



Recent result of ERL injector 2-cell cavities.

K. Watanabe (KEK) and STF cavity group.21st ILC cavity group meeting, 16/March/2010



## About ERL injector 2-cell cavities



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Proto-type model (fabrication at 2008)

ERL injector 2-cell cavity #1 (KEK, made by MHI)

Four HOM coupler equipped beam pipe for strong damping. (Two antenna type and two loop type HOM couplers)

1<sup>st</sup> V.T. with HOM pickup probe was done at April 2009. (See TTC meeting in Orsay, June 2009)

2<sup>nd</sup> V.T. without HOM pickup probe was done at February 2010.



Proto-type model (fabrication at 2009)

ERL injector 2-cell cavity #2 (KEK, made by MHI)

Five loop-type HOM coupler equipped beam pipe to obtain more strong damping.

1<sup>st</sup> V.T. without HOM pickup probe was done March 2010.

2<sup>nd</sup> V.T. with HOM pickup probe will be done April 2010.



Two step test for both cavities: (1) Without HOM pickup probe, (2) With HOM pickup probe.

To estimate the cavity performance (EBW) and the HOM coupler performance (RF design).

Surface treatment: 28 Jan 2010

EP-2 : 20um, low current density (40 mA/cm2) with Air condition

1<sup>st</sup> water rinsing with Air condition. 90 min

FM-20 rinsing (2%), 50 degC 1 hour

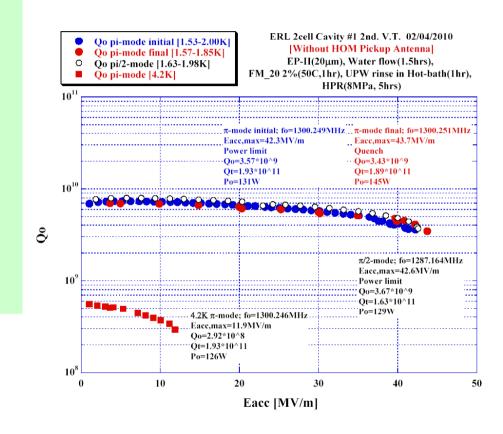
Hot bath with UPW, 50 degC, 1 hour

HPR: Total time 9 hour

Baking: 100 degC, 48 hour

Rres = 38 n $\Omega$ . (Measured)

SUS flange loss =  $23 \text{ n}\Omega$ . (Calculated by HFSS)



- •The reason of limitation was a heating of one loop-type HOM coupler at maximum field.
- •No quench at cells.



#### ERL-injector 2-cell cavity #2 without HOM pick-up probe, 1st V.T. at 04 Mar 2010

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Surface treatment: 22 Feb 2010

EP-2: 20um, low current density (30 mA/cm2)

with N2 gas flow

1st water rinsing with N2 gas flow. 90 min

FM-20 rinsing (2%), 50 degC 1 hour

Hot bath with UPW, 50 degC, 1 hour

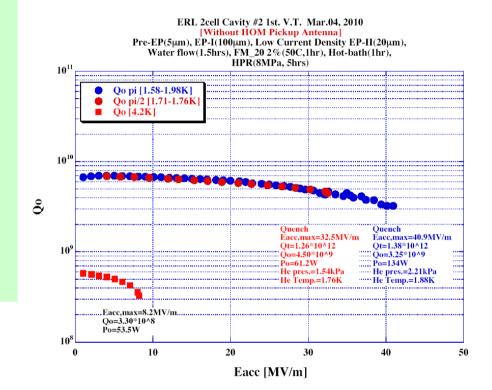
HPR: Total time 9 hour

Baking: 100 degC, 48 hour

Rres = 40 n $\Omega$ . (Measured)

SUS flange loss =  $23 \text{ n}\Omega$ .

(Calculated by HFSS)



- •The reason of limitation was a heating of one loop-type HOM coupler at maximum field.
- •No quench at cells.

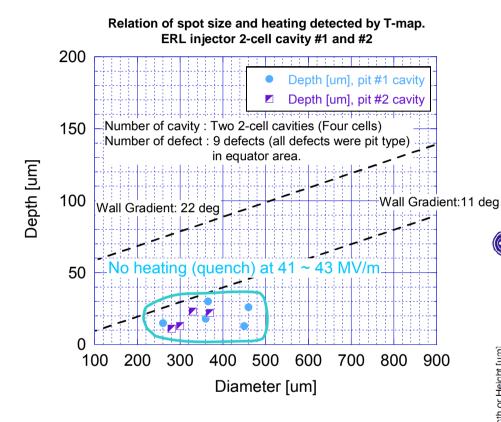


### Correlation of Geometrical spot size and hating (Rough estimation)

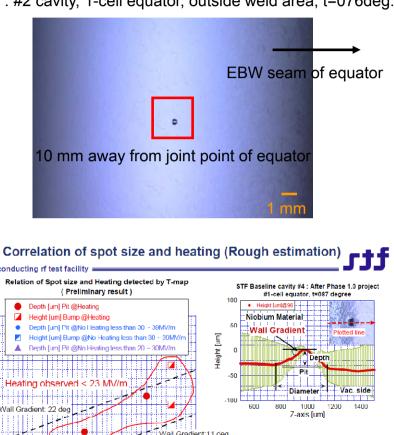


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Example: #2 cavity, 1-cell equator, outside weld area, t=076deg.



The information of geometrical spot size and field was updated.



Larger, deeper (or higher) pits (or bumps) seem to cause quenches.

- \* Not all of the optically observed detects lead to problems.
- \* Note: preliminary results of analysis which utilizes \*both\* the pimode and pass-band measurements.

STF K. Watanabe, Sept. 22 2009, SRF2009 in Belrin

150

100 200 300 400 500 600

Sample: MHI-01 ~ MHI-09, AES-01: 10 cavities

Diameter [um]

Number of cell = 90 cells, Number of detected spot = 49 spots

Depth or Height [um]







- Two ERL injector 2-cell cavities were achieved Eacc = 43.7 MV/m (#1) and Eacc = 40.9 MV/m (#2) without HOM pickup probe.
- \* The reason of limitation of both cavities was a heating of one loop-type HOM coupler at maximum field.
- The information of geometrical spot size and amount of field was updated.
- •We tried to make the low current density EP for two 2-cell cavities. The results were very successful.



# Inspection of #1 cavity after vertical test.



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