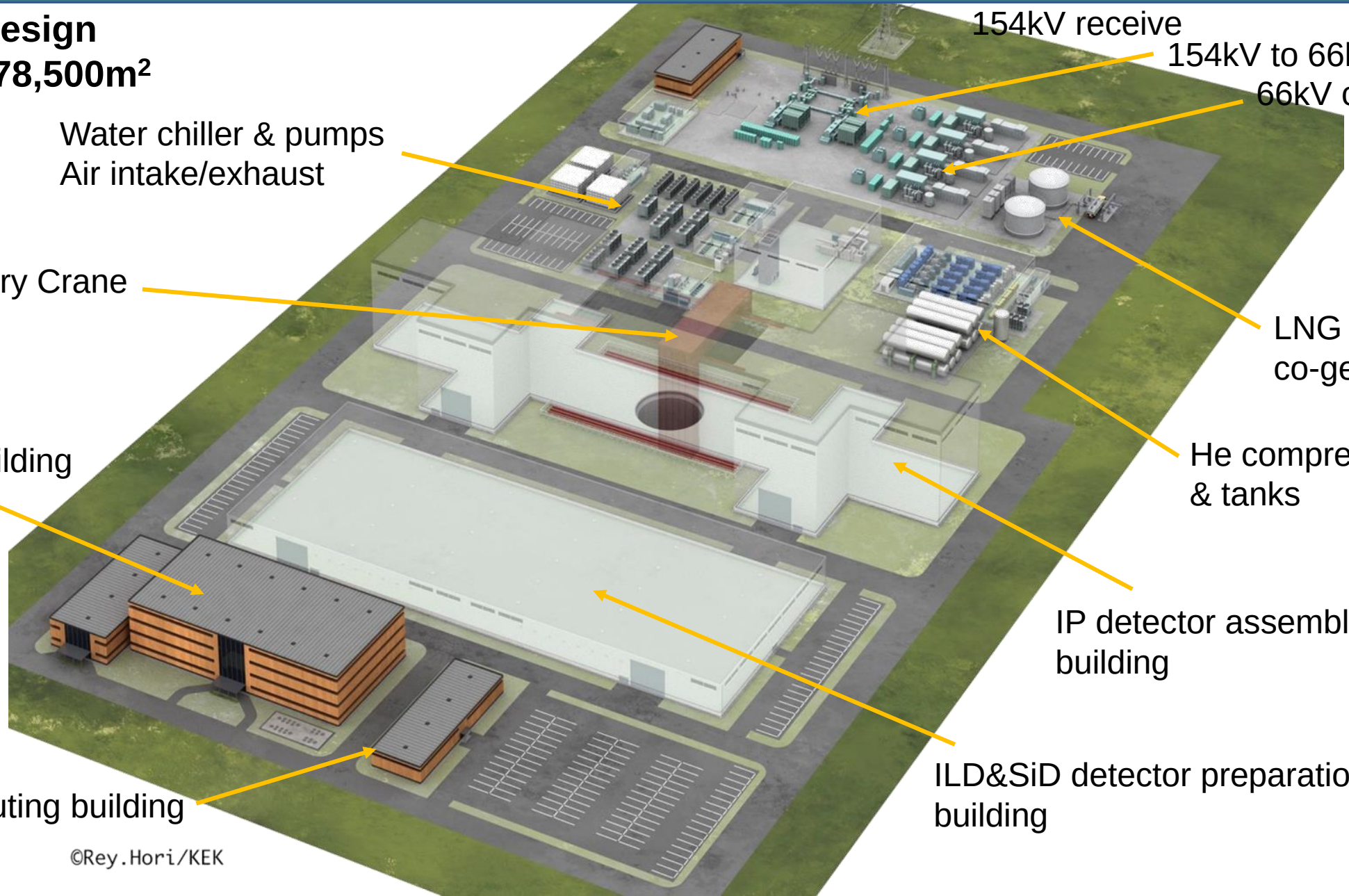
Rey.hori/KEK

Plan of Interaction point

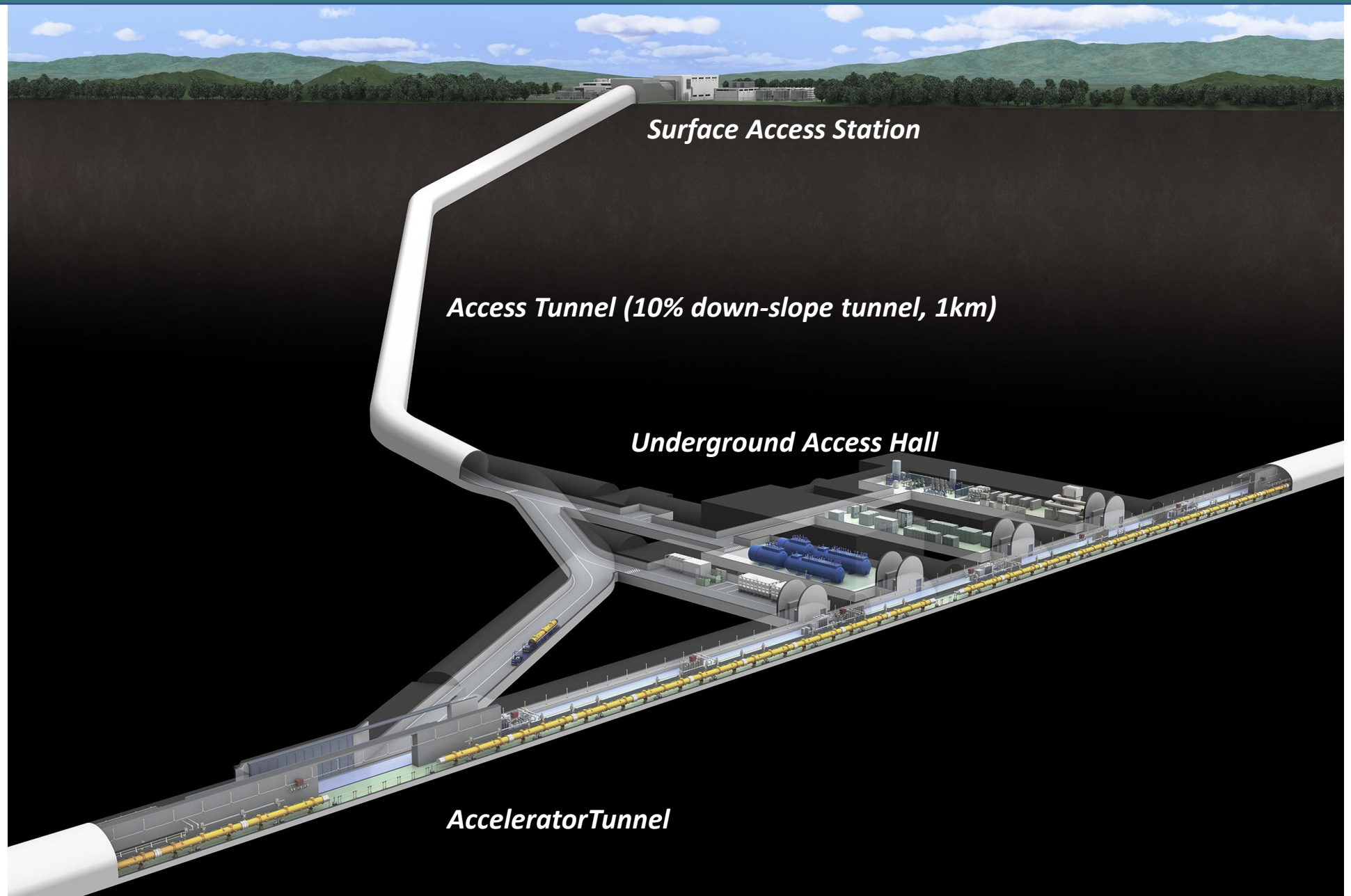


Plan of Interaction Point Campus at Surface

surface design
IP area 78,500m²

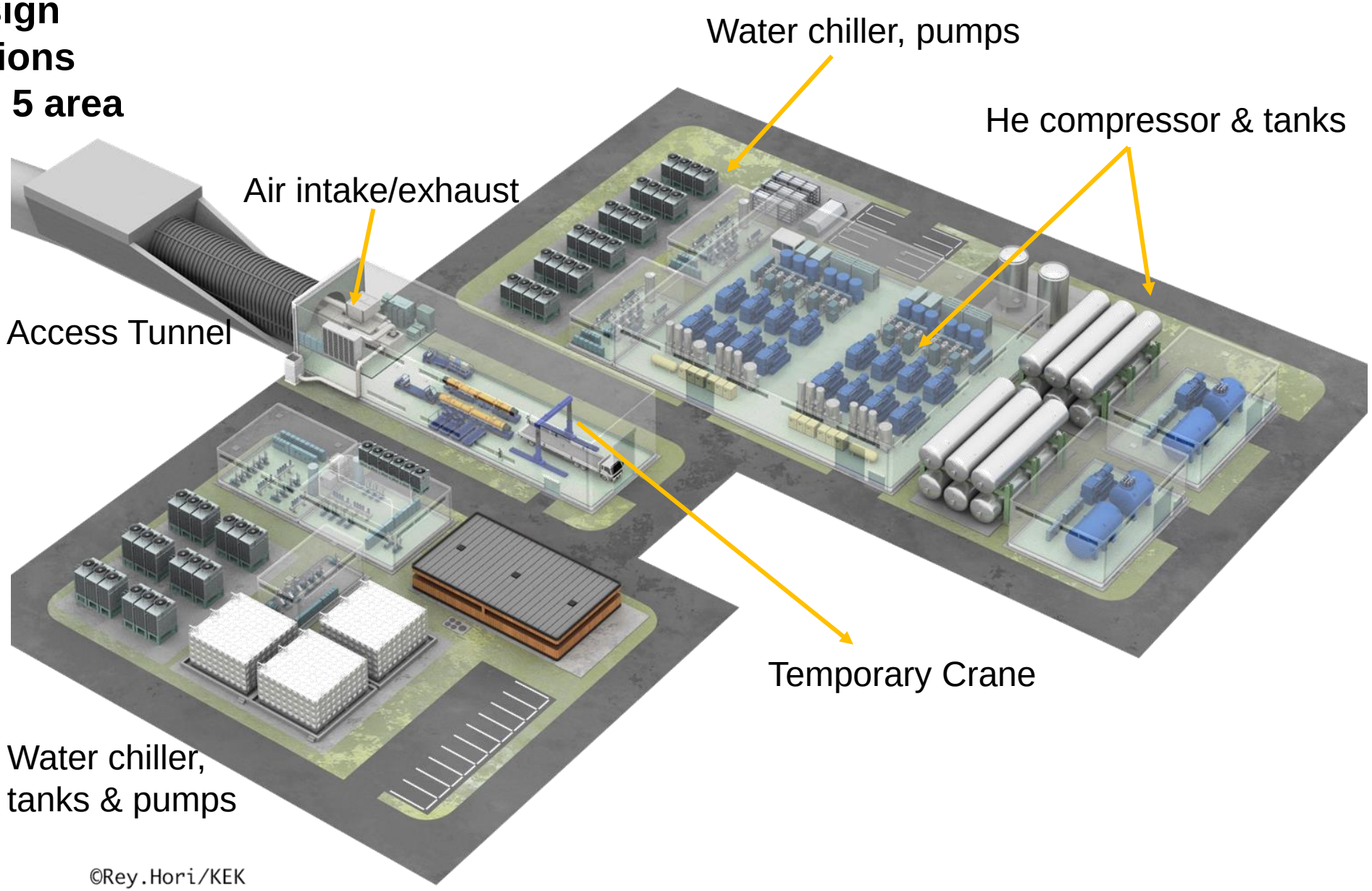


Plan of Surface-to-Underground access-tunnel

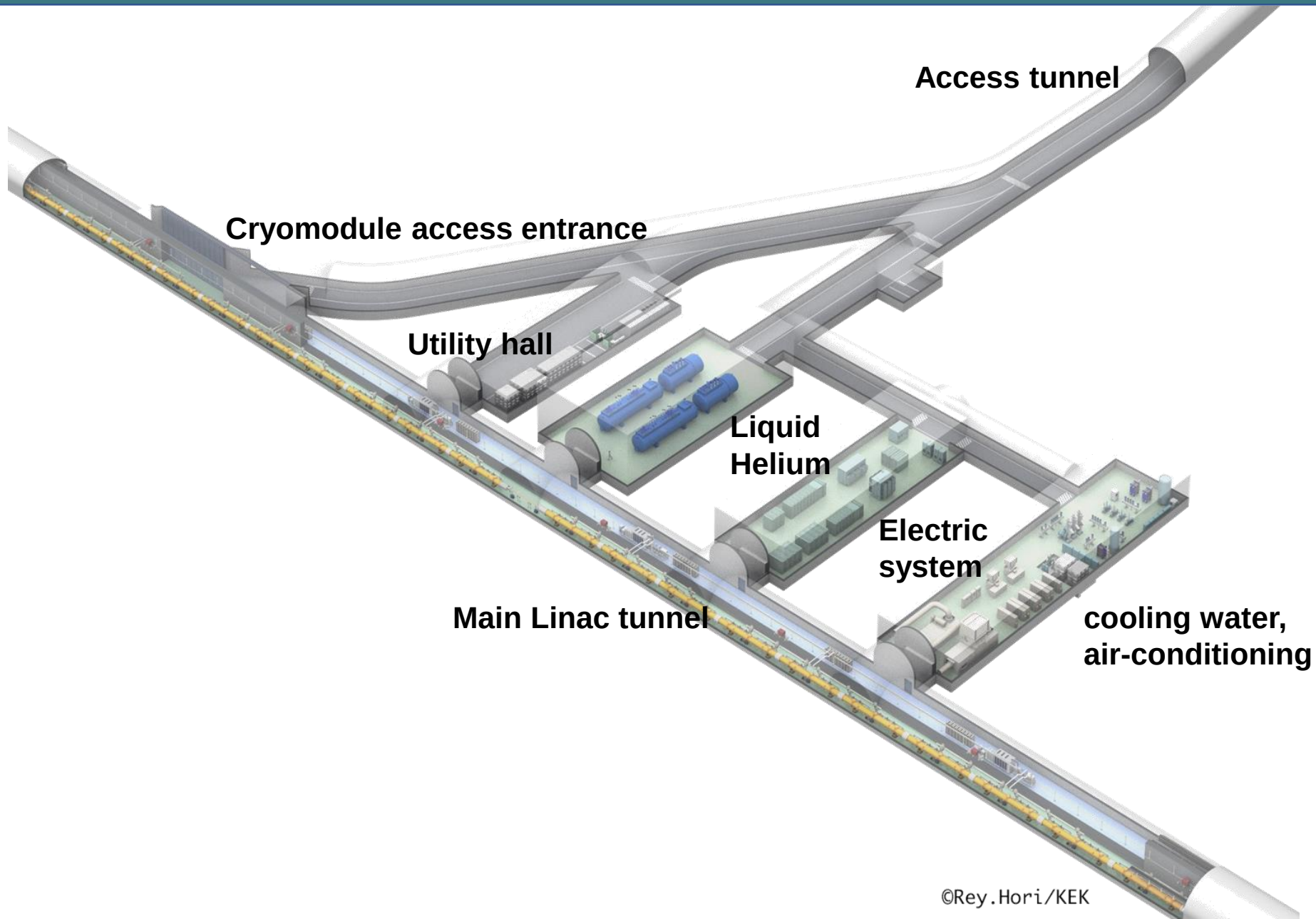


Plan of Access-station at Surface

surface design
access stations
16,600m² 5 area



Plan of Underground Access-Hall

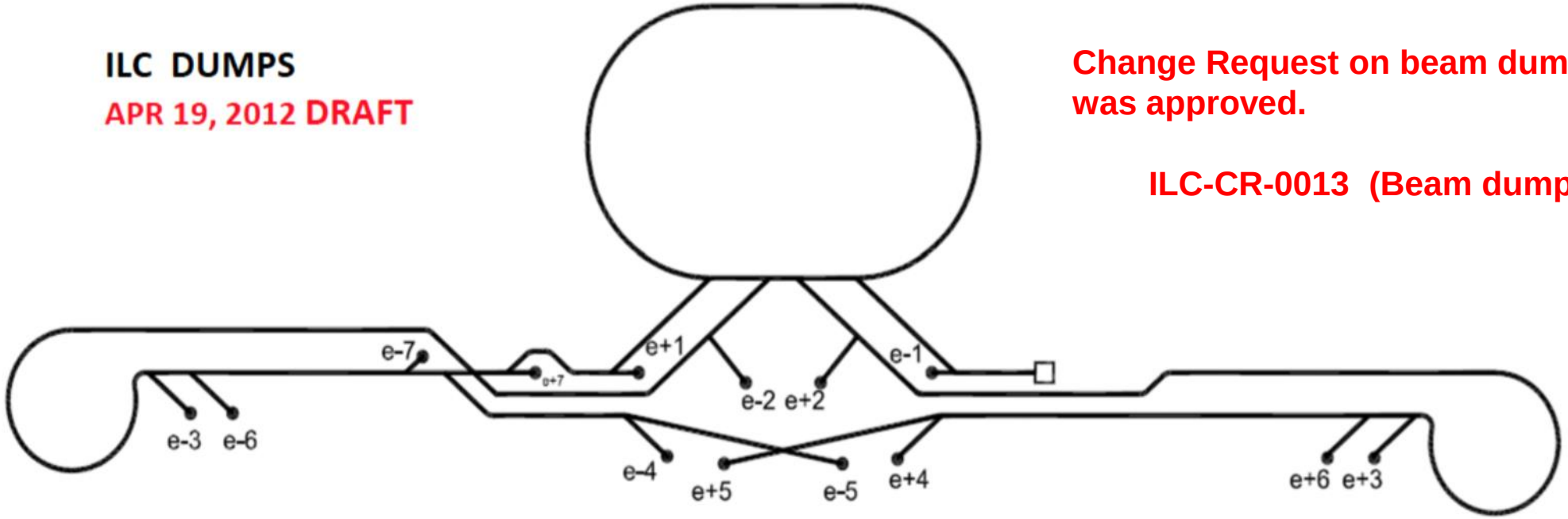


