

# Input Coupler Fabrication for KEK-STF

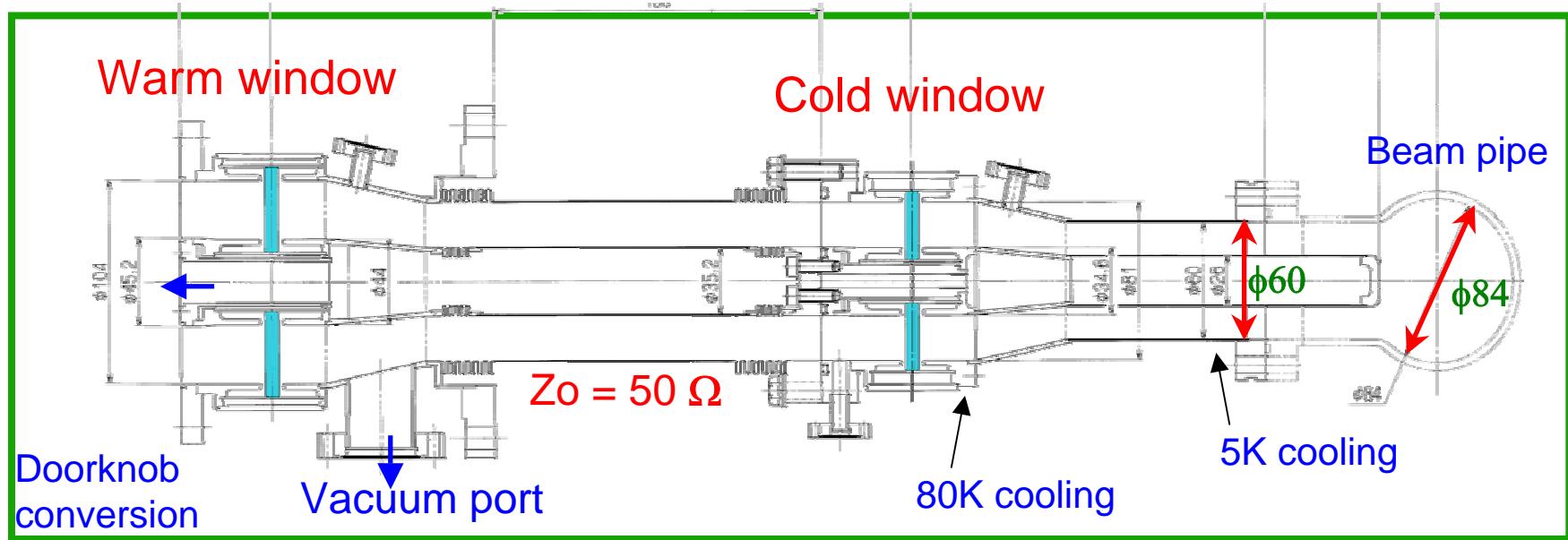
---

E. Kako, S. Noguchi, H. Hayano, T. Shishido,  
M. Sato, K. Watanabe, Y. Yamamoto  
(KEK, Japan)

# Outline

- Fixed Input Coupler in STF Phase-1.0
- Qin of Fixed Input Coupler in Cryomodule
- Processing of Input Coupler in Cryomodule
- Next New Variable Input Coupler
- Production Plan of Next Input Couplers
- Summary

