

International Development Team

IDT WG2 Activities

Benno List

ILC Europe Meeting

20.12.2023

ITN next step

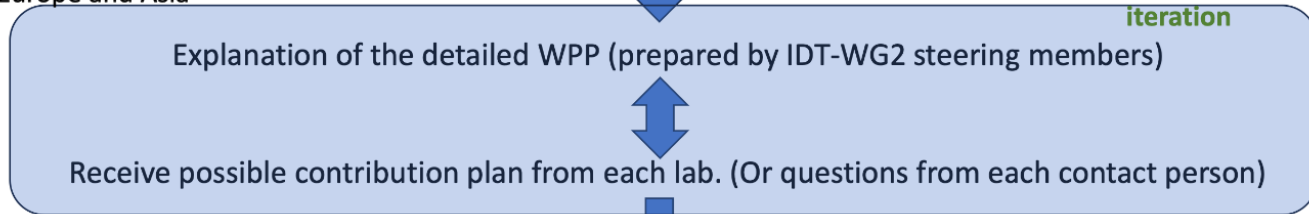
IDT-EB sent an e-mail to each lab to **check the list** and nominate **contact person** in each WPP.



Response from each lab



To Europe and Asia



Report them from IDT-WB2 to IDT-EB



IDT-EB will consider the ITN framework

SRF Subgroup Progress



40th Meeting of SRF Group in IDT/WG2

- ✓ Recent progress of SRF 5-year plan at KEK and global collaboration for ITN (Kirk)
- ✓ Others (if any)

Attendees: A. Yamamoto, K. Umemori, D. Delikaris, S. Steiner, P. Burrows, Kirk

<https://agenda.linearcollider.org/category/256/>

Kirk

5/Dec/2023

40th Meeting of SRF Group in IDT/WG2

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Recent progress of SRF 5-year plan ①

- Japan (KEK)
 - Cavity
 - FG 9-cell cavity is under fabrication, negotiation with local government and KHK is under progress, may be approved in Feb
 - Six 1-cell cavities (FG/MG) will be produced by KEK in-house, and VT will start after delivery in Jan
 - KEK sent some MG disks to vendors in EU for press-testing
 - KEK is preparing necessary Nb material for Eddy Current Scanning (ECS) at DESY
 - KEK started the discussion with a domestic vendor to produce 9-cell cavities in next FY
 - Power coupler
 - Drawing work and specification document are under progress
 - Ceramic samples were ordered for quality check of brazing, thermal cycle test, TiN coating test, etc.
 - RF simulation is under progress between FNAL and KEK within the framework of the US-Japan Science and Technology Cooperation
 - Tuner
 - Drawing work is under progress
 - Discussion with FNAL is under progress for rental of a set of cavity/tuner/helium tank within the US-Japan
 - Mechanical simulation for LFD is under progress
 - Magnetic shielding/Demagnetization
 - Demagnetization test with a small cryo-vessel is under preparation
 - Drawing work of magnetic shielding is under progress
 - Discussion with a domestic vendor is under progress
 - SC-Q magnet
 - Discussion with a domestic vendor is under progress

5/Dec/2023

40th Meeting of SRF Group in IDT/WG2

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Leaders for each sub-group at KEK (updated)

Sub-group	Leader
Drawing	Takeshi Dohmae
Cavity	T.B.D.
Frequency tuner	Mathieu Omet
Power coupler	Kirk
Magnetic shield	Ryuichi Ueki
SCQ magnet (+BPM)	Yasushi Arimoto (Hitoshi Hayano)
Clean work/Vacuum work	Hayato Ito
Cryomodule	Kirk
Infrastructure at COI	Shinichiro Michizono
RF	Toshihiro Matsumoto
Cryogenics	Hirotaaka Nakai/Kota Nakanishi/Hirotaaka Shimizu
Cavity fabrication/Material preparation	Takayuki Saeki/Takeshi Dohmae
High Pressure Gas Safety Act	Kensei Umemori/Takayuki Saeki/Takeshi Dohmae

5/Dec/2023

40th Meeting of SRF Group in IDT/WG2

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Recent progress of SRF 5-year plan ②