ILC250 beam dump review/update

Beam Dump

ILC DUMPS

APR 19, 2012 DRAFT



Change Request on beam dump in 2016 was approved.

ILC-CR-0013 (Beam dump)

MPD	e-1	SC TUNE UP DUMP	~~311 KW~~	60kW	MPD	e+1	SC TUNE UP DUMP	~~311 KW~~	60kW
MPD	e-2	EDRX TUNE UP DUMP	~~220 KW~~	60kW	MPD	e+2	PDRX TUNE UP DUMP	~~220 KW~~	60kW
MPD	e-3	RTML TUNE UP DUMP	~~220 KW~~	60kW	MPD	e+3	RTML TUNE UP DUMP	~~220 KW~~	60kW
~~HPD~~	e-4	BDS TUNE UP DUMP	~~14 MW~~	400kW	~~HPD~~	e+4	BDS TUNE UP DUMP	~~14 MW~~	400kW
HPD	e-5	PRIMARY e-DUMP	~~14 MW~~	17MW	HPD	e+5	PRIMARY e+DUMP	~~14 MW~~	17MW
MPD	e-6	RTML TUNE UP DUMP	~~220 KW~~	60kW	MPD	e+6	RTML TUNE UP DUMP	~~220 KW~~	60kW
MPD	e-7	electron fast abort dump	~~250 KW~~	60kW	MPD	e+7	TARGET DUMP	~~200 KW~~	300kW
	e-8	**electron 10Hz dump**		**8MW**					
MPD	*= HIGH POWER DUMPs (1e-; 3e+; 6 RTML)*				** = indicate non-stop dump (always on)*				
HPD	*=MEDIUM POWER DUMPs (4 BDS)*				***= indicate 45KW always on*				

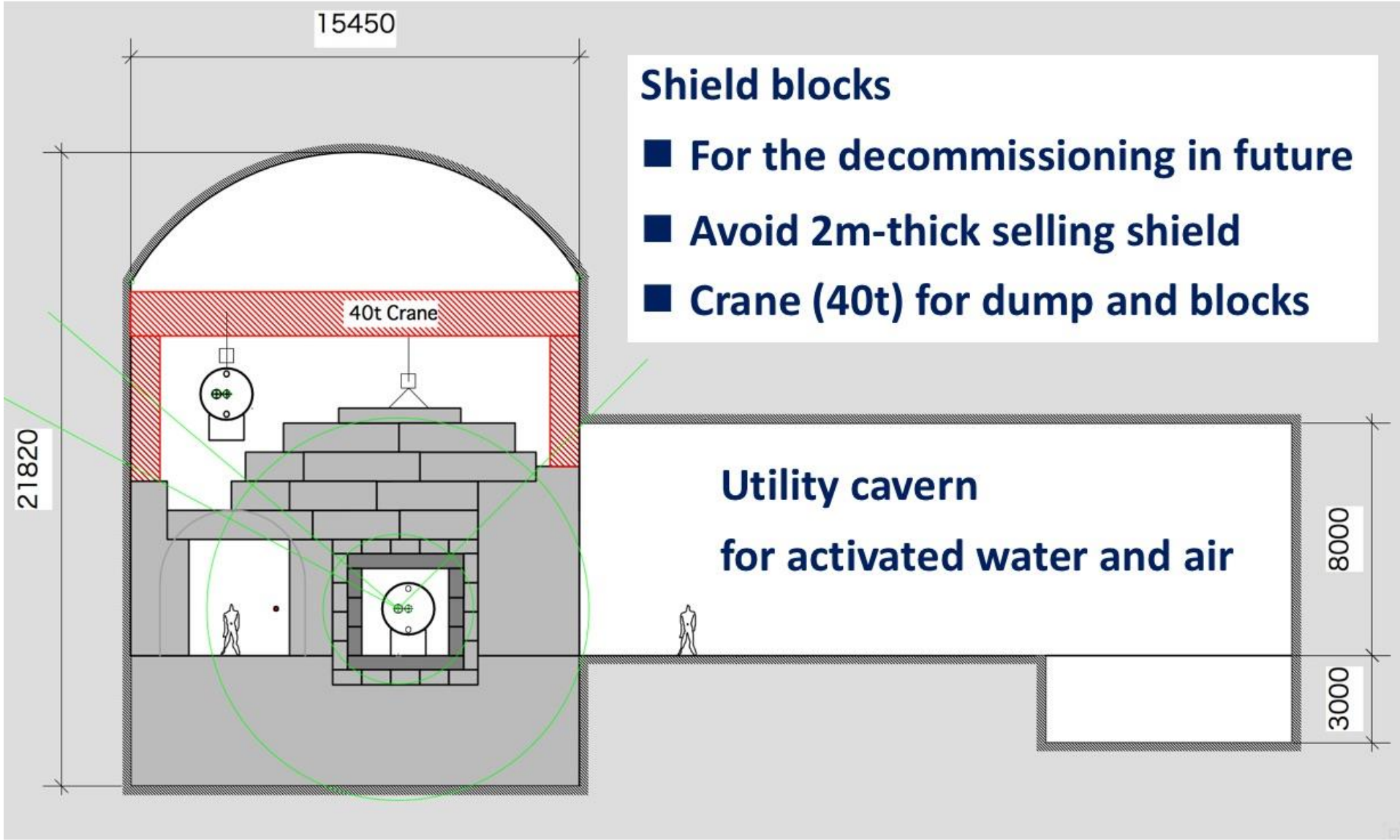
ILC-CR-0013 (Beam dump)