# Fixed Coupler for STF Phase-1.0



# Installation of Warm Couplers and Doorknobs into Cryomodule

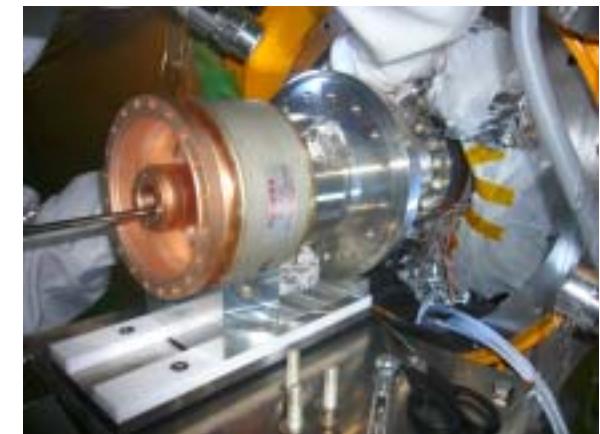
June, 2008



Coaxial - N Transition



Warm Coupler



Connection of Inner Conductor



Vacuum Pumping Tube

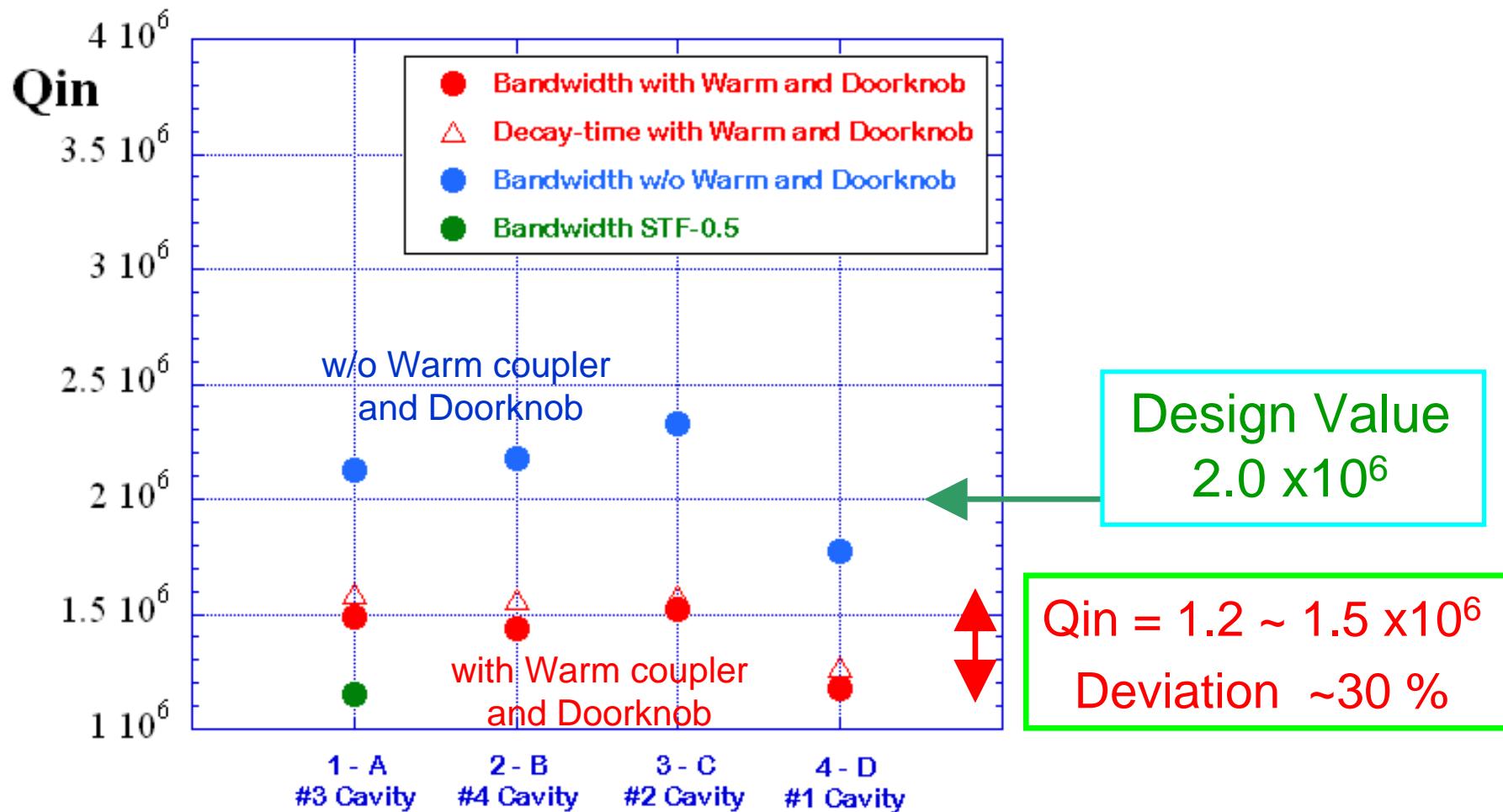


Clean Booth for Assembly



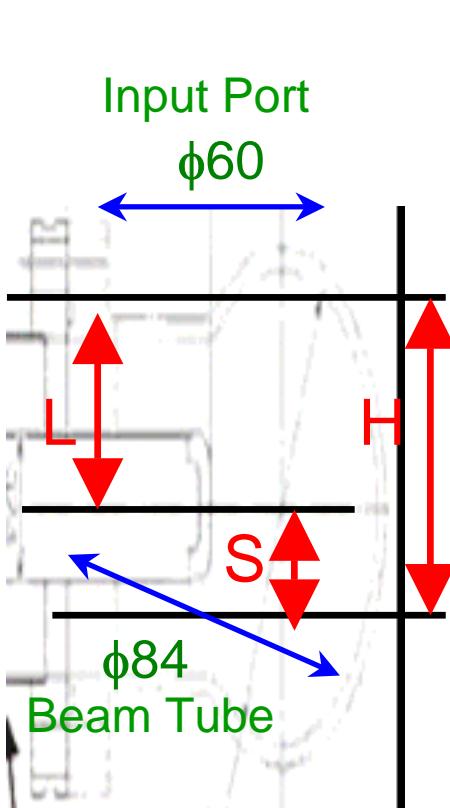
Doorknob-type Transition

