

WG2: Summary EP, new treatment infrastructure

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Conclusions:

- At Frascati TTC meeting we identified many new rinsing / cleaning methods after EP to reduce field emission – list generated
- At KEK TTC meeting we focused efforts on two areas, one QA of electrolyte and second was basic study reducing spread in performance (better rinsing methods)
- At FNAL TTC meeting – results from both rinsing methods and better QA were presented
Now a better understanding is emerging

Progress towards S0:

KEK:

- One group -14 Vertical tests completed
- Results gradients are limited by quenches around 20MV/m and one reached **28.5MV/m**
- Limits were diagnosed with thermometry each test
 - Quenches equator welds EBW?

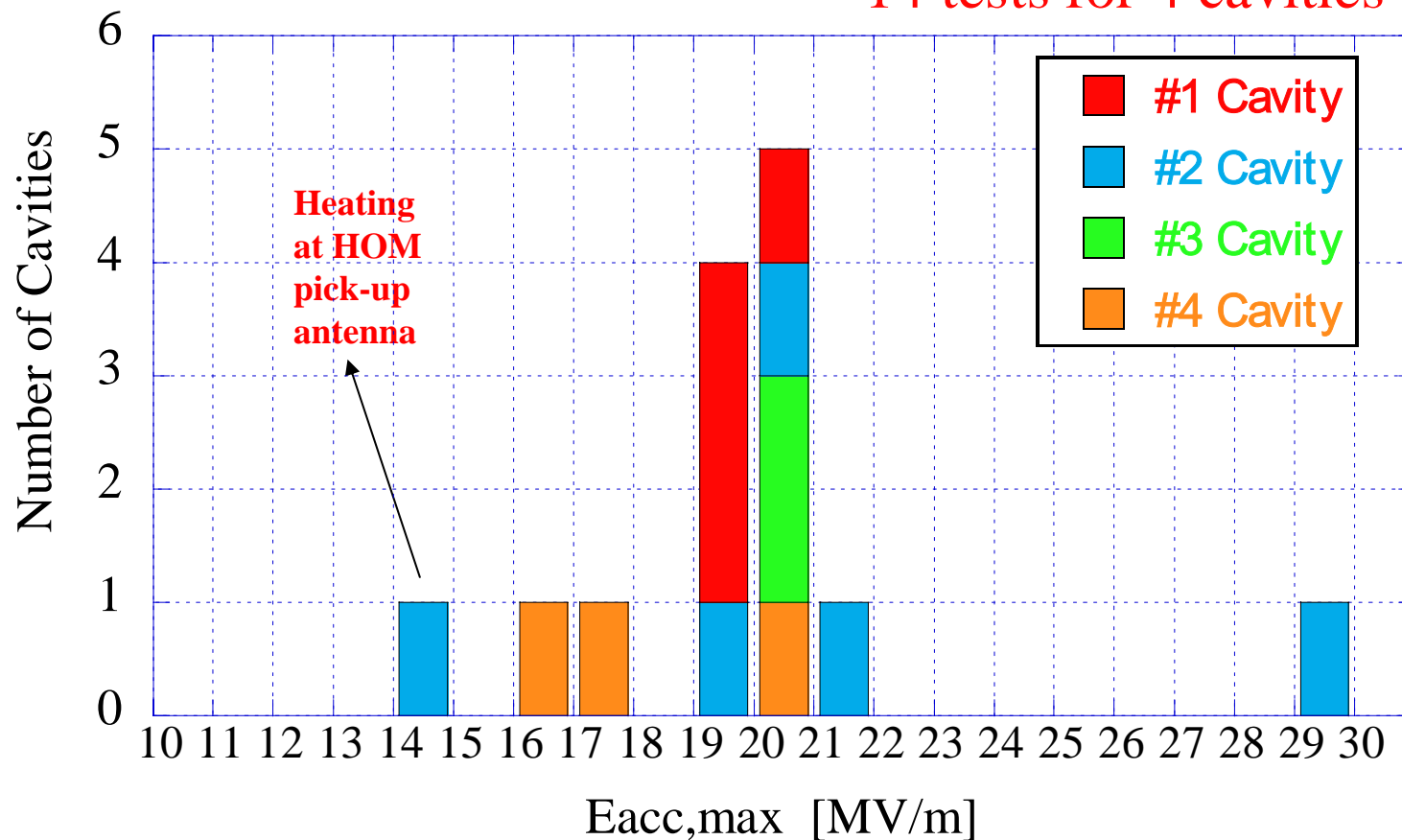
KEK just starting with tight loop studies, new cavity processing facilities under construction and will be completed June or July

