

Detector Requirements for Central Campus

Karsten Buesser

Mini-Workshop on ILC Infrastructure
and CFS for Physics and Detectors
15.03.2016

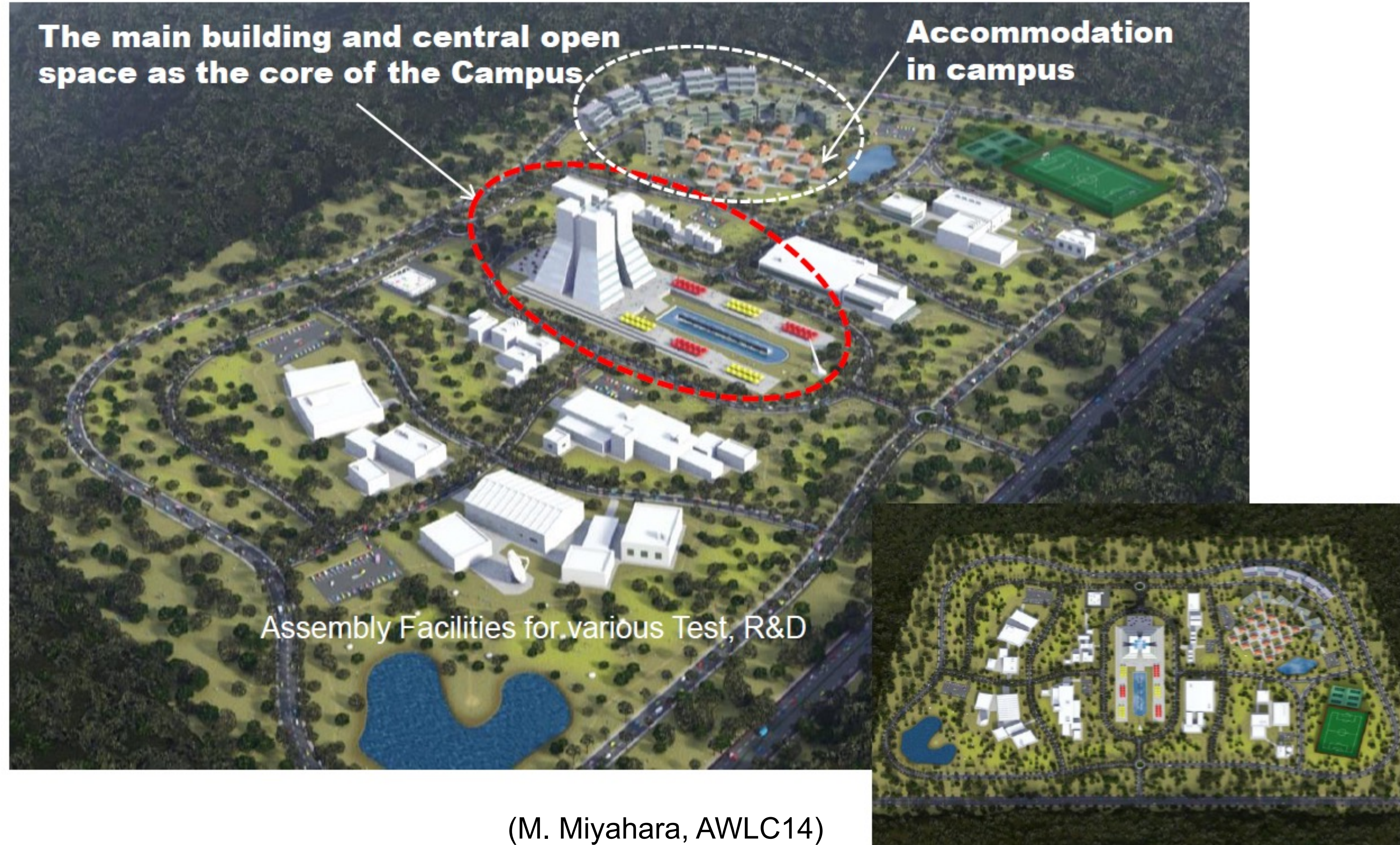
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Central campus