- Japan (KEK)
 - Clean work/Vacuum work
 - Design of mock-up cavities (will be used for training of cavity string assembly) was almost done, waiting for procurement
 - Remote control system for ionized gun and dust monitor will be completed soon, will be merged with robot arm system
 - Regular meeting on robotics with CEA and FNAL has been held
 - Cryomodule
 - Drawing work is under progress
 - Discussion with domestic vendors is starting
 - Infrastructures
 - Cavity Fabrication Facility
 - CFF group is preparing for new work area, install a new clean room and some devices
 - Cryogenics
 - They started the preparation for change request to discuss with local government
 - CM hanger
 - Currently under construction for improvement
 - CM test bunker
 - The design completed, the cost estimation done

5/Dec/2023

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Kirk Yamamoto
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<https://agenda.linearcollider.org/event/10231/>

Recent progress of power coupler

RF simulation is under progress

Metalized ceramics

Quality check of brazing

TiN coating on ceramics

Courtesy of R. Katayama

Courtesy of D. Kostin

cut-view of the ceramics to copper collar brazing; braze is very regular.

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Recent progress of infrastructure at COI

Layout of CM test bunker at COI

Tuner work area

Courtesy of M. Omet

Demagnetization study using m...

A room with many objects on it

CM hanger

Courtesy of H. Araki

Courtesy of R. Ueki

Courtesy of H. Hayano

5/Dec/2023 40th Meeting of SRF Group in IDT/WG2

Design/Production of mock-up cavities

KEK will introduce mock-up cavities for training of cavity string assembly.

We designed mock-up cavities for training of cavity string assembly

From T. Dohmae

We will replace dummy cavities with mock-up ones

Blank-bellows replacement system for training

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5-Year plan

Overall **production** schedule of 5-year plan at KEK

	JFY2023			JFY2024				JFY2025				JFY2026				JFY2027				
	CY2023			CY2024				CY2025				CY2026				CY2027				CY2028
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
1-cell cavity (FG, KEK)		4																		
1-cell cavity (MG, KEK)		2																		
9-cell cavity (FG, domestic)		1			6				1											
9-cell cavity (MG, KEK)		1 (training)			1				1											
9-cell cavity (MG, oversea)			training						2											
Power coupler					2 (prototype)				8											
Frequency tuner					1 (prototype)				8											
SCQ magnet+BPM					1 (prototype)				1											
Magnetic shield					1 (test)				1 (prototype)				8							
Cavity string																				
CM production																				
CM assembly																				
CM test																				
Cryogenics																				
HLRF																				
Rail of cavity string																				
CM assembly implement																				
CM test bunker																				

Deadline of clean assembly study for ITN



NOW

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Global collaboration and recent progress for ITN

- Overseas
 - Americas
 - US released the P5 report
 - Asia
 - Korea University and PAL newly joined the ITN, and KEK will explain for them in 19/Dec
 - Europe
 - CERN, CEA and INFN are considering production of two 1-cell cavities, will start from 2024
 - This depends on when the budget and the Nb material will be transferred from KEK to EU
 - CEA and INFN are discussing with DESY how to contribute to ITN
 - DESY is preparing for ECS
 - Free of charge for EU
 - Americas and Asia are under discussion
 - CIEMAT and IFIC are discussing with KEK to produce SC-Q magnet and BPM system
 - IFIC and IJCLAB newly joined the ITN, they will discuss internally in EU

Summary of Briefing Meeting for Sources IDT-WG2, Dec.12, 2023, K. Yokoya

➤ Dec.7 3 Briefing Meeting

- ✓ Gudi Moortgat-Pick, Yoshinori Enomoto, Steffen Doebert, Iryna Chaikovska, Kaoru Yokoya
- ✓ Indico <https://agenda.linearcollider.org/event/10236/>

➤ Contact Persons

✓ Asia-Pacific

- Yoshinori Enomoto WPP 8-11 KEK

✓ Europe

- Iryna Chaikovska WPP 8,9 IJCLab
- Steffen Doebert WPP 6,7 CERN
- Gudrid Moortgat-Pick Uni. HH

