

2008.04.21 GDE SCRF meeting @FNAL

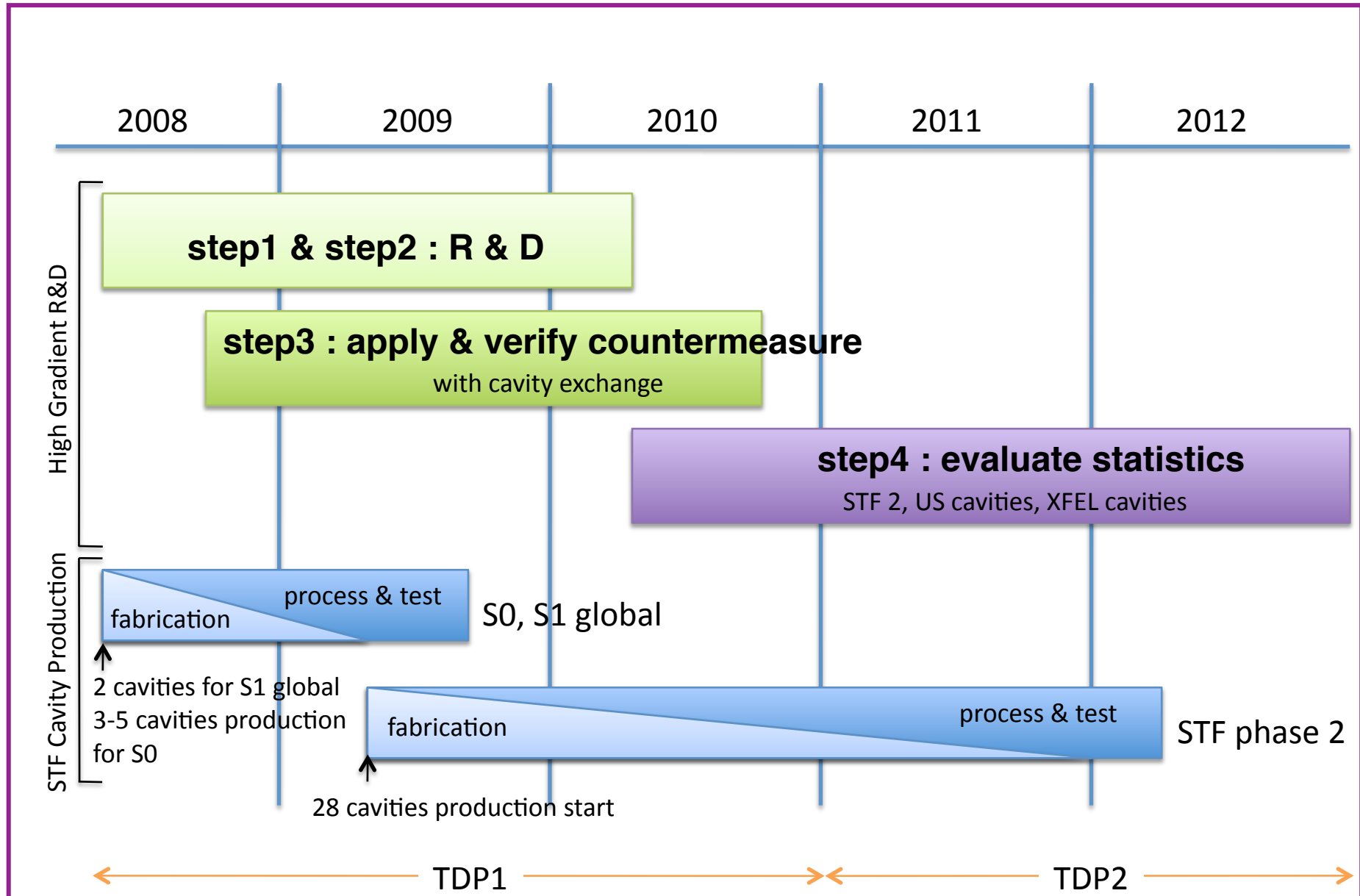
STF plan: Toward 35MV/m

H. Hayano KEK

High Gradient R&D

- step 1: research to find cause of low gradient
 - for quench: high resolution camera
 - for field emission: confirm what is the residuals on the surface (SEM, XPS)
 - for Q-disease: confirm what is the diffused into the surface (XPS)
- step 2: develop countermeasure
 - for quench: (remove beads & pits, material impurities & defect scan, ...)
 - for field emission: (ethanol rinse, degreaser rinse, sponge wipe, Ultra-sonic, HPR,...)
 - for Q-disease: (baking, Argon baking, ...)
- step 3: apply & verify countermeasure
 - exchange problem cavities and apply the countermeasure
- step 4: evaluate statistics for the countermeasure
 - install the countermeasure world-wide, get statistics world-wide.

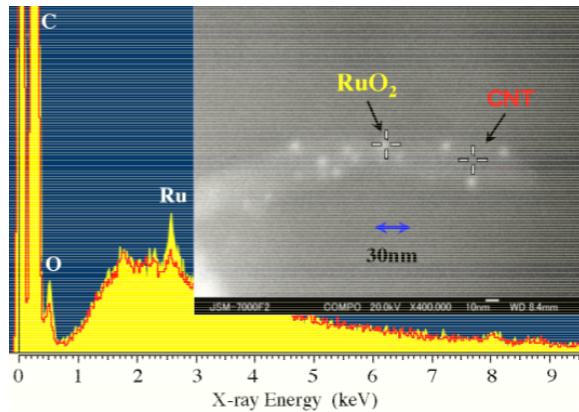
Cavity Schedule Proposal



Surface Research Plan

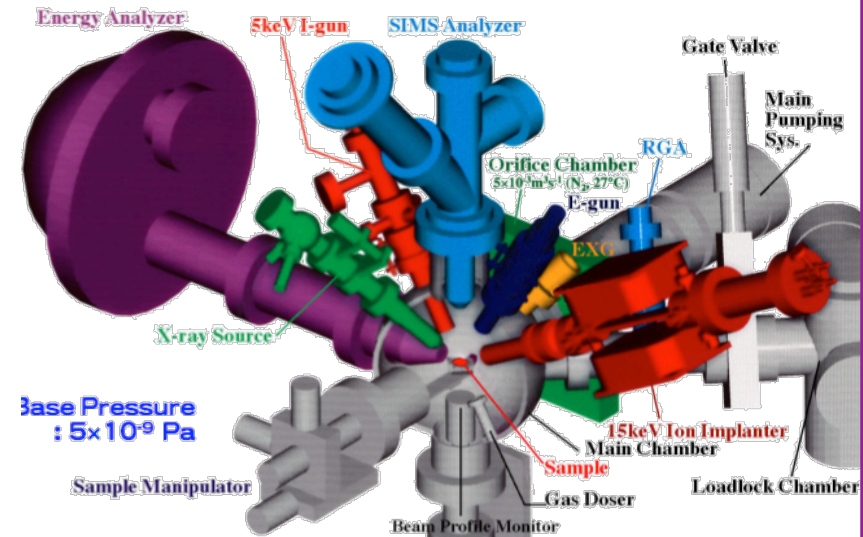
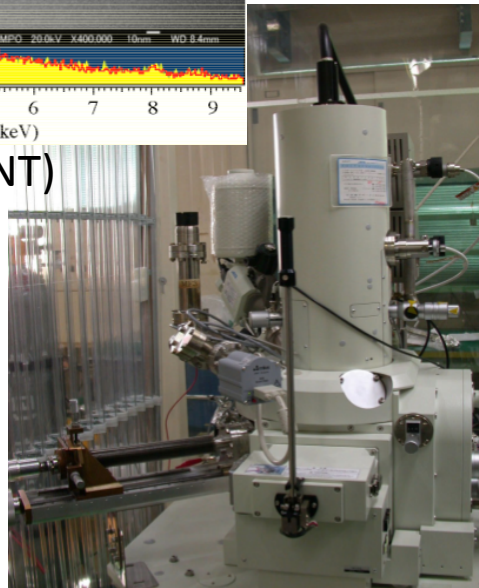
- Nb sample embedded into dismantlable single cell cavity.
- do regular EP and rinse
- analyze sample by SEM, XPS

collaboration with S. Kato (KEK-B)

