

S0 Status report from KEK

H. Hayano 08.26.2008

STF Vertical Test Stand Commissioning using AES001 FNAL cavity

magnetic shield was delivered in July 14, and installed. (residual field $\sim 50\text{mG}$)

Schedule of V.T. of AES001 is;

After VT without magnetic shield,

cavity was disassembled and check of EP fittings was done, in week of Aug. 18.

Aug. 22 AES001 had 4 hours HPR, antenna assemble, baking

Aug. 26 VT preparation

Aug. 27 – 29 Vertical test (1st Test)

Sep. 2-3 disassemble and mount on STF EP.

Sep. 4 20 μm EP, 1 hour ultrasonic, 5 hours HPR.

Sep. 5 additional 2 hours HPR with flange, antenna assemble, bake

Sep. 8-9 VT preparation

Sep. 10-12 Vertical test (2nd Test)



Slide from Rongli Geng(JLab)

KEK EP'ed samples field emission studies at JLab with SFSEM

August 26, 2008

Nb samples EP'ed by KEK for SFSEM analysis at JLab



Comments on sample container and transportation:

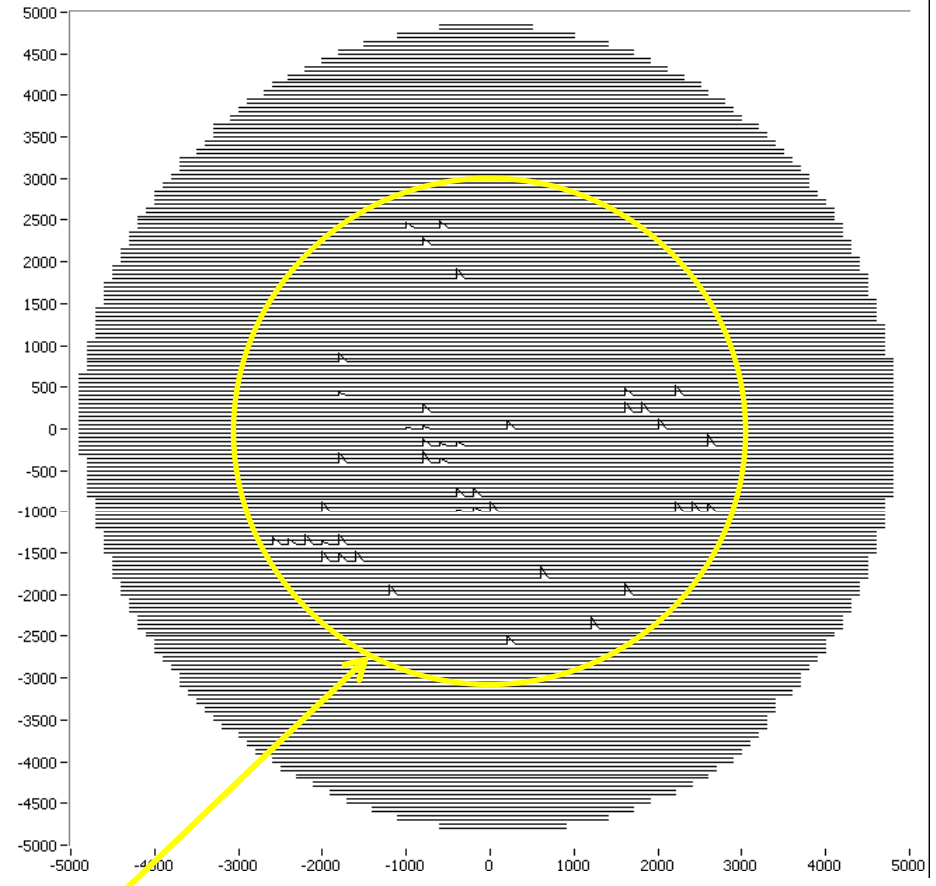
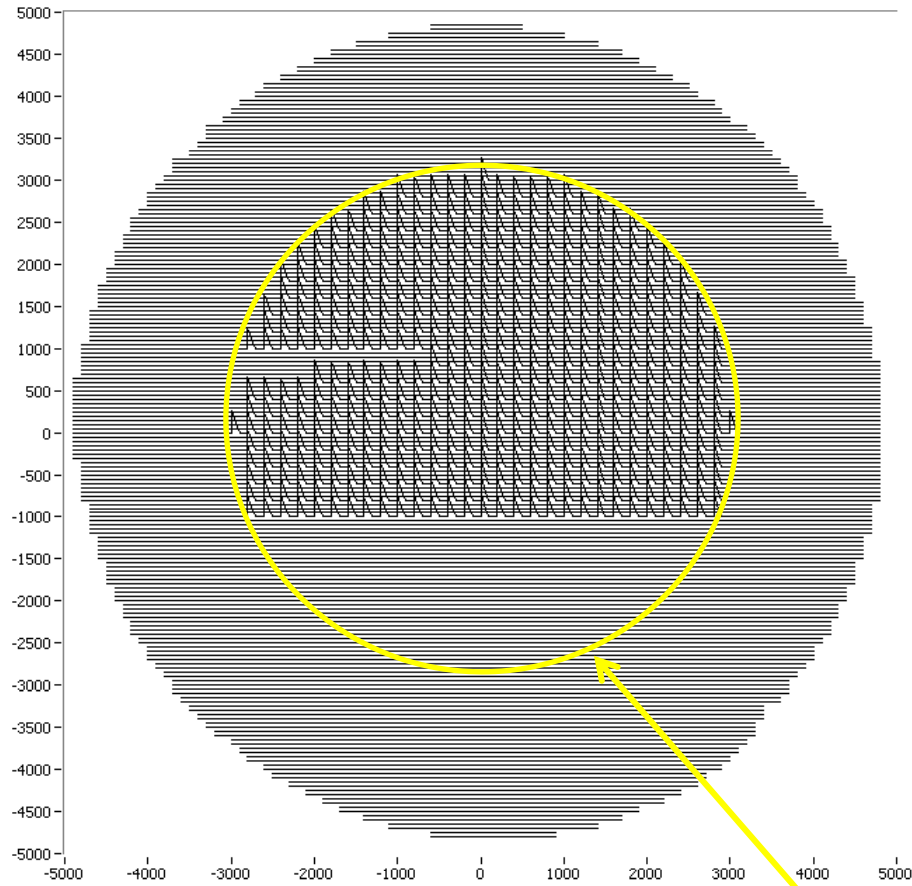
Overall samples were well protected from contaminations by air-borne particles – this is important for reliable field emission behavior studies.

