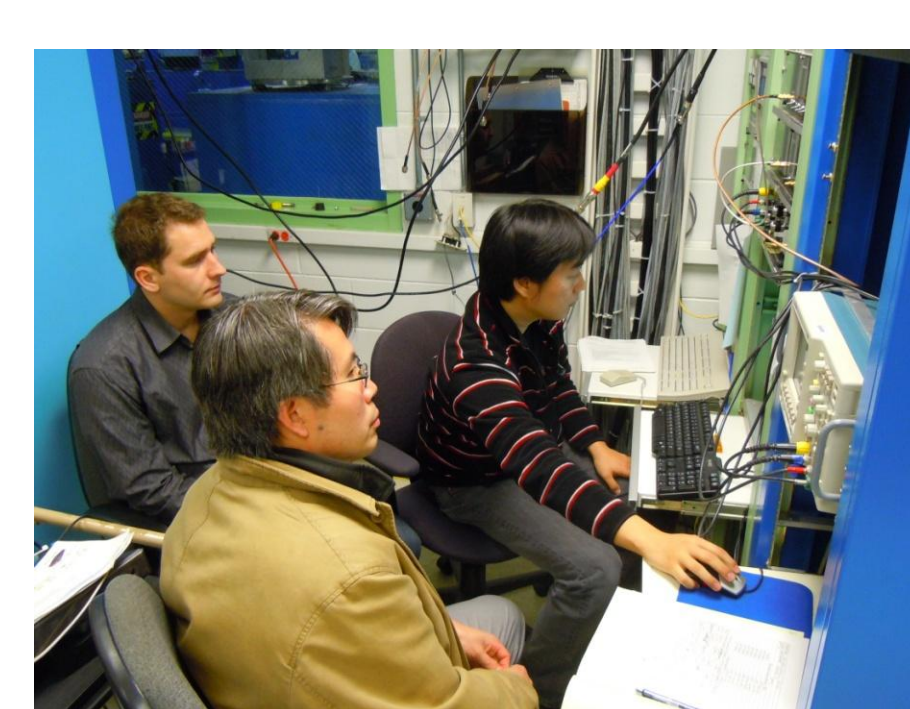


# HIGH GRADIENT RESULTS OF ICHIRO 9-CELL CAVITY IN COLLABORATION WITH KEK AND JLAB

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## ABSTRACT

KEK and Jlab have continued S0-study collaboration on ICHIRO 9cell cavities since 2008. In 2010, we have started S0 tight loop test on **ICHIRO full 9cell cavity, ICHIRO#7**. 7 vertical tests included 3 EP process were done on ICHIRO#7 at Jlab so far.

## BRIEF HISTORY OF LL/ICHIRO R&D AT KEK

- 2004** 1<sup>st</sup> ILC workshop at KEK on Nov. 2004. We have started as WG5 for ILC ACD HG cavity R&D (ICHIRO cavity, CC coupler, ball screw tuner).
- 2005** Proof of 50MV/m w/ single cell cavities, (LL, ICHIRO, RE).
- 2006** 29.3MV/m w/ first ICHIRO 9-cell (bare cavity).
- 2007** Establishment of HG recipe for single,  $47 \pm 2$  MV/m w/ 6 IS cavities.
- 2008** Jlab/KEK S0-study on ICHIRO#5 (bare cavity) 36.5MV/m @ JLAB, 33.4MV/m @ KEK.  
STF 0.5: High power test for one cavity package, BL, ICHIRO both succeeded operate at ~20MV/m.  
STF 1 started w/ BL cavity shape.  
**Reorganized WG5, FTE was reduced** (Saito and Furuta)  
Concentrate on Ichiro HG cavity. R&D budget is ~1% of KEK ILC budget.
- 2009** KEK-STF EP facility ready.  
Nomura EP facility shut down in summer.  
Re-start Nomura single EP/9-cell BCP facility in winter
- 2010** Jlab/KEK S0-study on ICHIRO#7 (full cavity)
- 2011** Jlab/KEK S0-study on ICHIRO#8 (full cavity) will start