Slide from Masanobu Miyahara

Draft proposal plan for discussion

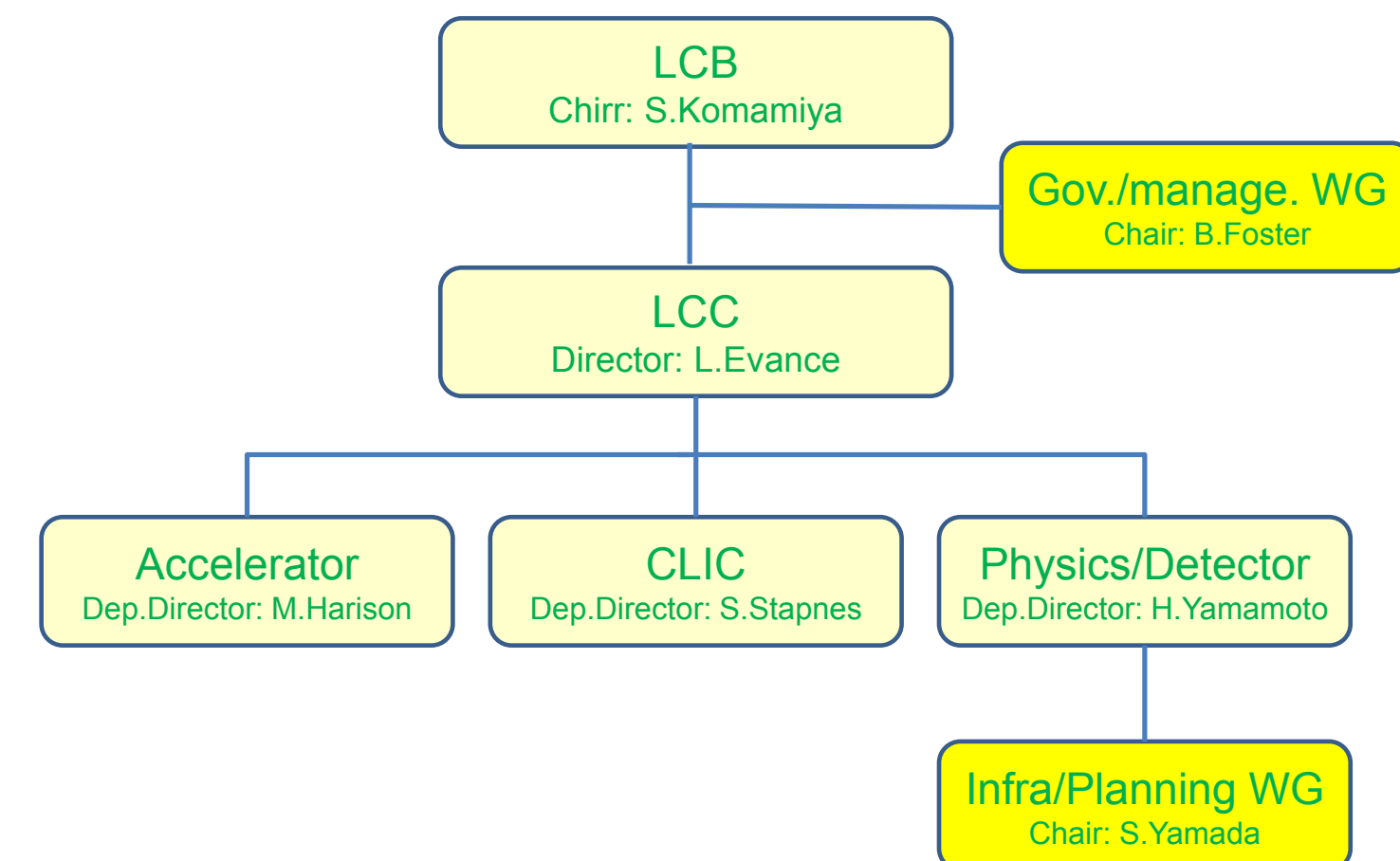


ILC Infrastructure and Planning Working Group



- Established in May 2014 by LCCPD Associate Director, Chair: Sakue Yamada
- Charge:
 - This working group studies the human and budgetary resource needs for the physics and detector activities of the ILC during construction as well as operation.
 - In doing so, it evaluates time profiles of the resources and how realistic they are in terms of where they could come from.
 - It also examines the organizational structure where the detector groups interact with the ILC laboratory from the establishment of the ILC laboratory through the operation.

- Input for MEXT TDR Validation Group
- Input for LCB Subcommittee on Governance and Management



- Philosophy of ILC laboratory has an impact on the distribution of the detector resources and vice versa
- Possible laboratory role model extrema:
 - Very basic facility: „hole in the ground“
 - Only minimum required infrastructure for the running of the experiments; data taking and data analysis done via fast internet links at existing labs and universities around the world
- Full-scale international laboratory: „CERN-style“
 - Detector construction and assembly, data taking, data analysis done to large extent on-site
 - All infrastructure available (including computing, guest services, safety, press office, etc.)
 - Own research groups (including theory)
- The decision on a model depends on budget scenarios and is likely also a political decision

Model Assumptions



- We assume a laboratory model somewhere in between both extremes:
- Laboratory provides (list could be extended):
 - Technical and radiation safety
 - Assembly and operational support (riggers, crane operators, surveyors, etc.)
 - Administrative support
 - Housing (short term and long term)
 - Office space
 - Meeting rooms
 - Cafeteria
 - Laboratory space, possibly clean rooms
 - Mechanical and electrical work shops
 - Computing support
 - Storage and assembly space
- Not all of these services need to be paid for by the lab, some services could also be outsourced

KITAKAMI Site: Transportation

- Some requirements depend on detector assembly and maintenance models (to be decided)
- And on the distance between central lab and IP!



