

A_RD_03

R/D for the High Power Couplers for ILC

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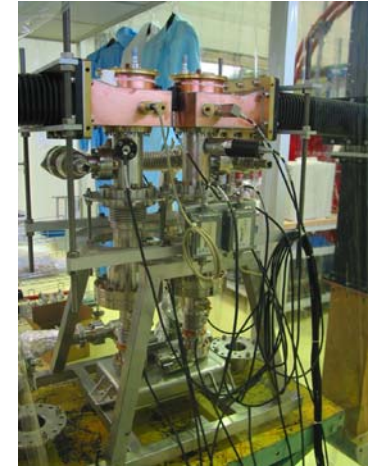
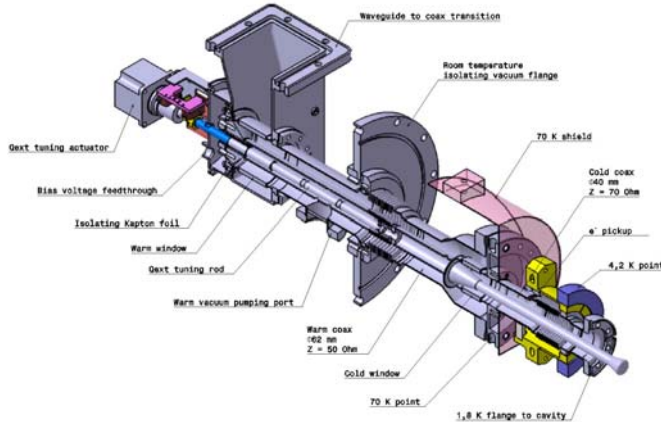
Outline

- Coupler Activities at LAL
- Coupler Activities at KEK
- LAL Coupler Processing at KEK



- Summary and Plan in 2009-2010'

- 30 TTF-III Couplers for FLASH cryomodule

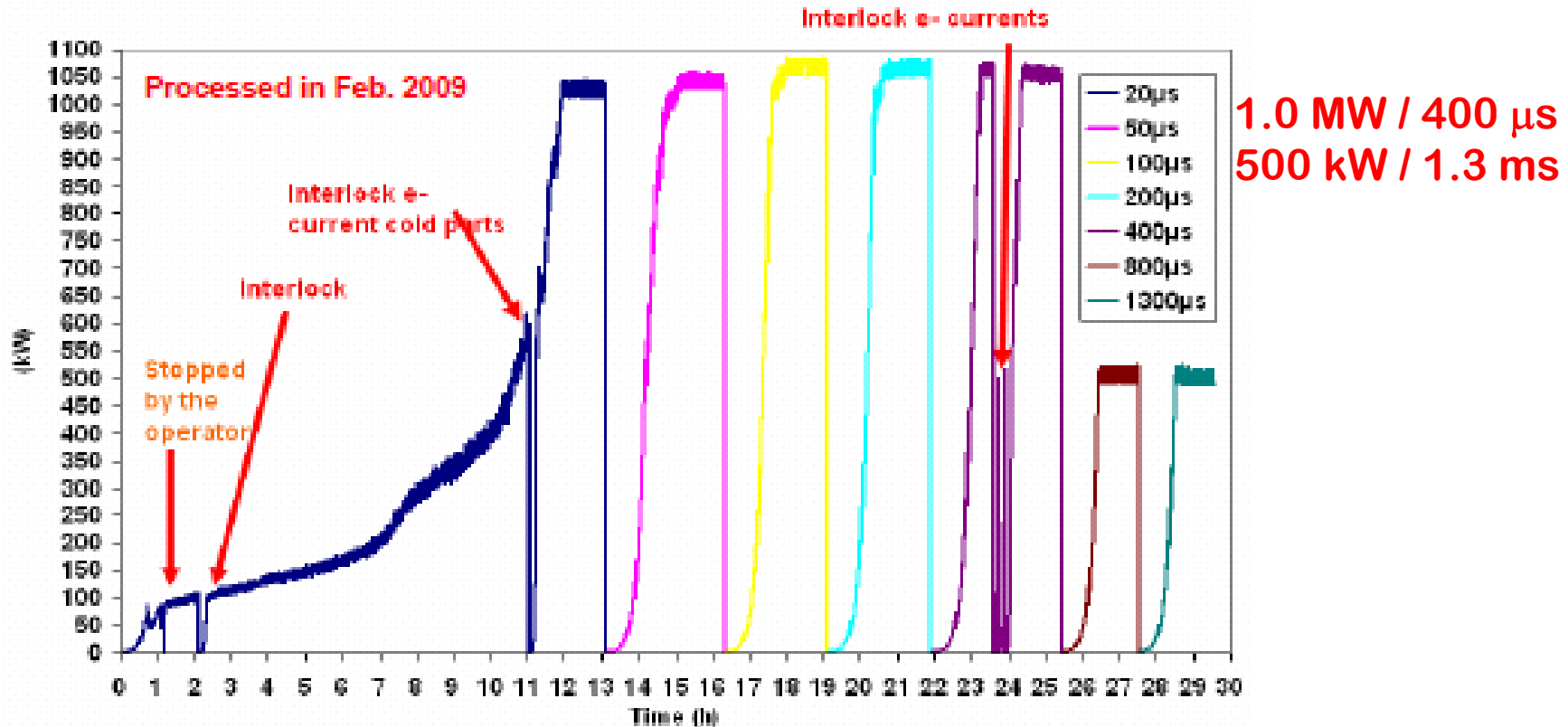


- XFEL Prototype Couplers ; Candidate 1
- XFEL Prototype Couplers ; Candidate 2
- TW-60 Couplers for future ILC project
- TTF-V Couplers for future ILC project



Coupler Activities at LAL (2)

TTF-III Coupler RF Conditioning (4Hz)



Conditioning of a TTF-III coupler pair (CP3_H45C59_H46C60) using 4Hz repetition rate instead of 2 Hz in order to have more conditioning effect. The conditioning time is comparable the usual performances.

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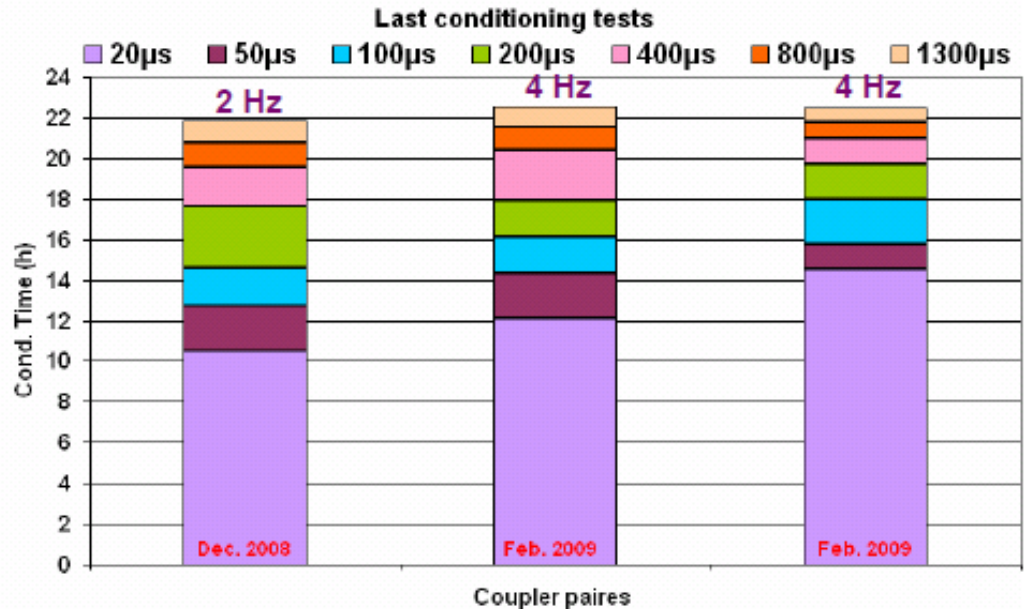
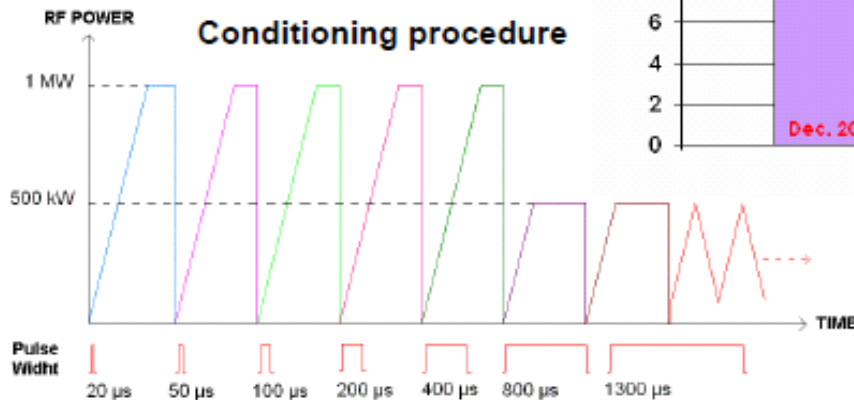