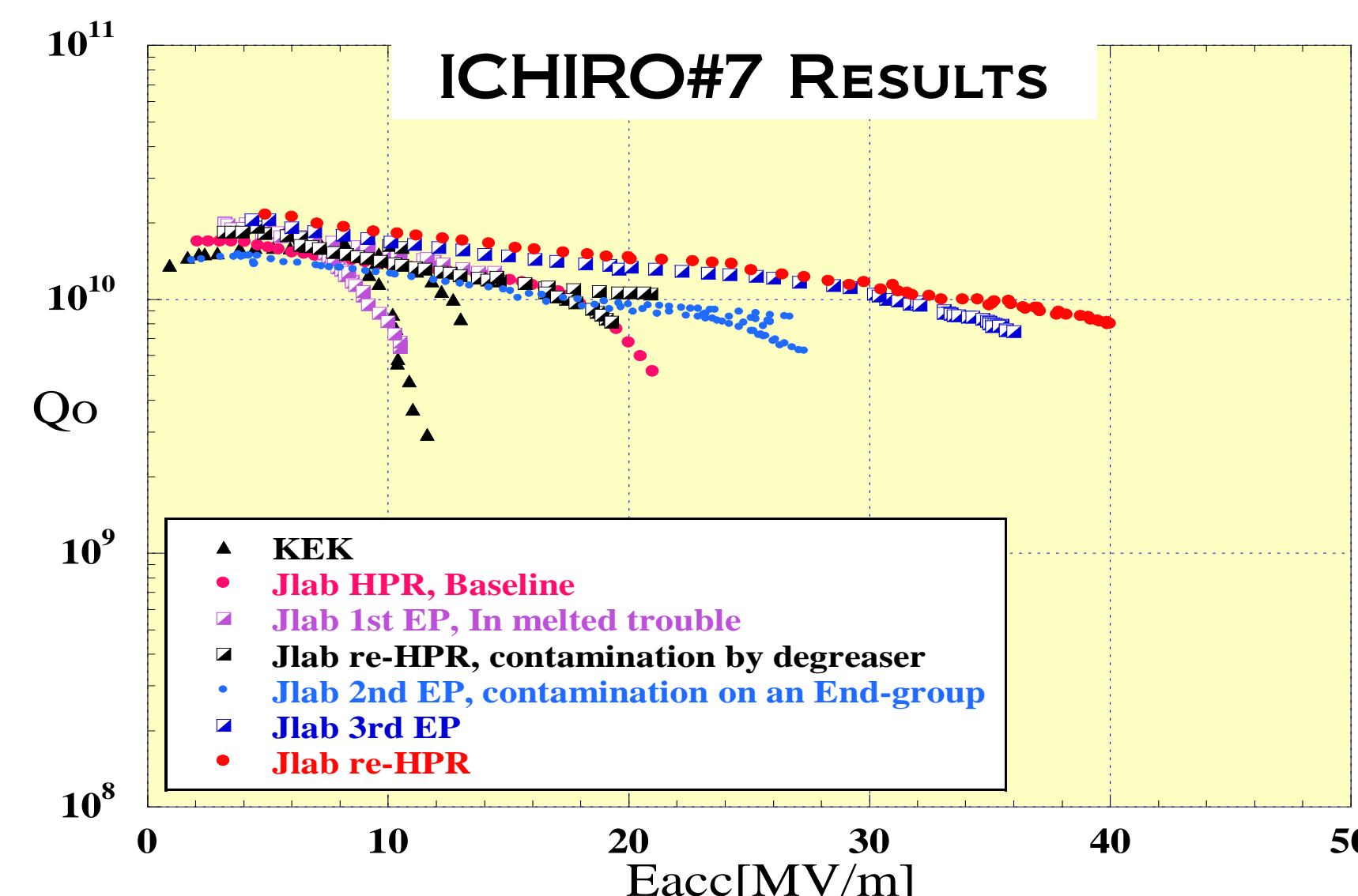
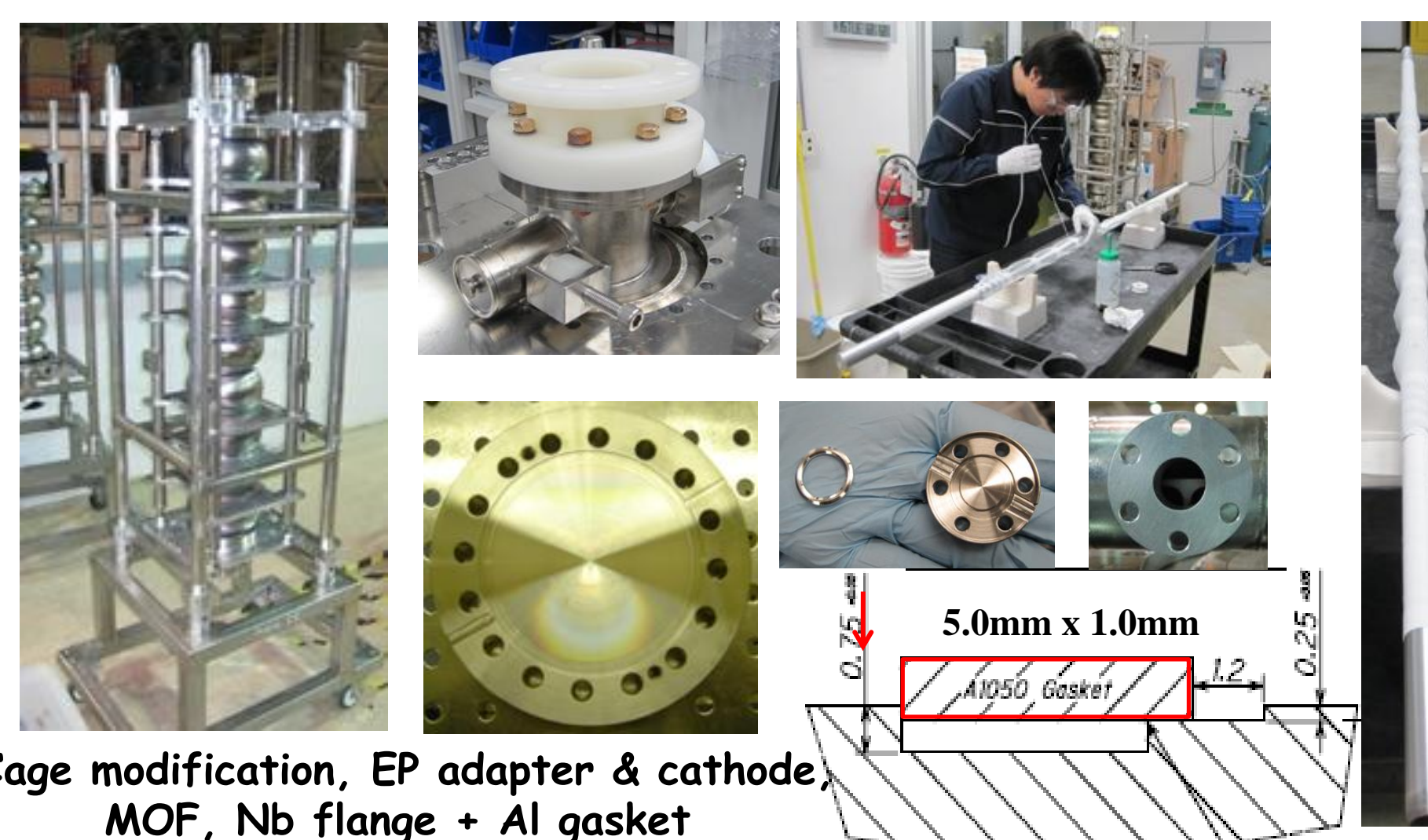
## ICHIRO#7 SO-STUDY AT JLAB, TIME LINE