Vertical Test Results, $E_{acc,max}$

One Result ;
a final performance
after processing in one surface treatment

Ave. $E_{acc,max}$ = 20.3 MV/m
Limitation \rightarrow Quench

14 tests for 4 cavities



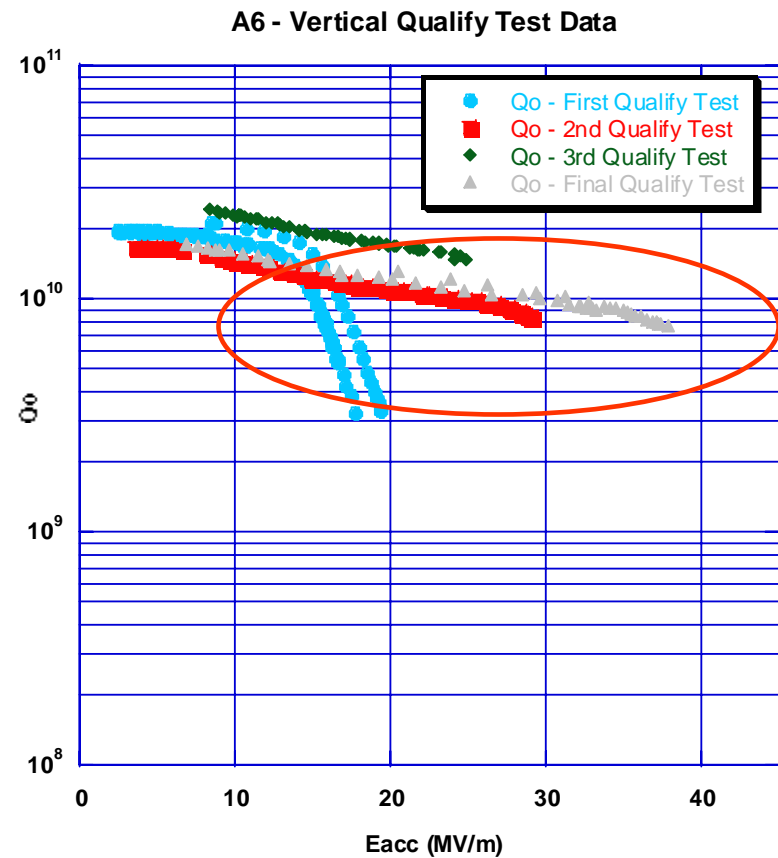
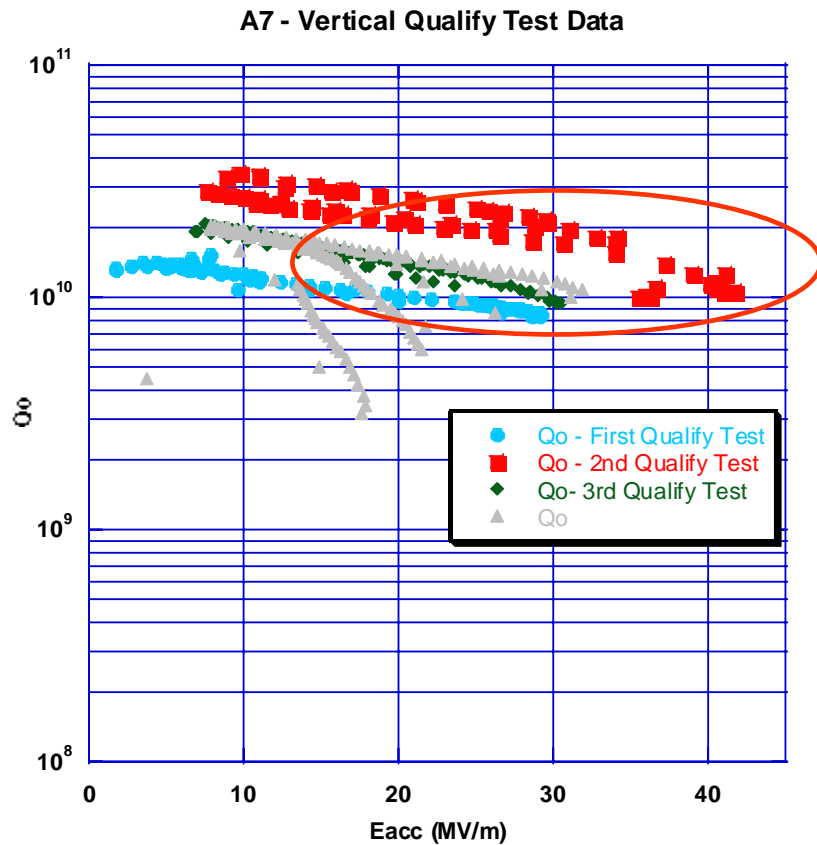
Progress towards S0:

JLab:

- 11 Vertical tests completed
- Tight loop process fully underway
- Much reduction in field emission below 30MV/m
- Two cavities qualified for S0 31.8MV/m and 38MV/m
- Highest gradient greater than 40MV/m
- Currently qualifying new USA cavity vendor

Great start towards S0, successfully implemented degreasing method to remove sulfur after EP

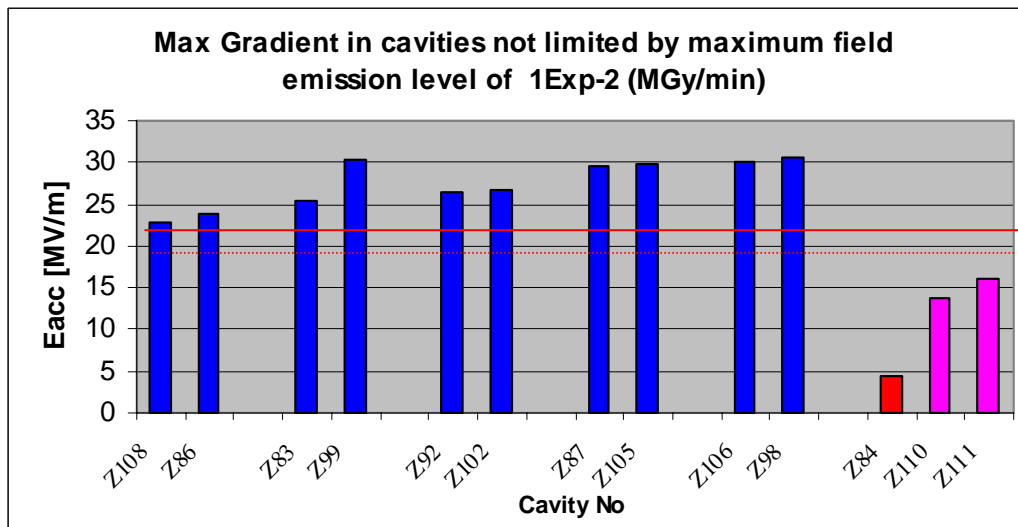
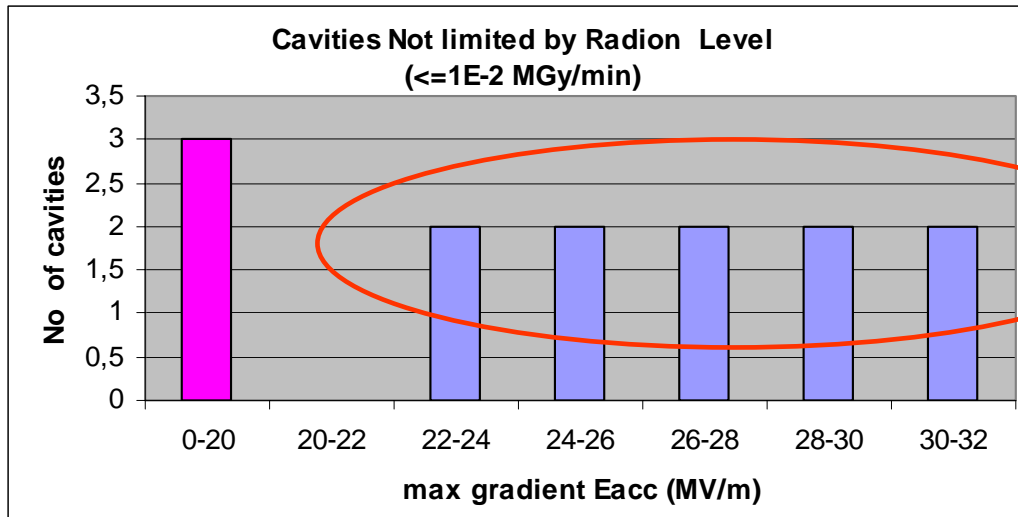
Large distribution of quenches!!