Coupler Activities at LAL (3)

Recent TTF-III Couplers conditioning Tests

Contract with DESY to condition 30 TTF-III couplers

The conditioning time of standard TTF-III couplers at LAL is almost the same, if they don't have "significant" manufacturing problems.



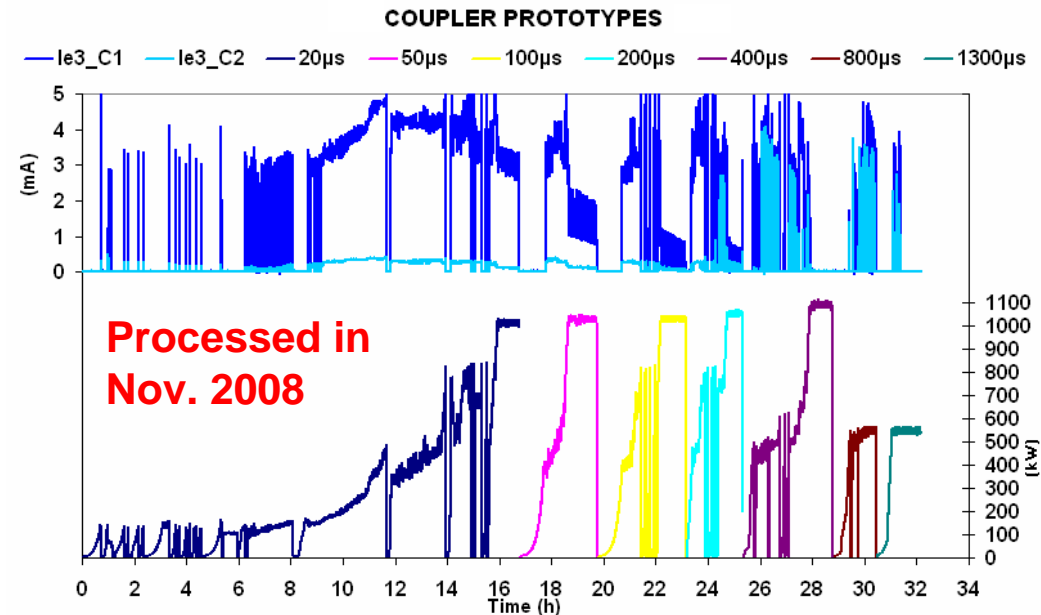
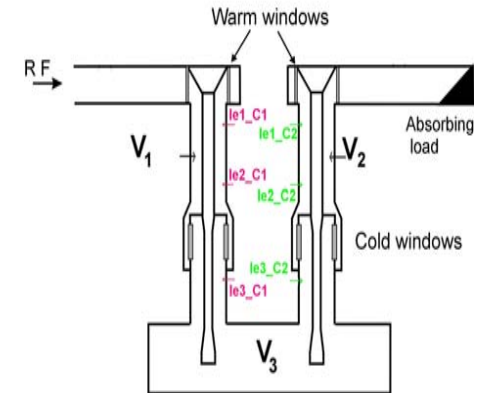
Some of the received couplers were turned back to industry of non-conformity reasons.

Hassen Jenhani, March the 9th, 2009, KEK

XFEL Coupler Prototypes ; Candidate 1



1.0 MW / 400 μ s
500 kW / 1.3 ms

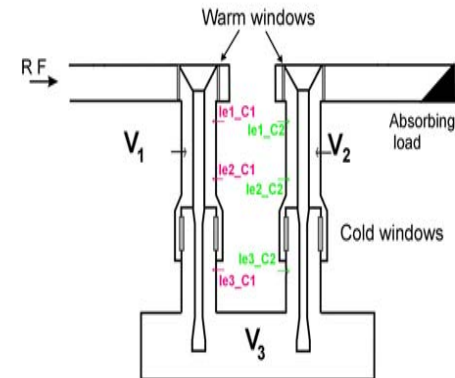


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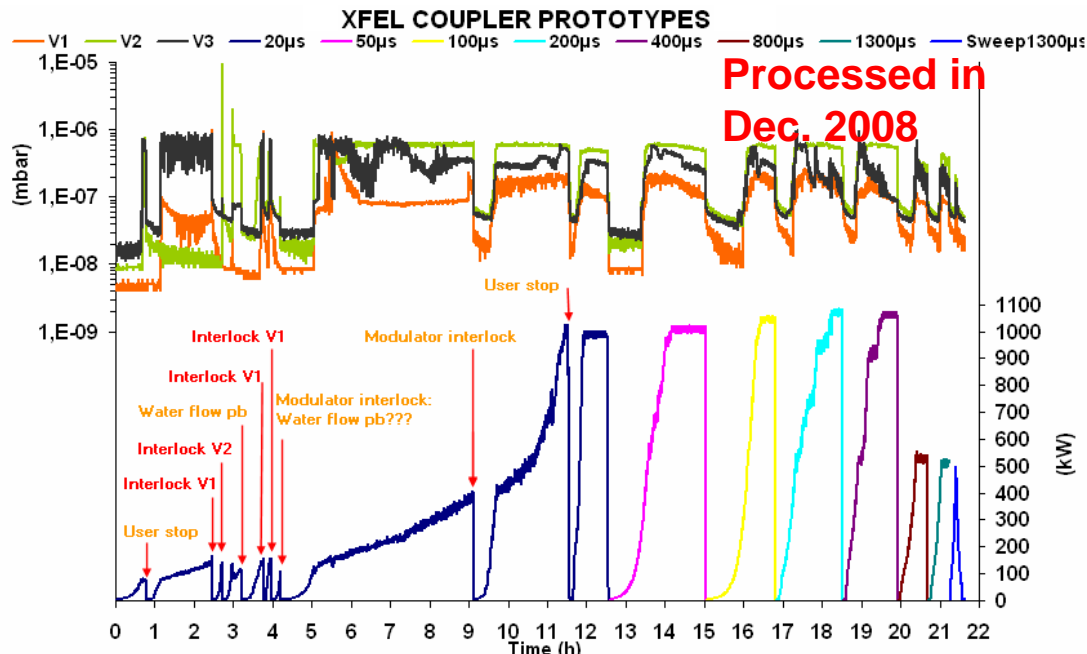