ICHIRO#7  
w/ end groups

2010 Feb.	March	April	May	June	July
2weeks, Fumio, Kenji 1 RF test (baseline)				10weeks, Fumio 3 RF test (2 EP, 1 re-HPR)	
Aug.	Sep.	Oct.	Nov.	Dec.	2011 Jan.
	SSTIN @Jlab Fumio, Kenji		13weeks, Fumio 3 RF test (1 EP, 1 re-HPR, 1 re-test w/OSTs)		

## ICHIRO#7 INSTALLATION TO JLAB AND COMMISSIONING, 2010 JUNE ~ AUG.

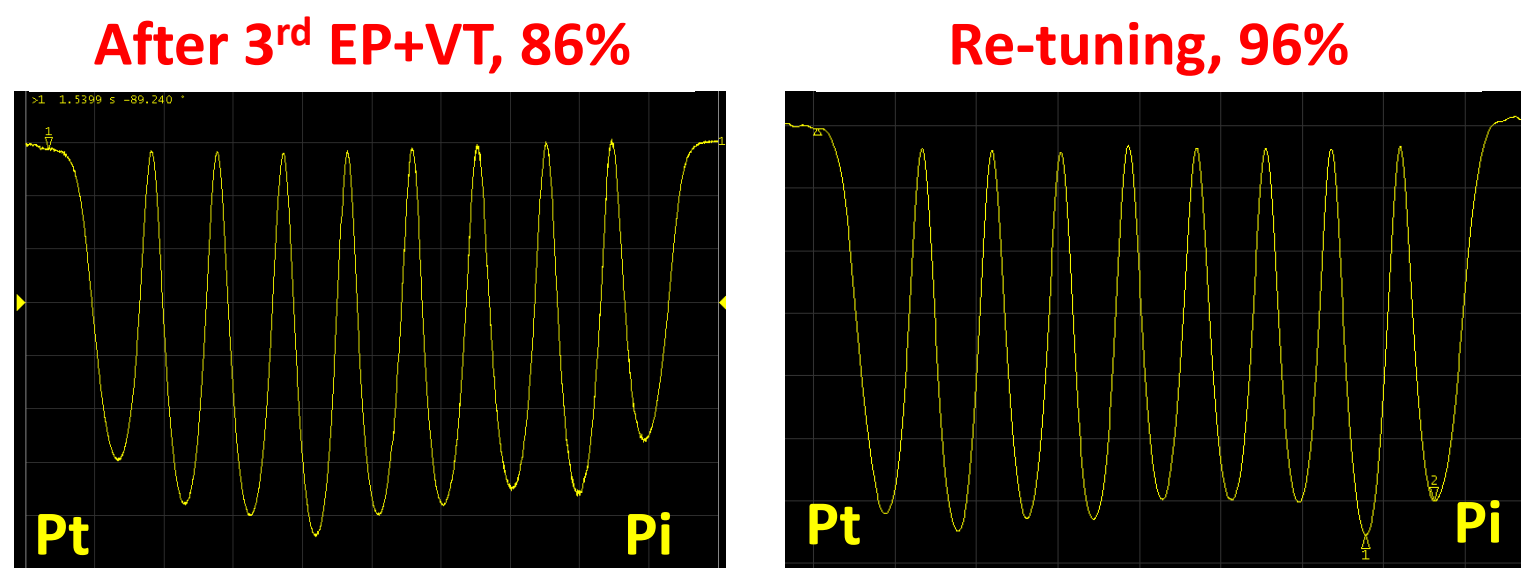
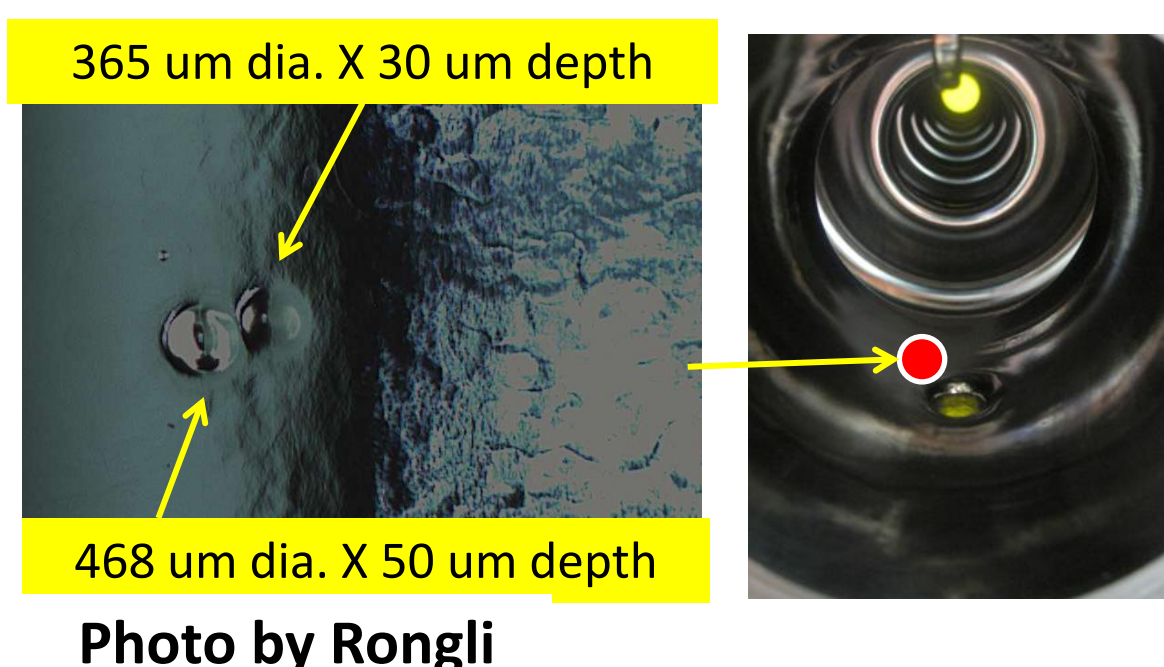


