Progress work and the result of vertical test : HIT-01

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2010/July/20 webex meeitng

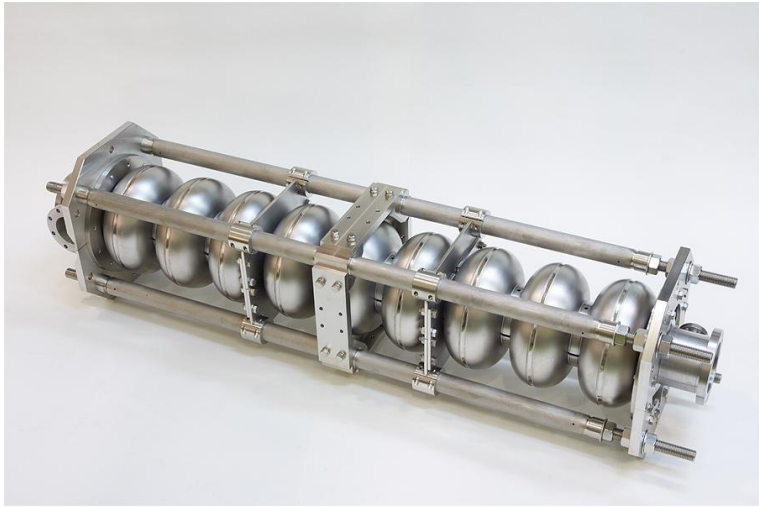
Progress work of HIT-01 after “as built”

2010/May/07 : Cavity fabricated by Hitachi. Cavity Type: TESLA-like without HOM couplers.
1st Optical Inspection, Thickness measurement etc…
Bulk EP (105 um removed.) and Anneal
2nd Optical Inspection
Pre-tuning : tuned to 97.8 %

2010/June/15 ~ 21 : EP-2 (20 um), 1st water rinsing (total time : 90 min and with vibration motor),
FM-20 2% rinsing with Ultra-sonic (50 C 2 hour),
HPR (10 hours), Assembly and Baking (105 C 48 hours).

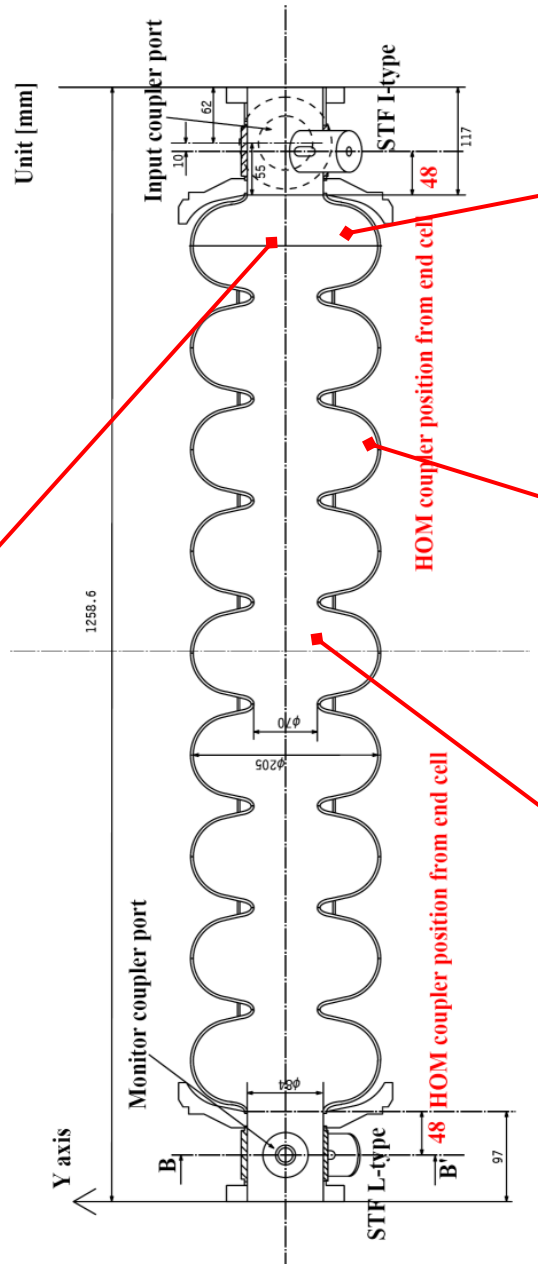
2010/June/22 ~ 25 : 1st vertical test. Eacc = 35.2 MV/m Qo = 6.50 x 10^9

