Summary report of SRF session in LCWS2024

Y. Yamamoto, on behalf of SRF conveners

E. Cenni, S. Belomestnykh, D. Delikaris, D. Sertore, M. Wenskat

General summary of SRF session

- Conveners:
  - E. Cenni, Y. Yamamoto (Kirk), S. Belomestnykh, D. Delikaris, D. Sertore, M. Wenskat
- Locations:
  - 9/Jul ~45 persons @Koshiba Hall in Science Faculty Building #1 (Center)
  - 10/Jul ~30 persons @Room 207 in Science Faculty Building #1 (West)
- 25 presentations (incl. 8 remote) in six slots (full slot)
- Local laptop is not available, then every convener needed to use their own laptop
- LOC, especially Suehara-san and Daniel-san, had good work for this session

Thank you very much!

Talk by Eric Lechner (remote)

- Topic of oxide component as impurity
- A diffusion model was assumed for calculation by diffusion equation
- Low-temp Nb was examined, O diffusion depends on baking time
- This model was compared with the experimental data taken by FNAL

Talk by A. Miyazaki (in-person)

- Topic of future project at IJCLAB
- Organization change in French institutes
- PERLE as new project proposed by IJCLAB
- 800MHz cavity
- Mid-T baking needs clean vacuum furnace
- 1-cell cavity produced
- High residual resistance was observed in first test by IJCLAB
  - Maybe magnetic field
- In this October, IJCLAB will test at KEK

Talk by T. Saeki (in-person)

- Topic of cavity fabrication at KEK
- Before his talk, he explained the new program for MEXT-ATD at KEK
- FG/MG are used at KEK
- First 9-cell cavity was produced in last FY to be satisfied HPGS in Japan
- Six 1-cell cavities are under production
- ECS as material inspection at DESY was done for first QC/QA
- Iron component was observed in some MG disks
- Infrastructures at CFF was upgraded incl. control system of old EBW

Talk by R. Geng (in-person)

- Topic of sX mapping system at ORNL between Japan and US
- Areas of interest
  - Fundamental physics
  - Emitter detection
  - Curing FE
- Strip-type 32 photodiodes were installed inside iris between each cell
- 10 strips incl. 320 channels are used for 9-cell cavity with 10Hz A/D converter
- Some x-ray mapping data were obtained as movie

Talk by M. Omet (in-person)

- Topic of development of frequency tuner at KEK
- Based on LCLS-II tuner, but some components will be replaced
- FNAL sent a set of tuner/electronics to KEK to be tested together
- The team of FNAL/KEK has successfully done demonstration for LFD at RT
- They are moving to cold test in horizontal test stand, but before that, they have a plan to test only a motor using cryo-cooler system

Talk by R. Katayama (in-person)

- Topic of development of power coupler at KEK
- Based on E-XFEL type
- Some changes decided
  - Ceramic material
  - Waveguide material
  - No actuator
- RF simulation done by FNAL/KEK
- Samples of cold ceramic produced as QC/QA before production
- The other QCs will be done soon

Talk by P. Joshi (in-person)

- Topic of HLRF system for ILC CM
- Current scheme explained
- RF phase is adjusted for lower FE in the CM bunker
- Comparison of original and proposed design for cost reduction
- Concept of LPDS without circulator examined

Talk by J. Chambrillon (in-person)

- Topic of clean assembly for IFMIF
- IFMIF prototype accelerator is under construction at QST/Rokkasho
- The team for clean assembly had many troubles due to NC of vacuum parts
- The presenter showed the case each by each
- Finally, all troubles were solved, they are moving to CM assembly soon
- Their experiences will be helpful for ILC as global project

Talk by A. Dhar (in-person)

- Topic of high power test for REBCO samples
- High temp. SC material (YBCO) considered
- X-band structure available at SLAC
- Quench observed by sample tests
- Other HTS is under testing

Talk by R. Kostin (in-person)

- Topic of travelling-wave SRF cavity
- Introduction to Euclid TechLab. in US, collaborating with FNAL
- History of conceptual design and technical demonstration presented
- 3-cell cavity with backward waveguide proposed
- BCP and pre-tuning available for VT
- Forward/backward waves are simultaneously observed in NWA
- F.E. observed in all modes, LFD also measured
- Next steps are toward EP available, High-Q/High-G

Talk by F. Furuta (in-person)

- Topic of travelling-wave SRF cavity
- 7-cavity design proposed by Kazakov-san
- RF simulation/Mechanical simulation under progress
- Mechanical fabrication of half-cell examined
- Some fundings are available

Talk by K. Yokoya (in-person)

- Topic of ERL option as luminosity upgrade in ILC
- As basic concept, after beam collision, the both beams will circulate in their both damping rings located nearby from IP, then collision done again
- “Ghost collider” proposed by Andrew Hutton as aggressive option
- “ERLC” proposed by V. Telnov as ring collider
- Key critical issues to be solved
  - Beam dynamics: emittance growth
  - SRF: twin-axes cavity is needed, large HOM loss
- Crossing angle not changed, then synchrotron radiation is big issue

Talk by J. Han (in-person)