## RE-START ICHIRO#7 SO STUDY FROM 2010 NOV. ~

\*After VT4, features on an end-group and flatness degradation were found.

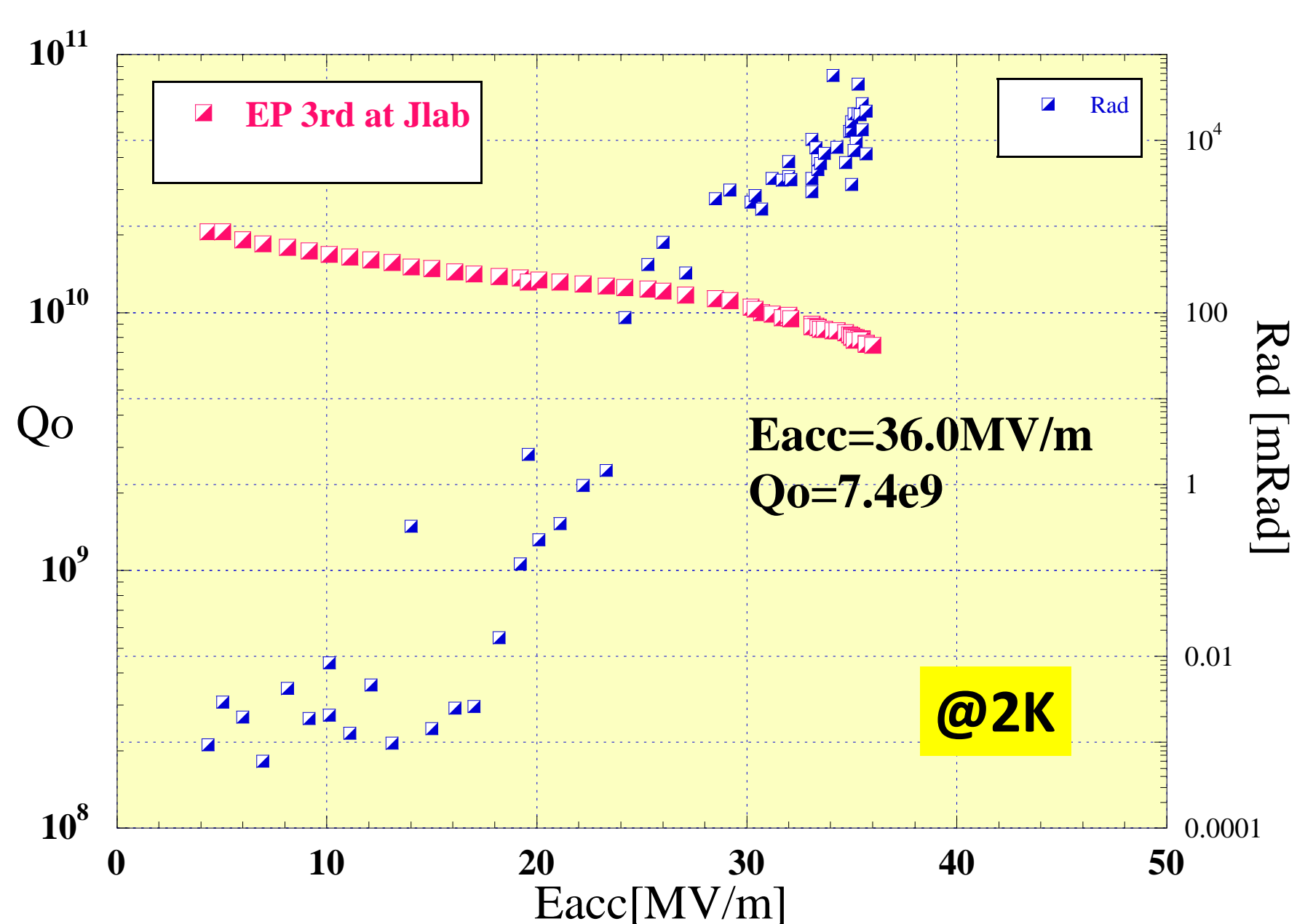
(1) Defects were found on an end group.  
→ Polish by Scotch-Brite by Fumio.