2010/June/28 ~ 30 : 3rd Optical Inspection
Field flatness measurement : 97.0 % (Kept)

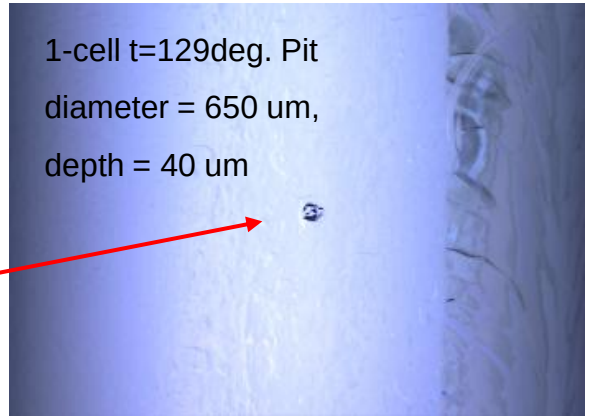


HIT-01, Map of the defects before EP-2 and 1st vertical test.

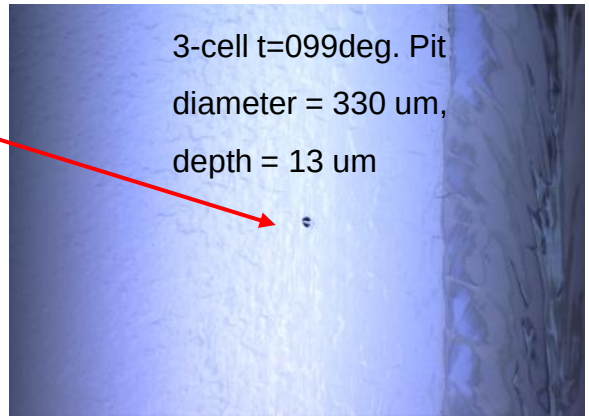
1-cell equator, t=200 deg.



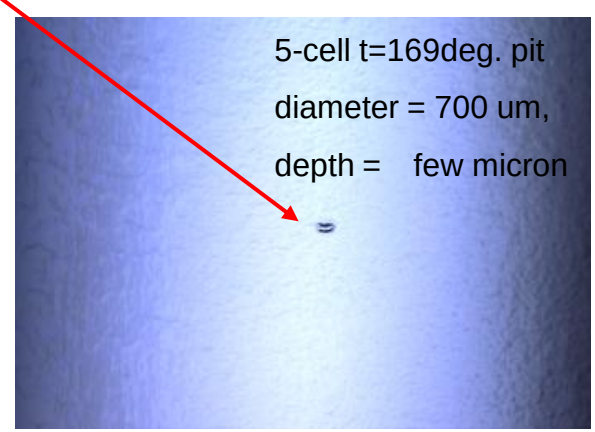
1-cell t=129deg. Pit diameter = 650 um, depth = 40 um



3-cell t=099deg. Pit diameter = 330 um, depth = 13 um



5-cell t=169deg. pit diameter = 700 um, depth = few micron



1st EP-2

HIT-01 9-cell without HOM coupler 2010/06/16

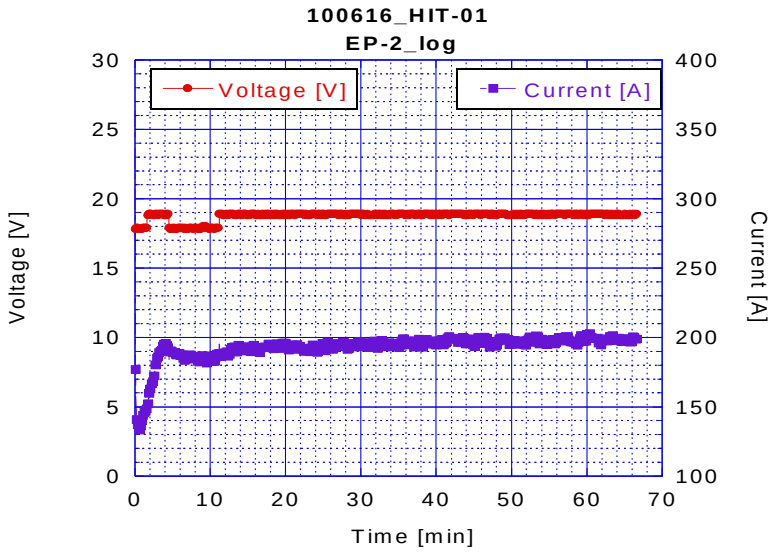
EP-2 with N2 gas. Current density = ~ 36 mA/cm2