There is however a possible bacteria growth issue as indicated by initial data. At JLab, this has not been an issue, since the sample is transported immediately from the EP room to our SEM room where the sample is dried by blowing nitrogen gas. In deed, a 9-cell filled with DI water was shipped from FNAL to JLab in the past and tested successfully without field emission - but the duration of water/cavity contact may have been shorter. Yet, we had one EP'ed sample, after long period of soaking in DI water (not intentionally), showed series bacteria growth.

Suggestions for improvement: (1) minimize duration of water/Nb contact; (2) replace water with other liquid that forbids bacteria growth (alcohol?); or ship sample under vacuum (however, this requires experiment to verify the EP'ed surface not contaminated during pump down and venting of sample container).

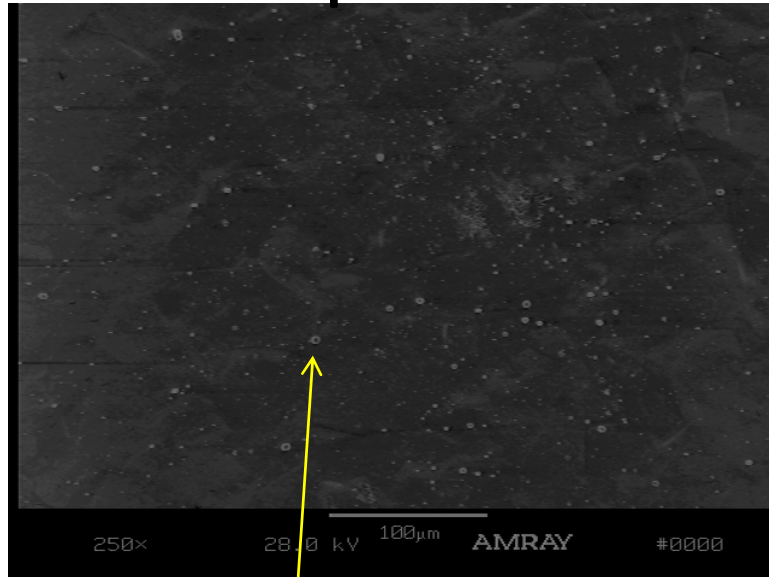
Sample#1: many field emitters
Low FE onset ~ 10 MV/m