➤ US

- ✓ US people could not participate. Hence no discussion on the electron source (WPP4) yet

➤ Presentation

- ✓ Gudi undulator itn-wpp-positron.pdf
- ✓ Yoshinori e-driven 231016-ITN-information-meeting-source-v5.pptx

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K.Yokoya

Kaoru Yokoya

IDT WG2 Meeting 12.12.23

<https://agenda.linearcollider.org/event/10231/>

Undulator Scheme

- WPP6 (rotating target)
 - ✓ Design finalization, partial laboratory test, mock-up design
 - ✓ Magnetic bearings: performance, specification, test
 - ✓ Full wheel validation, mock-up
- WPP7 (Magnetic focusing system)
 - ✓ Pulsed solenoid, plasma lens, including yield calculation
 - ✓ OMD with fully assembled wheel
- WP5 (Undulator) is not included in WPP (higher maturity)

2023/12/12 WG2
K.Yokoya

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WPP7 Magnetic Focusing System

- The strongest candidate: Pulsed Solenoid
 - ✓ Other candidate: plasma lens
- Mechanical design department at DESY: available manpower for design
- DESY-CERN collaboration already going on
- Planned: prototype tests 2024
- Goal of development is a prototype solenoid to demonstrate
 - ✓ magnetic field strength, field stability, mechanical stability, thermal stability
 - ✓ Vacuum vessel not foreseen in first prototype design
- Tests : where?
 - ✓ Possible test at CERN (power supply available)

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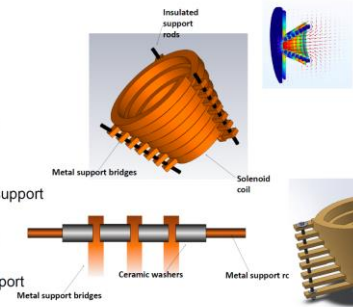
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Solenoid construction

Tenholt, Loisch, Lemke, Yakopov

Possible mechanical design

- Solenoid coil
 - Tapered winding
 - 7 planar windings with interconnections
 - Conductor cooled from inside
- Metal supports to hold coil
 - Support rods insulated from support bridges
 - Washers e.g. of SiN ceramics
- Magnetic shielding cut at support locations
 - Influence on field to be determined
 - Main shielding to target unaffected



WPP6 Rotating Target

- Specification
 - ✓ Titanium alloy, 7mm thick, diameter 1m, rotating at 2000 rpm in vacuum, photon power ~60 kW, deposited power ~2 kW, Magnetic bearings, Radiation cooling
- Already long studies
 - ✓ But no plan yet for constructing prototype
- Reactivate rotating wheel effort
 - ✓ Several meetings took place
 - ✓ In principle, the plan is to construct a 'new' prototype
 - ✓ Needed: one lab that puts the hand up
 - maybe some ITN money for the wheel available...
 - would fit perfectly well in time since pulsed solenoid is on the way.....
 - Maybe even something at DESY possible
 - might be also needed for a HALHF-like e+ source

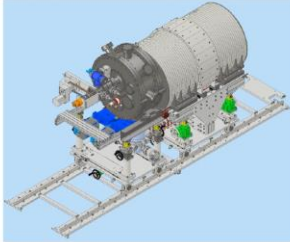
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e-Driven Scheme

- WPPs
 - ✓ WPP 8 Rotating target
 - ✓ WPP 9 Magnetic focusing
 - ✓ WPP10 Capture cavity
 - ✓ WPP11 Target replacement (no candidate lab for WPP11)
- Test bench being constructed at KEK



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Possible Participation as ITN

- SuperKEKB and FCC-ee, CLIC already have some kind of collaboration and connection.
- IJC Lab
 - ✓ IJC lab is mainly involved FCCee
 - ✓ requirement different (ILC, FCCee, CLIC, KEKB)
 - ✓ Collaboration still useful for benchmarking, etc.
 - collaboration already several years
 - ✓ Is any money from ITN needed?
- CERN
 - ✓ Discussion about FC with CERN date back to LCWS2019 at Sendai
 - ✓ Steffen Doebert showed big progress on the development of FC at LCWS2023

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