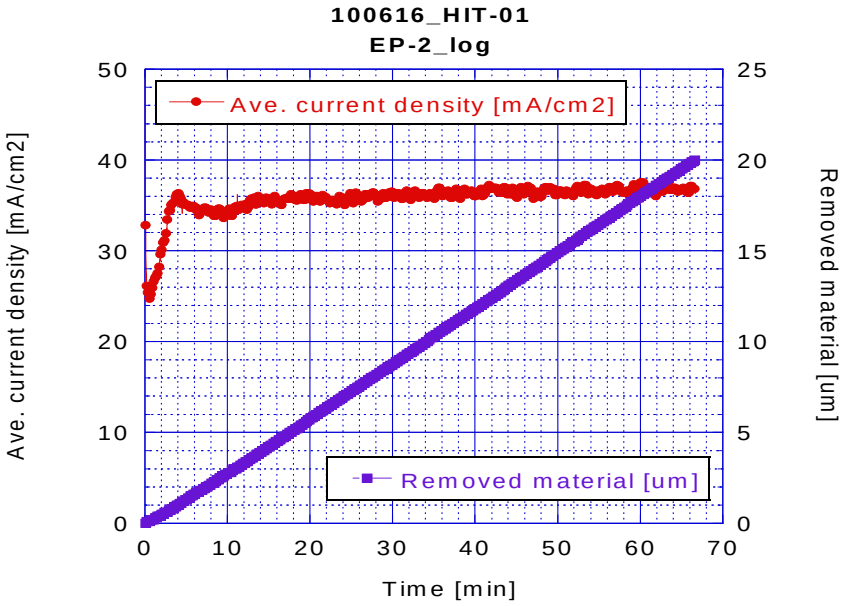
Removed material : 20 um

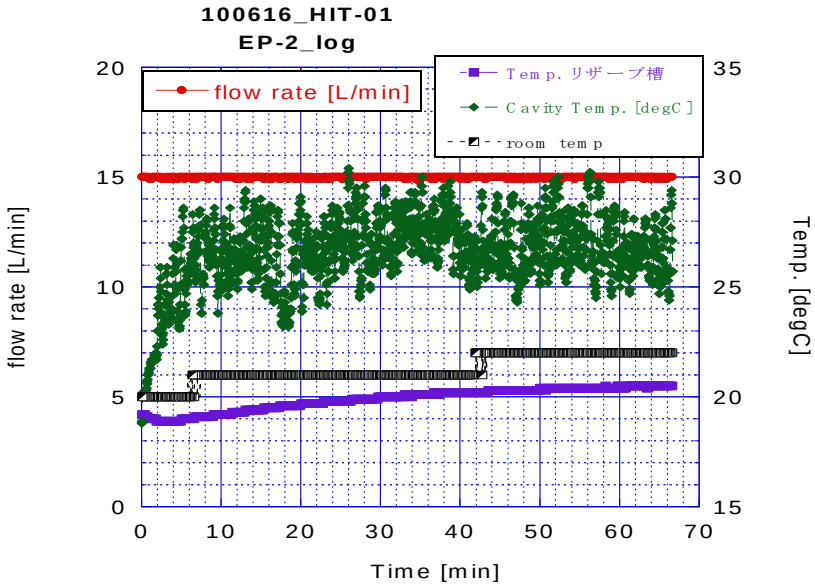
(Total : Bulk EP 105 um + 1st EP-2 20 um = 125 um)

Room temp around EP bed : 20 ~ 22 degC

Surface temperature monitored during EP-2.