# Qin of Fixed Input Couplers in Cryomodule



Large difference of Qin between with / without Warm & Doorknob

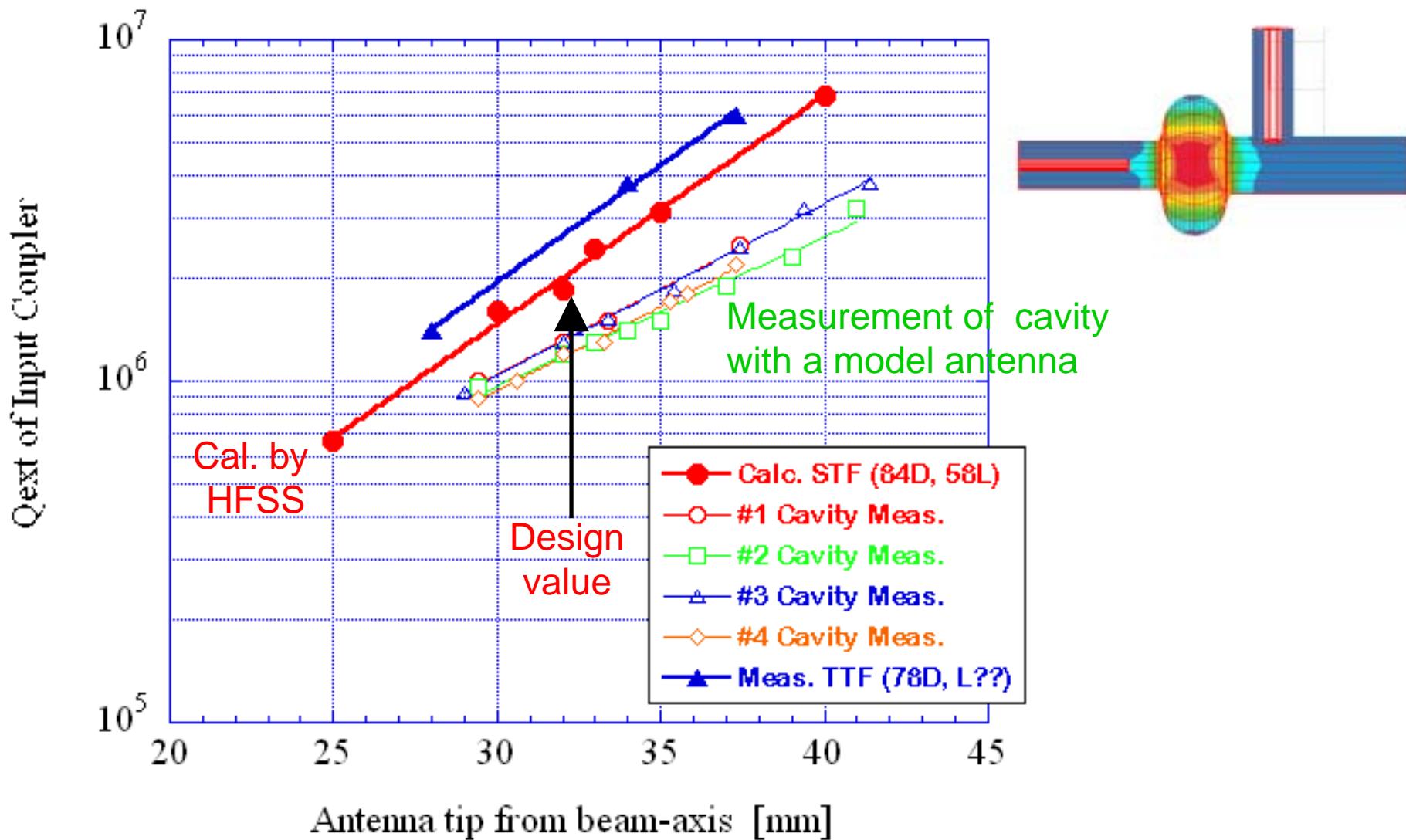
# Dimensions of Input Coupler and Port



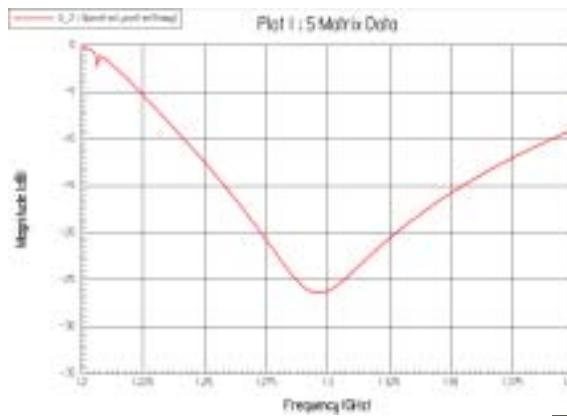
Cryomodule Cavity Input coupler	1 - A #3 No.2	2 - B #4 No.4	3 - C #2 No.3	4 - D #1 No.1	Fabrication Error [mm]
Height of port (H = 95.0 mm)	96.0	95.9	95.8	95.7	+0.7~1.0
