



STF Status and Plans

at ILC10 Main Linac session

Hitoshi Hayano, KEK

Outline

1. STF facility status

1. 'S1-Global' cryomodule test

3. STF Phase2 development

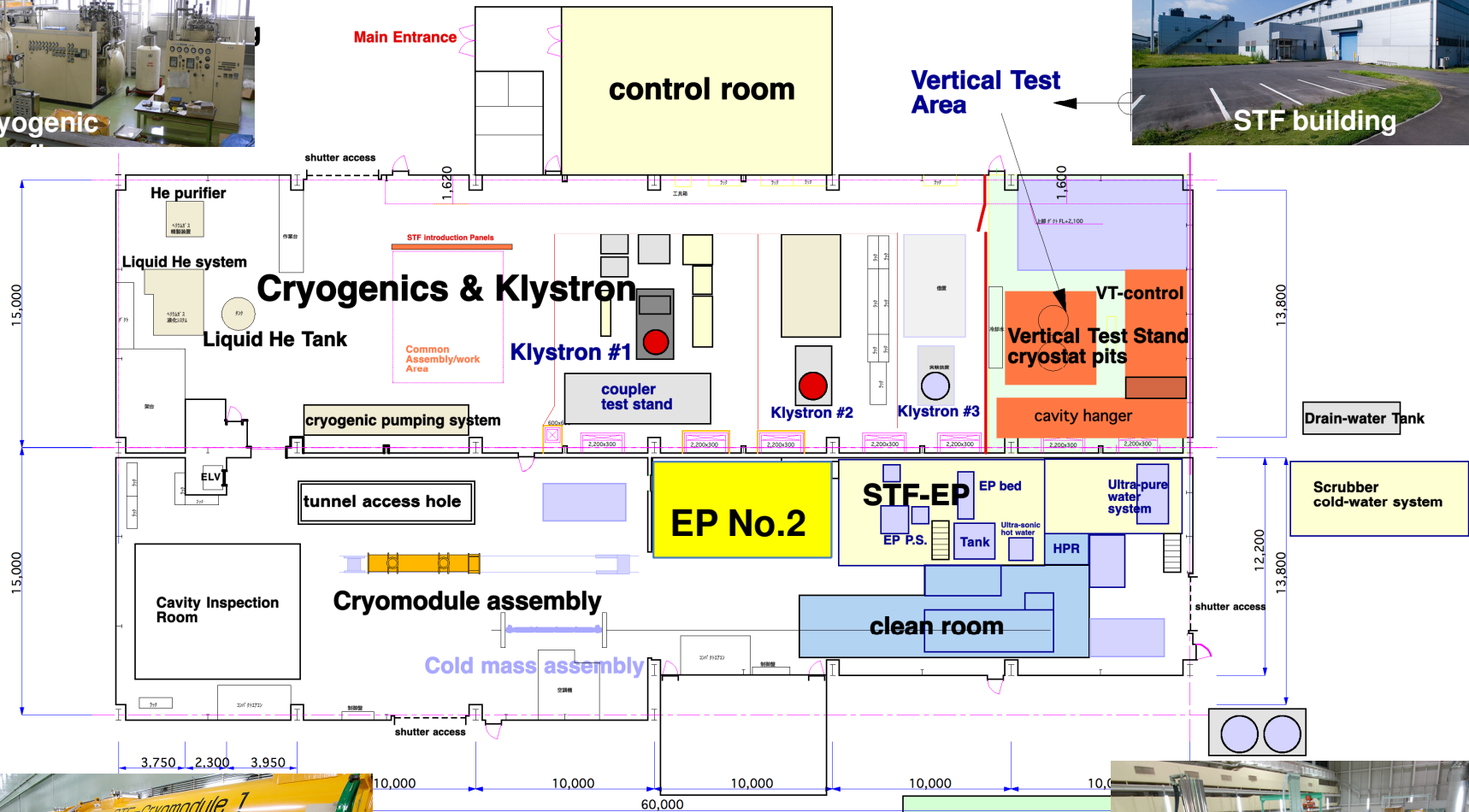
Compact X-ray source experiment using STF2 injector

Cryomodule production plans

STF location



STF (Superconducting RF Test Facility)



DC-HV power supply for Klystron #1 mod

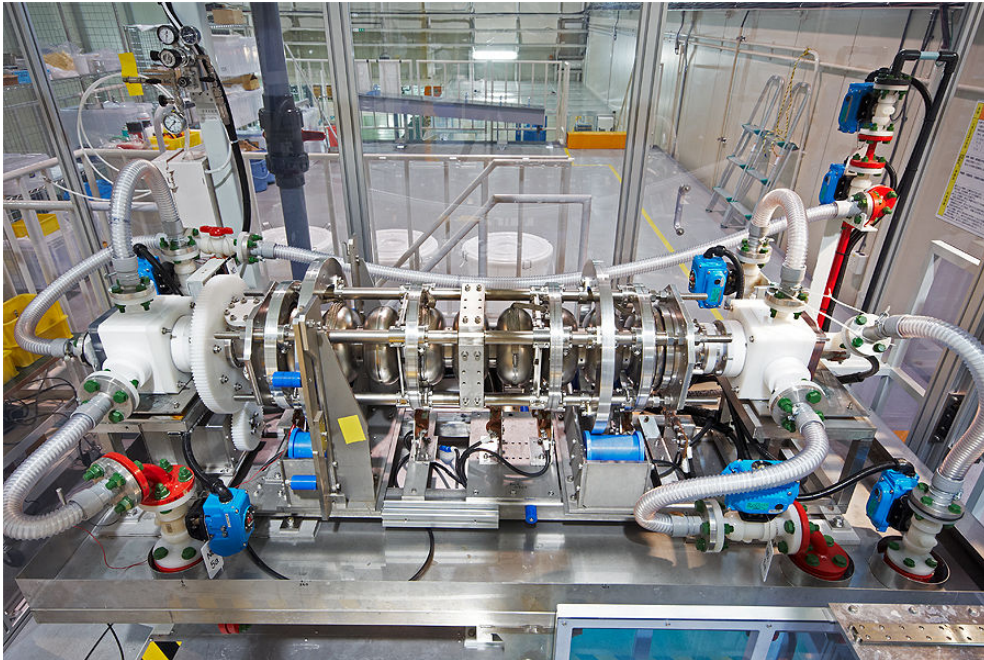


(1) STF Facility status

Infra-structure developments

Surface treatment : EP system No.1

Electro-chemical polish at STF



EP acid: HF + H₂SO₄
Aluminum anode,
surface removal speed: 20μm/hour,
~18V ~270A ~25degC (for 9-cell)
cavity rotation: 1 rot/min

Improvements;

1. change water filling sequence, right after EP.
2. cooled air flow onto cavity outside during EP.
3. N₂ gas flow during EP and water rinsing.
4. Low current-density operation
5. Temperature monitors onto cavity outer surface.
6. More rigid electrode-insertion device.
7. EP room enclosure with HEPA air filters.
8. Pressurized air driven crane for cavity hanging.
9. Pre-EP, fresh EP function

Surface treatment : EP system No.2

Electro-chemical polish for 500MHz cavity, ILC cavity, ERL cavity, etc



500MHz single cell tst cavity mounted on the 2nd EP bed

Moved from Nomura co. in 2009,
rebuild in STF with some parts renewal.