Infrastructure Design Guidelines



- KEK Report 2013-5
- Requirements for the planning of the ILC central lab campus and the international science city
- Very interesting to read!
- Many numbers and assumptions that are interesting for detector groups
- Need to check whether technical requirements from ILD and SiD are matched

KEK Report 2013-5
February 2014
A/H

国際リニアコライダープロジェクト 立地に関する調査検討報告書

Study of the ILC Project Infrastructure Design Guidelines

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Edited by

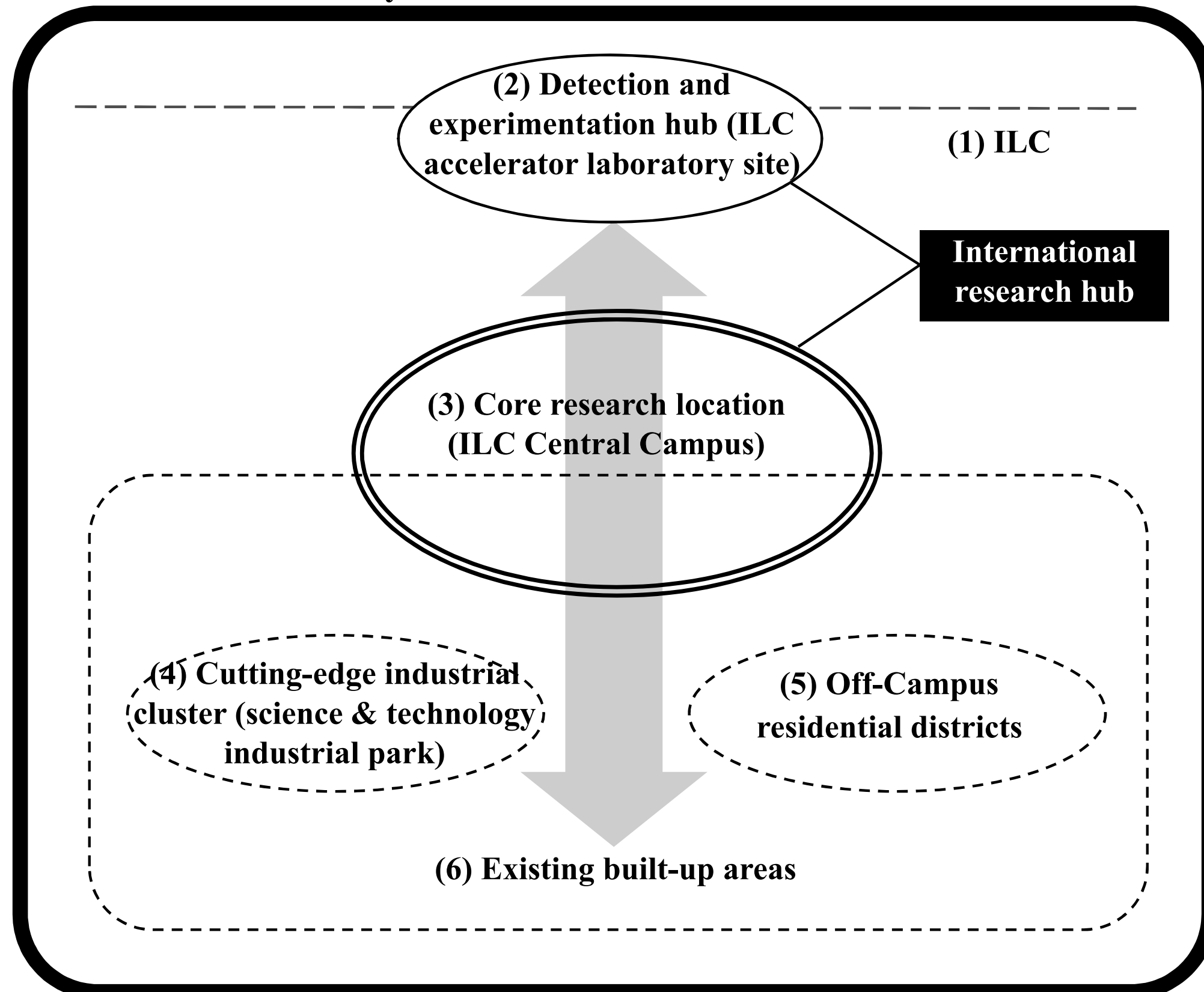
Akira Yamamoto and Masanobu Miyahara (KEK)