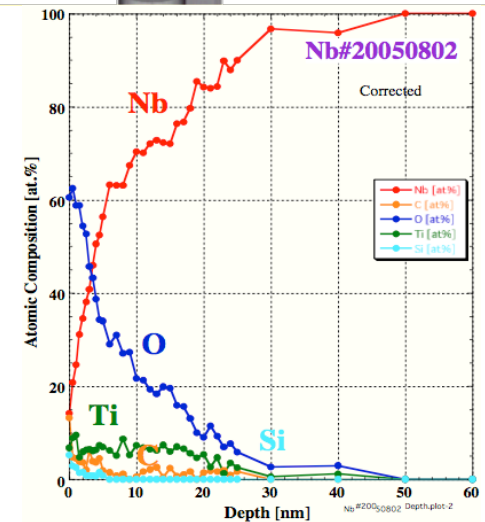


SEM example (CNT)

KEK SEM

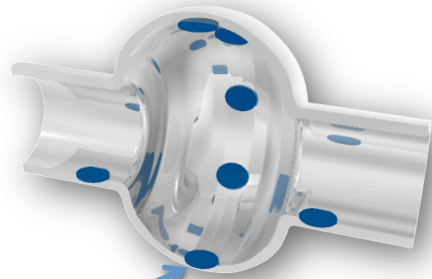


KEK XPS, AES, SIMS

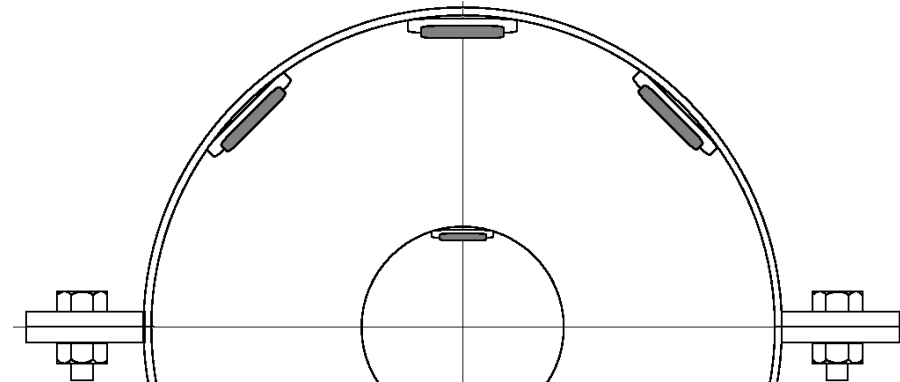


XPS example (Nb)

Plan of treatment sample in 1 cell cavity

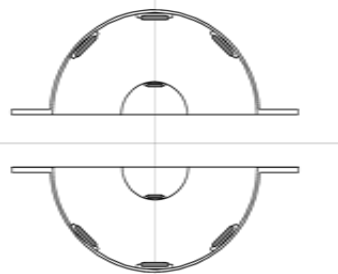
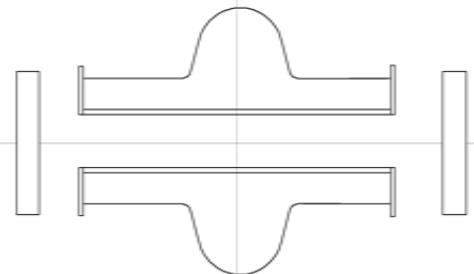
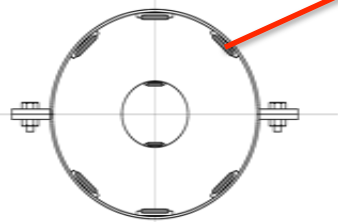
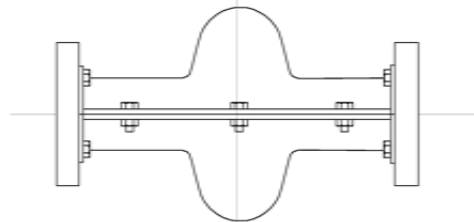