EP acid tank, pumps, acid heat exchanger



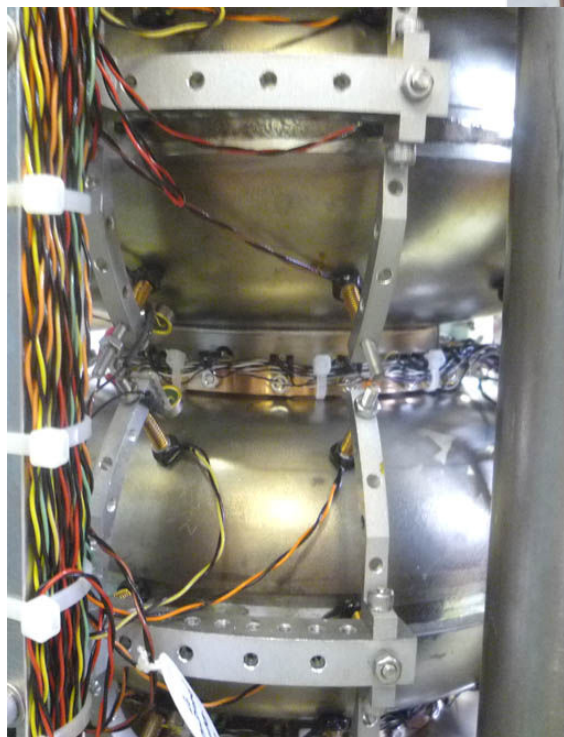
Ultra-sonic(left), water spray rinse(right)

Ready to commissioning; First EP test is scheduled on April 15,16

Temperature-mapping, Xray-mapping in every vertical test

temperature sensors
on equator
and cell taper

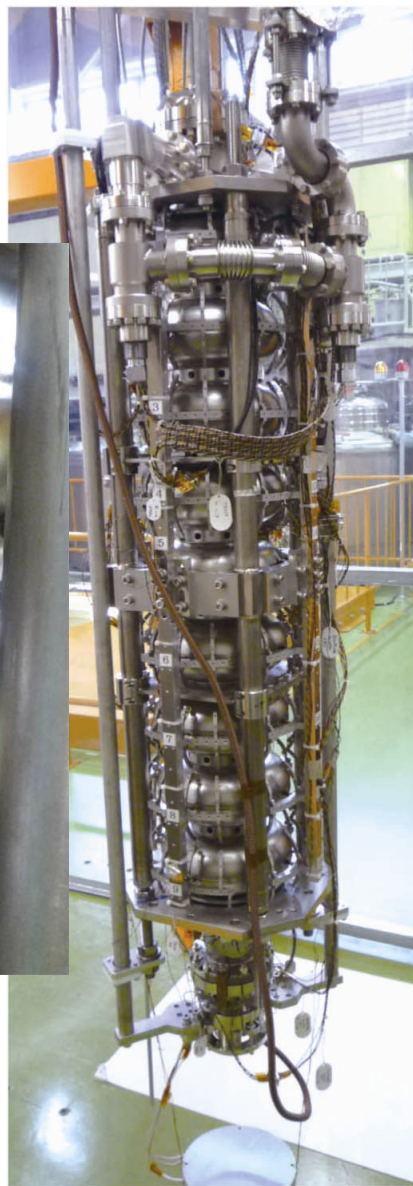
352 carbon resistors
(Allen-Bradley, 50 or 100 Ω)



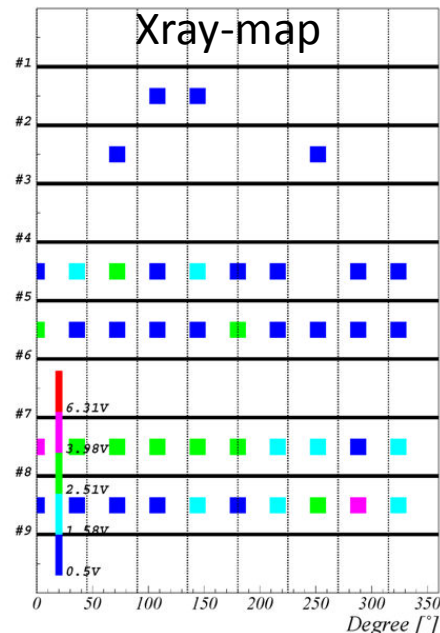
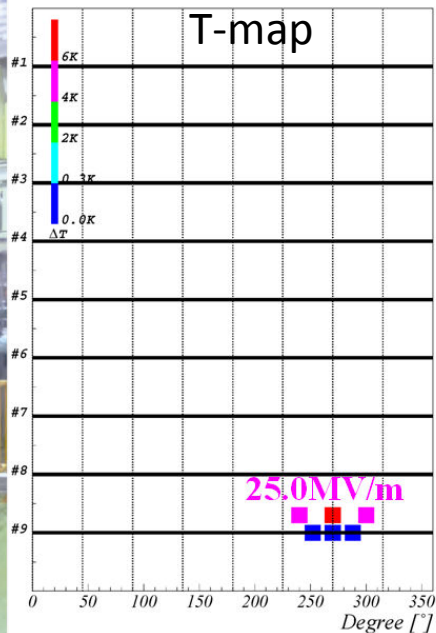
X-ray sensors on iris

142 PIN diodes
(HAMAMATSU, S1223-01)

total 494 sensors
55 sensors/cell



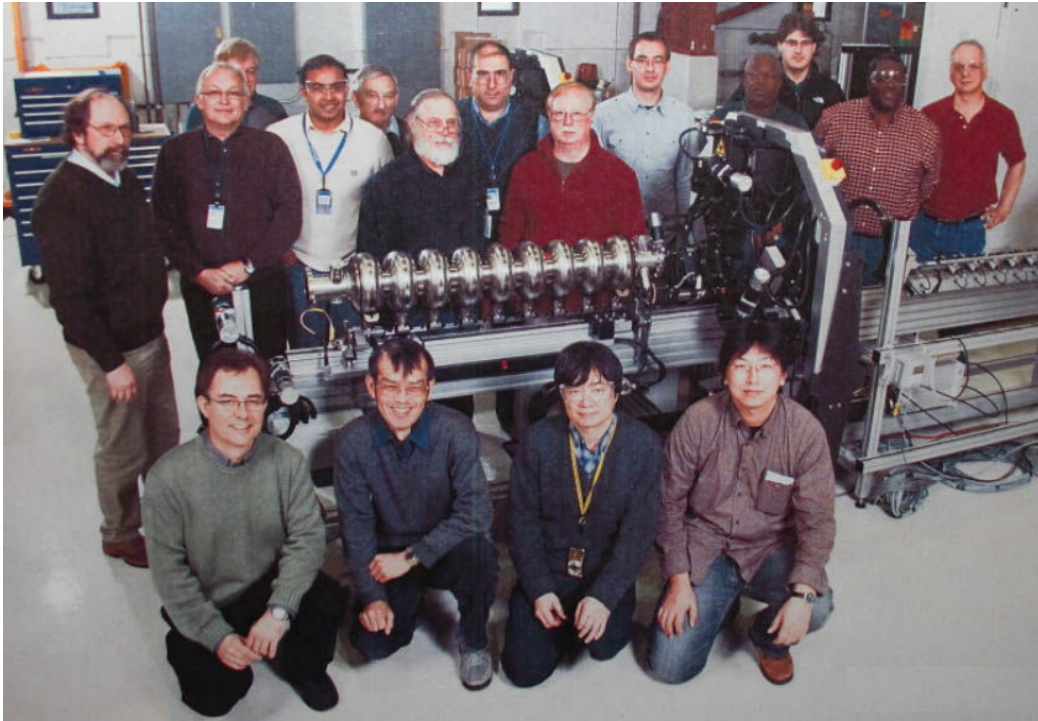
MHI-09 1st VT π -mode



$E_{acc}=25MV/m$ (Quench)

on-line T-map display, Xray-map display
are in operational.

Automated Pre-tuning machine



DESY-FNAL-KEK collaboration

Eccentricity measurement and correction,
Beam pipe tilt correction,
Frequency and field flatness corrections

KEK-STF will receive 1 pre-tuning machine
on June 2010.