Quantity	Unit	Dump e±1 Source Tune-Up Dump	e±2 DR extraction dump	e±3 BC1 tune-up dump	e-4 Electron BDS tune-up dump	e+4 Positron BDS tune-up dump	e±5 Main dump	e±6 Electron BC2 tune-up dump	e-7 Electron fast abort dump	e+7 Undulator photon dump	e-8 Electron 10 Hz dump
Particle type		e±	e±	e±	e-	e+	e±	e±	e-	gamma	e-
Absolute Maximum Ratings											
Particle energy	GeV	5	5	5	750	750	750	15	750	N/A	150
Bunch charge	nC	6.0	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**
Bunch energy	J	30	20	20	3004	3004	3004	60	3004	18	600
Abort Dump Maximum Ratings											
Dumped pulse length	μs		10.8	113	1.7	113	1201	3.3	113		
Dumped bunches			3000	310	5	310	2888	9	310		
Dumped pulse energy	**kJ**		**60**	**6.2**	**15**	**931**	**4261**	**0.5**	**931**		
Continuous Beam Maximum Ra											
Particle energy	GeV	5	5	5	750	750	750	15	500	0.12	150
Pulse energy	kJ	79	53	53	4261	4261	4261	158	158	32	1577
Repetition rate	Hz	10	10	10	10	10	10	10	10	10	5
Average beam power	kW						**17046**			**315**	**7886**
Typical Tune-up Operational Parameters											
Particle energy	GeV	5	5	5	250	250	500	15	250	0.12	150
Bunch charge	nC	4.8	3.2	3.2	1.6	1.6	2.8	3.2	1.6	3.2	3.2
Bunches per pulse		1250	1312	1312	500	500	2450	1312	500	2625	2626
Pulse energy	kJ	30.0	21.0	21.0	200	200	3409	63.1	200.0	25.2	1262
Collision rate	Hz	2	3	3	2	2	4	1	N/A	10	5
Average beam power	kW	60	63	63	401	401	13637	63	N/A	252	6309
Nominal Power Rating	**kW**	**60**	**60**	**60**	**400**	**400**	**17000**	**60**	**60**	**300**	**8000**
TDR Power Rating	kW	311	220	220	14000	14000	14000	220	250	200	N/A

Main beam dump/ target room design (given in the previous Fukuoka-WS)

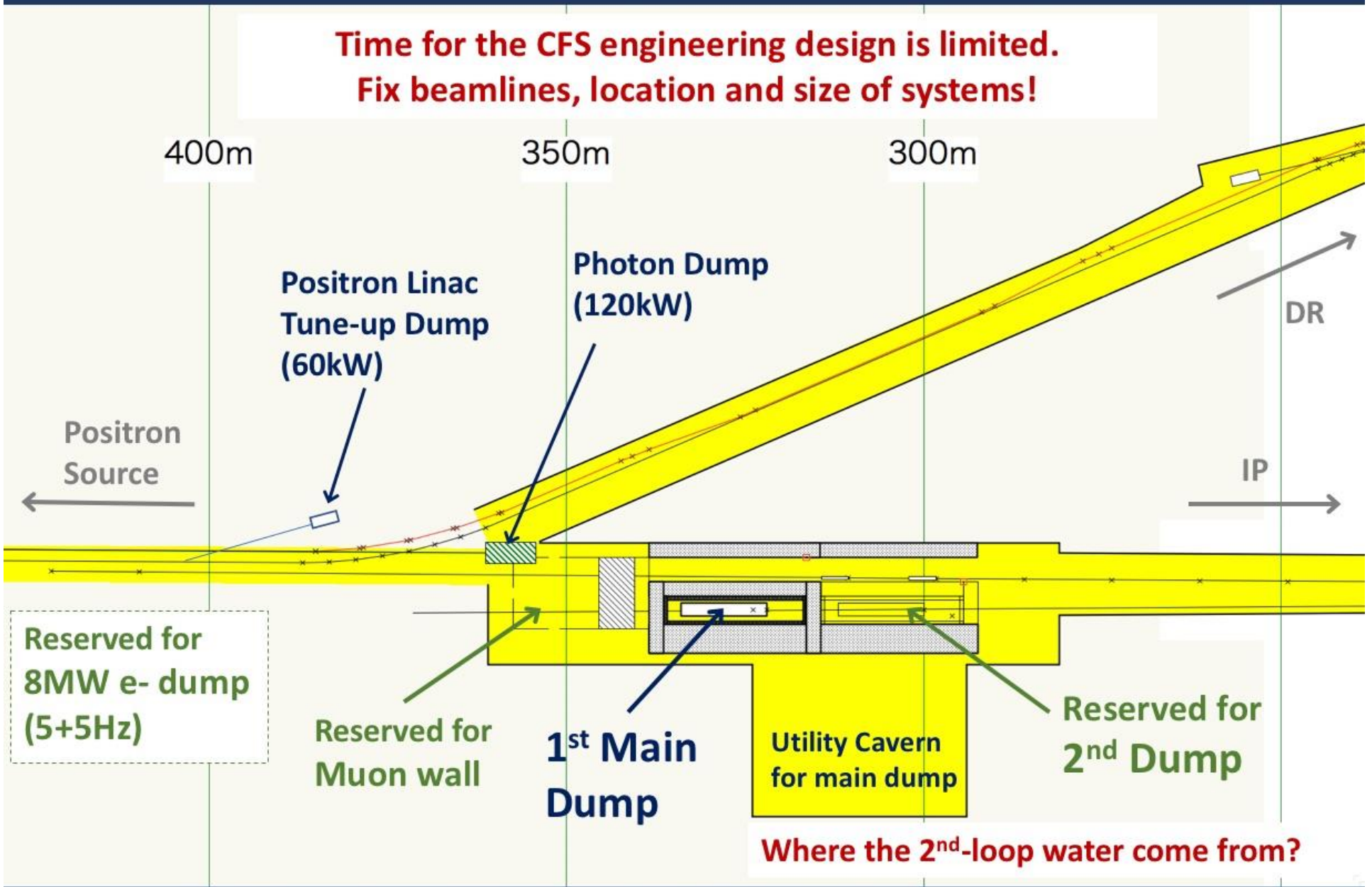
Slide from N. Terunuma (ALCW2018 Fukuoka)

Main Dump Cavern



Slide from N. Terunuma (ALCW2018 Fukuoka)