Michio Kitamura (NRI), Toshimasa Kataoka (FCC)

Science City

- Concept to form a multinational science city with the ILC main lab as the focal point

Multinational science city



Basic ideas underlying the formation of ILC multinational science city (five elements)

■ Science

⇒ **Forming a top science center that leads the way in world-class basic science research**

- World-class basic science research will be conducted with the establishment of an extensive cutting-edge scientific experimental facility (the ILC) as an international public good and the clustering of top-class research organizations and researchers/engineers; the resultant scientific discoveries and creations will have great value for humanity

■ Innovation

⇒ **Creating accelerator technology and industrial innovation originating in Japan and having knock-on effects throughout the world**

- The construction of the ILC utilizing state-of-the-art technology and the scientific value discovered/created by the ILC will serve as a driver for technological innovation, leading to development in both the supplier industry (accelerator industry) and the user industry (beam industry) utilizing this innovative technology

■ Attractiveness

⇒ **Creating “attractiveness” that will appeal to researchers and their families worldwide**

- Putting in place an intellectually creative environment, an efficient research environment, and a high-quality living environment will appeal to the sensibilities of top-class researchers/engineers worldwide and their families

■ Community

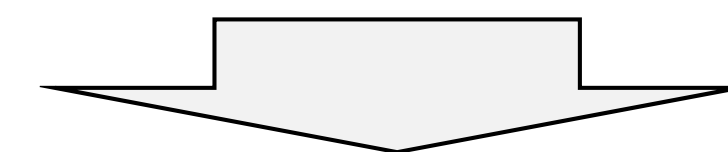
⇒ **Forming a “global community” where people from around the world interact and exercise their creativity**

- With large numbers of researchers/engineers from around the world and their families residing together, a community of basic science researchers and a local community of vigorous cultural exchange and contact will be formed

■ Amenity

⇒ **Maintaining a comfortable living environment so that people from around the world can live stress-free day-to-day lives**

- Enhancing social infrastructure and daily living services to ensure universality will allow researchers/engineers from around the world and their families to conduct their research and live comfortably and safely



■ Overall concept

“An area for pursuing the creation and innovation of the world’s most cutting-edge science and technology through multinational and multicultural coexistence (=multinational science city)”