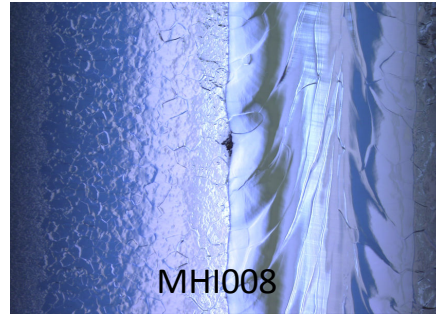
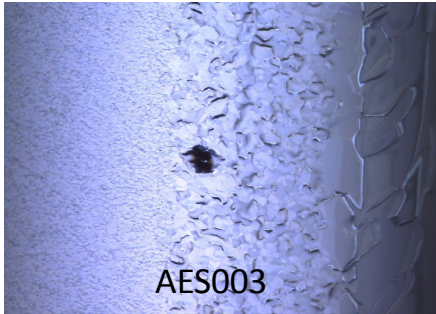


training at FNAL, Feb. 23, 2010

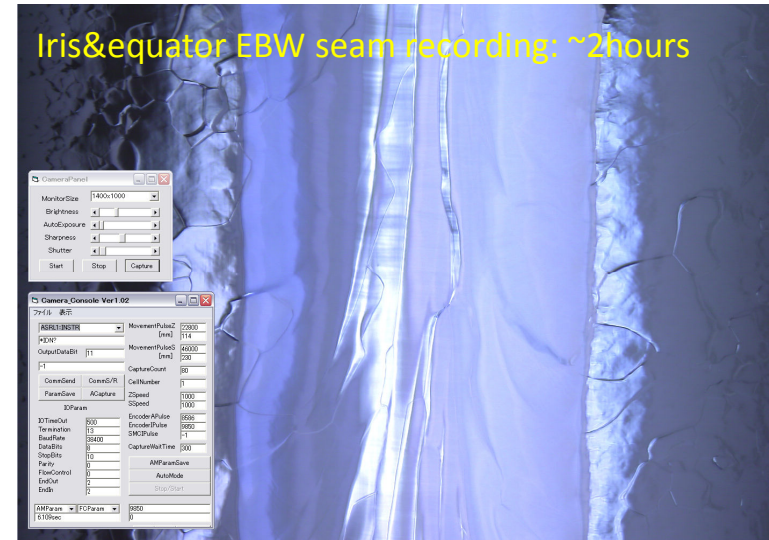
Improvement of inspection camera for defect finding

Kyoto-KEK collaboration

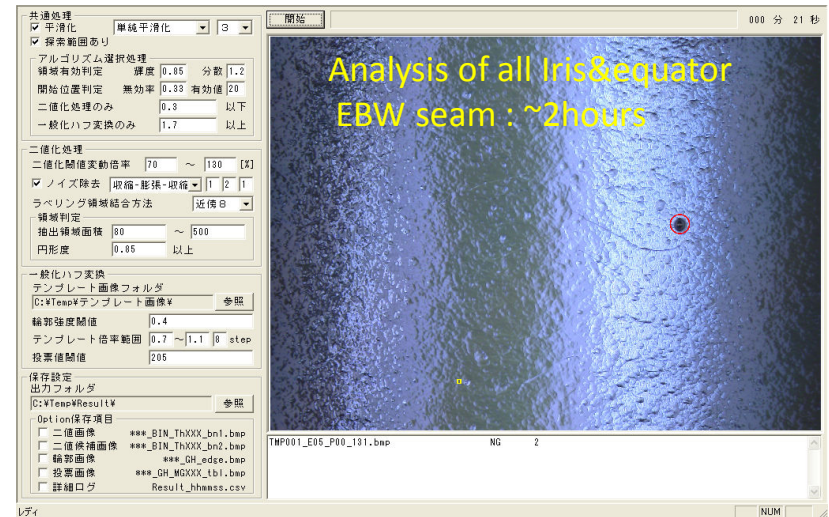
new C-MOS camera, new lens, LED illumination ->3.7 μ m/pix
view area: 13mm x 9mm



improved performance Kyoto-camera



Automated image capture software



Automated defect finder software

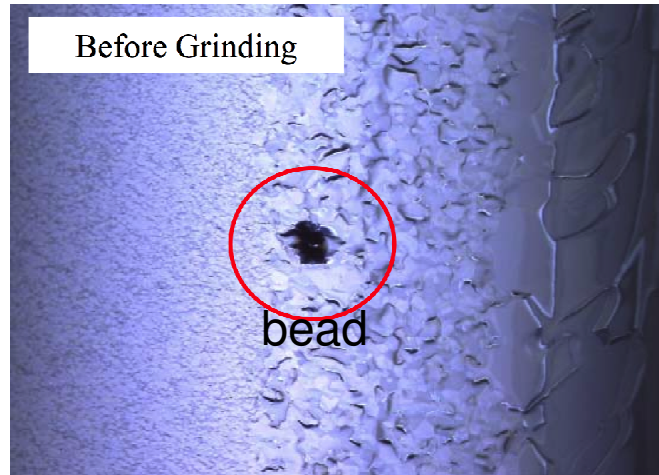
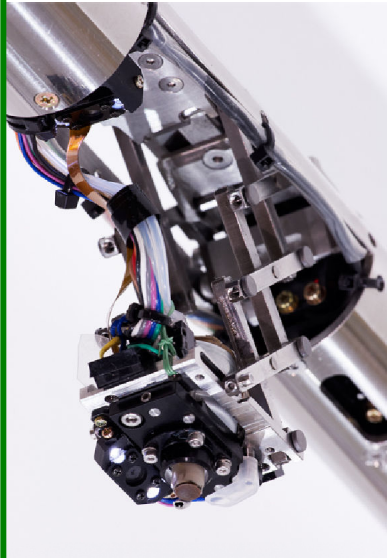
Development of cavity repair method using local grinding

FNAL-KEK collaboration

FNAL AES003 cavity inspection and local grinding repair test

quench at 20MV/m, in the heated position a bead was found.

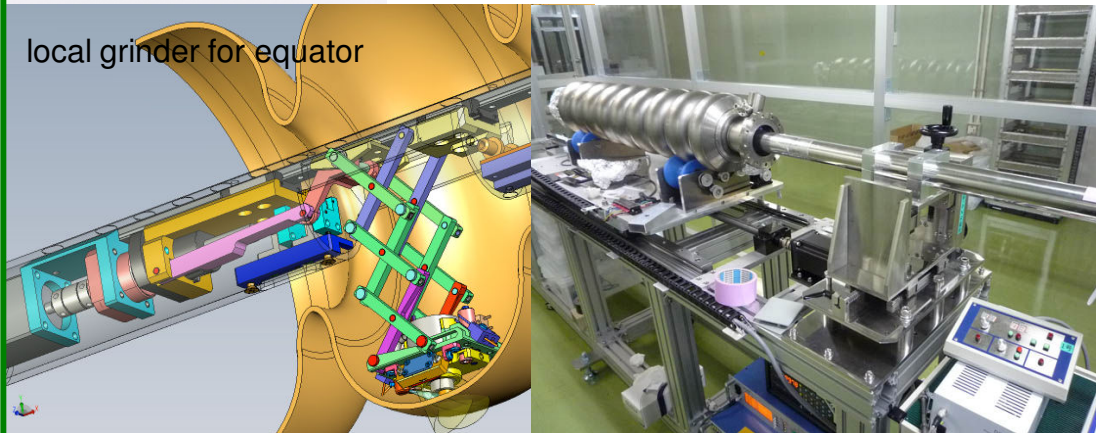
local grinding and EP treated, Field went up to 35MV/m (FNAL measurement).