Nb sample in 1 cell cavity



welded sample holder

Nb sample
ø10 - ø20

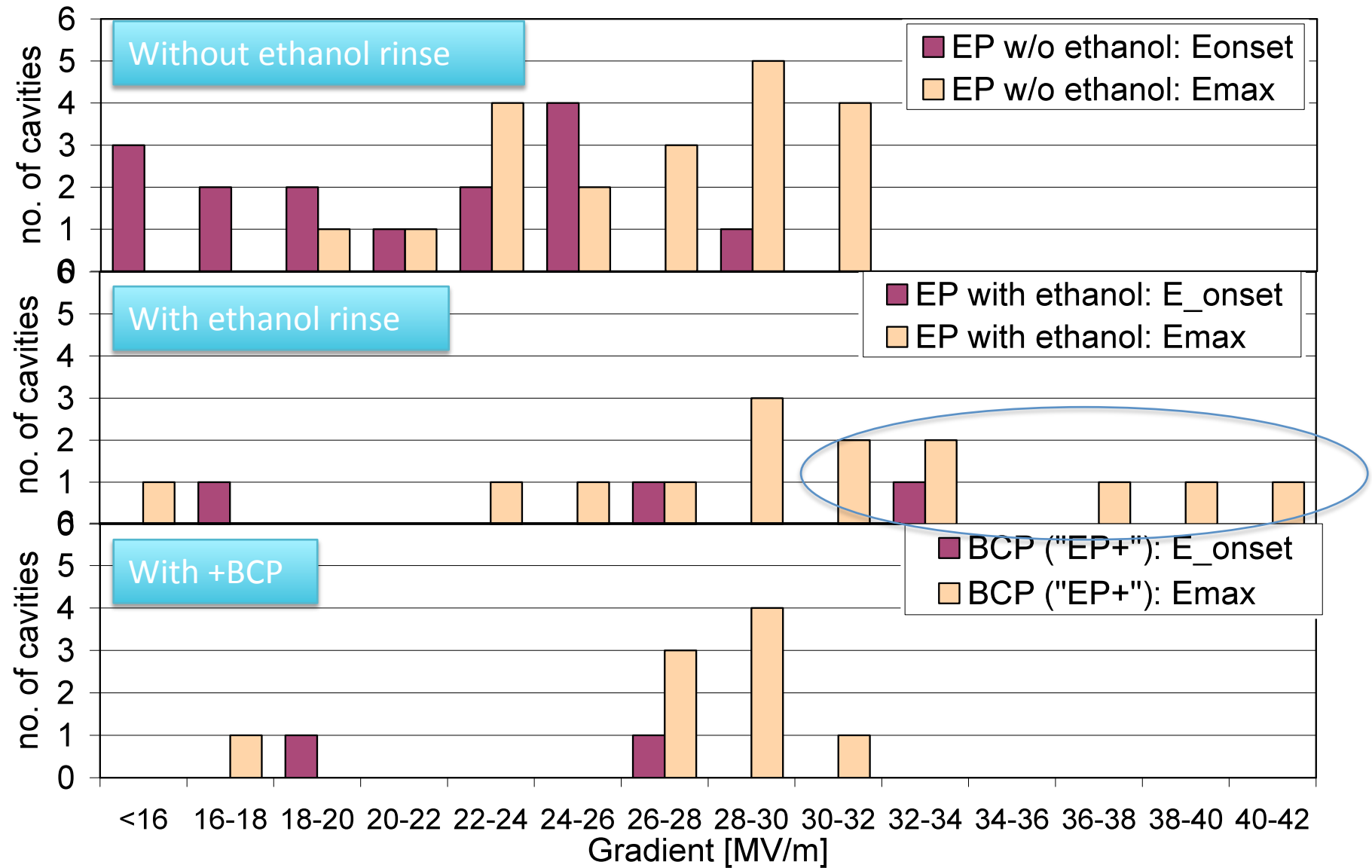


Split Open, easy to take samples out



1 cell cavity EP

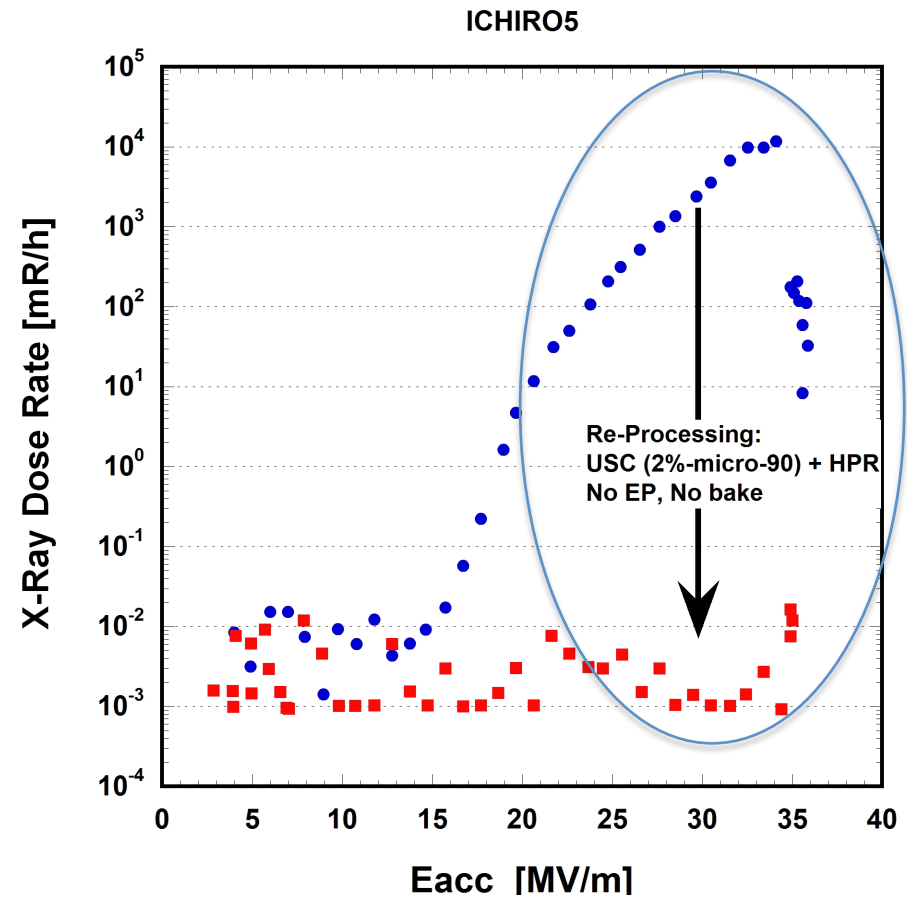
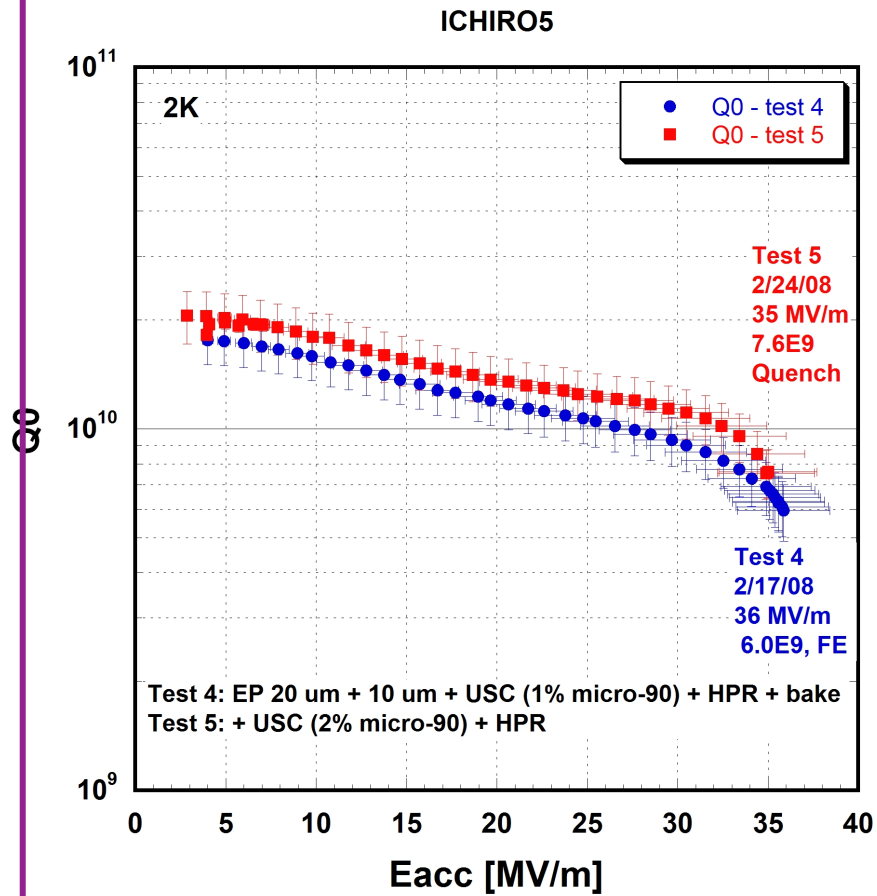
DESY 4th: Field Emission Analysis