Sample#2: much less field emitters
Higher FE onset

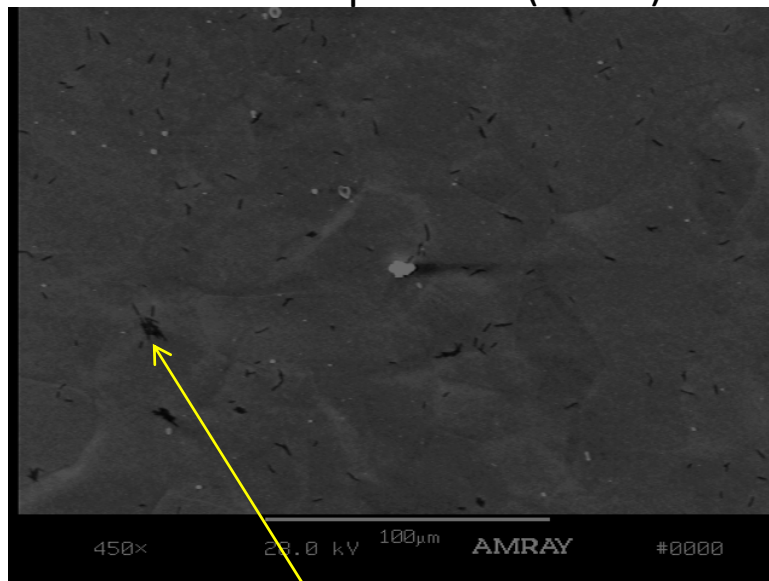


Area inside circle is scanned

Sample#1



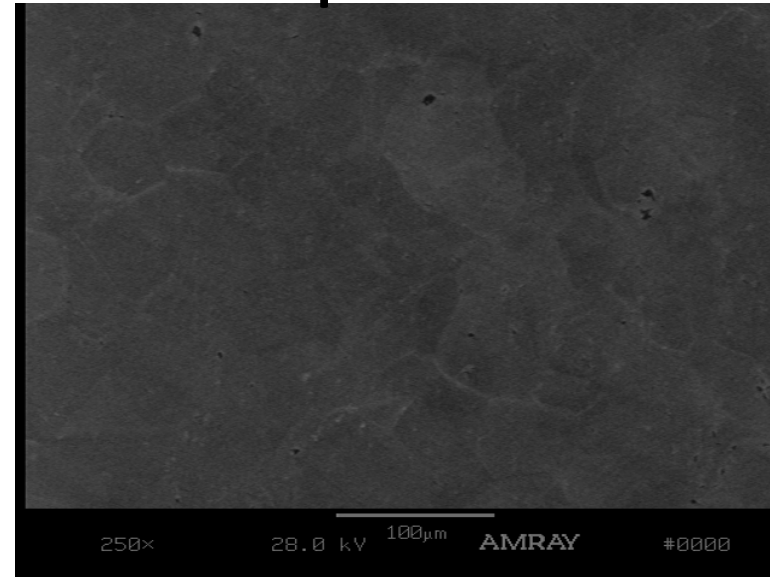
Lots of Nb-O particles (white)