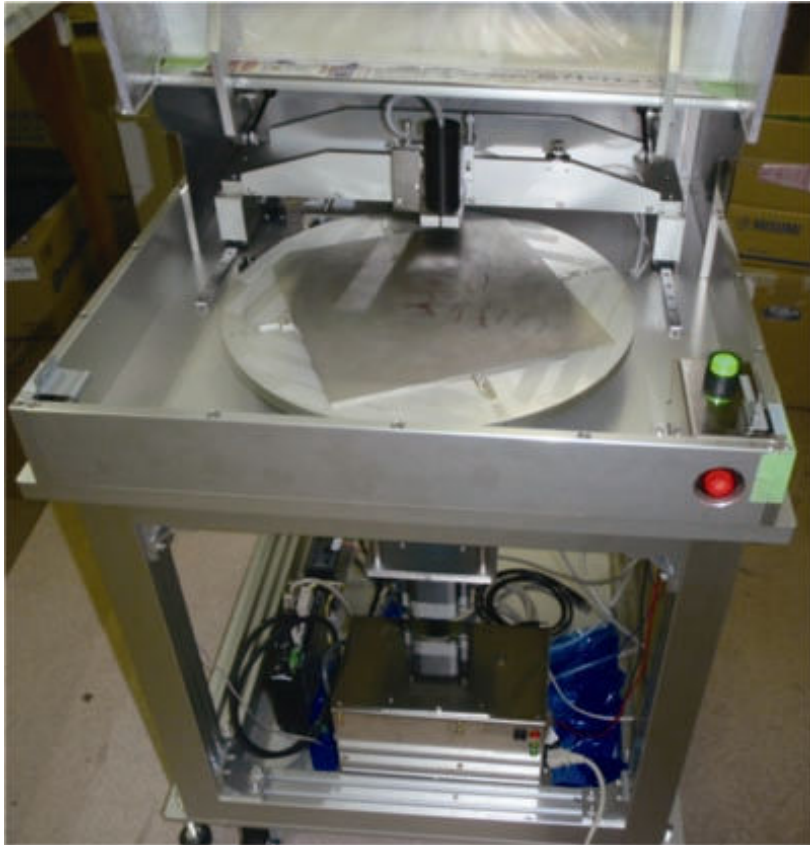
KEK Local grinding results of FNAL-AES003



local grinder for equator



Eddy-current scanner for Nb material



Kyoto-KEK collaboration

Defects and foreign material finding for Nb sheet.
Two Frequency pick is under testing.

50 μ m hole is detectable.



Scan result of Test Nb sheet with holes
which was borrowed from FNAL

(2) 'S1 Global' cryomodule test

S1-Global cryomodule test

Demonstration of average gradient 31.5MV/m cryomodule by international collaboration

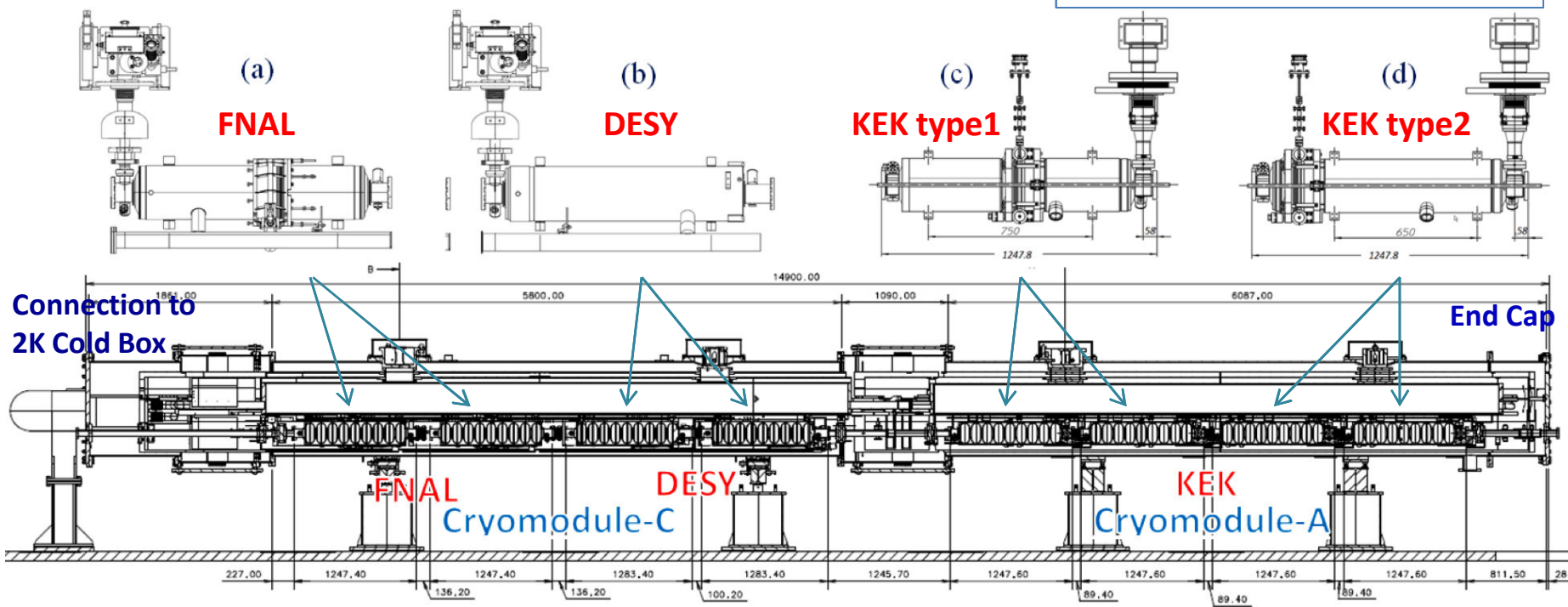
Module-C : INFN Cryostat + 2 FNAL cavities + 2 DESY cavities

Module-A : STF short cryostat + 4 KEK TESLA-style cavities

power distribution : 2 SLAC VTO + STF waveguides

1 AES004	27MV/m(VT)	25?MV/m(HT)
2 ACC011	33MV/m	
3 Z-108	31.3MV/m	
4 Z-109	30.7MV/m	
5 MHI-05	27.1MV/m	
6 MHI-06	27.7MV/m	
7 MHI-07	33.6MV/m	
8 MHI-09	27.0MV/m	

Assembly: Jan 2010 - May 2010
Operation: June 2010 – December 2010



Cavities assembly for Cryomodule C

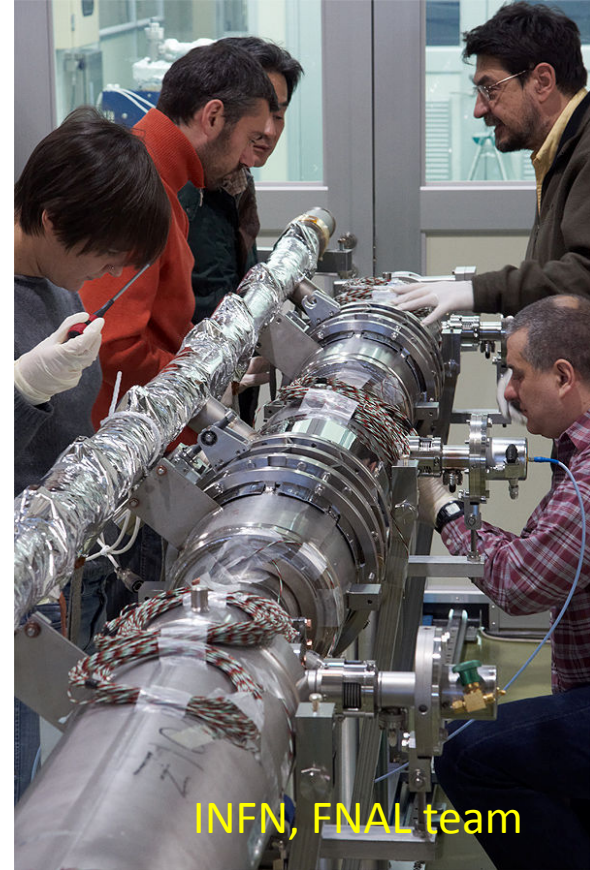
**Two cavities from FNAL, two cavities from DESY,
FNAL, DESY team assembled 4 cavities, INFN, FNAL team installed brade tuners and
Saclay tuners.**