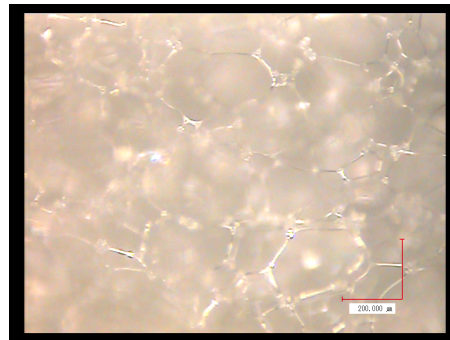
effect of ethanol

ICHIRO5 S0 Studies at JLab

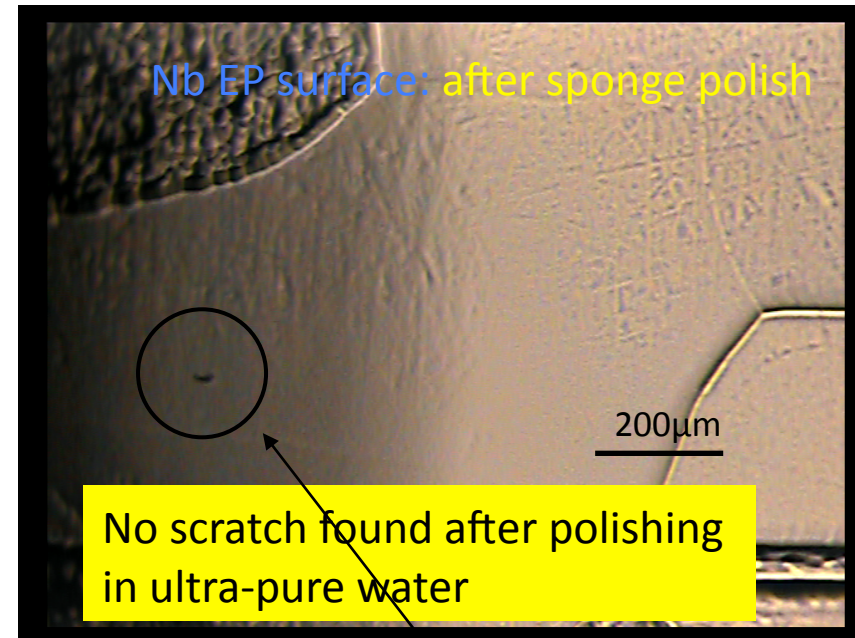
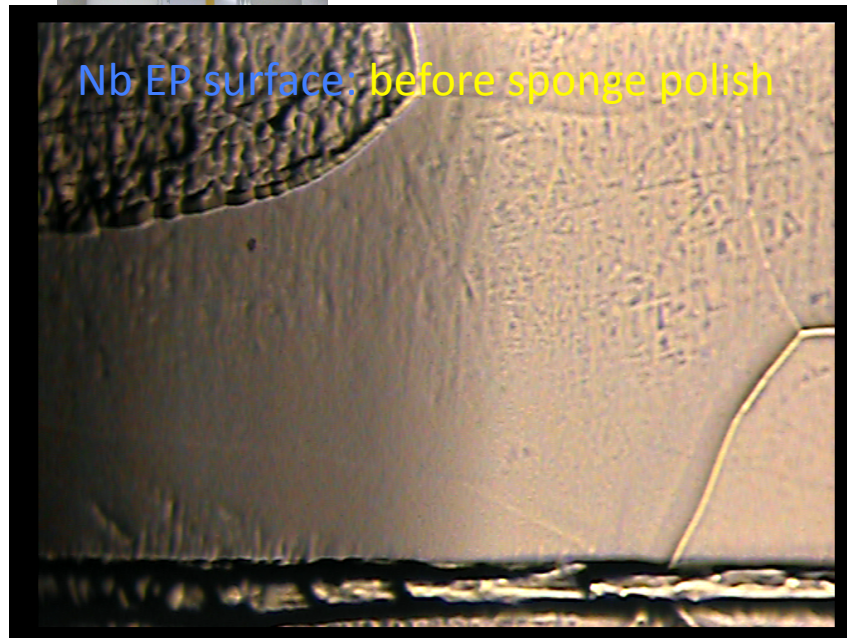
effect of detergent / degreaser



possible tool (sponge) to remove residual chemicals



sponge for metal polishing

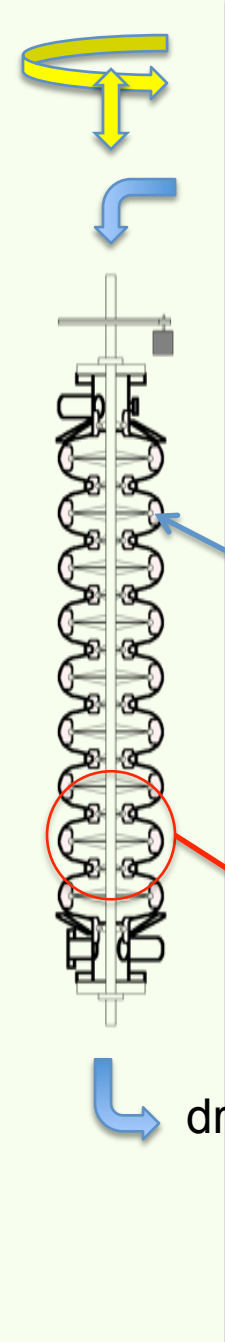
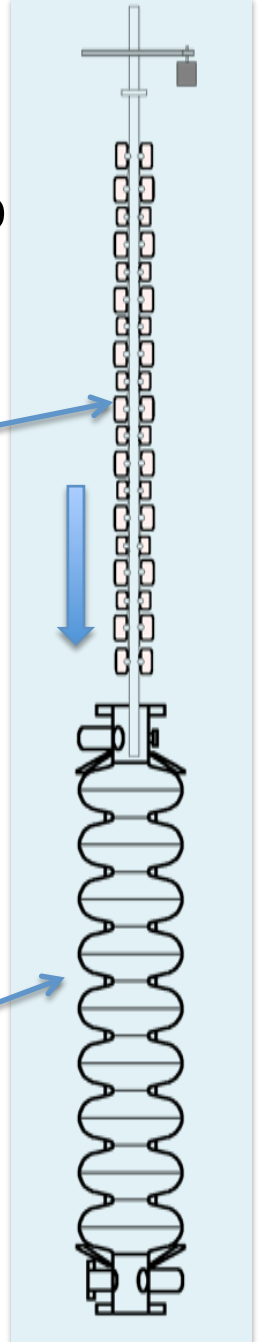


dust, but easy to remove

Plan of sponge wipe right after EP

Sponges on iris and equator with folded.

cavity

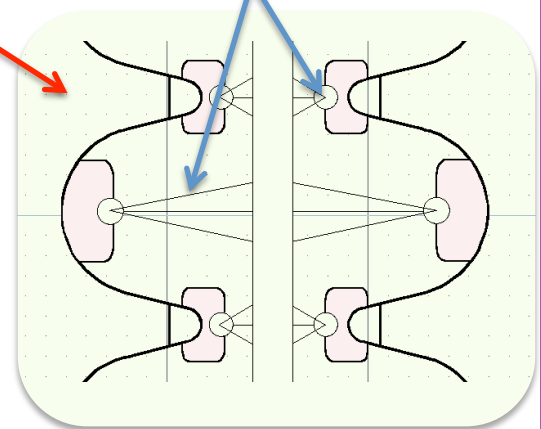


Sponge rotation & axial sliding

Filled with UPW, or Ethanol, or detergent, ...