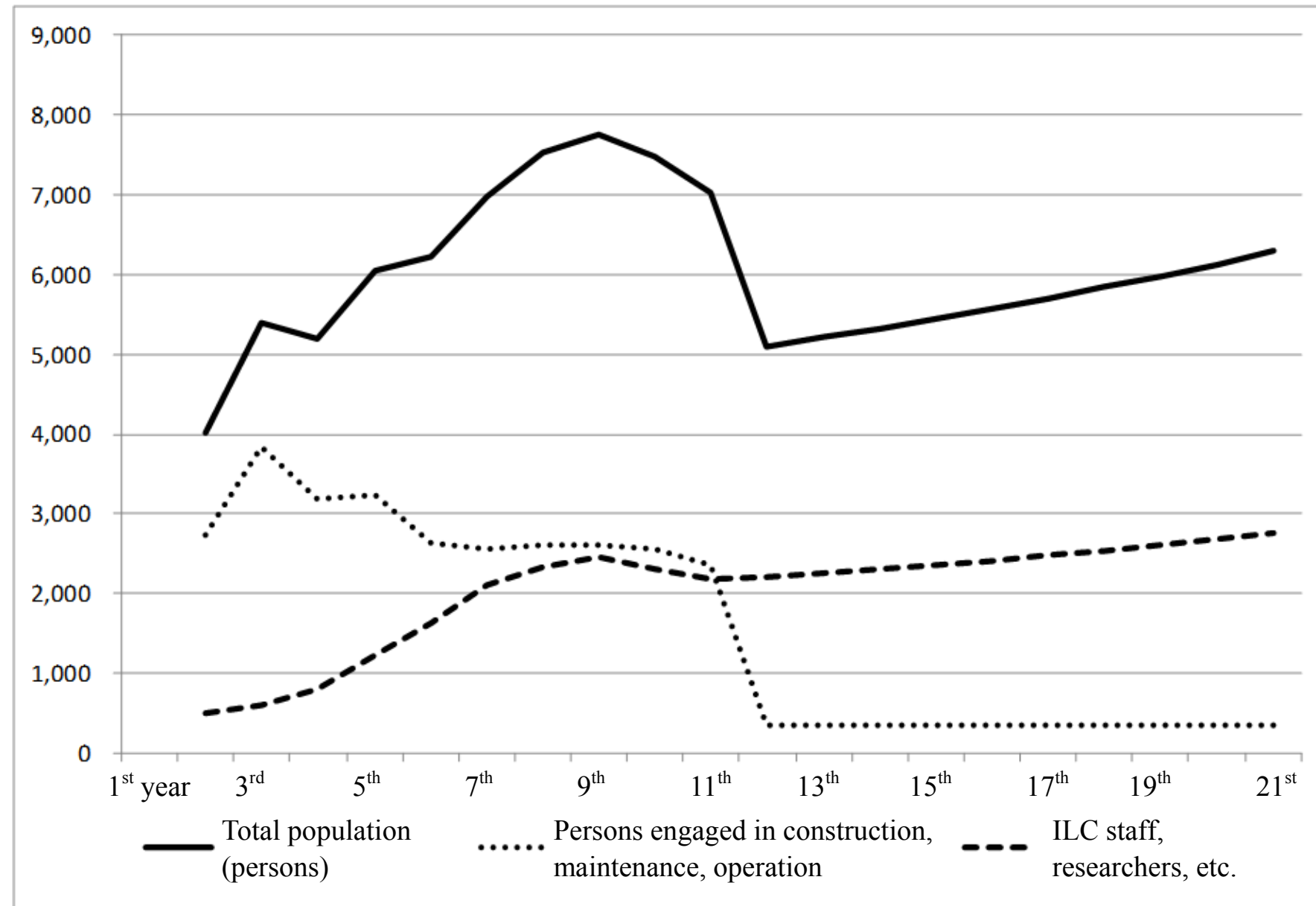


Figure 10 Presumed numbers of ILC International Research Institute personnel and experimental researchers, etc. (approximate figures)

(Year from start of construction) (→)	Peak of ILC construction (8 th year)	Start of ILC operation (11 th year)	ILC operation (15 th year)	ILC normal operation (20 th year)
ILC International Research Institute staff (full-time + part-time)	1,600	1,200	1,200	1,200
Experimental researchers, etc. (stayers at a given point in time)	500	700	800	1,000
Support staff, etc. (stayers at a given point in time)	300	300	400	500
Total	2,400	2,200	2,400	2,700

Human Resources (cont)