Tug Arkan
Brian Smith
Marco Battistoni
Manuela Schmoekel
Patrick Schilling

FNAL, DESY team

**cavity connection in clean room
for module installation**



Carlo Pagani
Angelo Bosoti
Rocco Pararella
Serena Barbanotti

INFN, FNAL team

**Tuner installation for FNAL, DESY cavities
at outside of clean room**

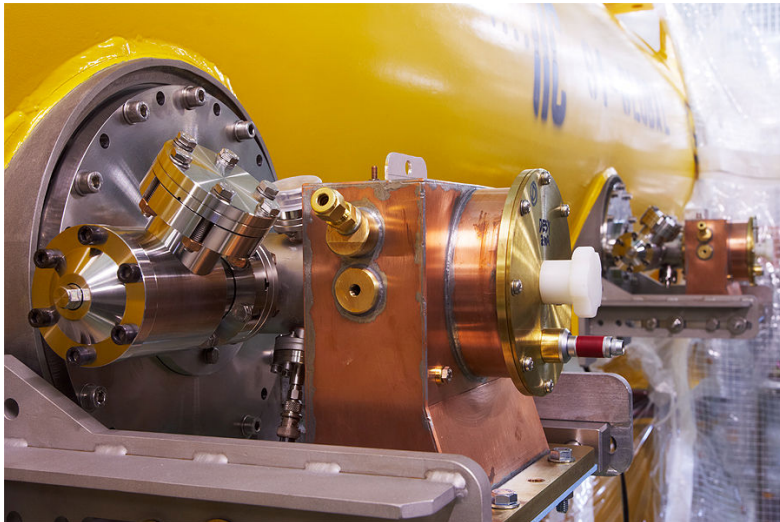
Finish Cryomodule C assembly, start cryomodule A assembly