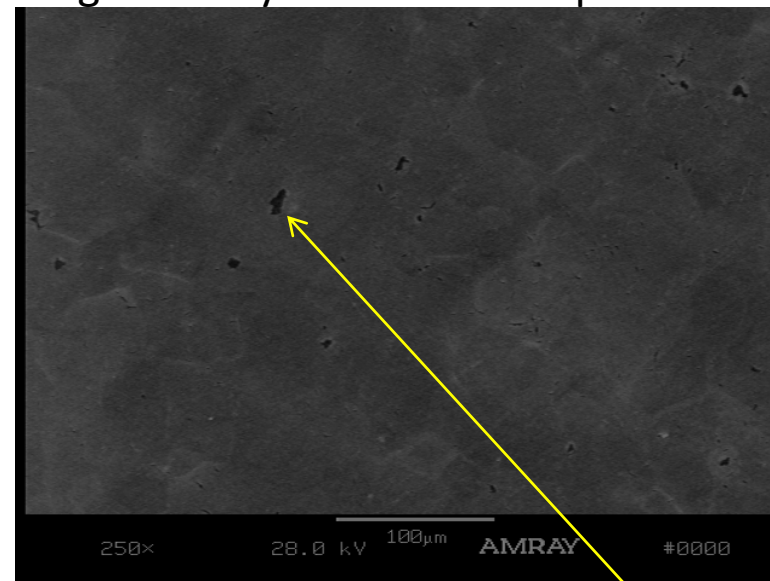
Suspected bacteria (black worm)

Sample#2

Rongli slide



Significantly reduced Nb-O particles

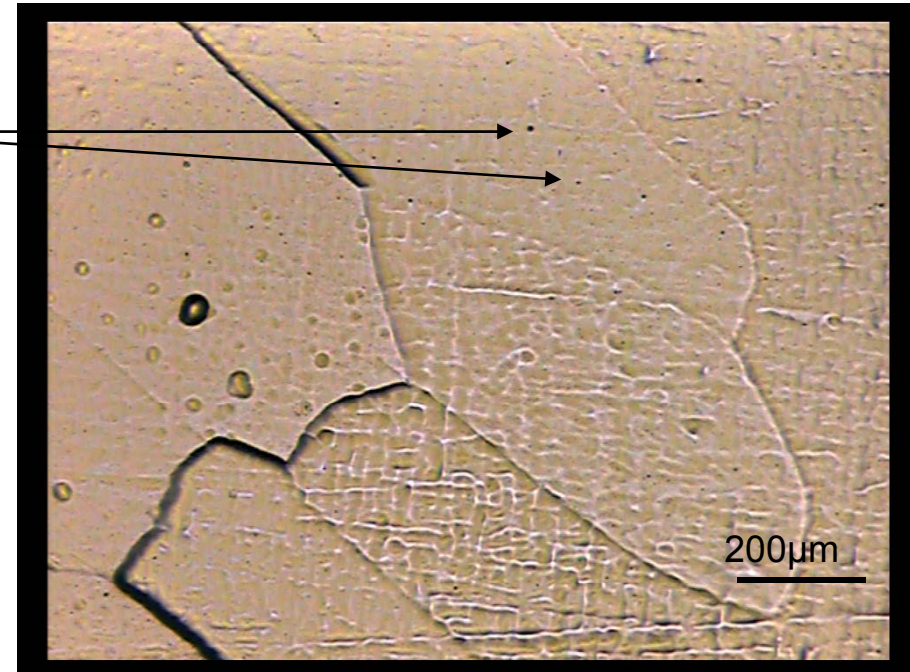


Somehow less bacteria growth, but new type of Contamination (black particulate)

Sponge Cleaning Pre-test at KEK (April 2008)

Black particles were found after wipe by sponge, they were a few 10 μm size.