Coupler Activities at LAL (5)

XFEL Coupler Prototypes ; Candidate 2



1.0 MW / 400 μ s
500 kW / 1.3 ms



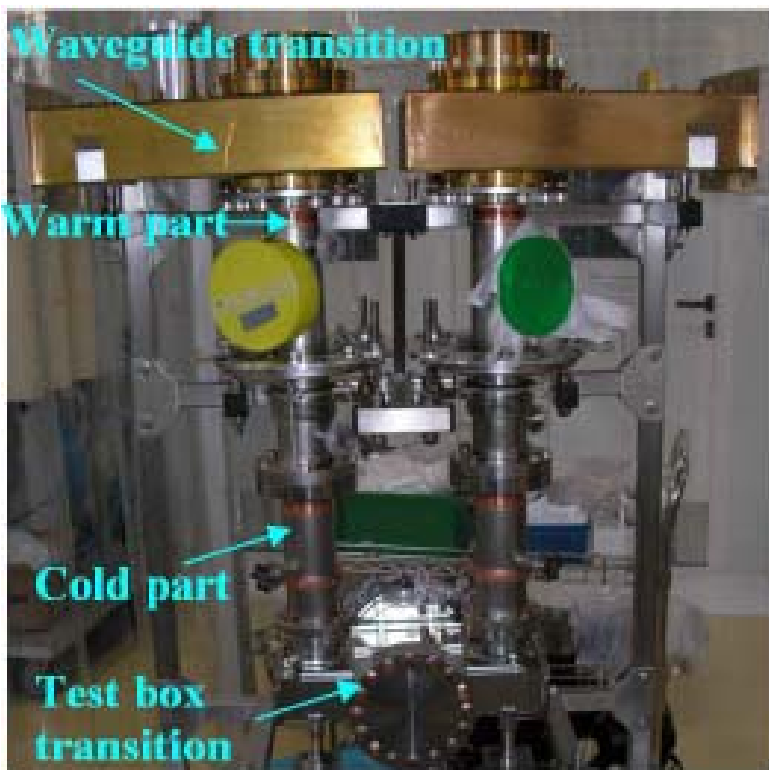
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Coupler Activities at LAL (6)

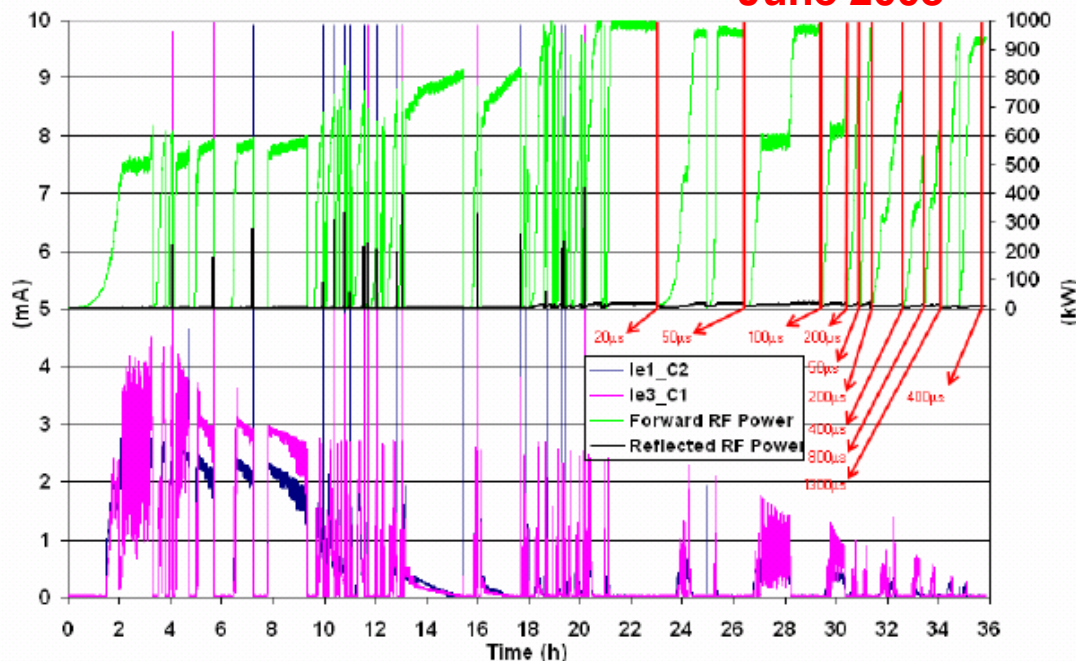
TW-60 Coupler Conditioning

Traveling Wave Type
Diameter of 60 mm



1.0 MW / 400 μ s
500 kW / 1.3 ms

Processed in
June 2008



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Coupler Activities at LAL (7)

TTF-V Couplers at LAL

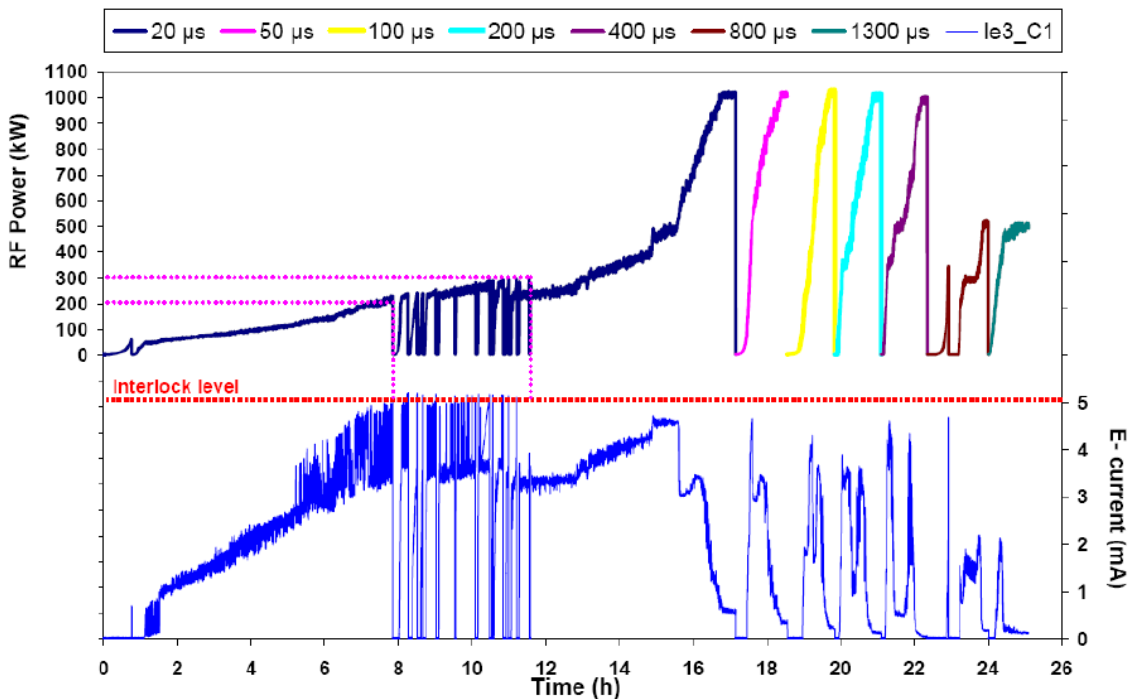
TTF-V (#1 and #2)