(2) After 3<sup>rd</sup> EP + VT, Flatness was degraded to 86%.  
Cavity was tuned again up to 96% by Fumio



\*ICHIRO#7 was EP'ed (20um) again and tested.

Results of VT5, after EP 3<sup>rd</sup>, Nov. 24<sup>th</sup> 2010

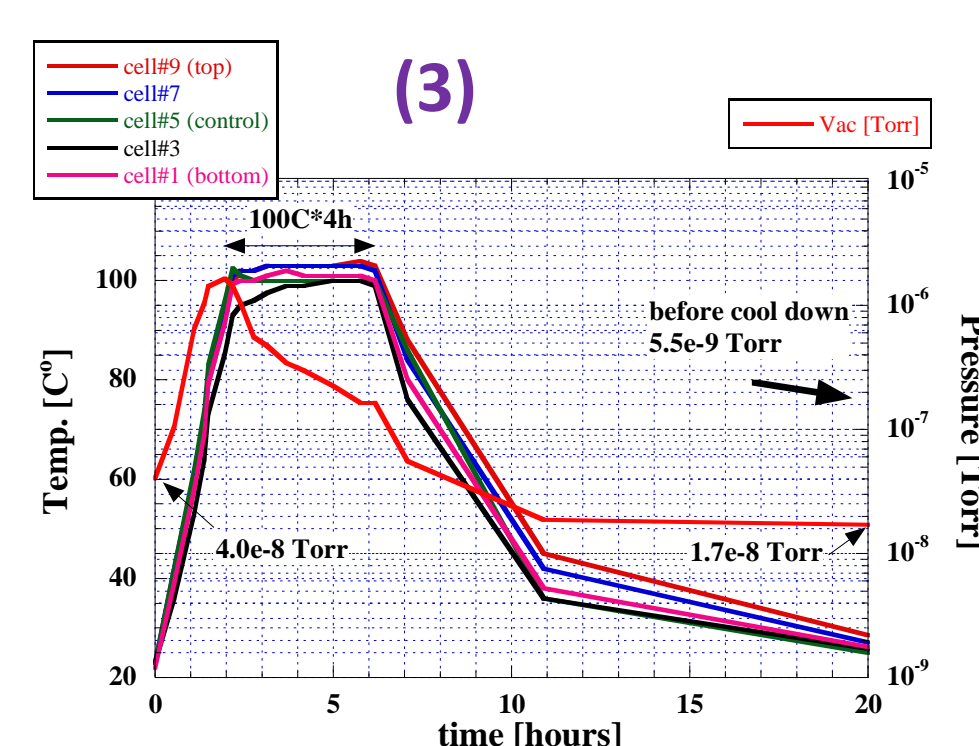


\*Achieved 36MV/m, but high radiation.

Re-HPR was applied to reduce radiation.

- (1) Additional HPR for end groups & full cavity.
- (2) put isolation valve.
- (3) short bake for degassing.

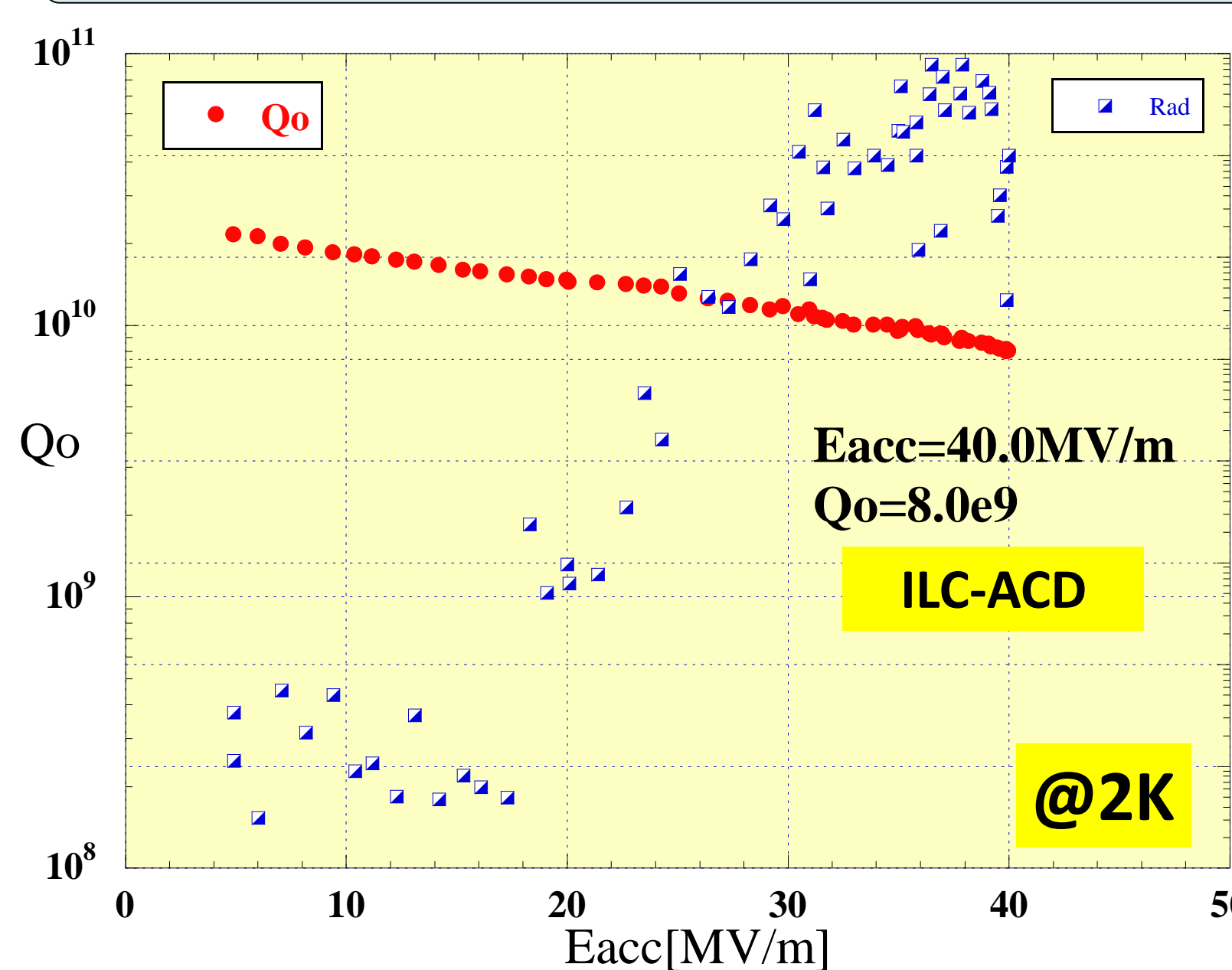
(1) (2) (3) (4) (5) (6) (7) (8) (9)