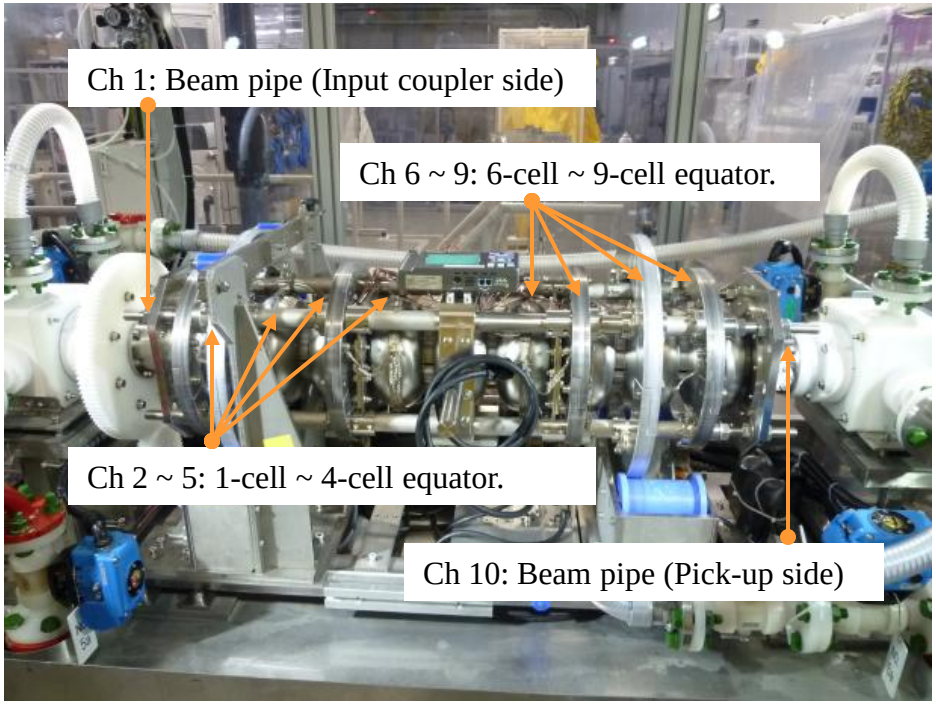




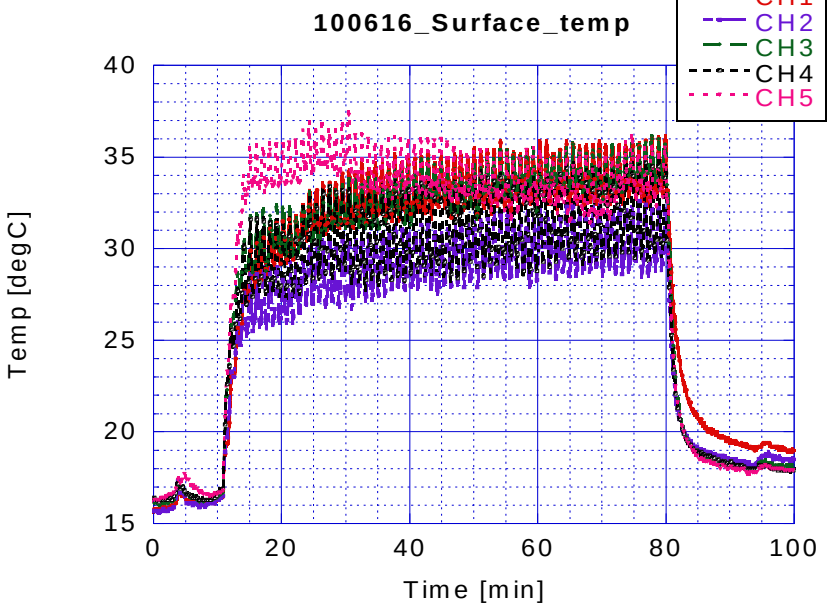


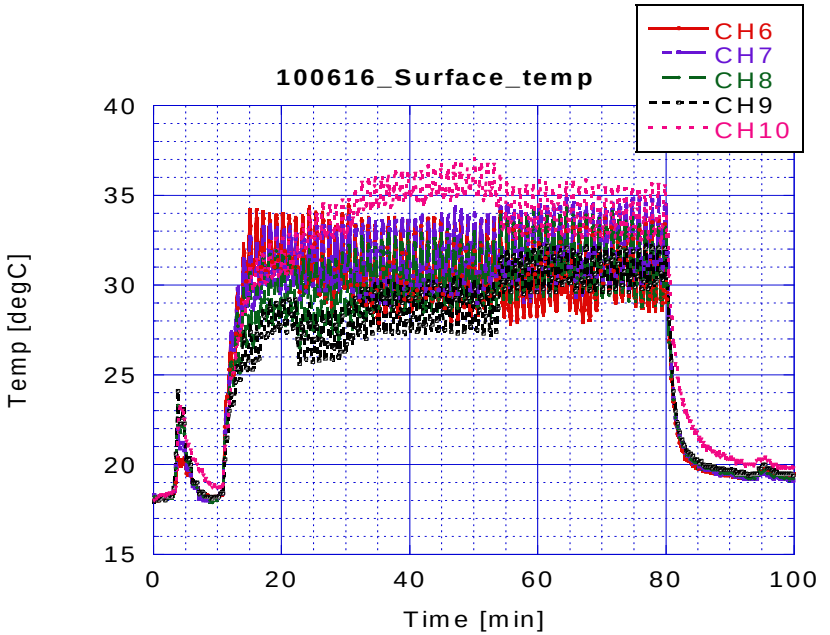
Surface temperature during EP-2

superconducting rf test facility



Data logger (Graphtec GL450) used to measure surface temperature during EP.