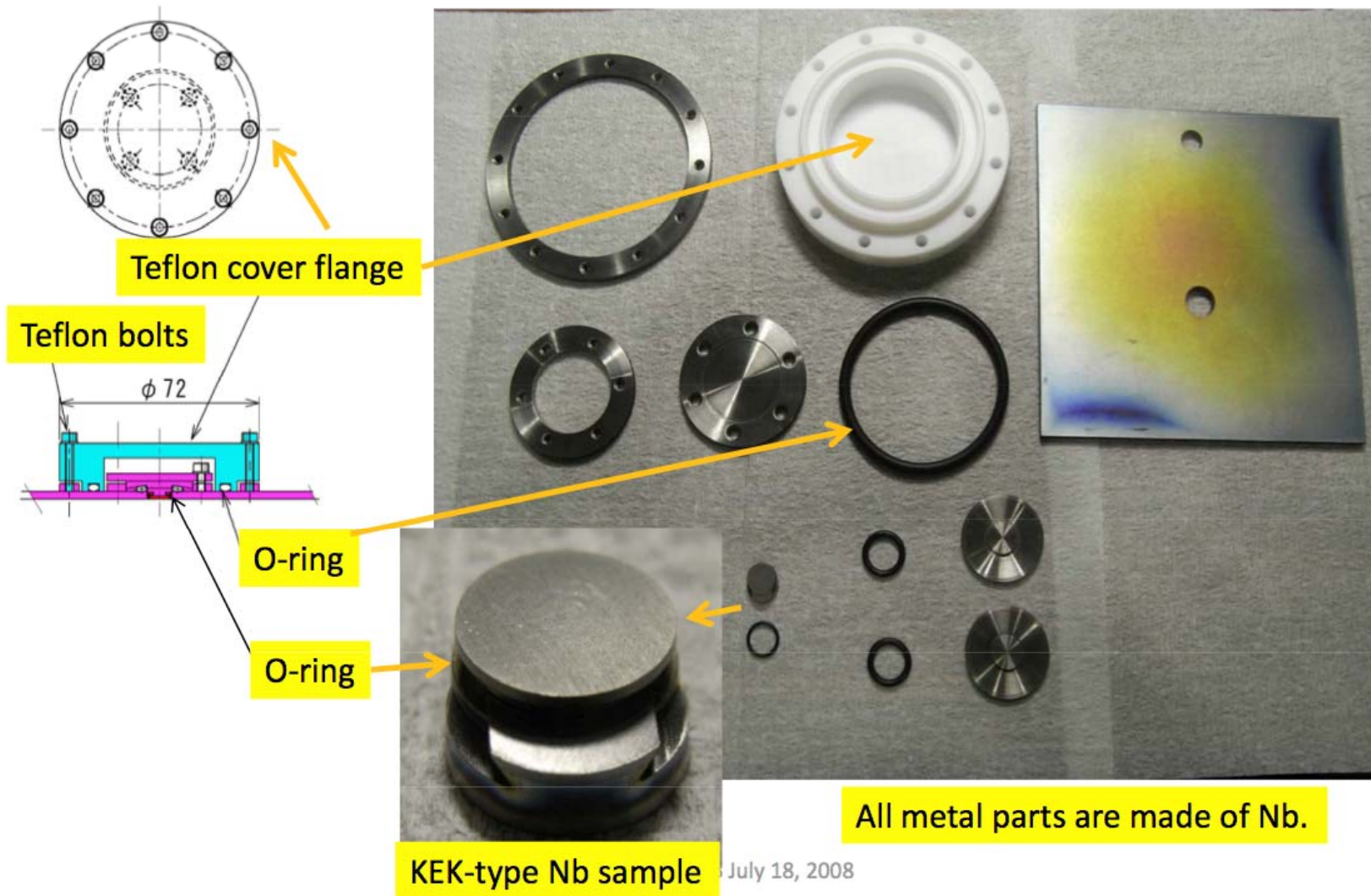
It was necessary to wipe them off by 'wiping cloth'



sponge

Nb sample plate

Fabrication of KEK-type Nb-sample setup

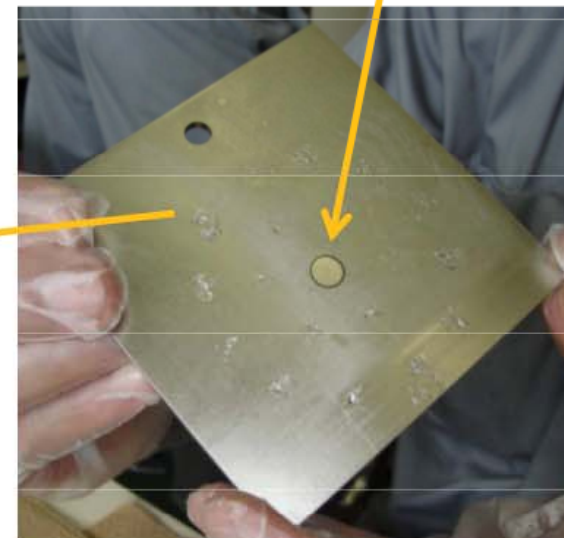


EP procedure (Nb-Sample-1)

Repetition of
EP (2 min) + Rotation of sample w/o EP (2 min)



Sequence 5) EP of Nb-sample-1



Nb area = 10cm x 10cm x 2 – [Teflon cover]

$V = 8 \sim 13$ (V), $I = 6 \sim 16$ (A) with oscillation, $T = 27 - 47$ °C.