Progress towards S0:

- DESY started acceptance testing for XFEL
 - $E_{acc} > 25 \text{ MV/m}$
 - Radiation level $< 10^{-2} \text{ mGy/min}$
- High success rate with modified procedures
 - EP / Alco rinse/ bake 3 (3)

Details on Results



■ Q disease
■ Fab. error

Summary of 9-Cell Testing:

JLab:

- 11 Vertical tests completed
- Only one limited by field emission
- Large distribution of quenches even with repeated tests of same cavity

Single cell efforts:

Saclay – developed a nice single cell EP system for basic studies

- Promising result with alcohol rinsing

DESY – dedicated study for XFEL program

- Single crystal results are good 42MV/m

KEK – concentrated on ILC process development

- Reduction of scatter
- Fresh EP method 4% scatter
- Reduction of Multipacting demonstrated
- Analysis of F⁻ during process (Nomura Plating/KEK)



April 21st, 2007

John Mammosses, Jlab

	Eacc,max [MV/m] / Qo @ Eacc,max									Emax average [MV/m]	Scatt. [%]	MP	Acceptability @ 40M V/m [%]
	IS#2	IS#3	IS#4	IS#5	IS#6	IS#7	IS#8	CLG#1	CLG#2				
CBP+CP+AN+EP(80)+HPR+ Bake	36.9	31.4	45.1	44.2	48.8	28.3				39.1 ± 8.2	21	Yes	50
	1.53E1 0	8.66E9	9.07E 9	5.38E9	9.64E9	1.94E9							
CBP+CP+AN+ EP(80+3 fresh) +HPR+Bake		42.0	46.1	44.3	34.3	39.3			43.8	41.7 ± 4.4	11	Yes	67
		9.72E9	9.47E 9	1.08E1 0	8.56E9	1.03E1 0			3.46E9				
CBP+CP+AN+ EP(40+3 fresh) +HPR+Bake	43.9						49.2*			46.6 ± 3.7	8	Yes	100
	9.47E9						4.33E9						
+EP(20)+HPR+Bake	47.2	52.2	52.9	31.1	48.9	46.5				46.4 ± 8.0	17	Yes	83
	5.98E9	1.51E1 0	5.23E 9	5.21E9	7.56E9	9.03E9							
+EP(20+3 fresh)+HPR +HF+Bake	47.1	44.7	47.8		48.6	43.9		47.9		46.7 ± 1.9	4	Yes	100
	1.06E1 0	9.80E9	7.80E 9		8.00E9	1.17E1 0		1.00E1 0					
+EP(20)+H ₂ O ₂ +HPR+ Bake	52.3			34.1	43.4	40.9				42.7 ± 6.0	18	Light	50
	1.09E1 0			1.37E1 0	1.39E1 0	3.01E9							
+EP(20)+Degreasing (US)+HPR+ Bake	50.1	52.2								51.2 ±1.5	2.9	Light s	100
	7.80E10	7.08E9											
Others Megasonic													

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IS: Ichiro center cell shape, Tokyo Denkai polycrystalline Nb material

CLG: NingXia Large grain, Ichiro center cell shape

Conclusions:

- Control of field emission being addressed differently at each lab
 - Degreasing at JLab
 - BCP+Alcohol rinse at DESY
 - Fresh Acid +Ozone water rinse at KEK
 - Limited success so far
 - Field emission has been reduced (JLab above 30MV/m) but not eliminated
 - There is a possibility that even small amounts of x-rays could be the cause of the early quenches?

Need a consistent approach to addressing field emission and currently not one single method has enough evidence to support global implementation
This should be our highest priority!!

Conclusions:

- Quench limits ?
 - In most cases quenches are reached in vertical qualifying tests –good news!
 - What is disturbing is the spread in performance and the majority are below ILC specifications
 - It is not clear that we understand what these limits really are (MP? or FE induced) and there is an inconsistent approach in the testing methods to quantify this type limit
 - Some using T-maping
 - Some established complicated and long processing times
 - Some have done little to understand (myself)

Need to focus effort on better understanding of mechanism and possible develop solution (new cleaning method?)