Antenna length (L = 63.0 mm)	63.2	63.5	63.2	63.4	+0.2~0.5
Space from beam-axis (S = 32.0 mm)	32.8	32.4	32.6	32.3	+0.3~0.8
$Q_{in}$	$1.49 \times 10^6$ $(1.15 \times 10^6)$	$1.44 \times 10^6$	$1.52 \times 10^6$	$1.18 \times 10^6$	

Unknown factor ; Location of antenna-axis from the end-cell.

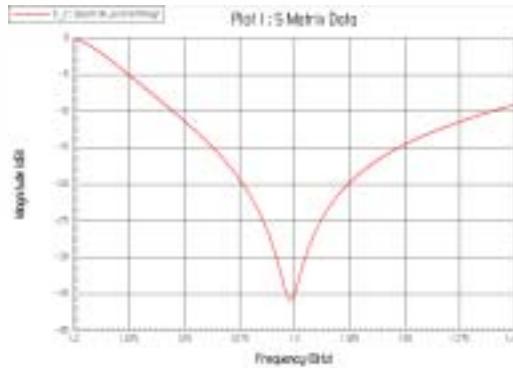
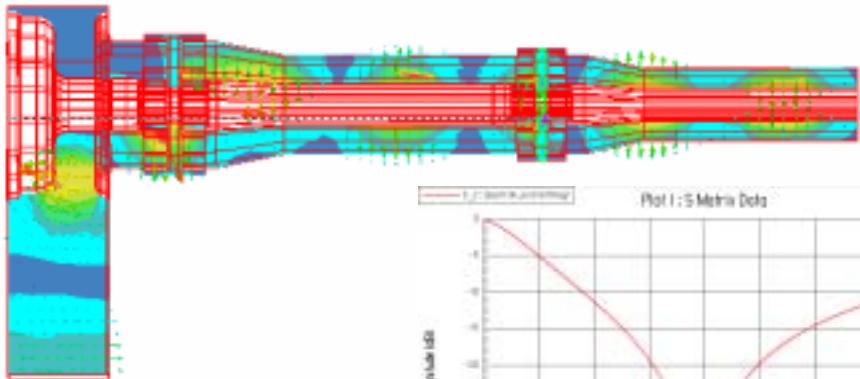
# Qin ; Calculation and Measurement of Model