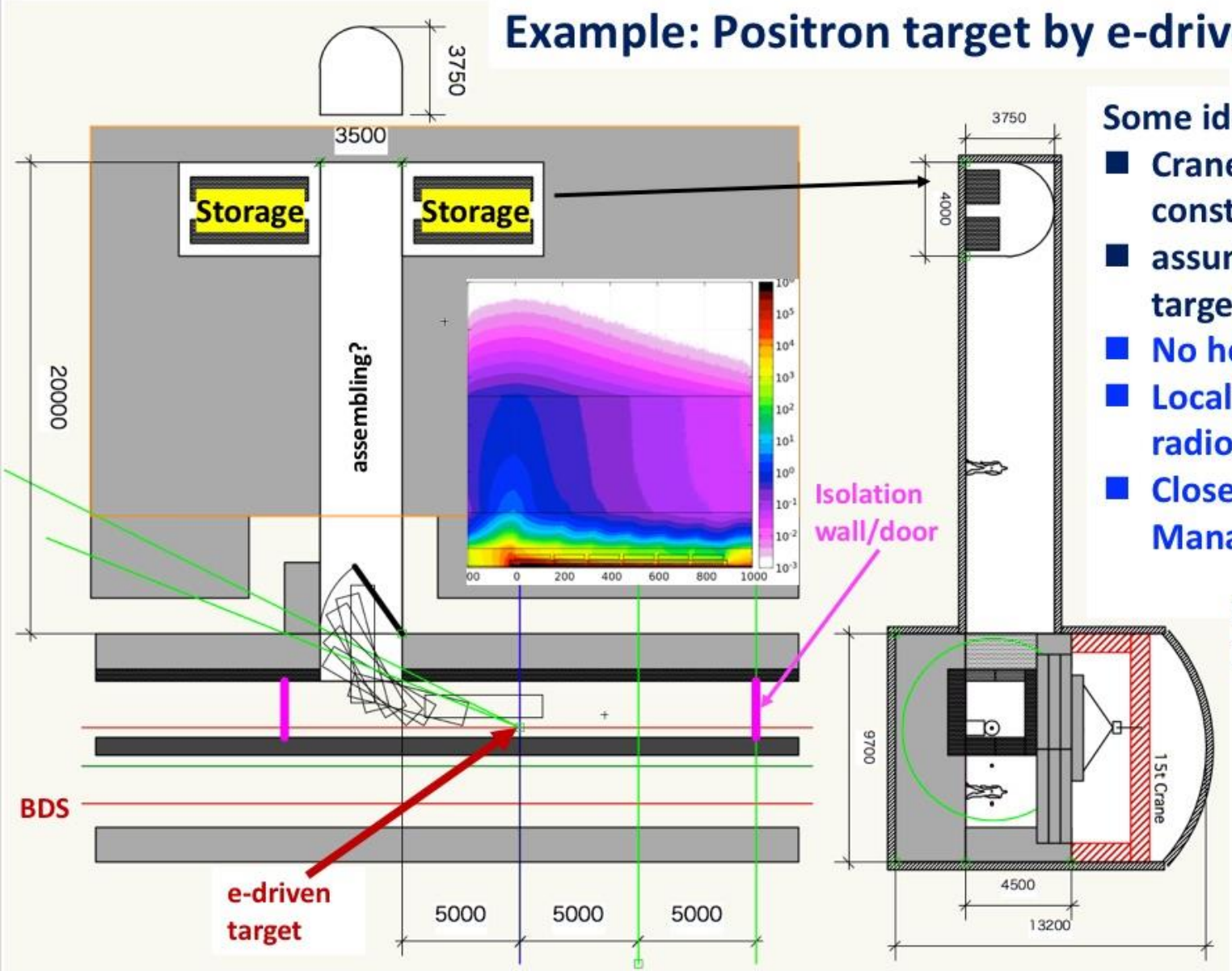
Summary: Main Beam Dump and Around



Slide from N. Terunuma (ALCW2018 Fukuoka)

For the exchange of Positron Target

Example: Positron target by e-driven scheme



Some ideas…

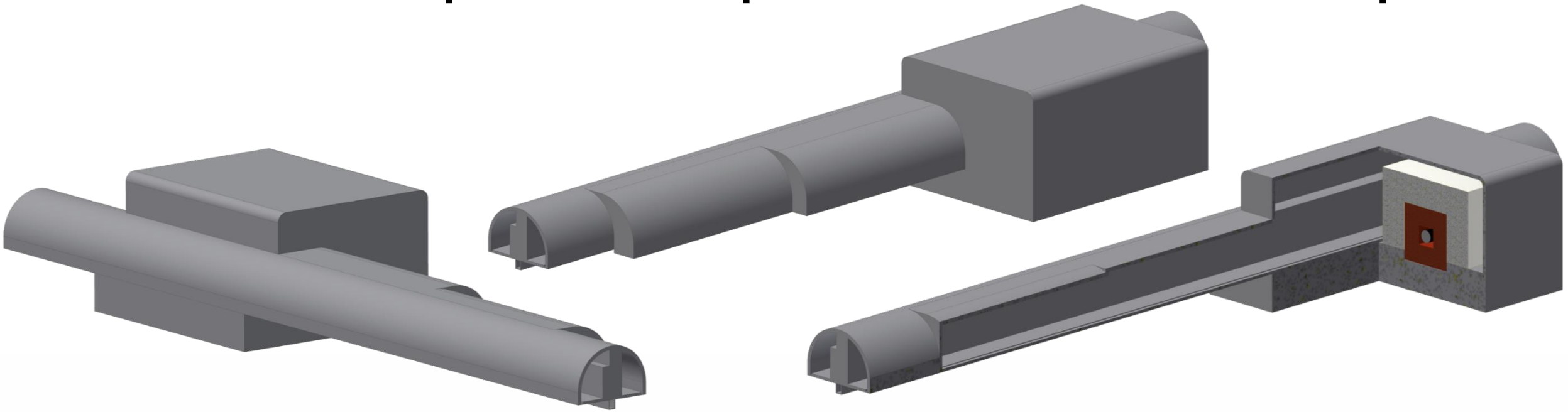
- Crane is used for construction only
- assumed 5m unit for a target exchange (max?)
- No heavy door
- Localizing the radioactive work
- Closed activated air Management

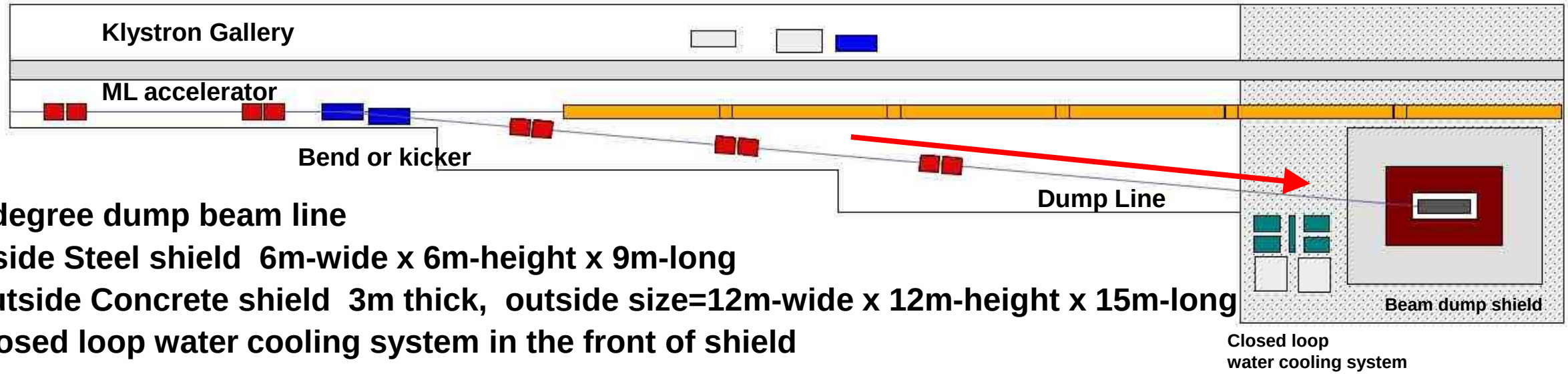
Power supply room in this region:

- Where?
- Anyway, we need shields.
- More wider/higher cavern?