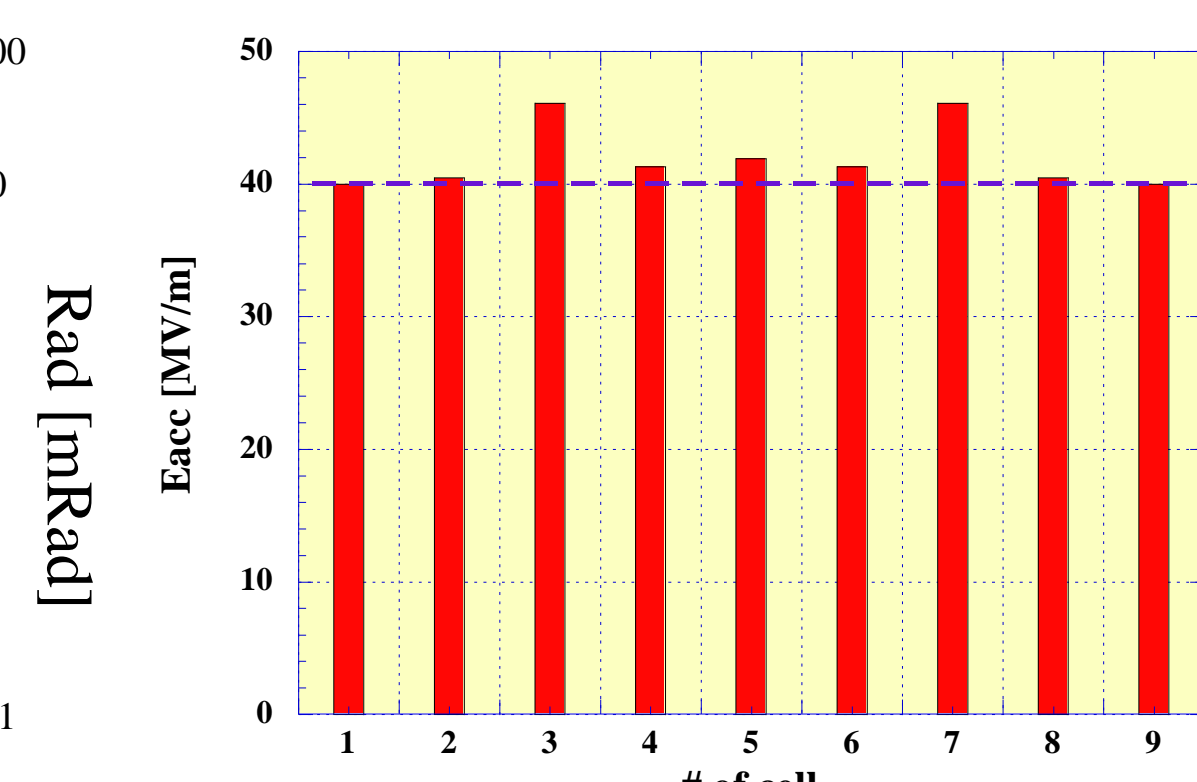
Re-HPR after VT5

## ICHIRO#7 HIGH GRADIENT RESULT AT JLAB

Results of VT6, after re-HPR, Dec. 14<sup>th</sup> 2010

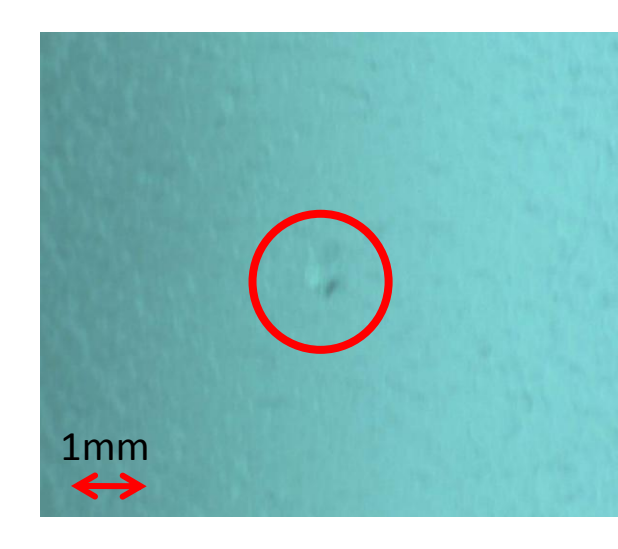
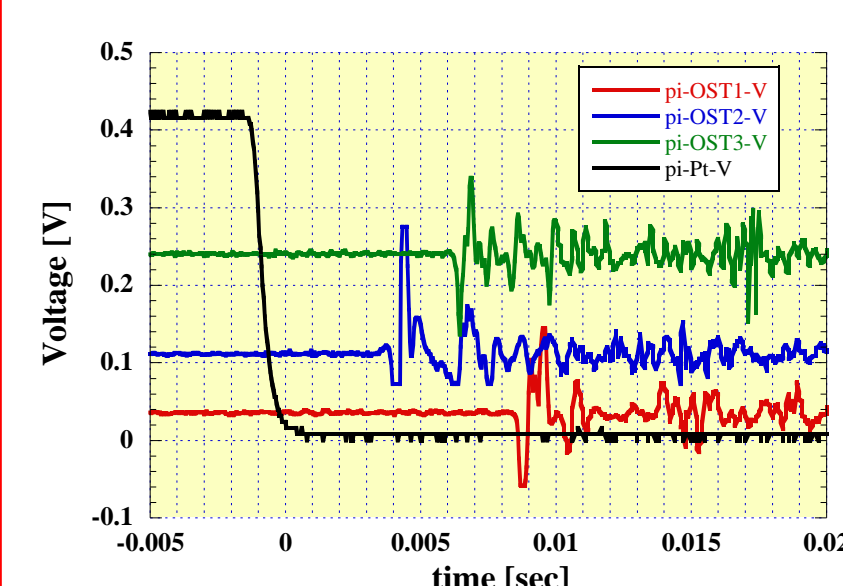