1.0 MW / 400 μ s
500 kW / 1.3 ms



TTF-V (#3 and #4)
at KEK

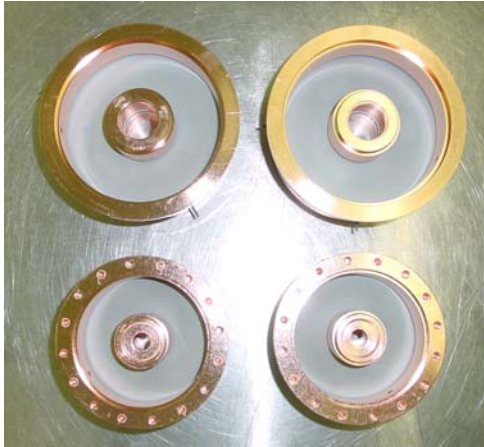
2.0 MW / 400 μ s
1.0 MW / 1.3 ms



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Coupler Activities at KEK (1)



Tristan type coaxial disk rf window



Cold couplers and warm couplers for STF phase-1 cryomodule



New input couplers for S-1 global cryomodule



New input couplers for ERL injector cryomodule



Coupler Activities at KEK (2)

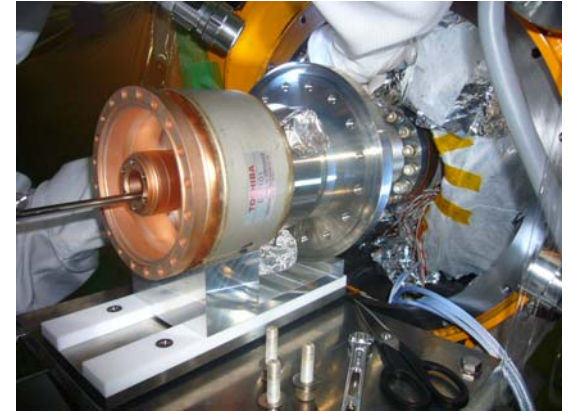
Assembly of STF phase-1 Cryomodule ; Jan.~Apr. 2008



String assembly of four cavities & Installation of cold couplers



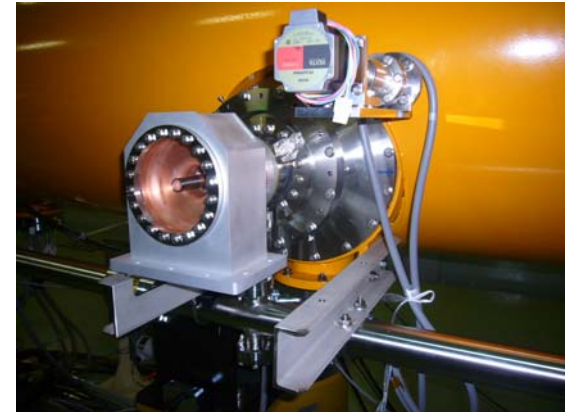
Insertion of cold mass



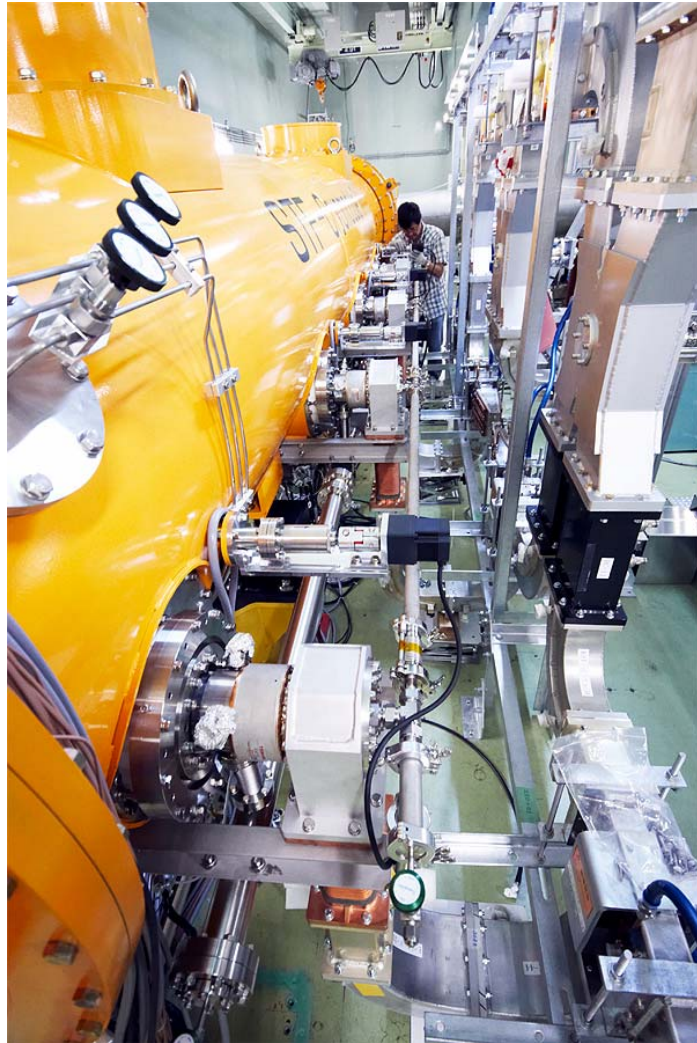
Installation of warm coupler



Completed STF cryomodule



Attachment of doorknob WG



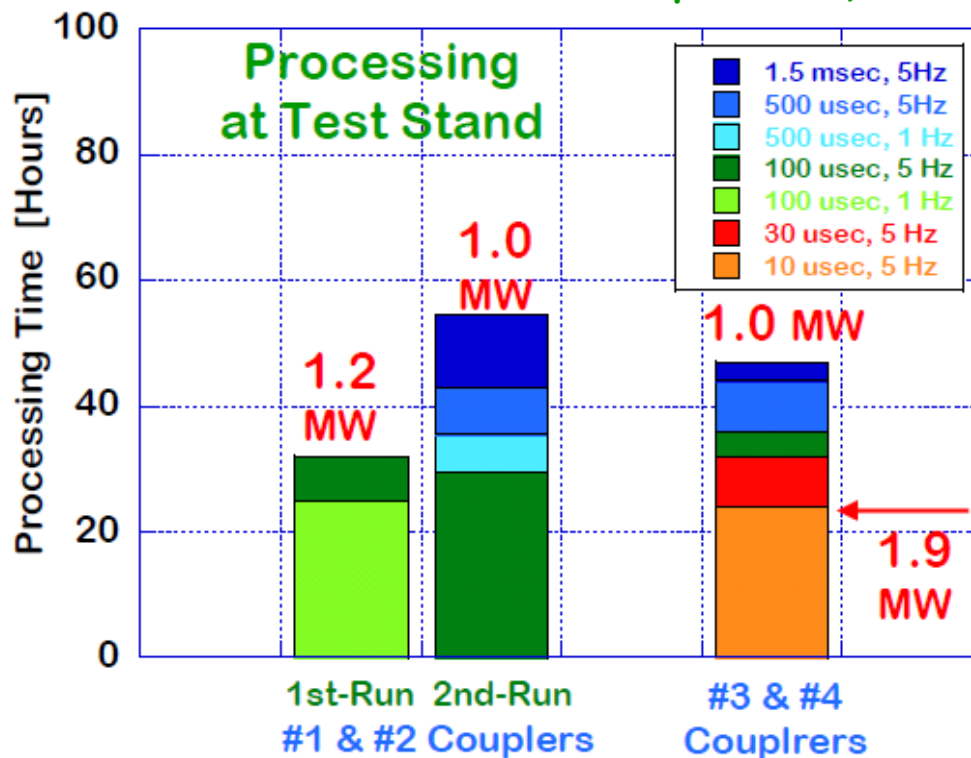
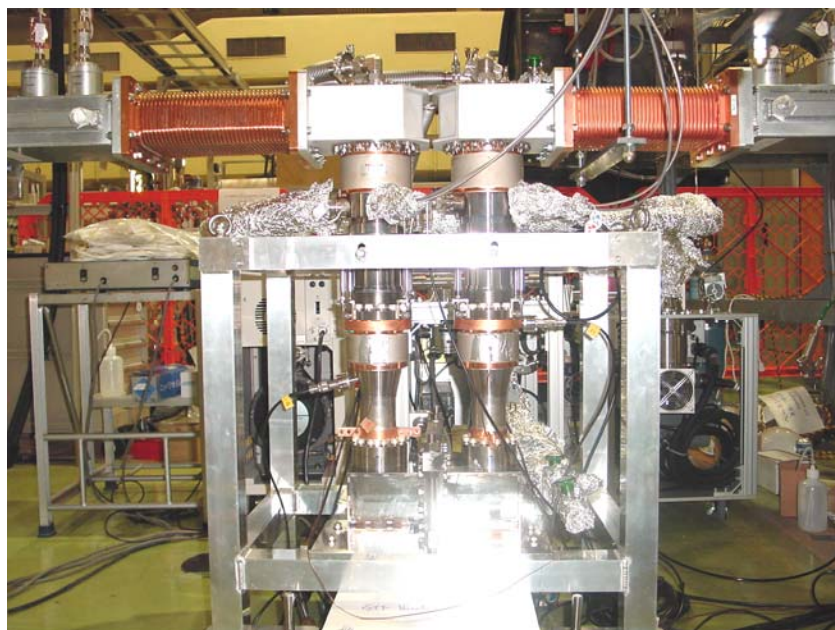
Installation of the cryomodule in the STF tunnel
Connection with high power rf distribution system