Sponges on iris and equator with un-folded.

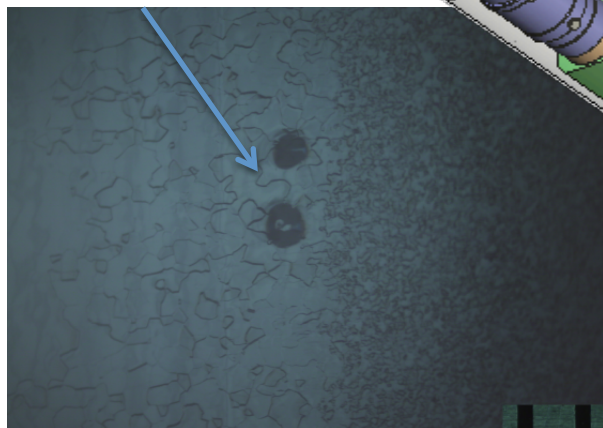
Unfold & expansion Mechanism (pantograph)



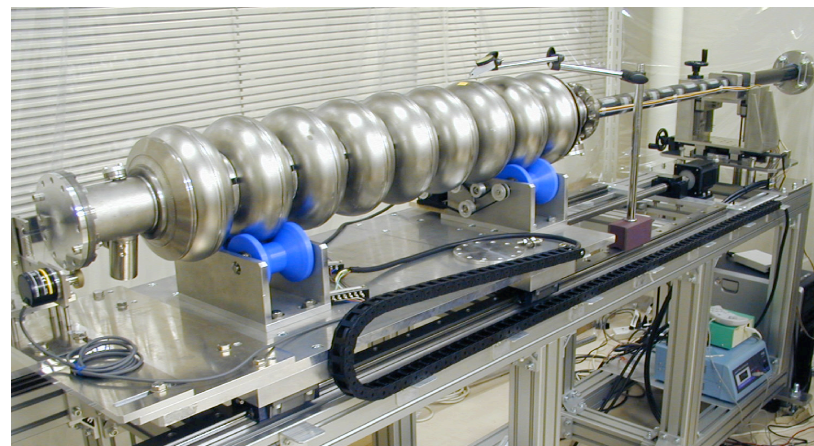
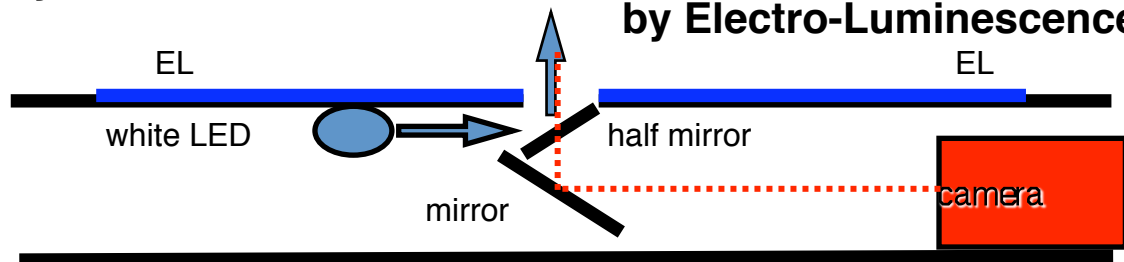
Kyoto/KEK High Resolution Camera

For visual inspection of cavity inner surface.

motor & gear for mirror
camera & lens
~600 μ m beads on Nb cavity



perpendicular illumination by LED & half mirror



Camera system (7 μ m/pix)
in 50mm diameter pipe.

sliding mechanism of camera

tilted sheet illumination by Electro-Luminescence

Possible tool (Ultra-sonic tool) for beads & pits

手に振動が伝わりません

作業時には研磨音と共に微妙な加工面へのクイツキやアタリを確認しながら正確に加工が進められます。

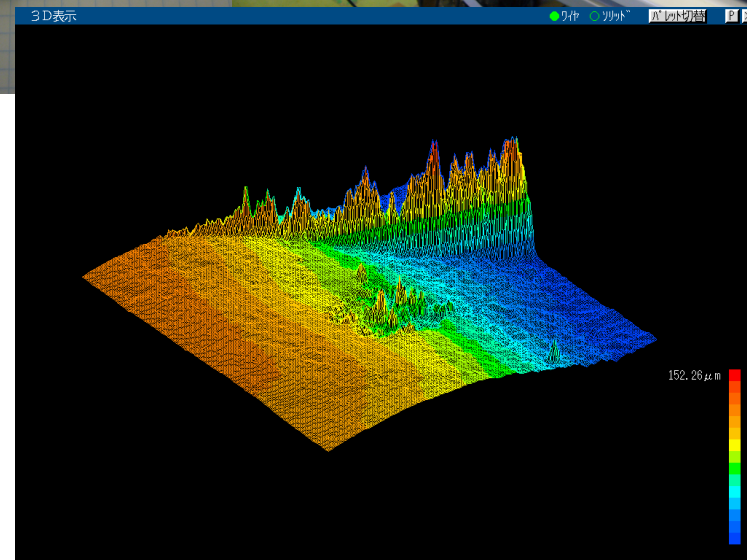
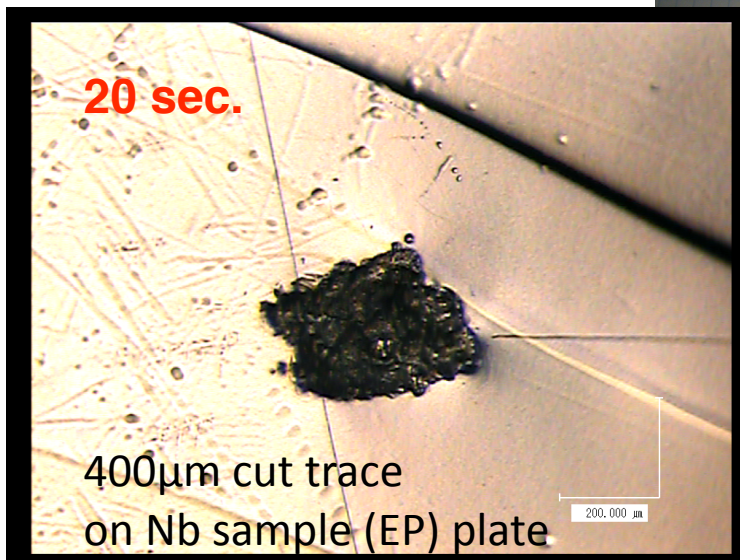
微小ストロークが可能にする微細部加工