1st water rinsing with vibration motor (1st try)

Total time : 90 min

Sequence : sealing by water during 1st water rinsing.

(1) Water in 10min -> water out 1 sec.

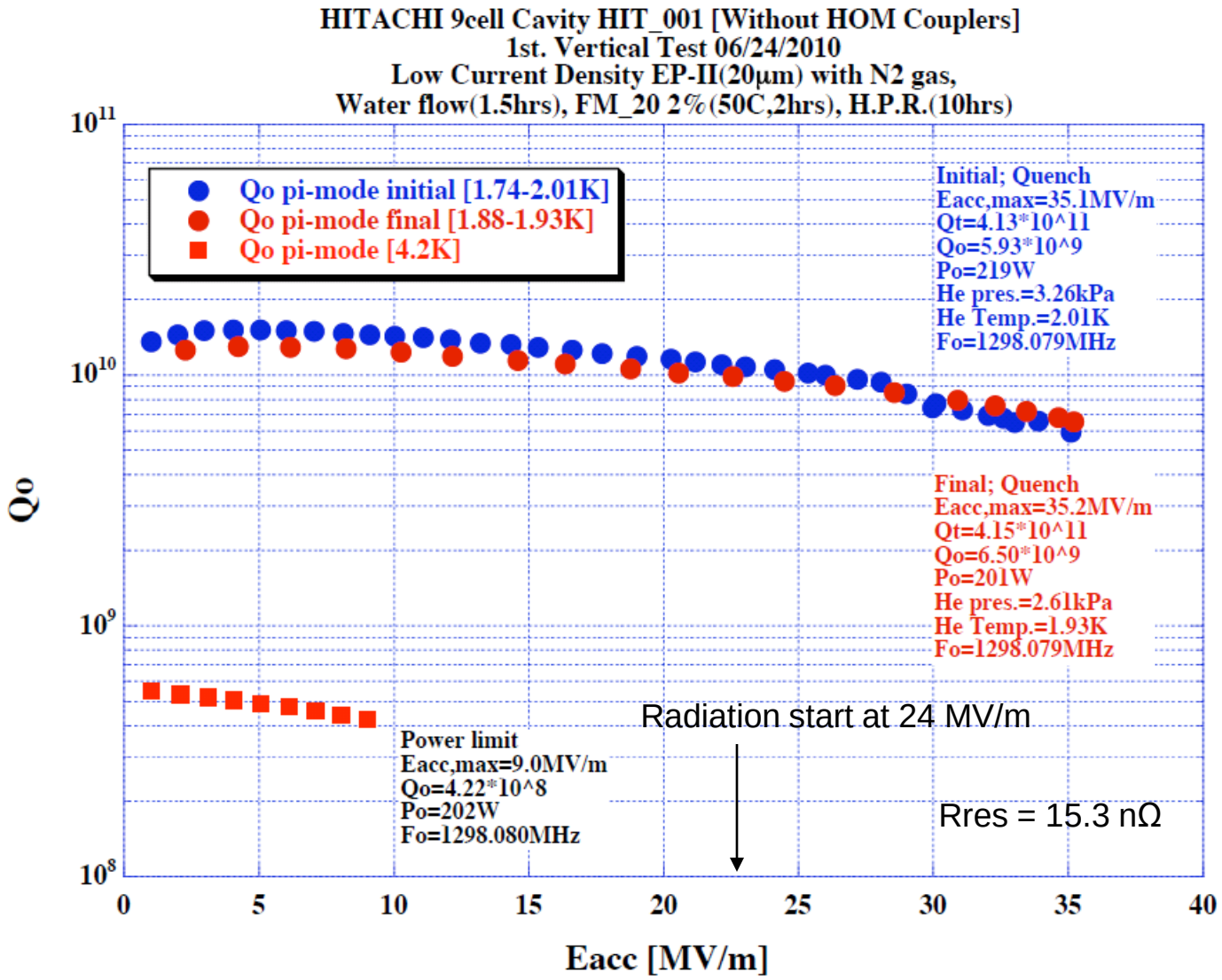
after overflow, motor was turn on.