Denis Kostin from DESY attached warm couplers



Cryomodule C work was completed

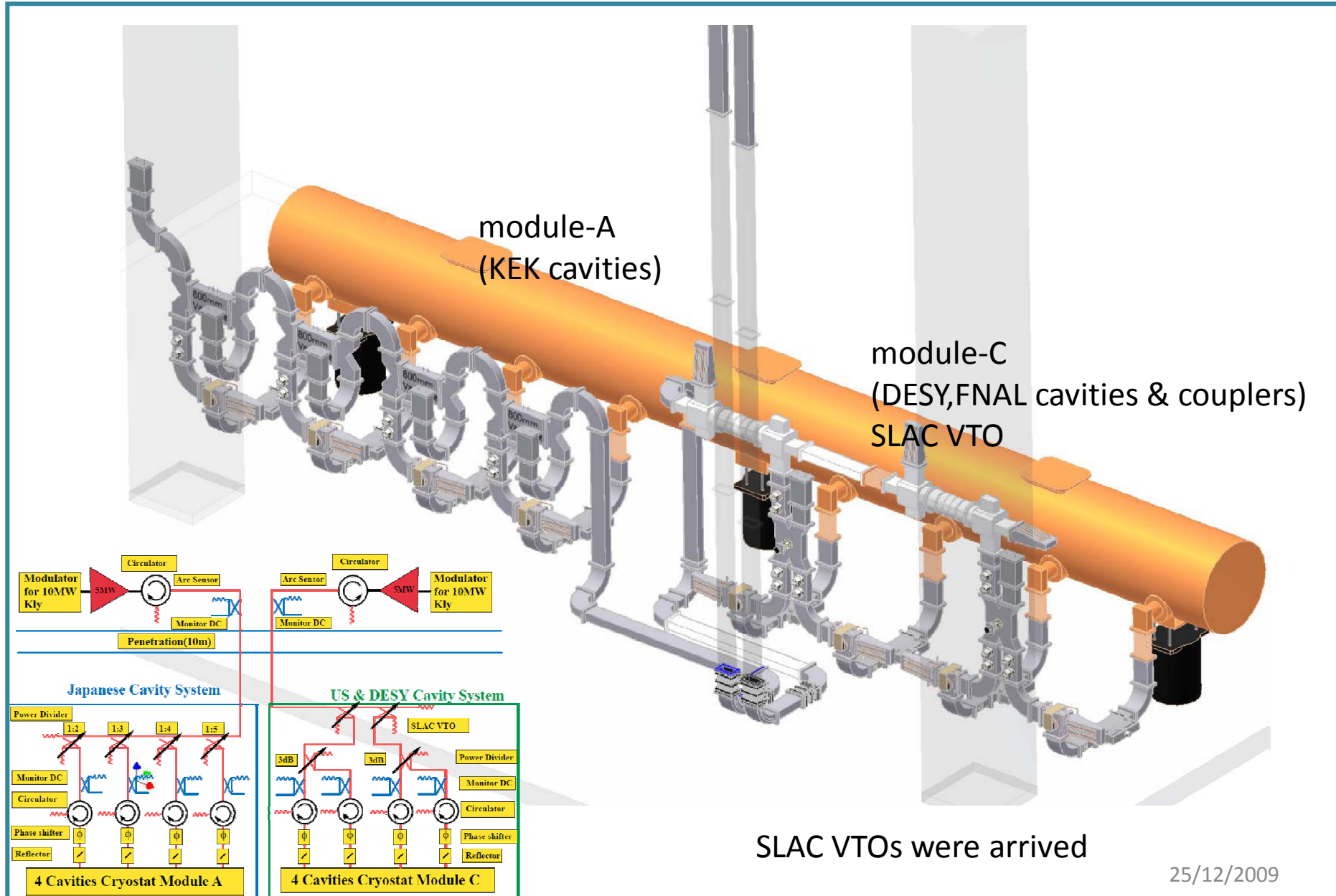


waveguides were installed into warm couplers

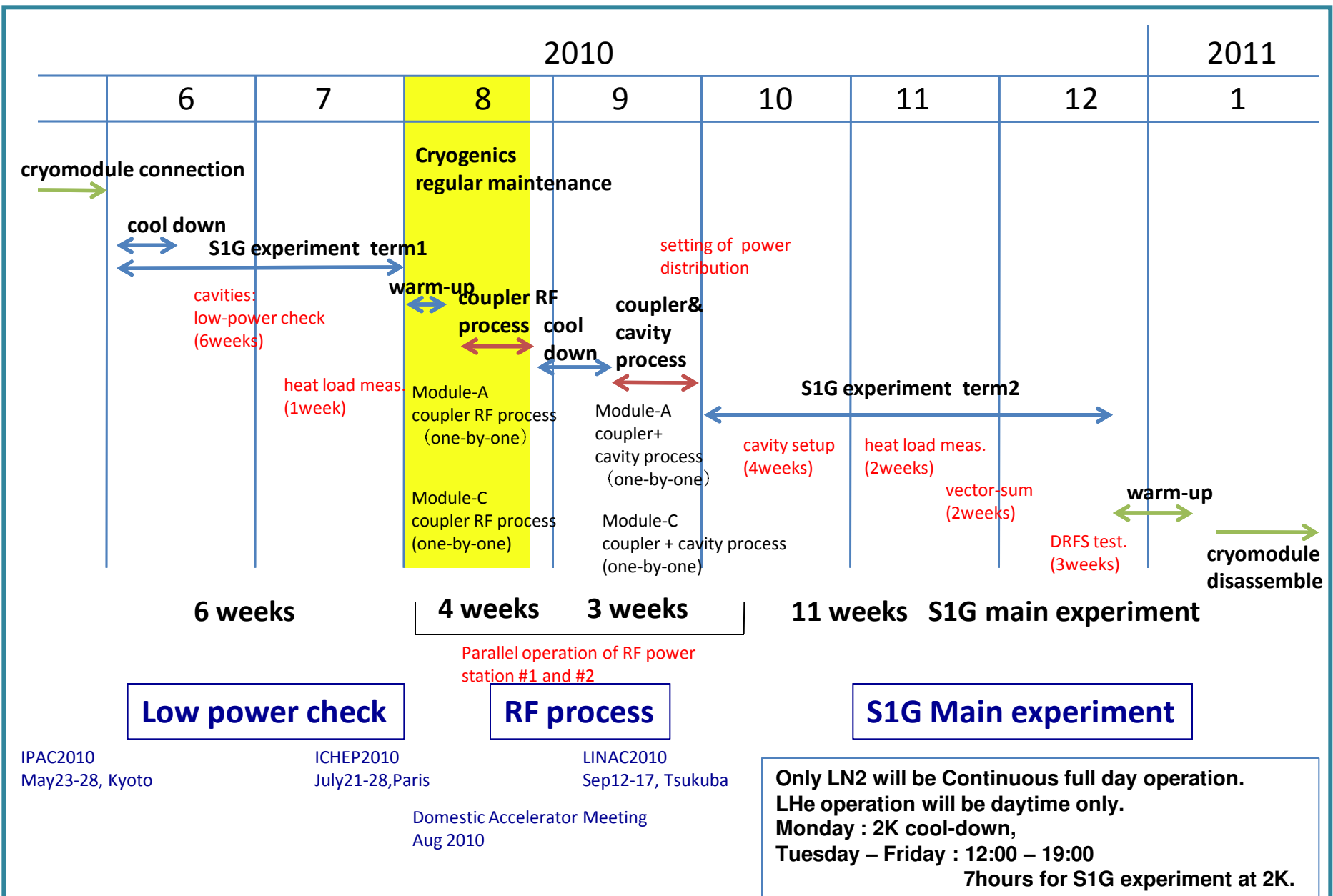


Tuner installation for KEK cavities
at outside of clean room

Proposed WG Layout for S1 Global

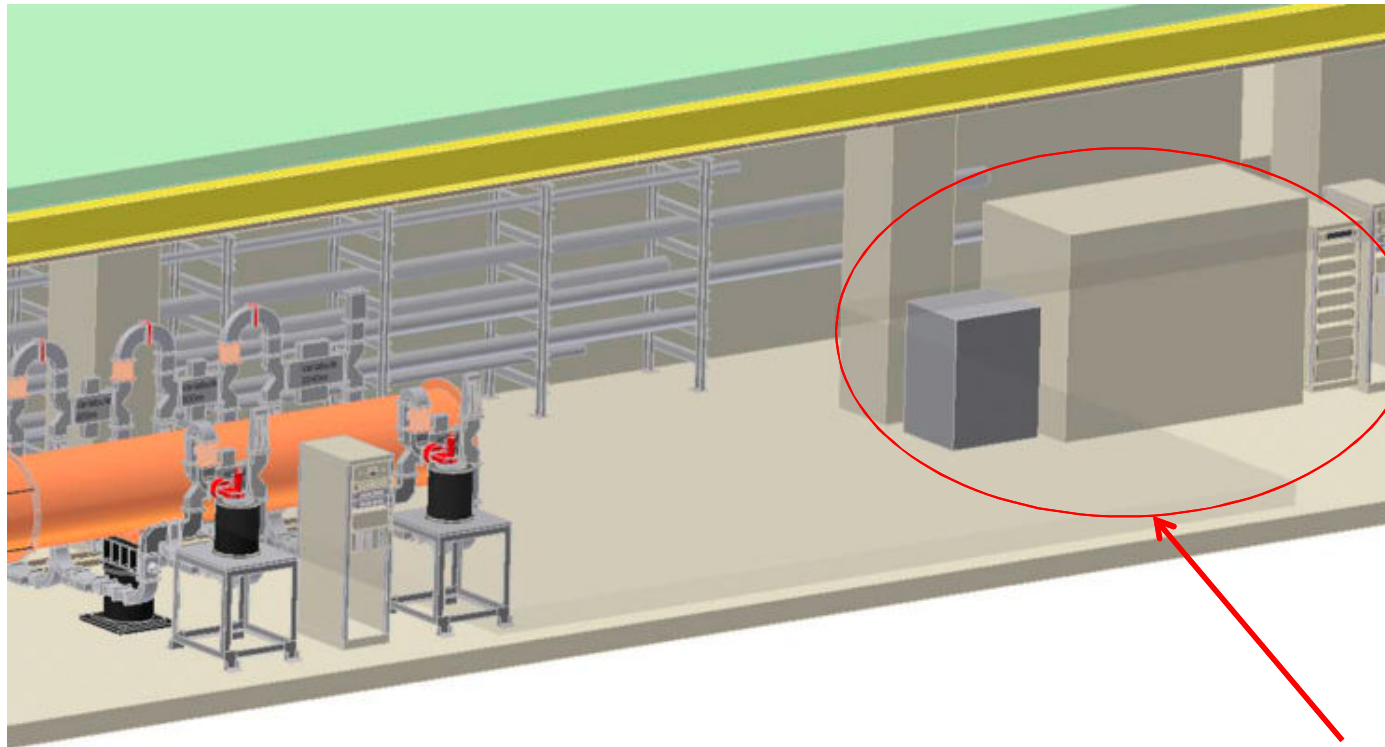


S1G overall schedule



DRFS Test in S1-Global

3 weeks DRFS experiment is scheduled in December 2010.



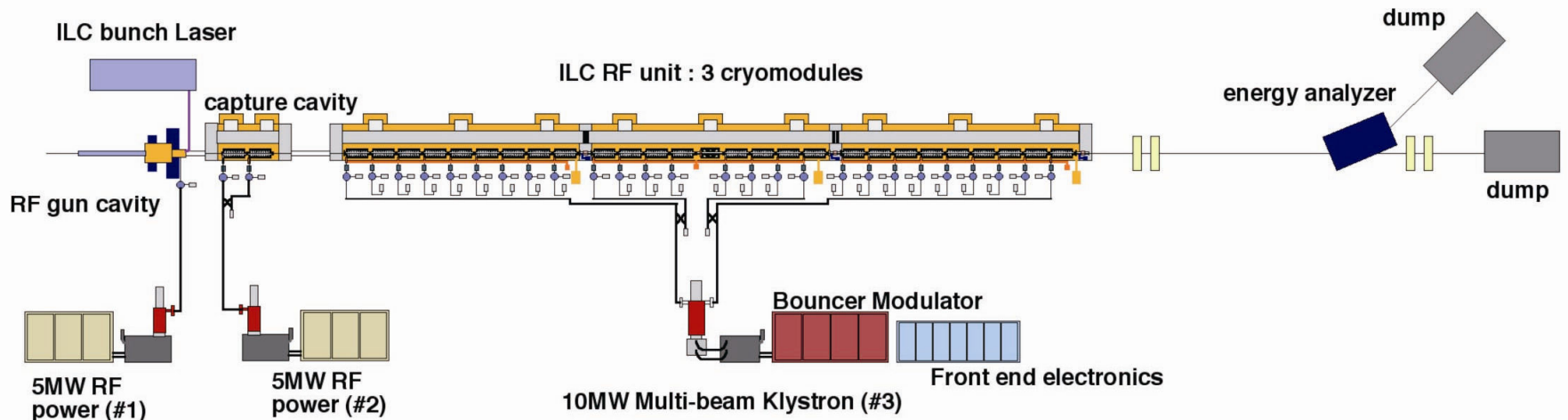
Two DRFS klystrons will be placed near the cryomodule A