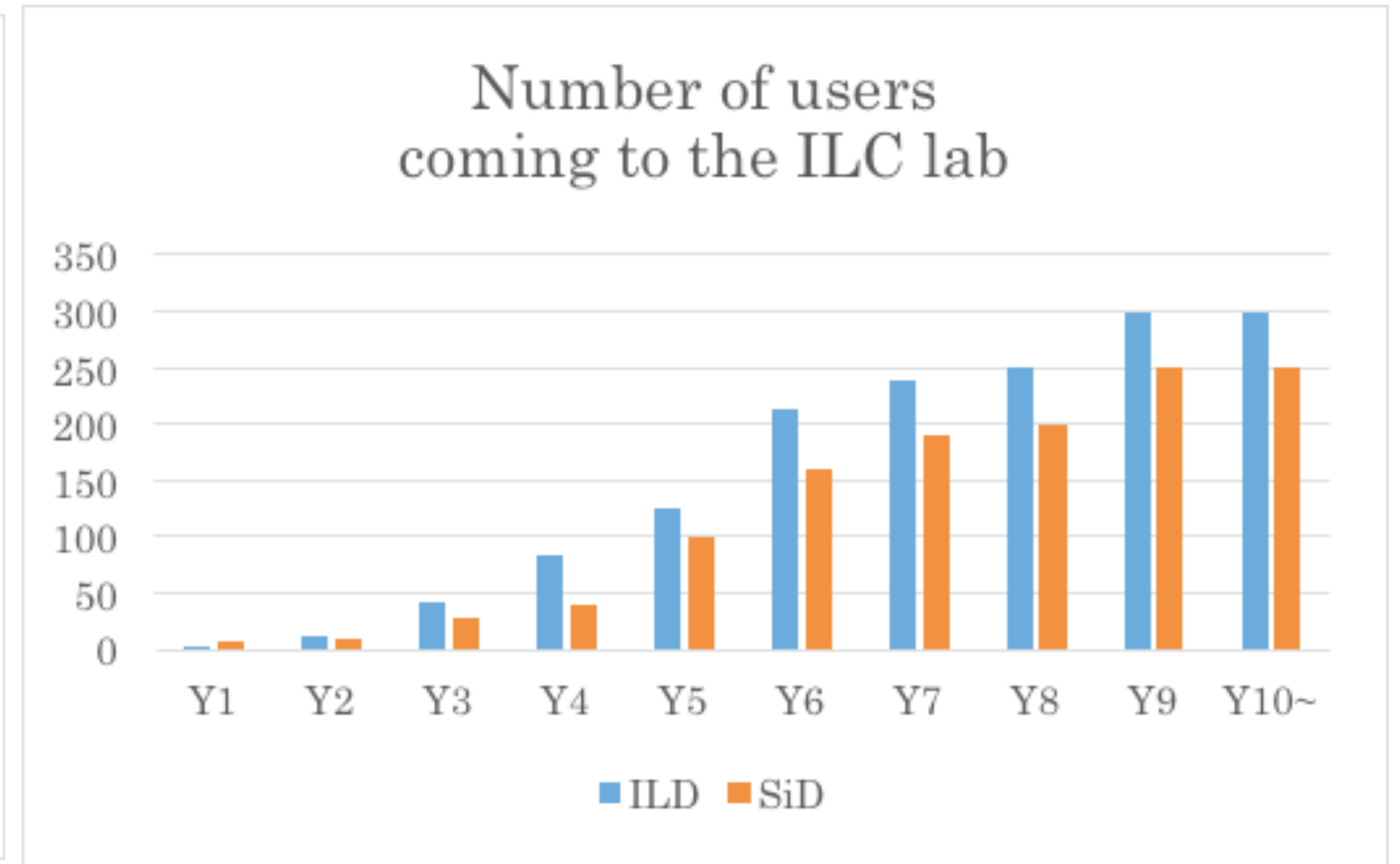
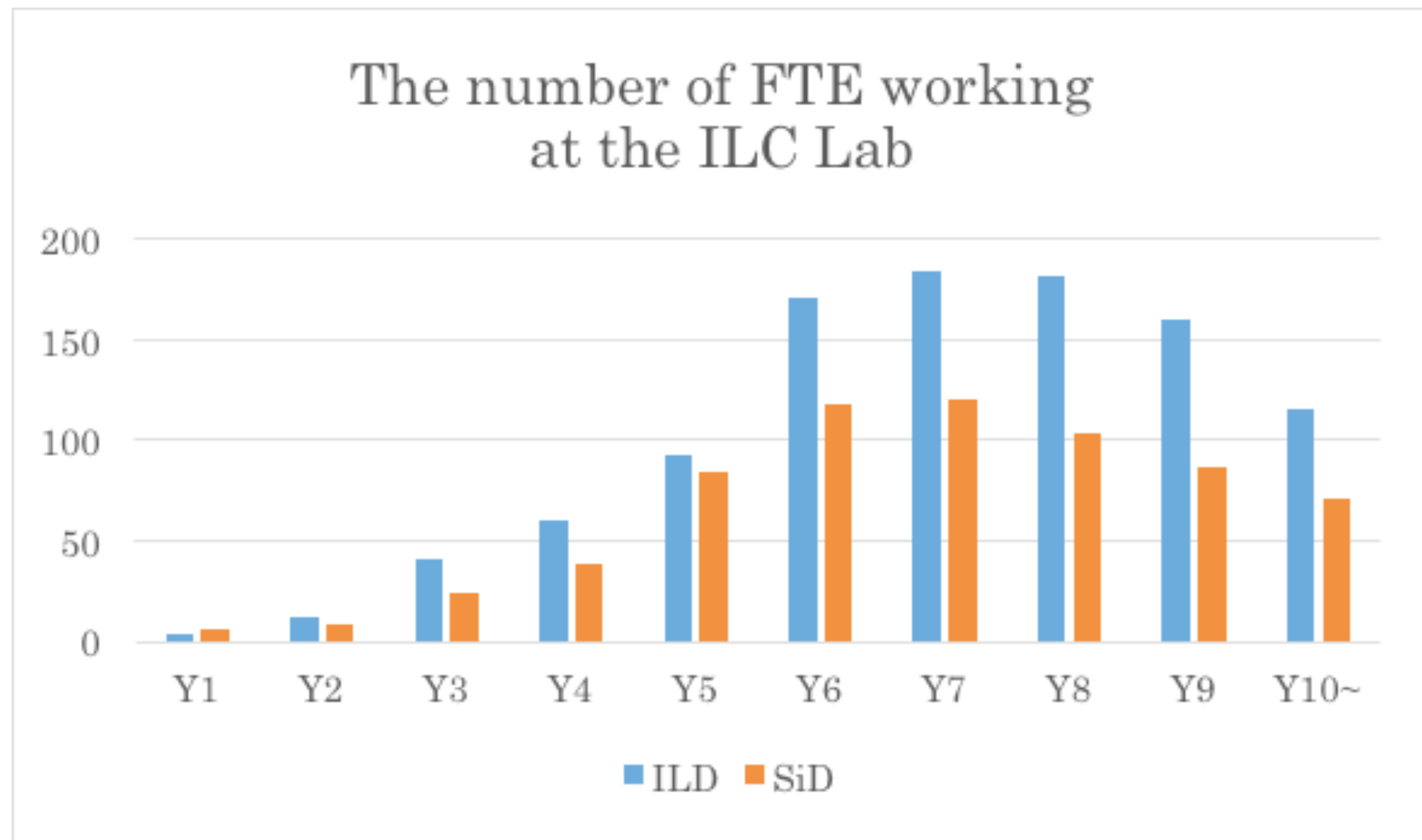