(2) Water in 3 min -> water out 1 sec.

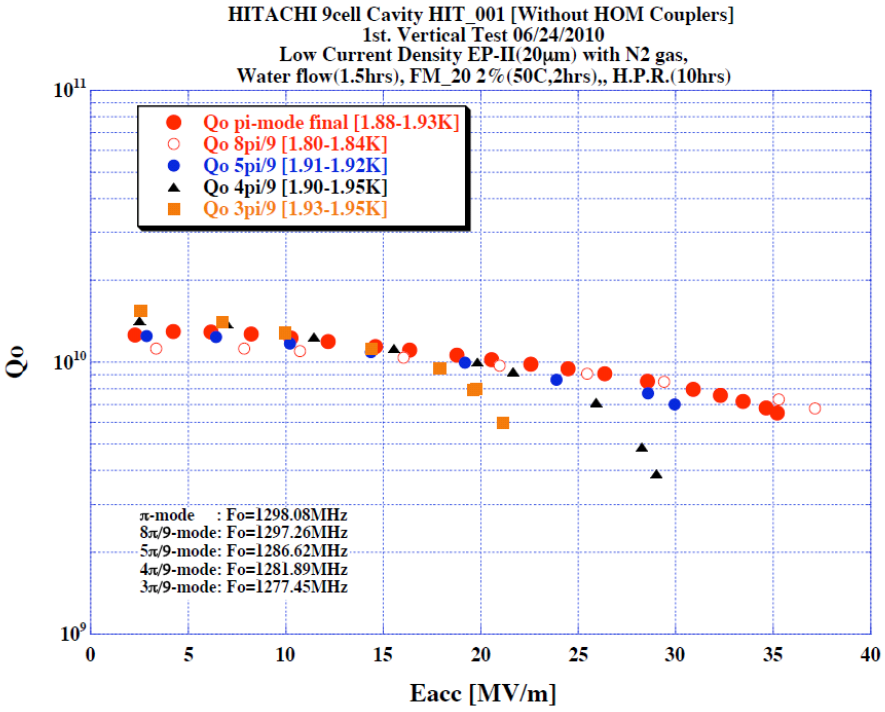
-> Repeat (2) until 90 min.

Target : for Stain problem, for improvement 1st water rinsing etc..