強力な加工エネルギーはその驚異的な振動数から生まれ、目に見えないわずかな振動が微細部や加工ポイントに集中した作業を熟練なくとも可能にしました。

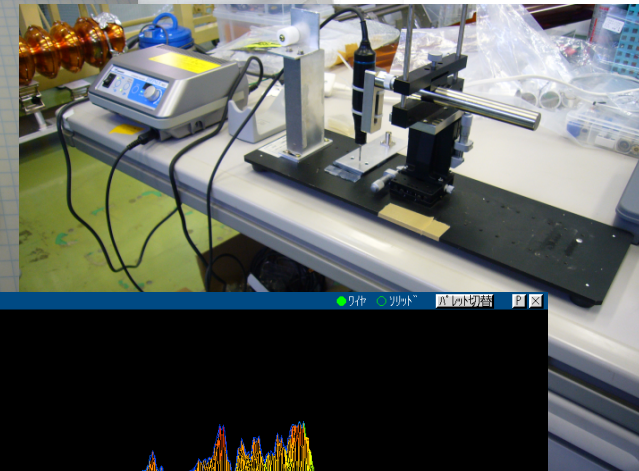
22.5kHz

22.5KHz Ultra Sonic, 40 μ m amplitude
2mm dia. half-sphere
diamond powder tool(#600)

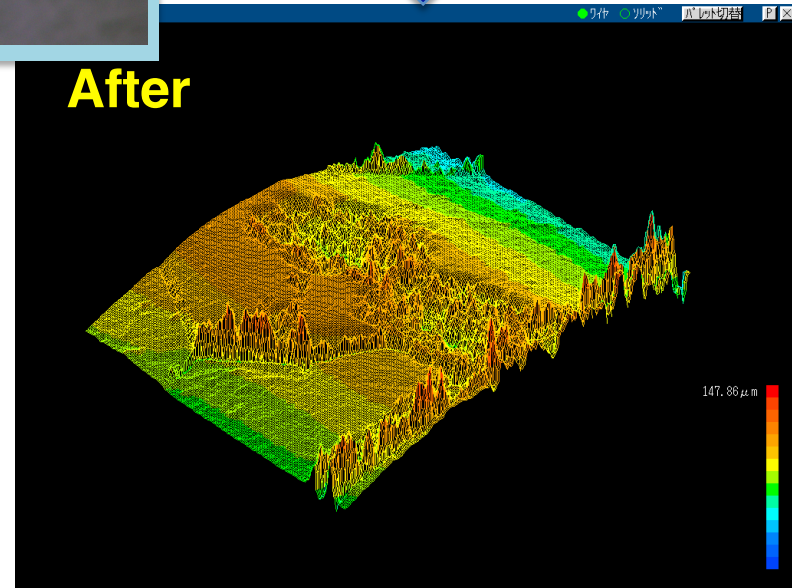
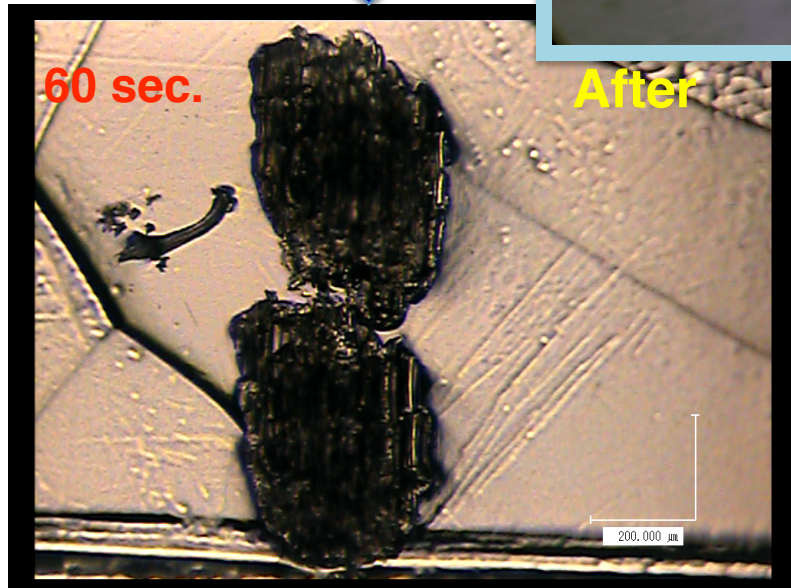
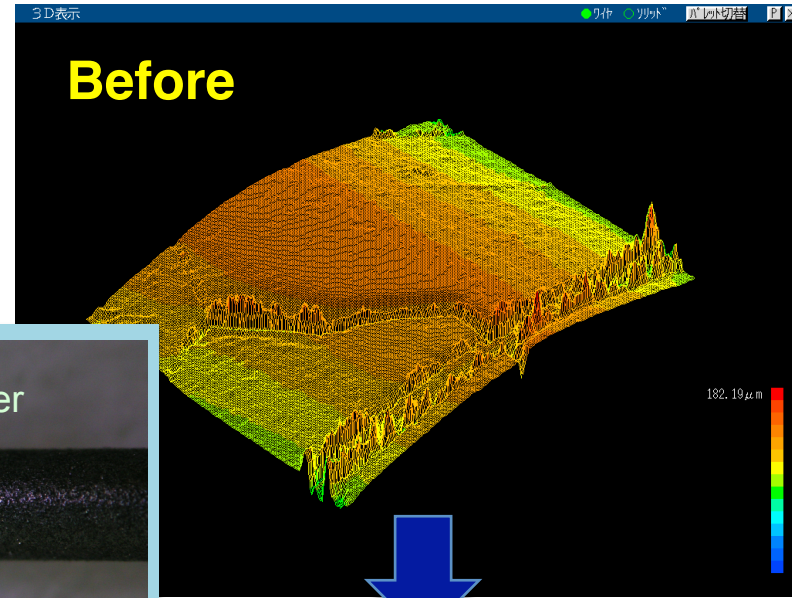
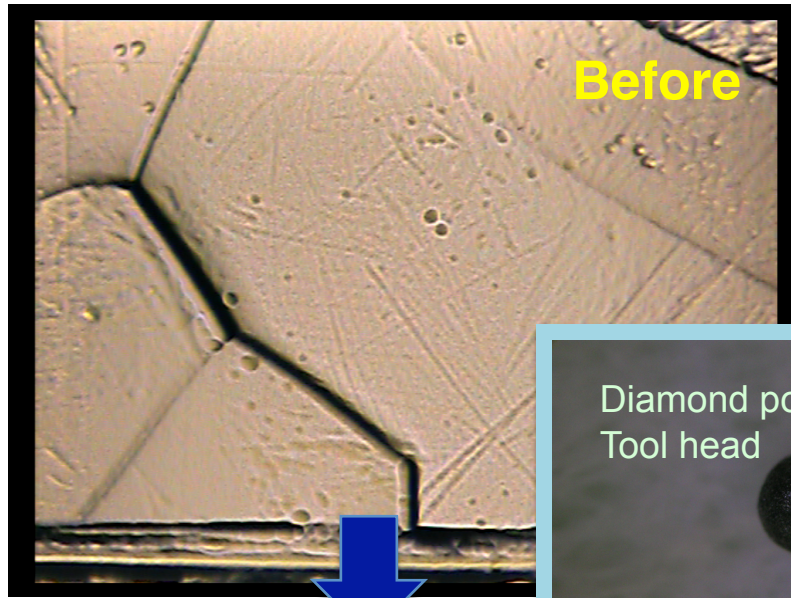
品名	電着ダイヤモンドヤスリ		
NO.	60155		
形状	φ2 先丸円柱		
粒度	200	入り数	1
メーカー	MG	Lot	624
NSK (株) アカシ			