Other dump room design

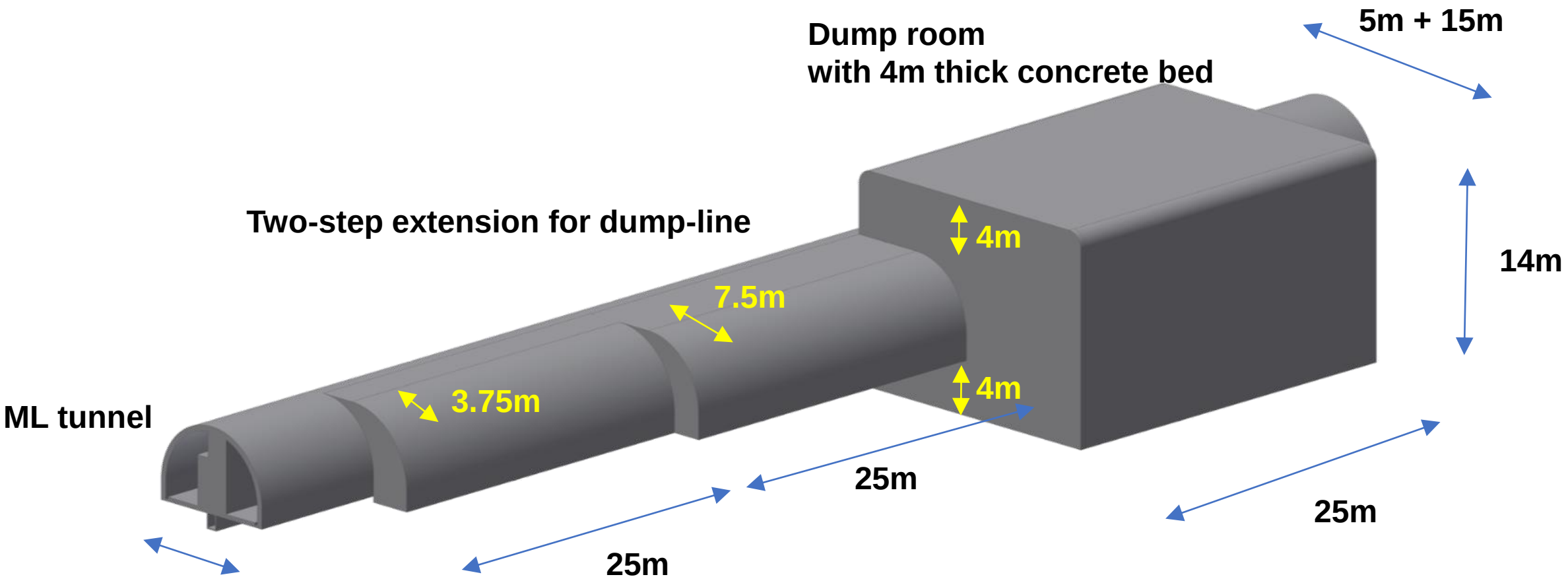
Proposal of Dump-room other than Main dump





5 degree dump beam line
Inside Steel shield 6m-wide x 6m-height x 9m-long
Outside Concrete shield 3m thick, outside size=12m-wide x 12m-height x 15m-long
Closed loop water cooling system in the front of shield

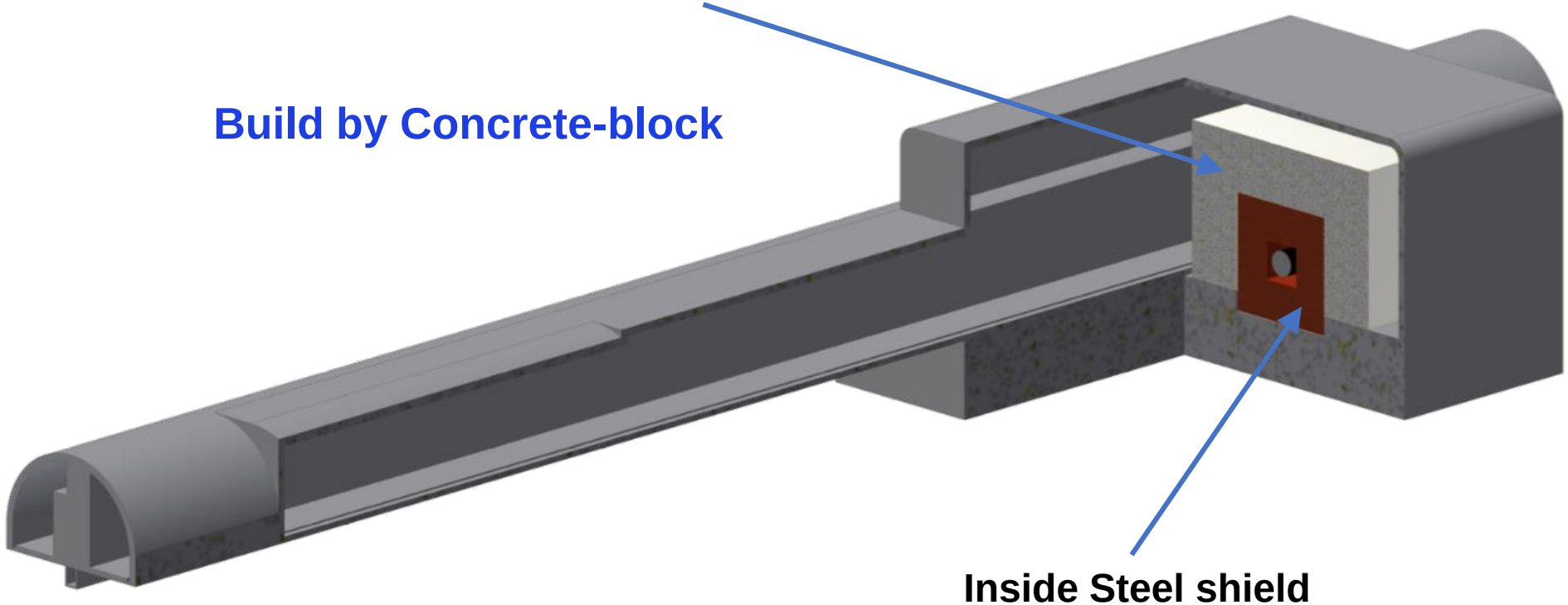
Proposal of Dump-room other than Main dump



Proposal of Dump-room other than Main dump

Outside Concrete shield 3m thick,
outside size=12m-wide x 12m-height x 15m-long

Build by Concrete-block



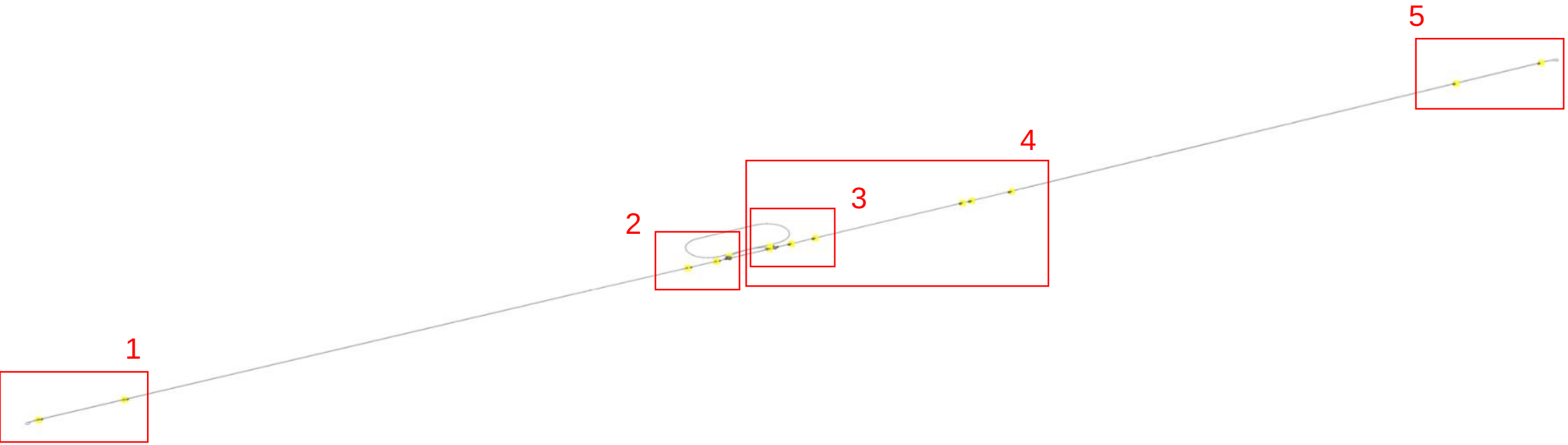
Inside Steel shield
6m-wide x 6m-height x 9m-long

Space for dump: 2m X 2m X 5m (inside of steel)