- Topic of recent status of cavity production in Korea for ITN
- Introduction to KAT
- KAT and Korea Univ. have collaborated for accelerator R&Ds
- Two 1.3GHz 1-cell cavities with FG/MG under production, to be finished soon
- KEK sent necessary materials
- EP/inspection/VT will be done in KEK this year

Talk by K. Umemori (in-person)

- Topic of recent status of HPGS for cavity production at KEK
- Refrigerator regulation is preferable for MEXT-ATD
- Nine 9-cell cavities to be produced from FY2023 to FY2027
- 900degC heat treatment is preferable for High-Q, but new for HPGS
  - Titanium material to be checked
- Many mechanical tests related to Nb/NbTi/Ti are necessary
- Cavity deformation by tuner at LT was considered
- Necessary documents: mill sheet, thickness data, welding data, pressure test
- Two-step baking was chosen as the best treatment

Talk by K. Nakanishi (in-person)

- Topic of cryogenics system for ILC/MEXT-ATD
- One CM will be produced/tested by FY2027 in KEK
- Cryogenic Gr. is designing a new cryogenic system for CM test bunker in COI
- Cooling lines inside CM are a little different from ILC scheme
  - 2.2 K forward line not necessary for CM test
- Design of transfer line is almost completed
- Cooling capacity examined

Talk by T. Dohmae (in-person)

- Topic of CM design/production at KEK
- Some change requests to be proposed
  - Tuner, current lead for SC magnets, pipes specification, 40/80K flow direction, etc.
- 3D model developed by KEK with note
- “Lower part” of 5K thermal shield removed, MLI still remains
- Earthquake effect will be examined again
- The other 3D model is under preparation
  - Cavity, coupler, tuner, magnetic shield, SC magnets/BPM
- Many questions under asking

Talk by W. Genfa (in-person)

- Topic of clean assembly for SRF at FNAL
- Bypassed line for purging/pumping is used
- Purging through a cryogenic-compatible filter after a metal valve
- New screw bolt to be considered for less dust generation
- Rotary joint is inconvenient, then longer holes for connecting bellows
- Power coupler assembly by robot demonstrated
- VT for 1-cell cavity done to check slow pumping system with bypass
- Field probe port may be available for purging

Talk by T. Yamada (in-person)

- Topic of clean assembly for SRF at KEK
- Technology transfer of clean work from human to robot
- First robot was installed in FY2022
- Cavity mock-ups were installed in FY2023
- Using 1-cell cavity, air blowing, flange exchange, relative positioning to be tested
- In near future, using 9-cell cavity, coupler installation will be tested
- Inter-connecting bellows with fixed-type flanges available

Talk by M. Bertucci (remote)

- Topic of High-Q activities in LASA
- VT for PIP-II 650MHz cavity is under progress
- Helmholtz coil was used for field cancellation
- Effect of flux trapping at various fields observed
- 20 OSTs detected quench location
- AMR measured residual magnetic field nearby cavity
- Mid-T baking tested
- Real-time x-ray scintillator used

Talk by J. Drant (remote)

- Topic of robotization in CEA
- Programming, Vision, etc.
- Auto-cleaning demonstrated using ESS cavity
- Cleaning time is about 1/3 of assembly time, then time-saving to be considered
- Vision camera is updated
- Cleaning extension is updated
- Cleaning for inter-connecting bellows and narrow space to be simulated
- Gripper for handling flanges to be considered

Talk by C. Maiano (remote)

- Topic of ESS status
- First five CMs in HBL installed
- A few CMs had problems in cold test
- Necessary gradients were confirmed in CM tests
- In VT, all cavities were checked by quench
- Cryogenic operation done for ~20 days in cold state
- FE is main limit for available gradient

Talk by P. Plattner (remote)

- Topic of HOM coupler development in MAINZ for high current operation
- Power from HOMs and beam blow-up (BBU) examined
- How to handle around 1 W at HOM couplers?
- Power loss at antenna tip for Nb/NbTiN/Nb_3Sn examined by simulation
- NbTiN antenna was produced by ALD
- They are helpful for increase of limit

Talk by C. Cheney (remote)

- Topic of plasma processing for SPIRAL2 at IJCLAB
- Propagation of plasma inside QWR simulated, changing frequency, power, pressure
- Coupler breakdown examined
- Comparison between experiment and simulation
  - Ignition and breakdown
  - Electron density

Talk by C. Pira (remote)

- Topic of Nb_3Sn study at INFN-LNL
- Basic technology is vaper tin diffusion on Nb
- Alternative solution is copper as substrate
- IFAST collaboration established
- Plasma electrolytic polishing to be considered
- Waiting for finishing PIP-II production

Talk by D. Reschke (remote)

- Topic of new strategy of cavity R&D for upgrading E-XFEL with HDC
- High-duty cycle, not CW, may be available in future
- SRF Gun will be installed in injector 2
- The specification is same as LCLS-II-HE
- PED certification should be very carefully taken
- A few vendors had many experiences through construction of LCLS-II/SHINE
- Mid-T baking is under testing for comparison with conventional treatment using 1-cell cavities
- Deconvolution of surface resistance (R_{res}+ R_{BCS}) also examined
- Under moving to 9-cell cavity

SRF2025 will be held in Tokyo from 21 to 26 in Sep.

See you in Tokyo again!
(The venue is probably same)

Thank you very much!