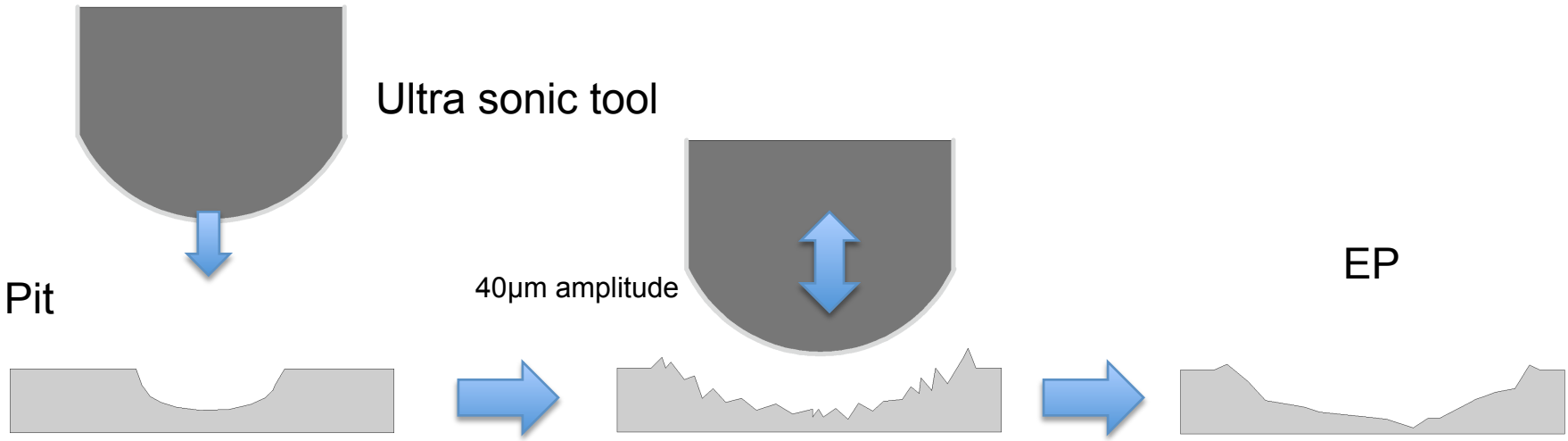
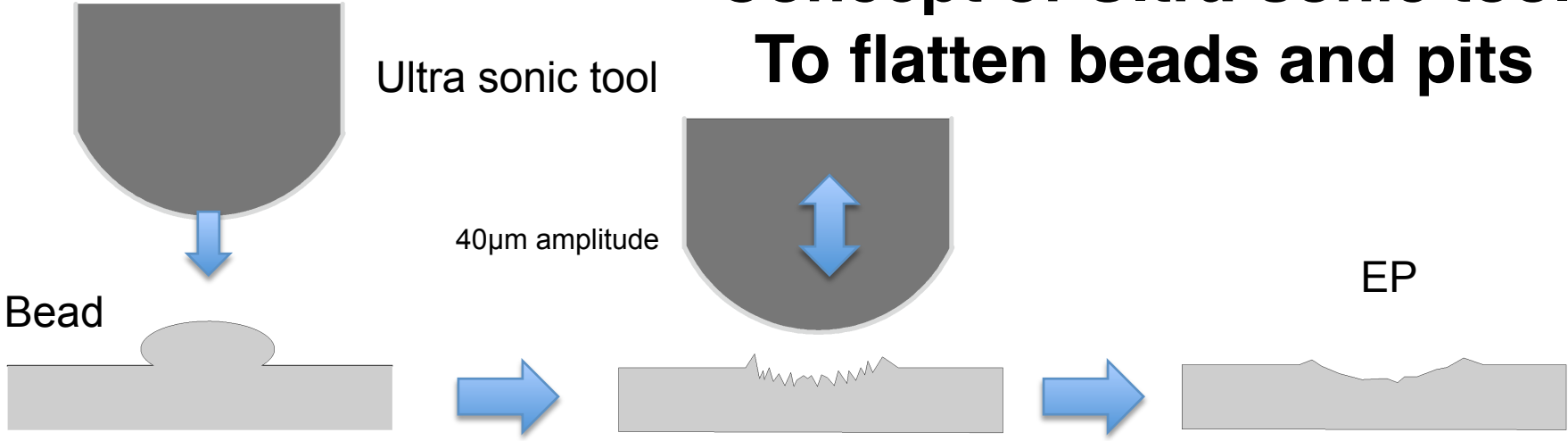
- ◆ フットペダル (FC-24)
 - ◆ スペルヒューズ 1.5A 250V
- 付属専用工具内容 (8点)
- ◆ 電着ダイヤモンドヤスリ 形状: 1.6X4X50mm #200 (00101)
 - ◆ シェンジュスヤスリ 形状: 1.6X4X50mm #600 (00735)
 - ◆ チップホルダ 形状: φ3mm用 (00923)
 - ◆ チップホルダ 形状: φ4mm用 (00922)



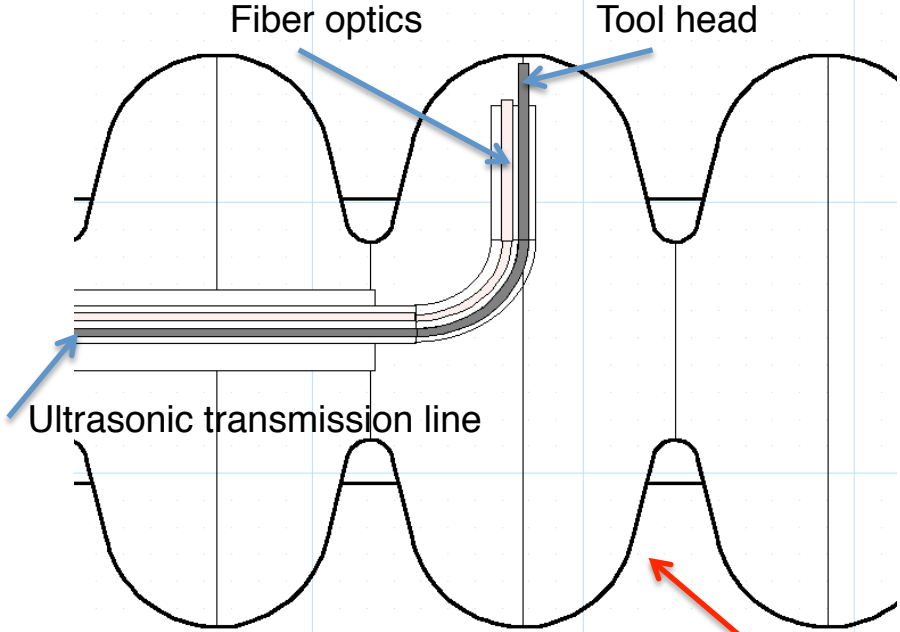
Example of Dia. 2mm Diamond tooling(#600)