\*ICHIRO#7 achieved ILC-ACD spec of  
Eacc=40MV/m w/ Q0=8.0e9 at 2K.



\*pass-band analysis consistent  
with pi-mode results.

OST analysis at VT7, Jan. 15<sup>th</sup> 2011

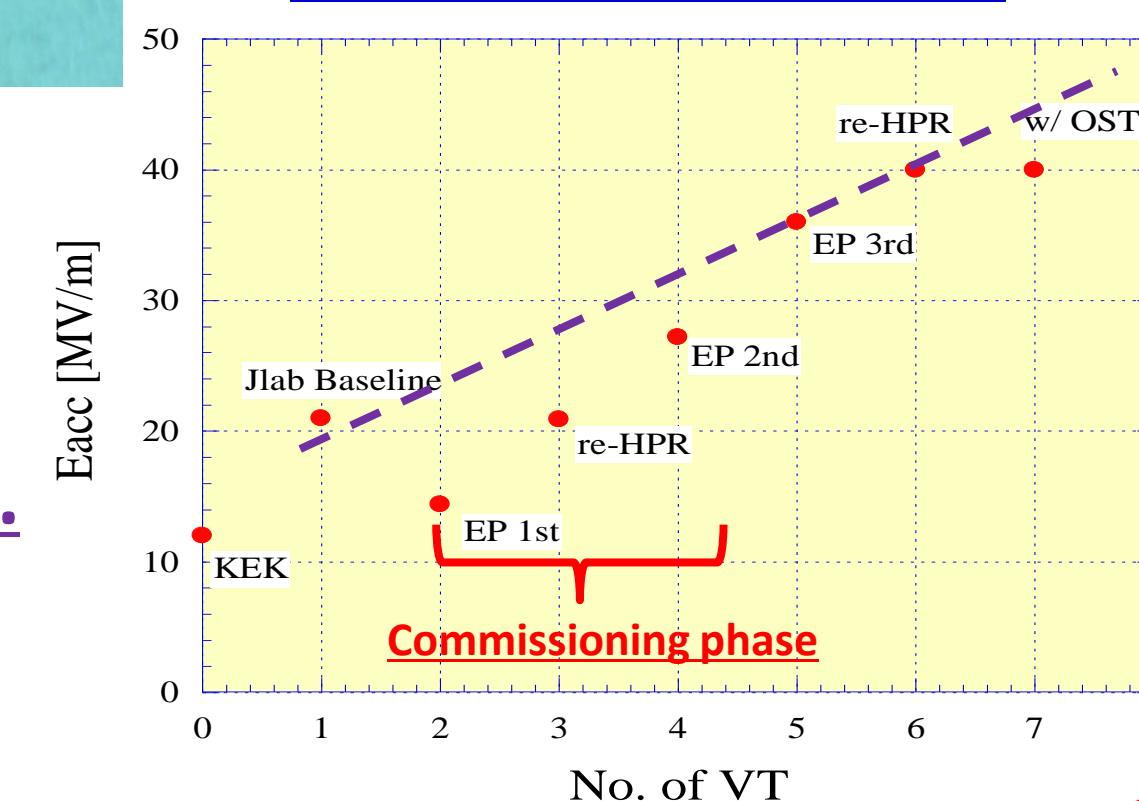
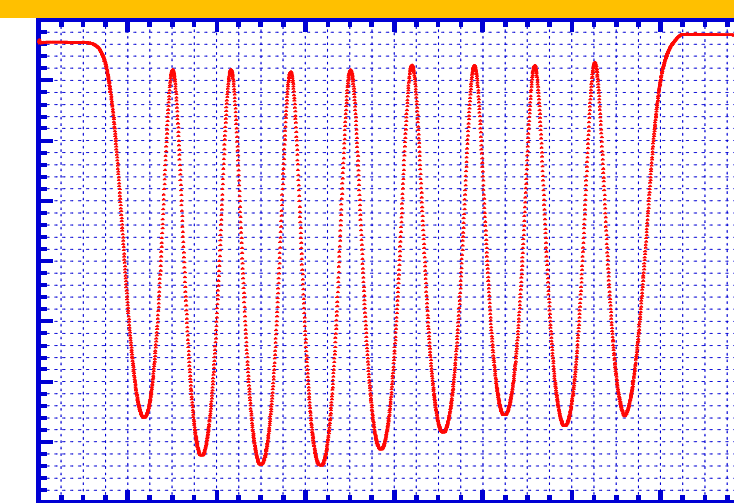