Current integration = $51.0 \times 10^{**3}$ (Ampere * Second)

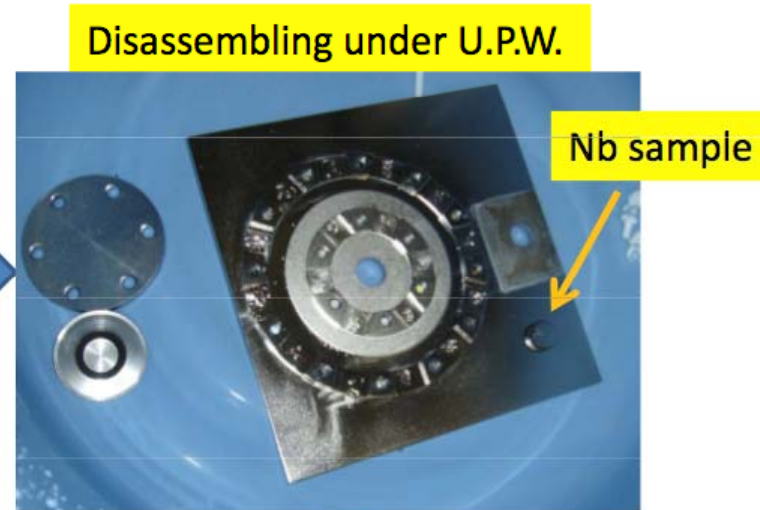
Removal-thickness of Nb-sample = 70 μ m (if assuming removal is uniform).

[Nb] before/after EP = 4.0 (g/L) / 5.1 (g/L)

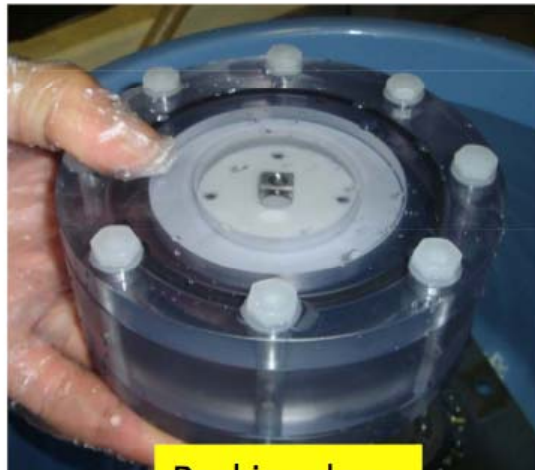
U.P.W. rinse (Nb-Sample-1)



Moving into a clean-room (class-1000)

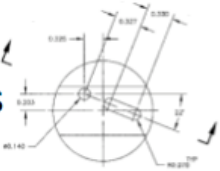
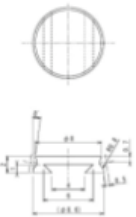


Sequence 6) Ultra Pure Water rinse (20 min)



Packing done

Plan for sample analysis

August 11	August 18	August 25	September 1	September 8	September 15
<p>Jlab-samples</p> 		<p>Analysis at JLab</p>			
<p>KEK-samples</p> 		<p>KEK-type Nb-sample (21 August) EP + UPW rinse</p> <p>KEK-type Nb-sample (22 August) EP + UPW rinse + PVC sponge</p>		<p>Analysis at KEK</p>	

Other studies

Kyoto camera : production model of Kyoto-camera of 1 year loan for DESY will arrive soon.
Improvement of existing Kyoto-camera is underway
for some protection mechanism.

Design and development of cavity surface repair is underway.

Design of sponge cleaning mechanism is underway.

Development of electrical multiplexing T-map is underway.

Development of eddy-current scanner is suspended at this moment.

Collaboration with JLab about re-melting technology.

Ichiro Cavities : (results are not yet released, still in summer break)