Build by Steel-block

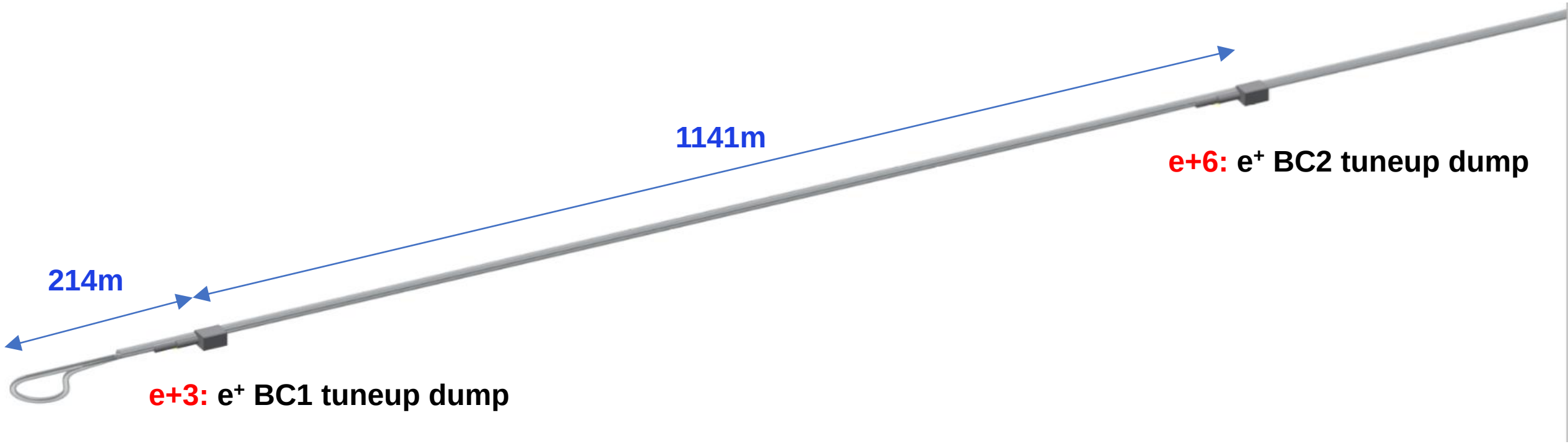
Dump-room location in the accelerator

Yellow Marks are the location of Dumps



Dump-room location in the accelerator

View 1

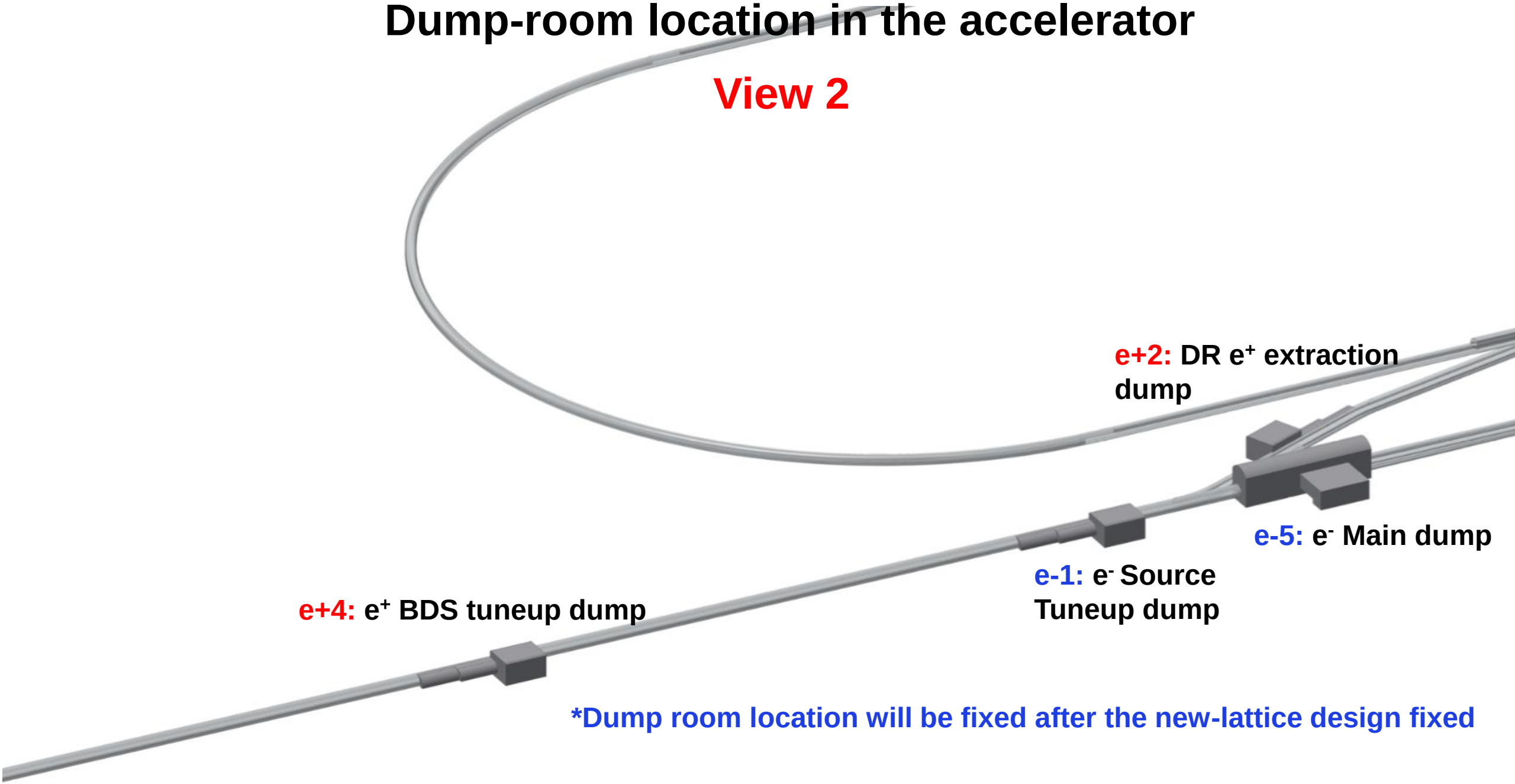


Positron turn around

*Dump room location will be fixed after the new-lattice design fixed

Dump-room location in the accelerator

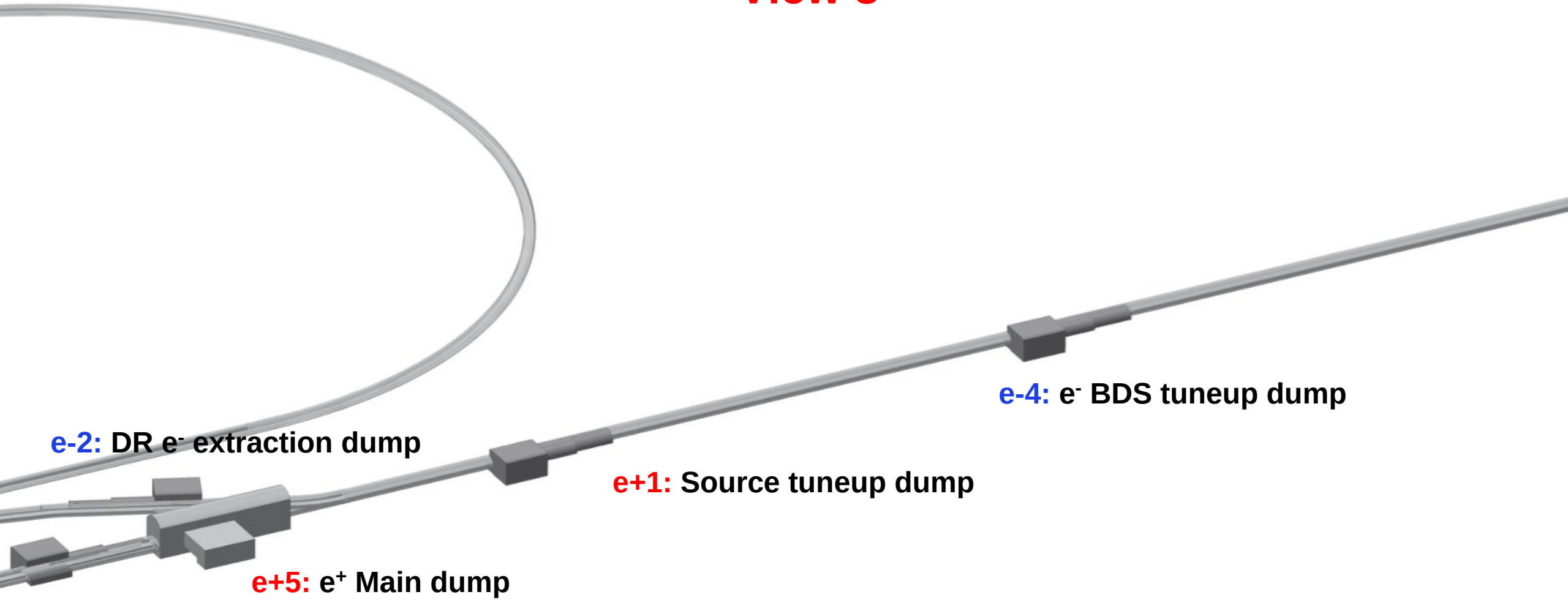
View 2



*Dump room location will be fixed after the new-lattice design fixed

Dump-room location in the accelerator

View 3



e-2: DR e^- extraction dump

e-4: e^- BDS tuneup dump

e+1: Source tuneup dump

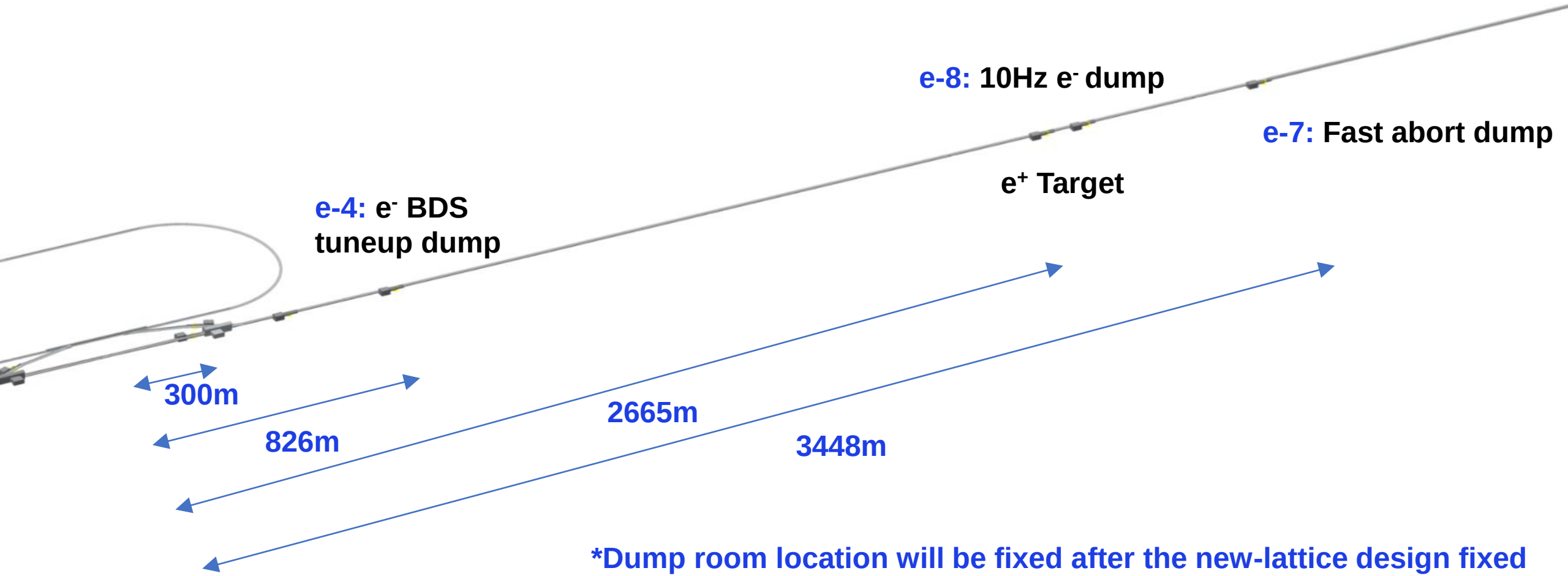
e+5: e^+ Main dump

e+7:
Photon dump

*Dump room location will be fixed after the new-lattice design fixed