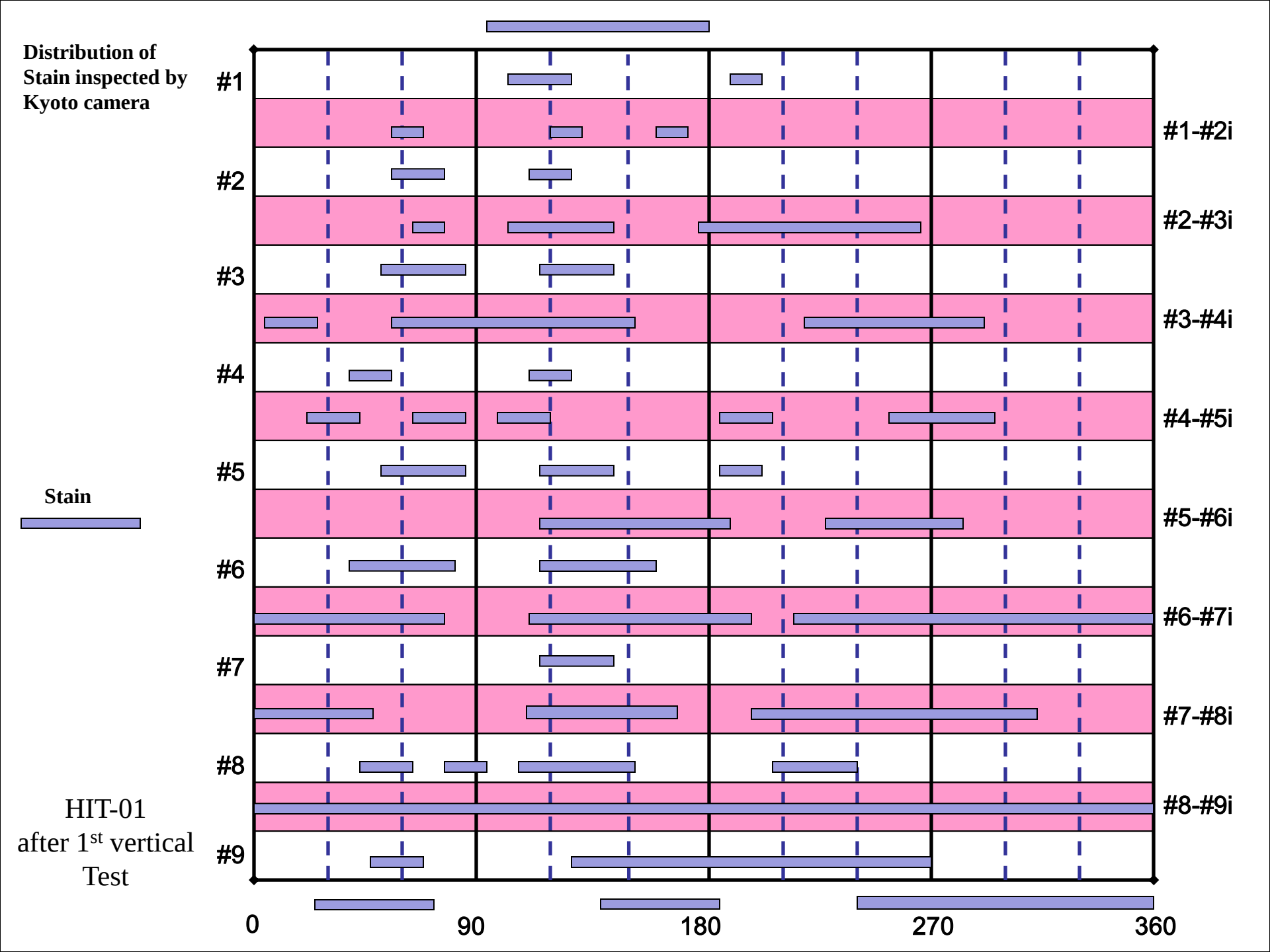
Result of 1st vertical test (1) : Pi-mode



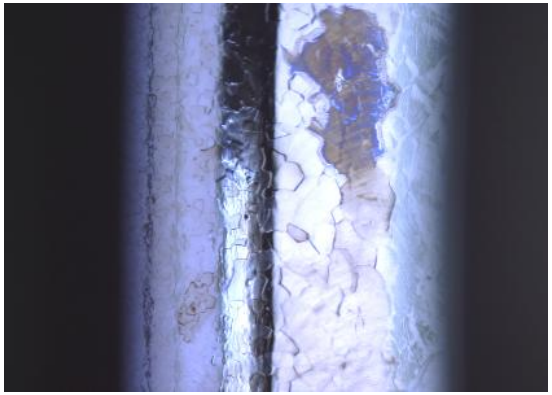
Result of 1st vertical test (2) : Passband measurement