(Unit: persons)

	Construction phase					Operation phase				
	1 st year	5 th	7 th	8 th	9 th	11 th	13 th	15 th	17 th	20 st
	2015	2019	2021	2022	2023	2025	2027	2029	2031	2034
■ Researchers, engineers, administrative staff - subtotal	100	1,278	2,481	2,291	2,318	2,200	2,303	2,416	2,540	2,751
(1) ILC International Research Institute staff (full-time + fixed-term)	100	840	1,760	1,440	1,400	1,200	1,200	1,200	1,200	1,200
(2) Experimental researchers, etc. <two experiment groups>		284	467	551	618	700	772	851	938	1,086
(3) Support staff, etc. (subcontractors, etc.)		154	254	300	300	300	331	365	402	465
■ Persons engaged in construction, maintenance, and operation - subtotal	2,610	2,522	2,658	2,562	2,550	360	360	360	360	360
(4) Persons engaged in construction work (including supervisors and contractees)	2,580	2,270	2,130	2,130	2,130	0	0	0	0	0
(5) Persons engaged in outsourced maintenance/operation	30	252	528	432	420	360	360	360	360	360
■ Dependent family members - subtotal	156	1,459	2,552	2,471	2,598	2,536	2,662	2,796	2,939	3,176
(1) Family members of ILC International Research Institute staff	142	1,128	1,952	1,845	1,936	1,844	1,897	1,949	2,001	2,079
(2) Family members of researchers, etc. participating in experiments	0	136	224	269	305	356	404	457	518	623
(3) Family members of support staff, etc.	0	74	122	146	148	153	173	196	222	267
(4) Family members of persons engaged in construction work	0	0	0	0	0	0	0	0	0	0
(5) Family members of persons engaged in outsourced maintenance/operation	14	121	253	210	208	183	188	194	199	206
■ Total	2,866	5,259	7,691	7,324	7,465	5,096	5,324	5,571	5,840	6,287

Experimental Researchers at ILC Lab

- Numbers estimated by ILD and SiD - Detector Infrastructure Group:



- Need to cross-check numbers with the ones from the report...

Facilities at Central Lab Campus



Function/facility category		Envisioned ILC Central Campus facilities (initial stage + future stages)	
		Facilities	Overview
■ Research and operation functions	Office-related facilities	Research-related offices	Laboratory A (Group A full-time researchers) ----- Laboratory B (Group B full-time researchers, engineering staff) ----- Laboratory C (part-time researchers + engineers)
		Management-related offices	Offices for managerial, support and service staff
■ Experiment and research functions	Experiment-related facilities	Assembly hall	For experiment preparations and testing/development experiments (CM assembly/adjustment, performance evaluation testing, elemental technology development)
		Common technology development center	Workshop, low-temperature, radiation, other
		Experiment control center	Computer room (approx. 1000m ²)
■ Meeting and exchange functions	Lecture and meeting facilities	Lecture hall	Large lecture hall – 500-seat capacity (school layout) ----- Small lecture hall – 200-seat capacity (school layout)
		Meeting rooms	Large meeting room – 100-seat capacity (school layout) ----- Medium meeting room – 50-seat capacity (school layout)
■ Stay and accommodation functions	Accommodation facilities	Visitor accommodation facility A (apartment-type)	For short-/medium-term single stayers (40m ² /unit)
		Visitor accommodation facility B (townhouse-type)	For short-/medium-term family stayers (100m ² /unit)