HV-DC power supply will be placed in the surface, not in tunnel

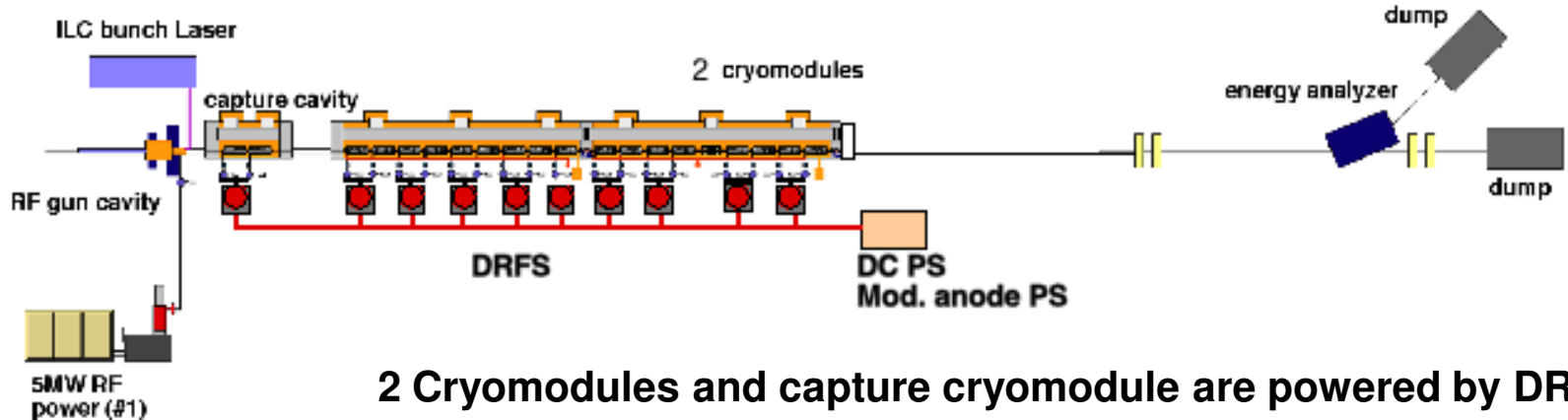
(3) STF Phase-2 Plans

STF phase2.0 accelerator: discussion for change is on going

STF Accelerator Plan



STF Phase 2 Plan



2 Cryomodules and capture cryomodule are powered by DRFS.

STF phase2.0 issues and discussion

Flat and limited budget in the next 3 years.

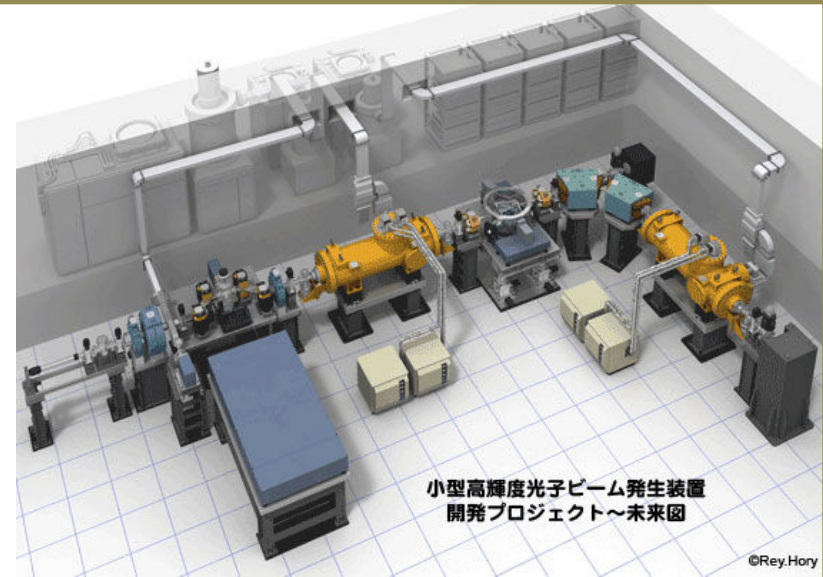
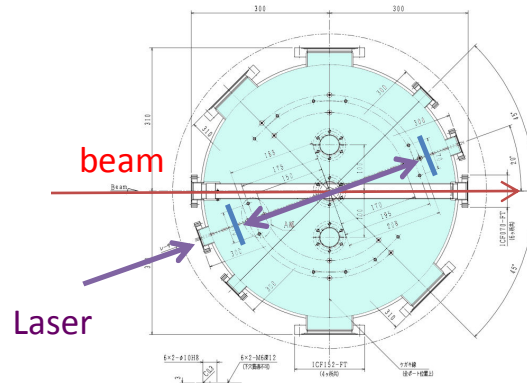
(Economy stimulus budget was canceled in 2009)

R&D plan has to be re-consider.

- 1. Reduce number of cryomodule from 3 to 2, or 1?,
two-cryomodule connection, or, replace CM-1 to CM-2.
CM-1 cavities: primary vender
CM-2 cavities: primary vender + other vendors + KEK pilot plant**
- 2. Avoid construction of cryomodule shaft (carry-in at downstream of tunnel)
and clean room extension.
Devide cryomodule into half-way and connect them in the tunnel,
or,
full size cryomodule assembly in the tunnel.**
- 3. Demonstrate DRFS scheme, instead RDR configulation.
(we assume FLASH, XFEL, FNAL will demonstrate RDR configulation,
or RDR-like configulation.)
STF pursue DRFS klystrons & modulators and LLRF.**

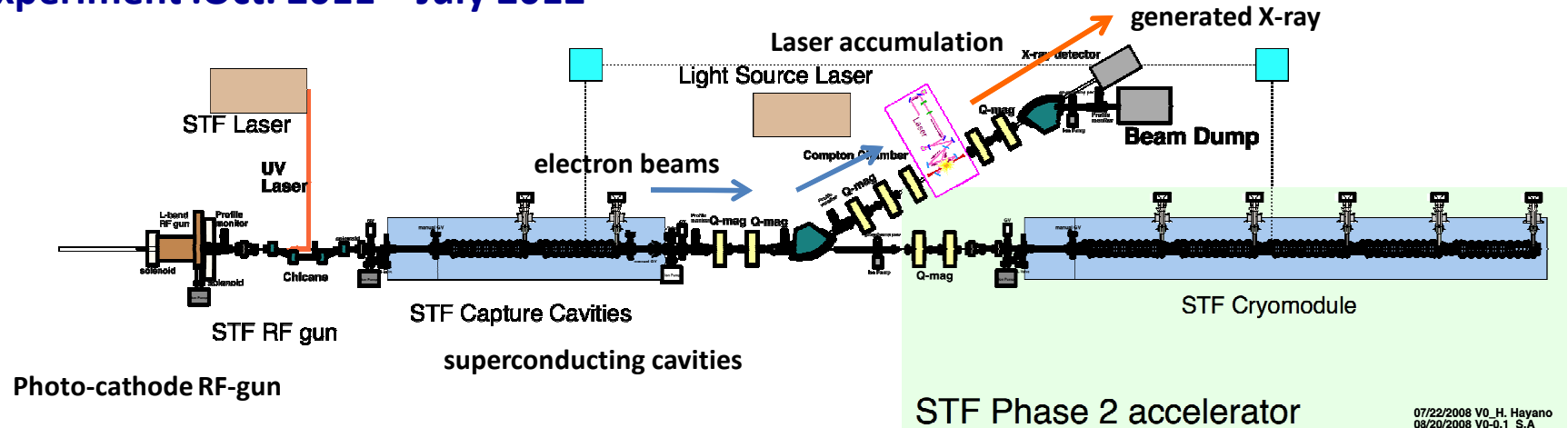
Compact X-ray source experiment using STF2 injector

Use of STF RF gun generated multi-bunch beam,
Collide to laser in a laser storage cavity,
Generate Compton scattered X-ray