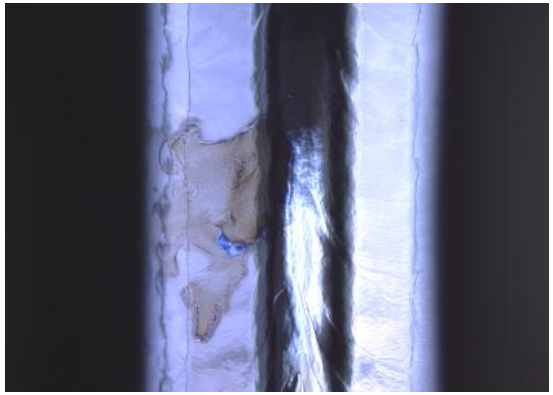
	Cell 1&9[MV/m]	Cell 2&8[MV/m]	Cell 3&7[MV/m]	Cell 4&6[MV/m]	Cell 5[MV/m]	Comment
π Initial	>35.1	>35.1	>35.1	>35.1	>35.1	Quench : Heat@1cell 210deg. Equator down Qo=5.93E9, Po=219W, X-ray 16.9 mSv/h
Final	35.2	35.2	35.2	35.2	35.2	Quench: Heat@1cell 210deg. Equator down Qo=6.50E9, Po=201W X-ray 14.6 mSv/h
8π/9	37.1	33.1	24.5	13.7	0	Quench: Heat@1cell 210deg. Equator down Qo=6.76E9, Po=104W X-ray 307 μSv/h
7π/9						
6π/9						
5π/9	29.9	20.4	35.3	6.0	38.0	Quench: Heat@5cell 120,150deg. Equator Qo=7.00E9, Po=105W X-ray 2.8 μSv/h
4π/9	29.0	38.0	16.5	42.1	0	Power Limit Qo=3.89E9, Po=246W X-ray 3.5 μSv/h
3π/9	19.6	39.2	19.6	19.6	39.2	Quench: Heat@5cell 150deg. Equator Qo=7.92E9, Po=92W X-ray 0.5 μSv/h
Eacc,max	37.1	39.2	35.3	42.1	39.2	ave. 38.5MV/m


Distribution of Stain inspected by Kyoto camera
Stain
HIT-01 after 1st vertical Test
#1
#2
#3
#4
#5
#6
#7
#8
#9
#1-#2i
#2-#3i
#3-#4i
#4-#5i
#5-#6i
#6-#7i
#7-#8i
#8-#9i
0
90
180
270
360

#9-BP : 135 deg.



#5-#6 iris : 123 deg.

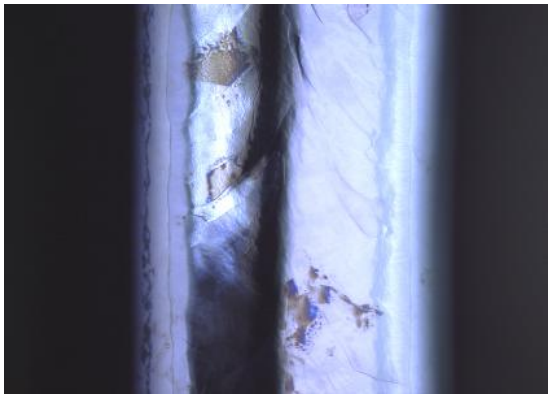


#9 : 143 deg.

#8-#9 iris : 136 deg.

#1 : 106 deg.

#8-#9 iris : 238 deg.



#2 : 118 deg.

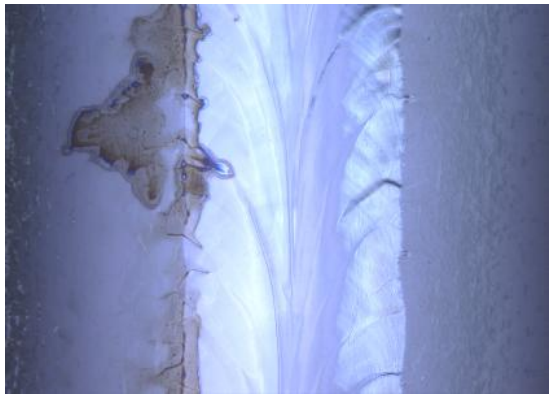


Image of stains after EP-2 and vertical test.

Summary

*HIT-01 was achieved the accelerating gradient of 35.2 MV/m at KEK-STF.
It is very successful result for us.

*The vibration motor used during 1st water rinsing for the stain problem and the field emission etc...
It was 1st try at STF EP system.
However, many heavy stains were occurred on inner surface.

But, the cavity performance was very good. How do you think about…

The vibration motor is not seen a bad for the performance in this treatment.