\*OST predicted quench location at cell#8.  
a feature was found, but seems not critical.

\*Data cross-checking were done and confirmed.

\*>45MV/m seems to be possible by next EP.

Flatness after VT : 94%



## DISCUSSION

1. What is the source of high radiation? MOF?

>R&D on going with MOF single at KEK.

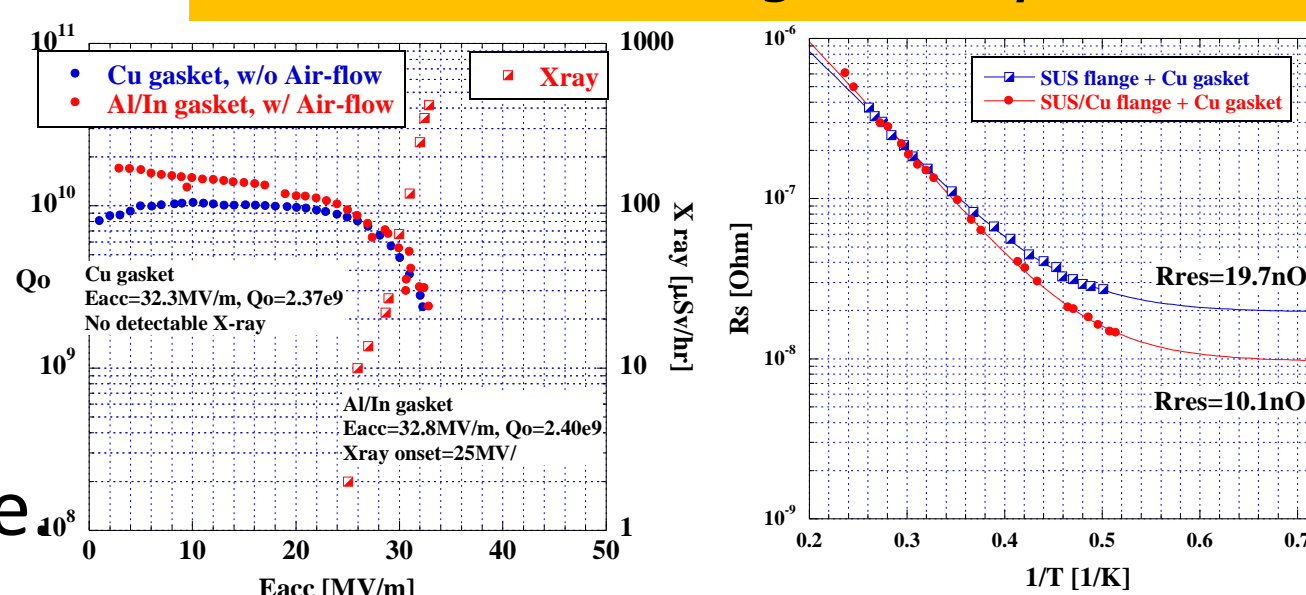
>Cu gasket, air-flow assy, Cu/SUS flange, etc.

2. What we need for 45~50MV/m?

>Understand and eliminate high radiation source

>Variable coupler, Effective post EP cleaning, etc.

## R&D w/ MOF single cavity at KEK



\*Reduce R<sub>res</sub> w/ SUS/Cu  
flange, improve Q<sub>0</sub>



## SUMMARY

1. ICHIRO#7 has achieved Eacc=40MV/m, Q0=8.0e9 at Jlab, satisfied ILC-ACD.
2. Reduction of radiation and Post EP cleaning are key for 50MV/m w/ ICHIRO.
3. R&D on MOF single is on going at KEK, results will feedback to ICHIRO#7.
4. >45MV/m seems to be possible by additional EP process.
5. S0-study on ICHIRO#8(full cavity), already sent to Jlab, will start soon.

Thanks to Jlab and colleagues for ICHIRO S0 collaboration!!