Coupler Activities at KEK (4)

Coupler processing at the test stand

Sept - Dec., 2006

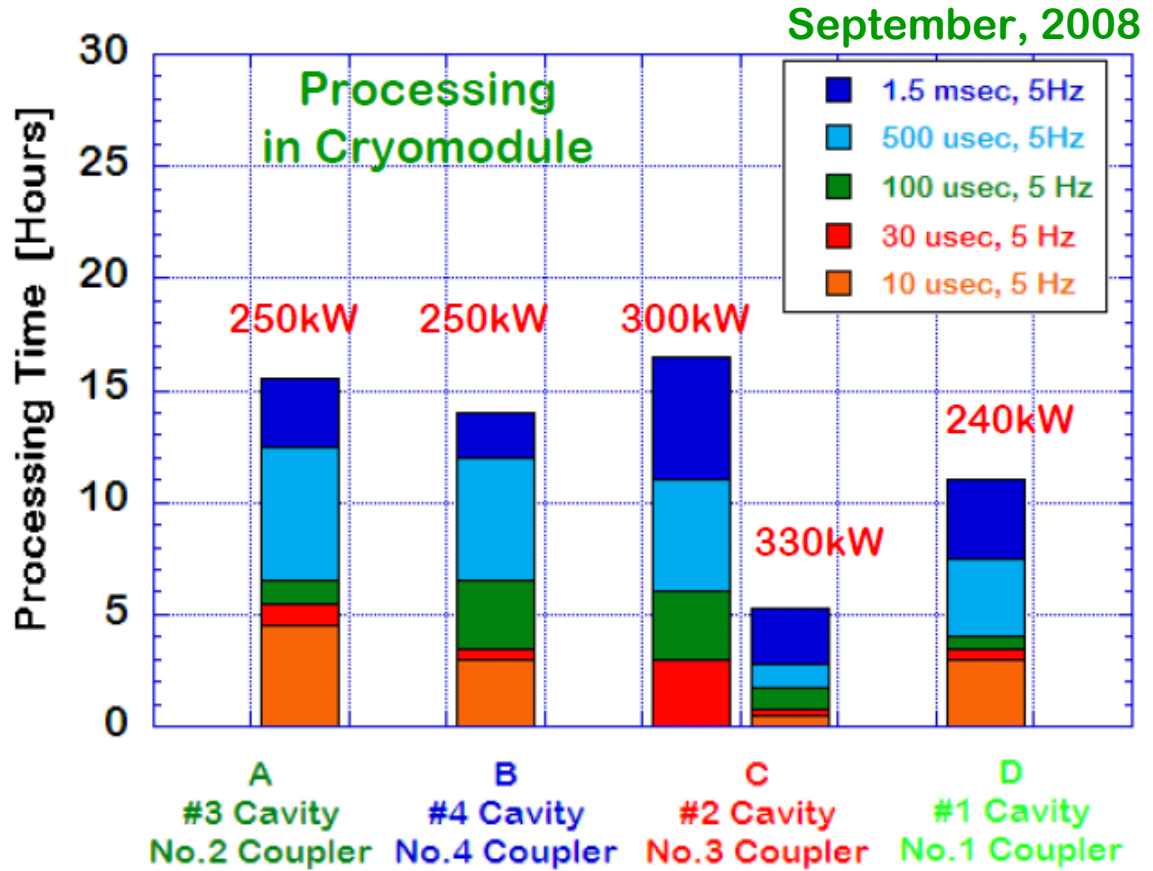
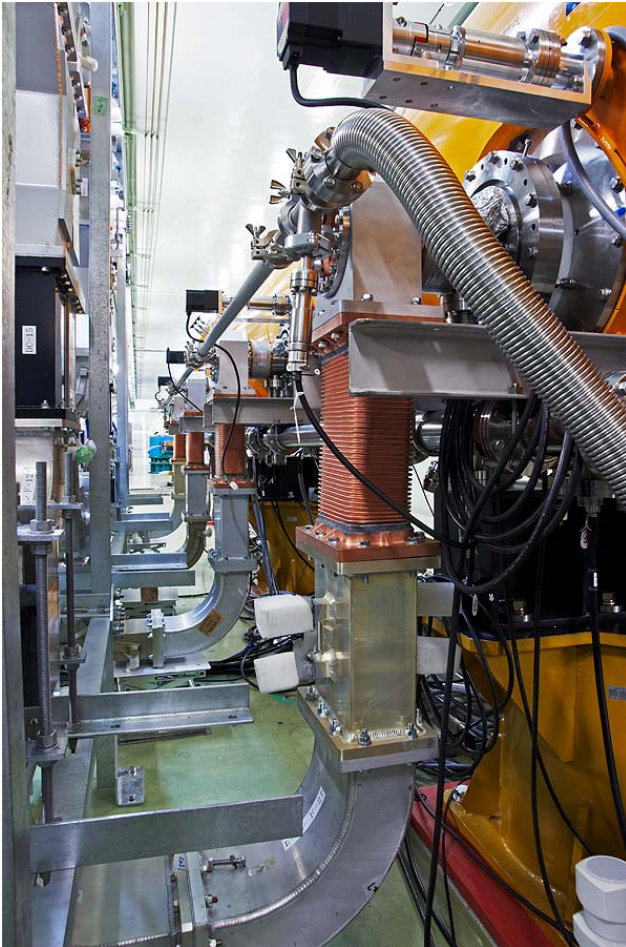


At the Test Stand
under matching condition



Coupler Activities at KEK (5)