Facilities at Central Lab Campus



■ Service functions	Information and exhibition facilities	Reception facilities	Facilities for receiving, briefing and welcoming visitors and tours
		Exhibition facilities (visitor center)	Exhibition facilities for tours (instrument displays, panels, videos, etc.)
		Library and information center	Facilities to provide materials/information to researchers
	Welfare facilities	Cafeteria	Dining room, coffee lounge
		Medical clinic	Medical office (nurse always on duty)
		Daycare facilities	Daycare (nursery school) facilities for young children of staff/researchers
		Entertainment/sports facilities	Recreation facilities for staff/researchers
	Daily living support facilities	User service center	User office Bank (and ATM), post office Travel agency office, etc.
		Shops	Convenience store, book store, etc.
	■ Transport functions	Parking facilities	Multi-level parking lot
■ Supply and disposal functions	Machinery and equipment room	Electric power room	
		Machinery room	
		Disaster-prevention control room	

Size of Facilities

Function/facility category	Facility	Overview	Envisioned total floor space (m ²)		Remarks
			Start of ILC operation (11 th year)	Normal ILC operation (20 th year)	
■ Research and operation functions	Research-related offices	Laboratory A (Group A full-time researchers)	18,000	18,000	Net floor space per person: 20m ²
		Laboratory B (Group B full-time researchers, engineering staff)	9,000	9,000	Net floor space per person: 10m ²
		Laboratory C (part-time researchers + engineers)	6,300	9,450	Net floor space per person: 7m ²
	Management-related offices	Offices for managerial, support and service personnel	2,100	2,100	Net floor space per person: 7m ²
	Subtotal		35,400	38,550	
■ Experiment and research functions	Assembly hall	For experiment preparations and testing/development experiments	25,000	25,000	Primarily accelerator-related
	Common technology development center	Workshop, low-temperature, radiation, other	5,000	5,000	
	Experiment control center	Including computer room (approx. 1000m ²)	3,000	3,000	
	Subtotal		33,000	33,000	
■ Meeting and exchange functions	Lecture hall	Lecture hall (large)	1,500	1,500	Capacity: 500 persons
		Lecture hall (small)	600	600	Capacity: 200 persons
	Meeting rooms	Large meeting room	600	900	Capacity: 100 persons
		Medium meeting room	600	900	Capacity: 50 persons
	Subtotal		3,300	3,900	

Size of Facilities (cont)

■ Stay and accommodation functions	Visitor accommodation facility A (apartment-type)	For short-/medium-term single stayers	18,000	27,000	Net floor space per unit: 40m ²
	Visitor accommodation facility B (townhouse-type)	For short-/medium-term family stayers	5,000	7,500	Floor space per unit: 100m ²
	Subtotal		23,000	34,500	
■ Service functions	Reception facilities	Reception, registration, waiting room	375	375	
	Exhibition facilities (visitor center)			900	
	Library and information center			450	
	Cafeteria	Dining room, coffee lounge	1,300	1,300	
	Medical clinic	Medical treatment room (nurse always on duty)		150	
	Daycare facilities	On-Campus nursery school	600	600	
	Entertainment/sports facilities			750	
	User service center	User office Bank (and ATM), post office Travel agency office, etc.	1,000	1,000	
	Shops	Convenience store, book store, etc.	500	500	
	Subtotal		3,775	6,025	
■ Transport functions	Multi-level parking lot			3,000	
	Subtotal			3,000	
■ Supply and disposal functions	Electric power room		200	200	
	Machinery room		700	700	
	Disaster-prevention control room		200	200	
	Subtotal		1,100	1,100	
Total			99,575	120,075	

Technical Detector Facilities at Central Lab

- Current plan foresees
 - Common technology development centre (workshops, labs): 5000 m²
 - Assembly hall (for experiment preparations, primarily accelerator related): 25000 m²
- Is this sufficient for ILD and SiD?
- What technical work do we want to do at the central lab campus?
 - Functional tests of detector elements
 - Pre-assemblies
 - R&D for possible upgrades
 - Own contributions of ILC Lab to future experiments?
 - Maintenance and repairs
 - Storage
 - ...

Conclusions

- ILC Infrastructure and Planning Working Group (Physics/Detectors) assumes a model of a rather self-sustained international facility, similar in complexity as CERN, FNAL, KEK, DESY,...
- This is matched in the Infrastructure Design Guidelines laid out in KEK Report 2013-5
- The biggest uncertainties on the technical requirements for the detectors come from
 - the detector assembly and maintenance models assumed by the collaborations
 - where will the sub detectors be built?
 - do they need assembly/testing space or are they installed immediately at the IP?
 - (...)
 - the distance between the central lab campus and the IP
- Both detectors should have a look at the requirements in the KEK Report and define their technical requirements
 - space, infrastructure, clean rooms, special equipment (gas systems, cryo), etc.