Compact Light Source accelerator in STF Phase 2

Experiment :Oct. 2011 – July 2012

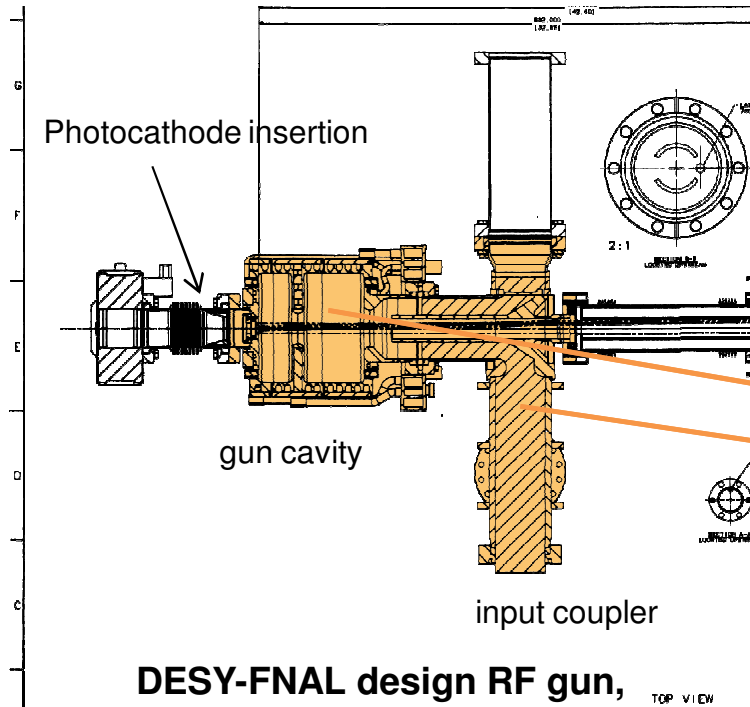


STF Phase 2 accelerator

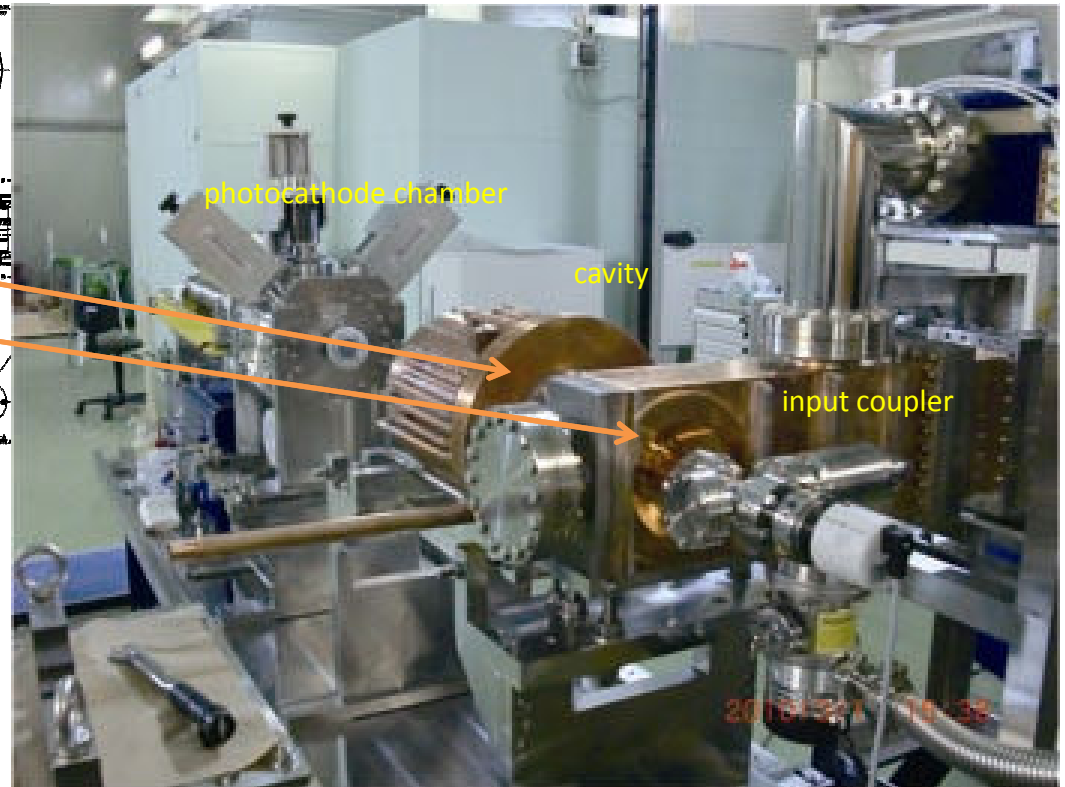
07/22/2008 V0_H. Hayano
08/20/2008 V0-0.1_S.A

Photocathode RF gun will supply beam into cryomodules

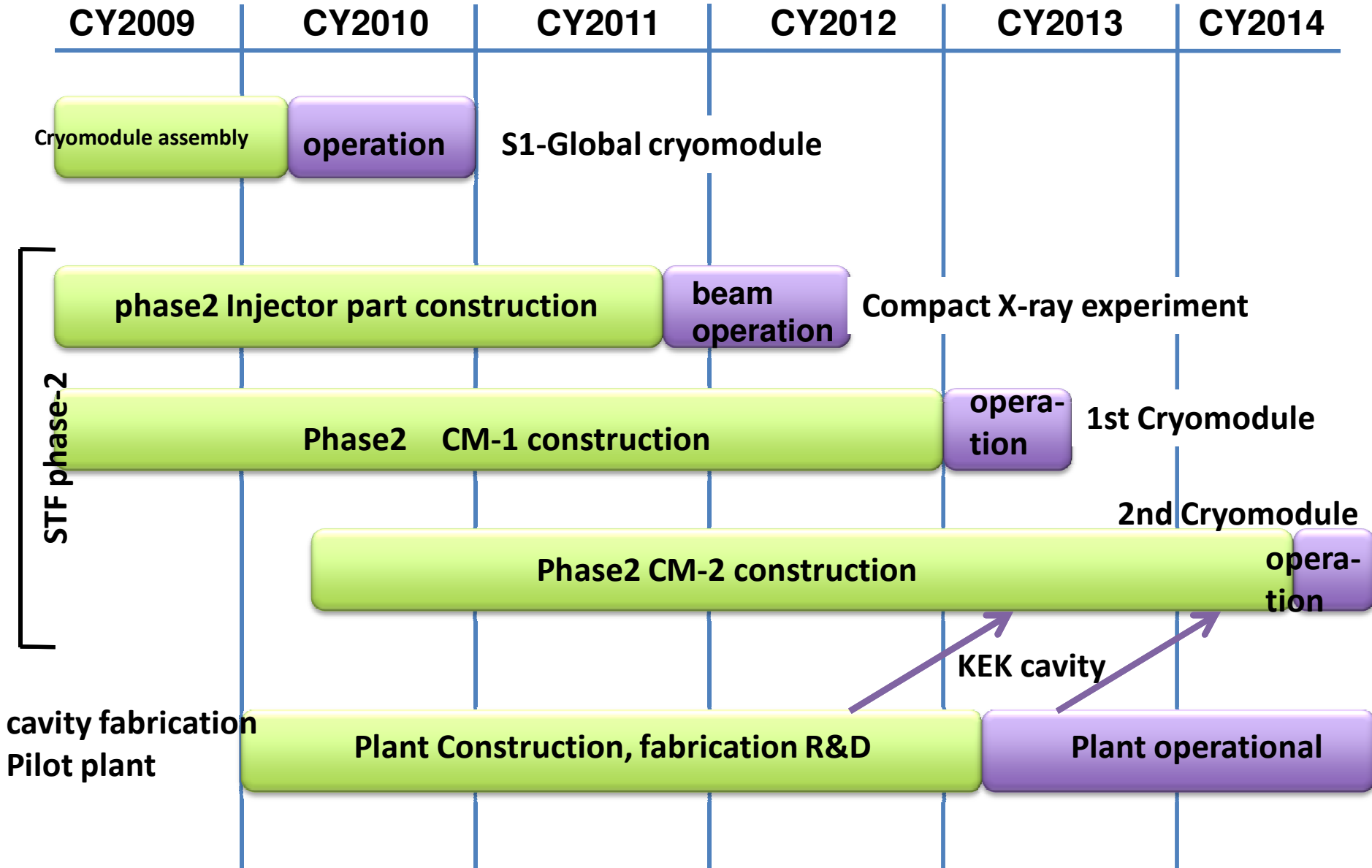
- RF gun cavity and input coupler were fabricated by FNAL. (DESY-FNAL-KEK collaboration)
- FNAL delivered gun cavity and input coupler in November 2009.
- KEK started the gun assembly in STF tunnel.
- RF process in 2010, beam extraction in 2011.



Photocathode RFgun under assembly in STF



STF Plans for 5 years (under discussion)



Cavity fabrication Pilot plant R&D

STF



Pilot plant R&D

Slide 26

SY1

aa

Seiya Yamaguchi, 9/18/2009