Coupler processing in the cryomodule



In the cryomodule
under total reflection condition

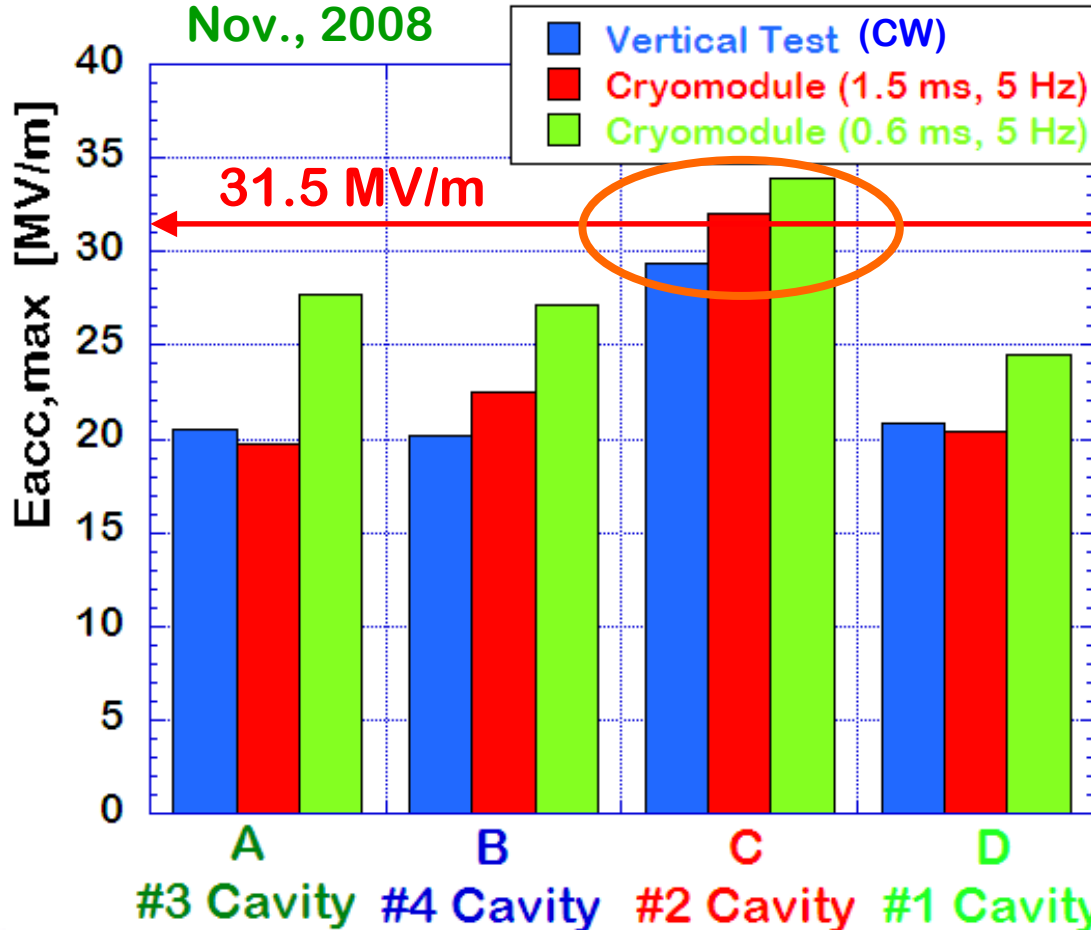


Coupler Activities at KEK (6)

Achieved Eacc,max in the Cryomodule Tests

Comparison of Eacc,max between V.T and C.T

Nov., 2008



RF Feedback / ON

Operational Gradient at 31.5 MV/m for ILC

Ave. Eacc,max (V.T)
= 22.7 MV/m

Ave. Eacc,max (Cryo. T)
= 23.7 MV/m

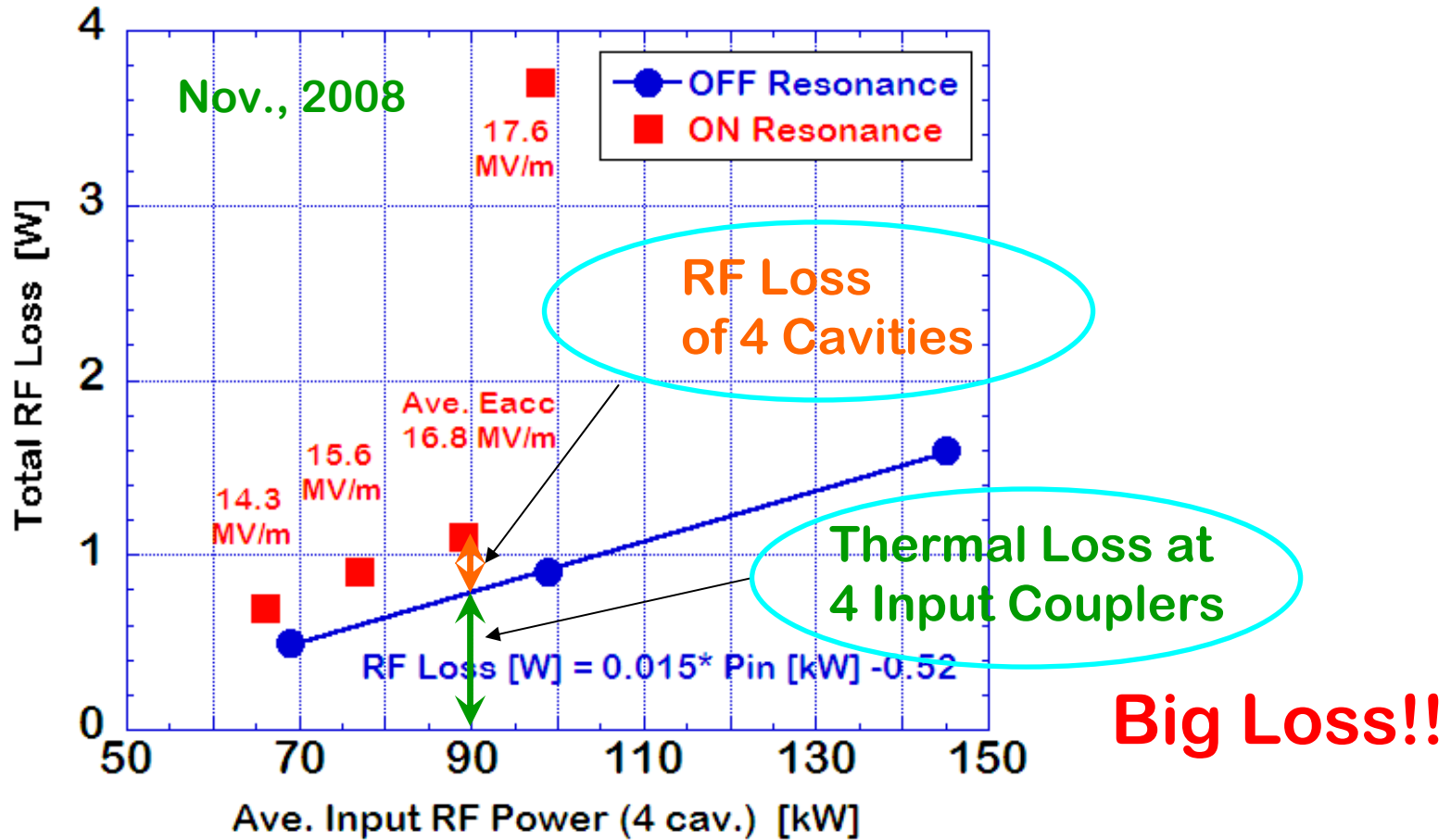
No degradation was observed in the cryomodule tests.