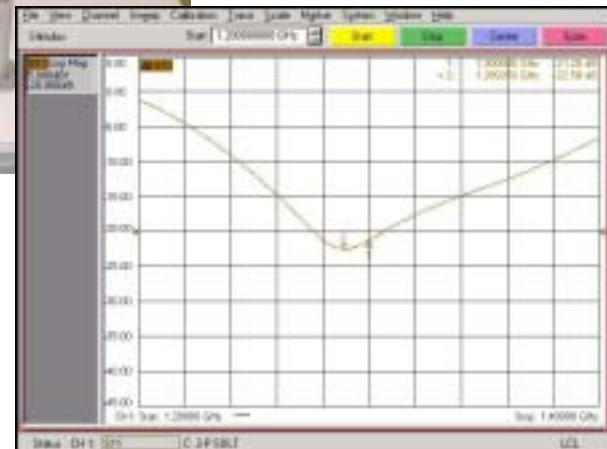
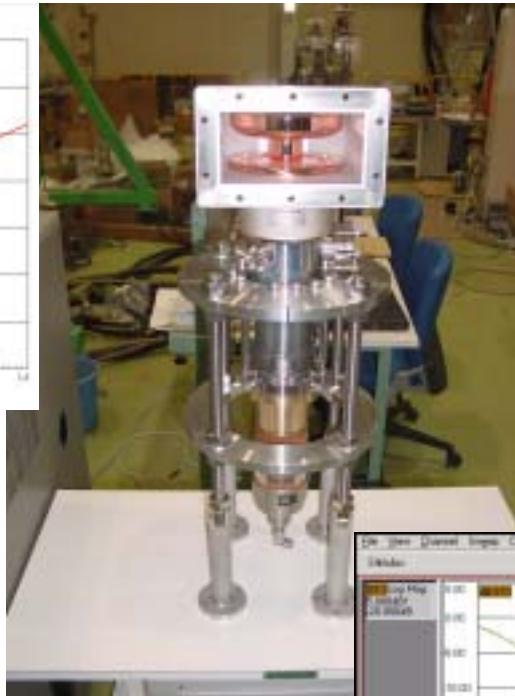
# Warm window and Doorknob