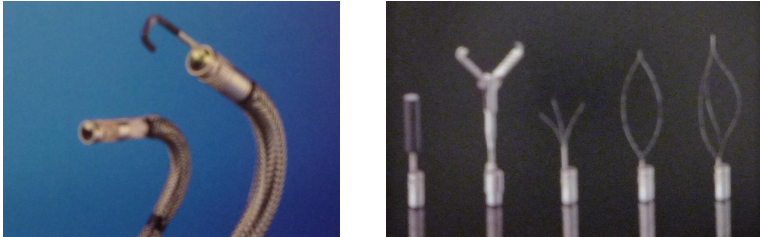
Concept of Ultra-sonic tool To flatten beads and pits



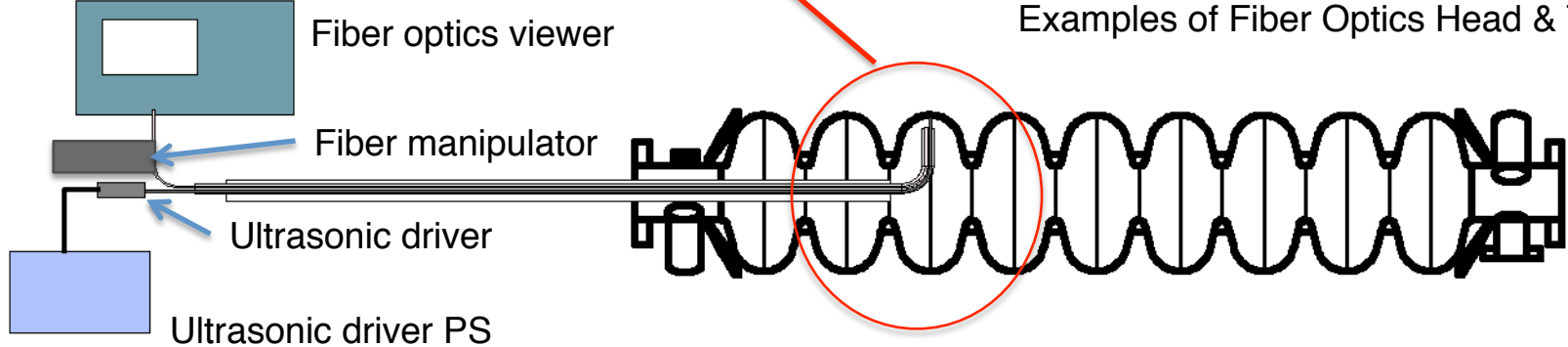
Concept of Ultra-sonic tool application to cavity cell repair



Fiber Optics Viewer & Manipulator



Examples of Fiber Optics Head & Tools



Material evaluation : High sensitivity eddy current scan
-> Y. Iwashita's presentation

quench identification : Easy handle multiplexing T-map
-> Y. Iwashita's presentation

STF Cavity Surface Process Facility

Under commissioning

STF – EP system commissioning using old MHI cavity
 Picture shows acid draining by holding cavity up.
 more than 5 times EP cycle (10+40+60+60+40+ μm removal) were done.
 So far, 1.28g/l Nb melt into acid of 1100 l.

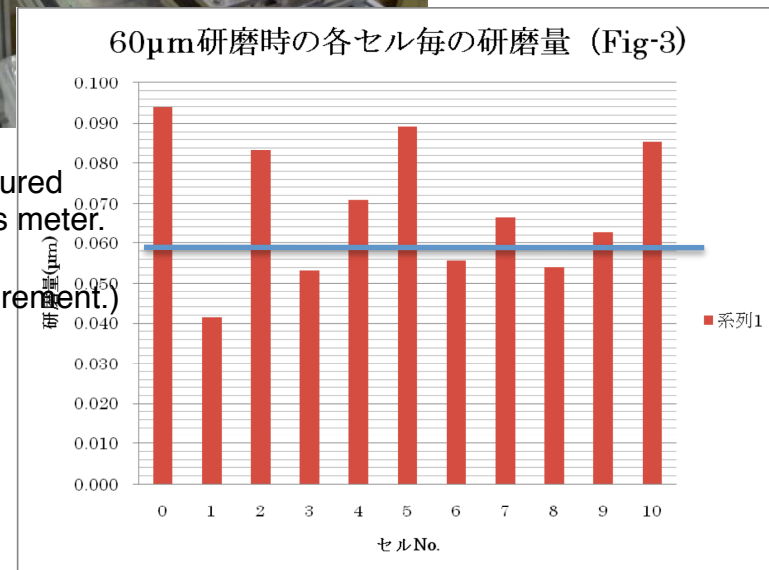


Surface check by
 Kyoto camera;
 No special residuals
 were found.



Material removal measured
 by ultra-sonic thickness meter.
 EP target was $60\mu\text{m}$.
 (Big error in the measurement.)

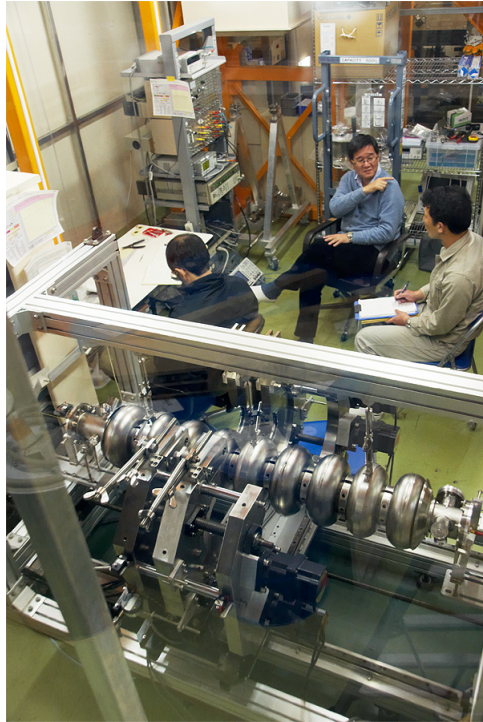
Snap shot of
 inner surface
 after EP.



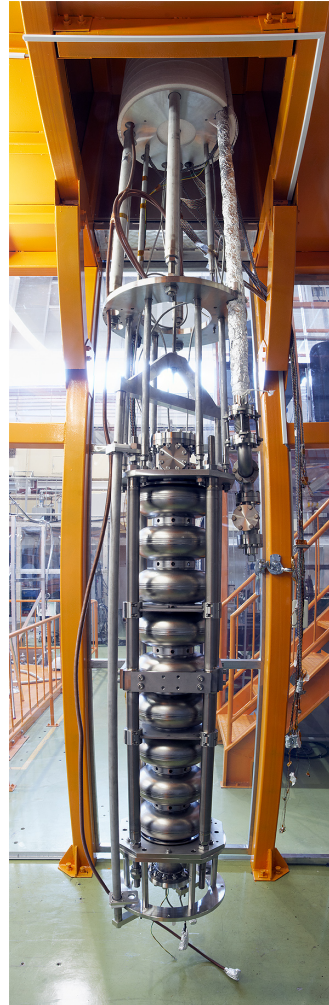
STF Vertical Stand

Thanks to FNAL AES01, STF VT is ready to commission.

*Waiting for deliver of cryostat magnetic shield.



**AES01 pre-tuning,
got 96.6% flatness.**



**Fitting test into VT cavity holder,
pumping test.**



Fitting test into VT cryostat

KEK-STF 2008 schedule rev0