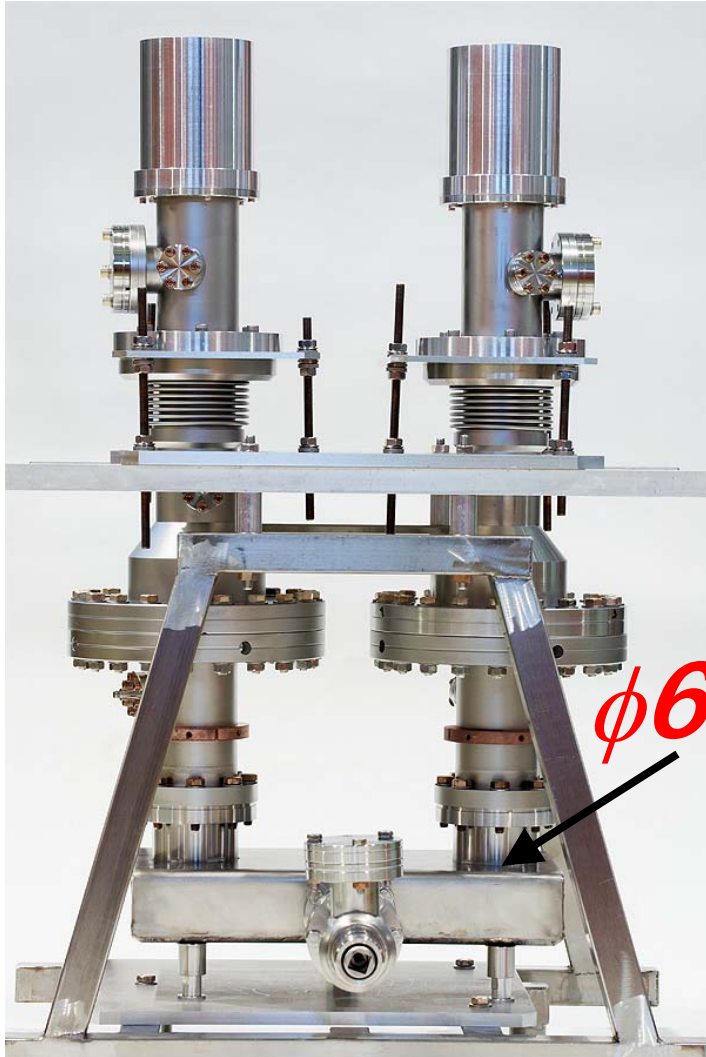
Coupler Activities at KEK (7)

Dynamic RF Loss in on/off Resonance

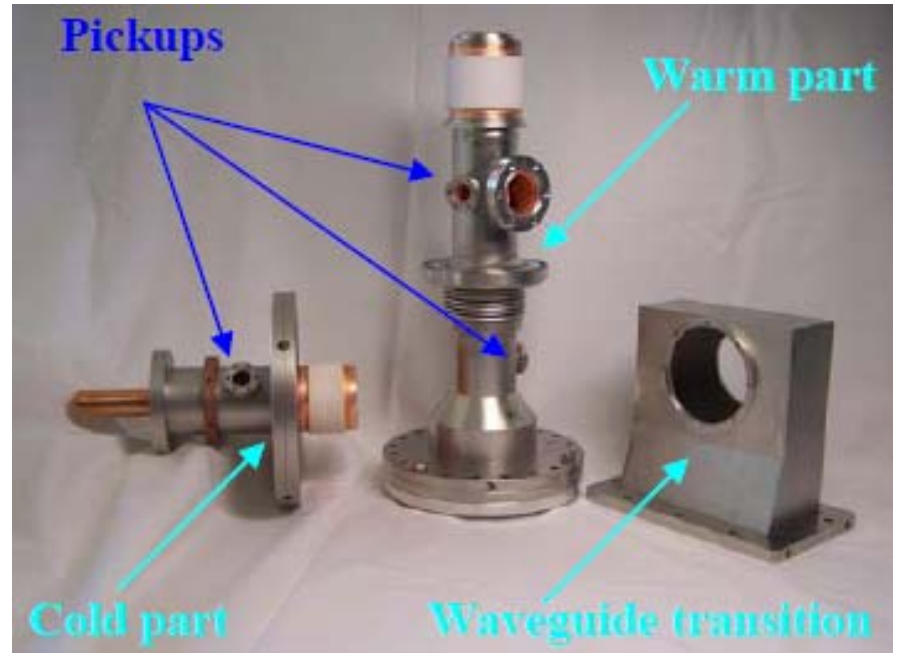
Measurement of thermal loss at input couplers



TTF-V Couplers at KEK (1)



FJPPL Collaboration between KEK and LAL



The TTF-V is a LAL design based on the TTF-III coupler design at DESY, and they were fabricated by ACCEL.

TTF-V Couplers at KEK (2)



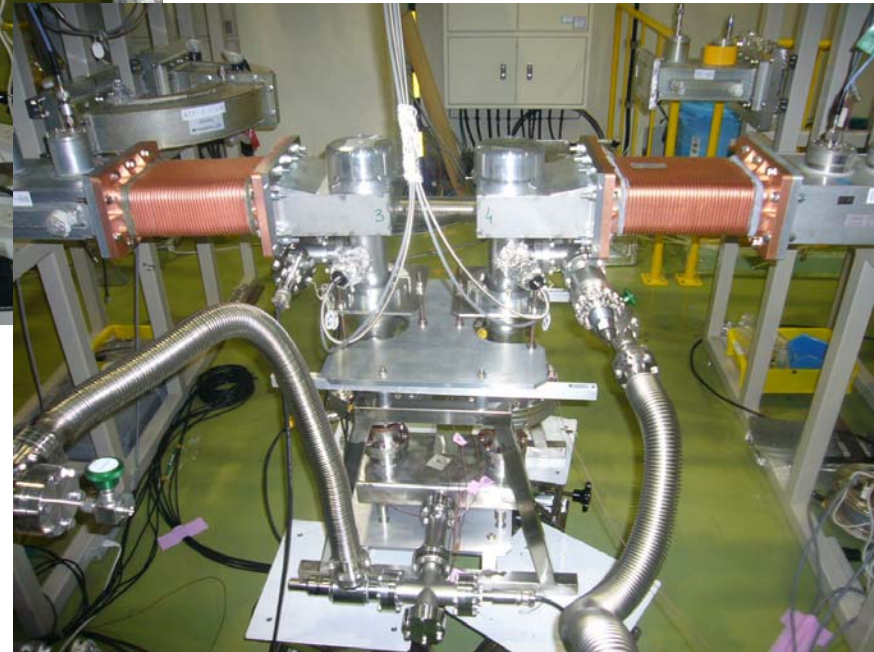
Assembly of pumping ports and vacuum gauges