$S_{11} = -35. \text{ dB at } 1.3\text{GHz}$



$S_{11} = -26. \text{ dB}$   
at  $1.3\text{GHz}$

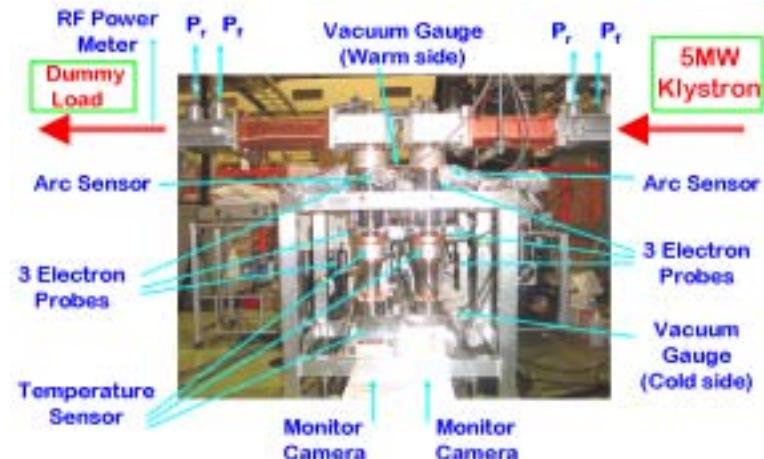


$S_{11} = -21.3 \text{ dB at } 1.3\text{GHz}$

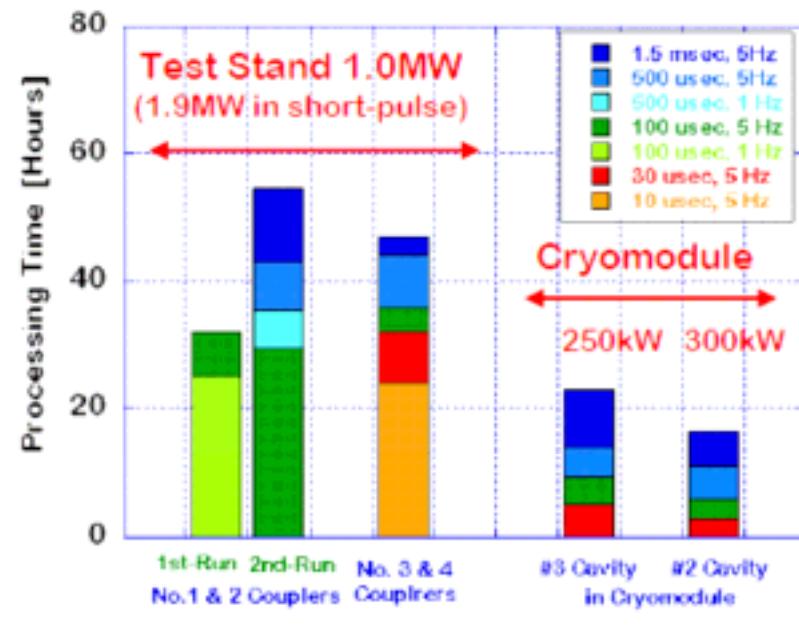
# Component Test ; Input Couplers



## Processing in Test Stand



## Processing in Cryomodule at R.T.

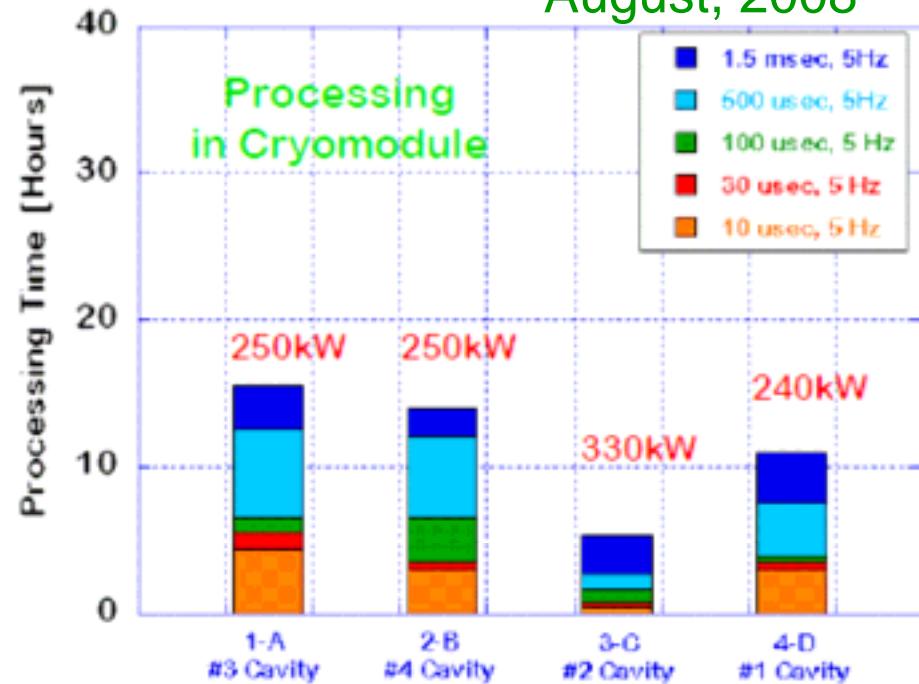


# Processing of Input Couplers in Cryomodule ; STF Phase-1.0

Four STF-BL Cavities



August, 2008



Processing time  
up to 240~330 kW  
for 5 ~ 15 hours

RF processing with much higher power (500~600 kW)  
at R.T is scheduled in January, 2008, after the cryomodule tests.