Dump-room location in the accelerator

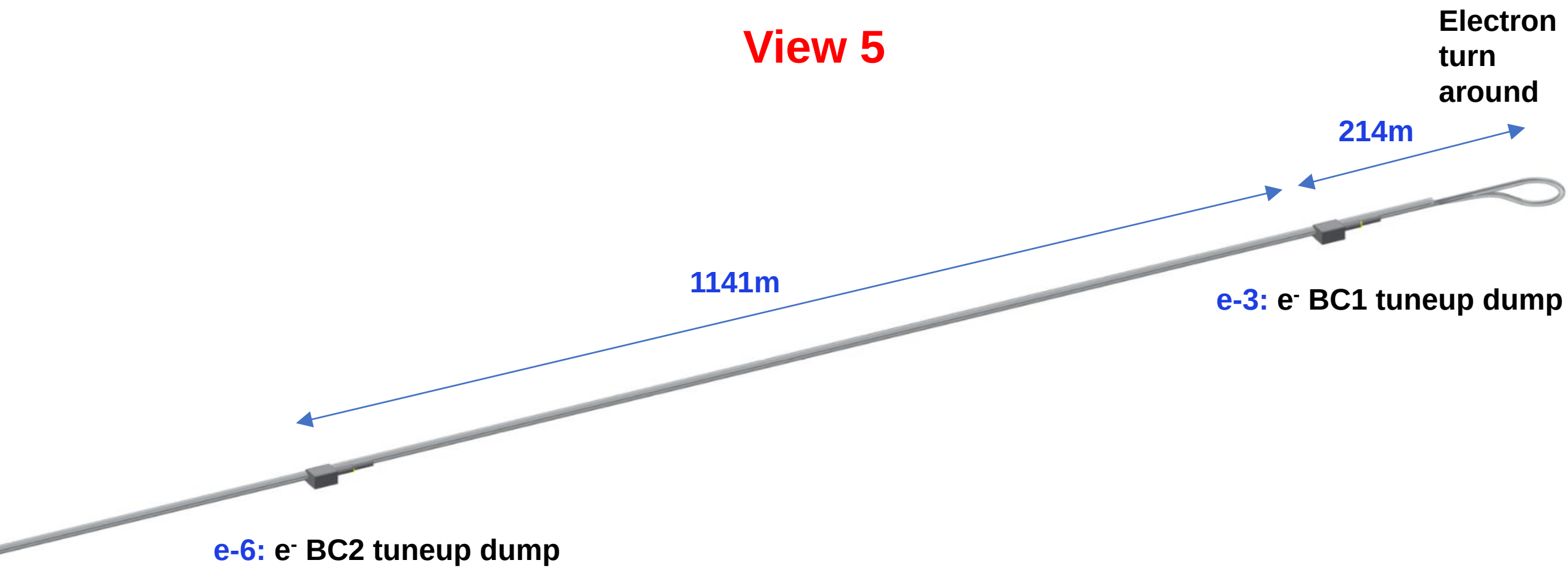
View 4



*Dump room location will be fixed after the new-lattice design fixed

Dump-room location in the accelerator

View 5



*Dump room location will be fixed after the new-lattice design fixed

Summary

1. ILC250 configuration review/update

The configulation of ILC250 (Lattice design) is on-going
by beam dynamics group, expecting next year completion (K. Kubo).

2. ILC250 beam dump review/update

The conceptual designs of shield rooms are on-going,

Concept of Main dump room, positron target room were
given in Fukuoka WS (N. Terunuma, Y. Morikawa),

Concept of other dump rooms are given in this talk.

End of slide