Baking at 130°C

January, 2009

Set-up of High Power Test Stand

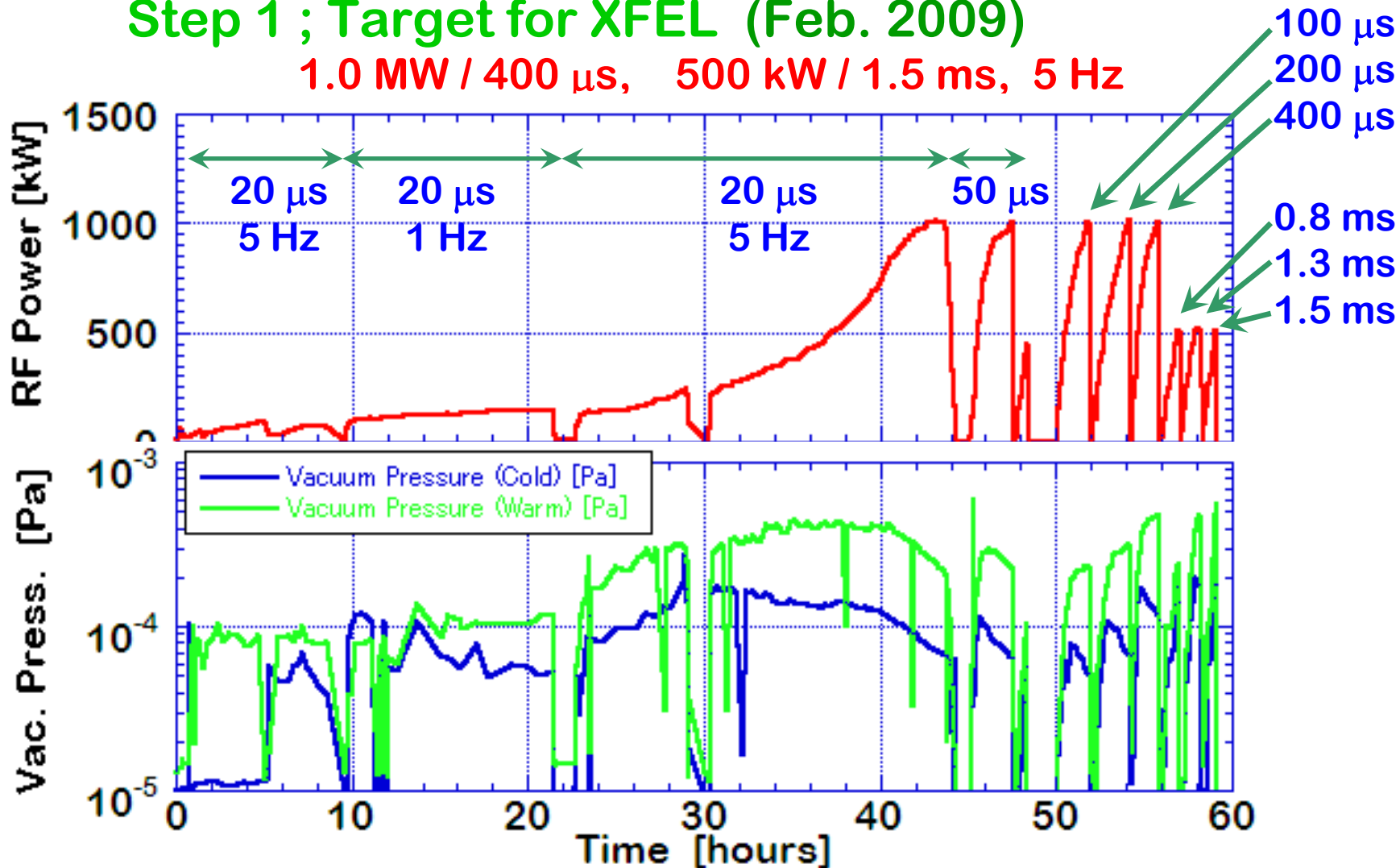




TTF-V Couplers at KEK (3)

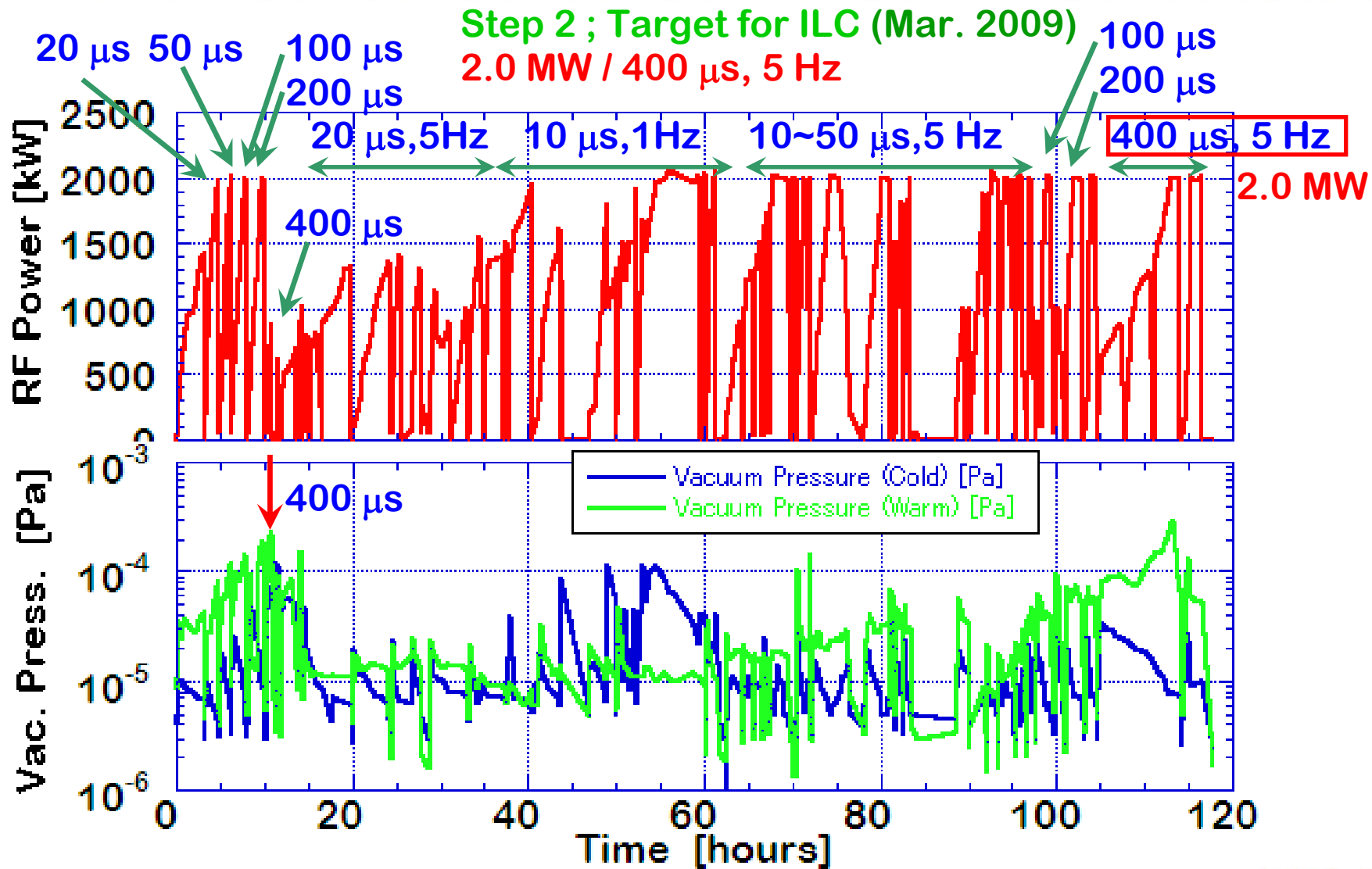
Step 1 ; Target for XFEL (Feb. 2009)

1.0 MW / 400 μ s, 500 kW / 1.5 ms, 5 Hz





TTF-V Couplers at KEK (4)





TTF-V Couplers at KEK (5)

Step 3 ; Target for ILC (May, 2009)

1.0 MW / 1.5 ms, 5 Hz



SUMMARY

- At LAL, TTF-III couplers, XFEL prototype couplers, TW60 couplers and TTF-V couplers have been successfully tested. The optimized procedure of the conditioning has reduced the processing time.
- At KEK, high power tests of the STF cryomodule including four cavities and input couplers were carried out. One cavity achieved the stable pulsed operation at 31.5 MV/m of the target in ILC.
- TTF-V couplers were shipped from LAL to KEK, and they were installed in the high power test stand at KEK-STF. The RF processing has been going on, just now.



2009-2010' Plan in the

LAL/KEK Collaboration on Coupler R/D

- Tests of LAL couplers at KEK;
the processing of TTF-V couplers has been continuing.
- Tests of new KEK couplers at KEK;
new couplers for S1 global cryomodule are tested with the participation of LAL staff.
- Development of NEG coating technology at LAL;
KEK staff is invited to participate to this effort.

LAL TTF-V input couplers have been tested at KEK-STF



Thank you
for your attention.....