# New Variable Input Coupler for S1 Global and STF Phase-2

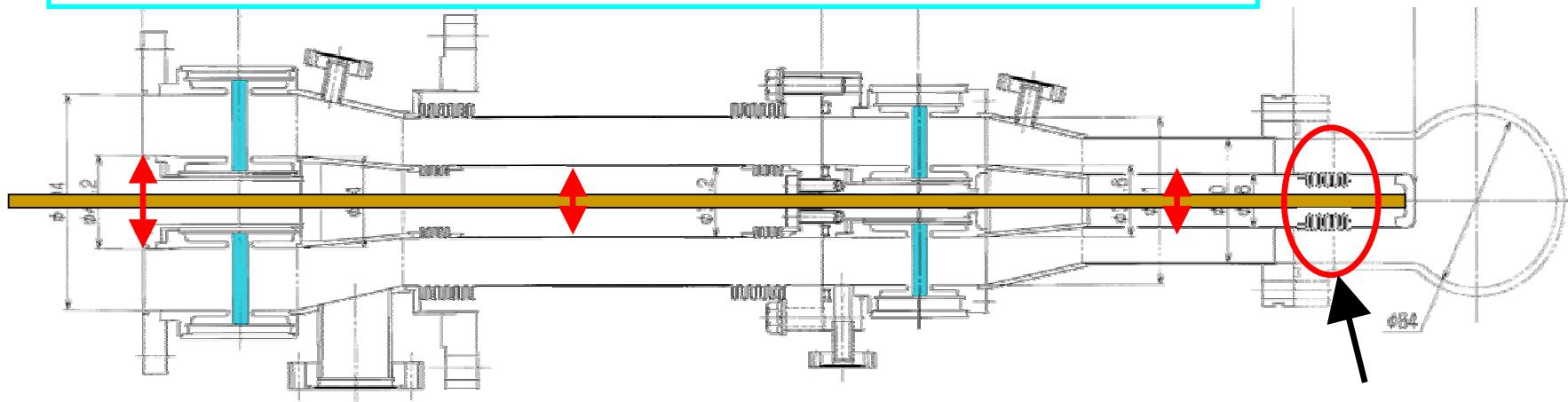
Present Fixed Input Coupler

$\phi 45.2$

$\phi 35.2$

$Z_0 = 50 \Omega$

$\phi 26$



Large diameter of an inner conductor and Low impedance

New

$\phi 52$

$\phi 41$

$Z_0 = 41.5 \Omega$

$\phi 30$

Bellows  
of Inner  
Conductor

Variable Antenna Length  $\rightarrow +/- 2.5 \text{ mm}$

Tune-ability of  $Q_{in}$   $\rightarrow +/- 30 \%$

# Future Plan toward STF Phase-2

- 4 cavities for S1 Global                          4 Input Couplers
- String assembly of 4 cav. for S1 Global
- Operation of cryomodule for S1 Global
- 2 cavities for capture cryomodule              2 Input Couplers
- String assembly of 2 capture cavities
- Operation of capture cryomudule  
for Quantum Beam Project
- 9 cavities for cryomodule I                      9 Input Couplers
- 8 cavities for cryomodule II                    8 Input Couplers
- 9 cavities for cryomodule III                    9 Input Couplers

# Summary

- Different Qin between with/without warm coupler & doorknob was observed.
- Input couplers for STF Phase-1.0 have been stably operated in cryomodule tests.
- New variable input couplers will be developed for the next cryomodules.
- Thirty-two input couplers will be ordered for the future projects .

Thank you for your attention.

The END.