

Fabrication of STF Cavity Package

Activity of Japanese Industry & Compatibility

Japanese Industry

- MHI : Mitsubishi Heavy Industry
- MELCO : Mitsubishi Electric
- SHI : Sumitomo Heavy Industry
- TOSHIBA
- HITACHI

MHI

- Nagoya Aircraft : Tristan, 36-Cavities
- Kobe Shipyard : Tristan, 18-Cryostats
: 2-Cavity

Cryomodule

for Proton, $\beta = 0.7$
: KEK-B

Crab-Cavity

: ERL Cryomodules

Melco

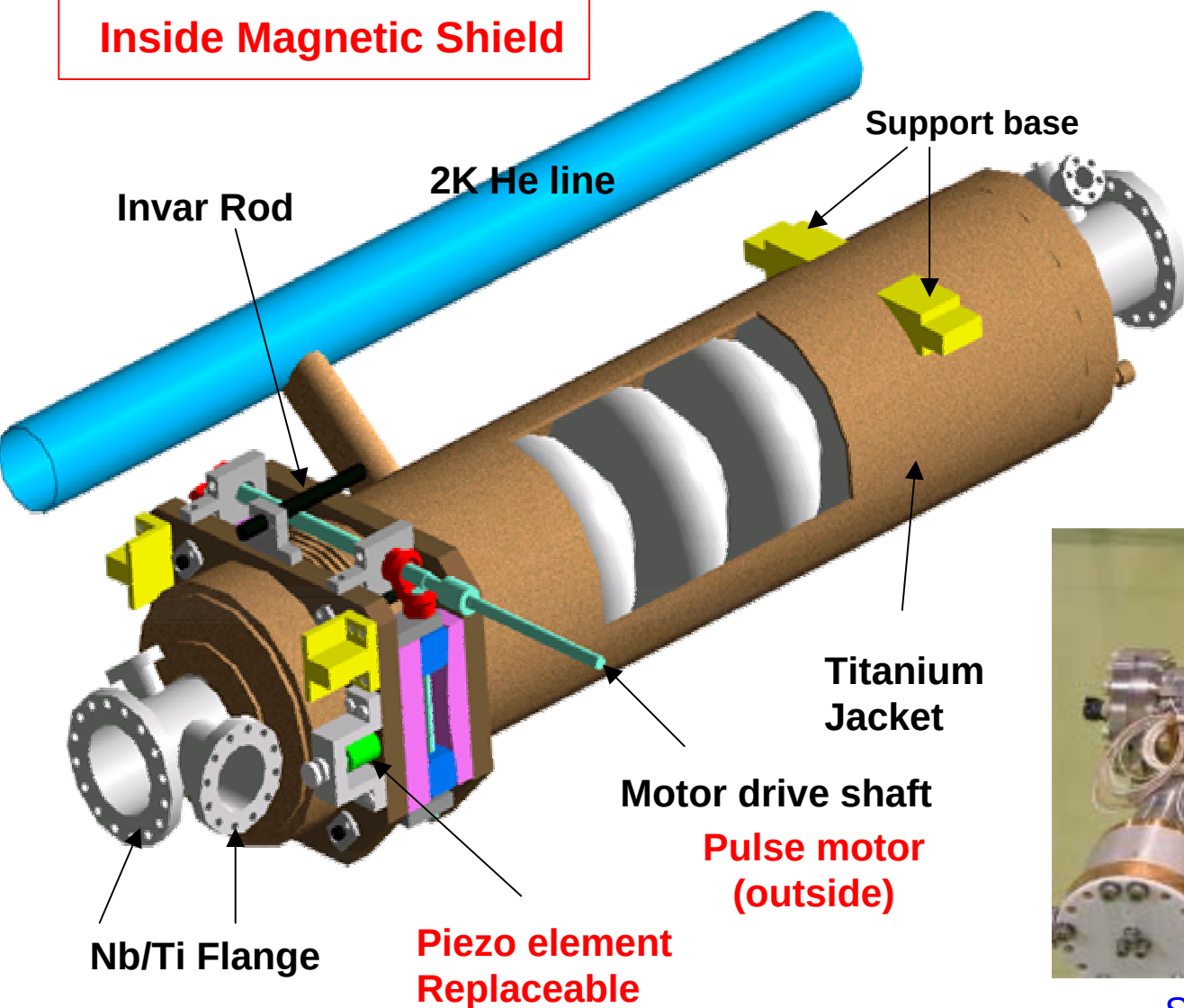
- KEK-B Cryomodules
- IHEP Cryomodules
- 600 MHz ADS Prototype Cryomodule

STF Phase-1 Package

- Niobium : Tokyo Denkai
- Cavity : MHI
- Tuner, Jacket : MHI
- Surface Treatment : Nomura Plating
- Input Coupler : Toshiba

Tesla-like STF Baseline Cavity Package

Inside Magnetic Shield

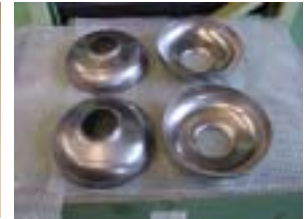


Slide Jack Tuner

Fabrication of STF Baseline Cavities



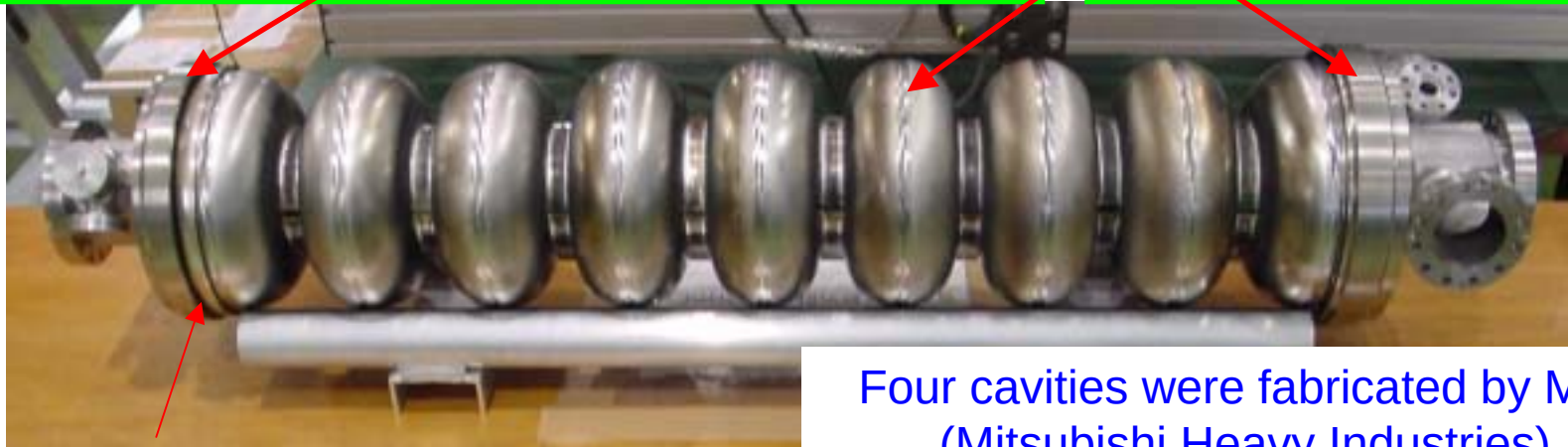
Center-cells
(Tokyo Denkai ; RRR~300 Nb)



HOM coupler



End-groups



Magnetic Shield

Four cavities were fabricated by MHI
(Mitsubishi Heavy Industries)

Three cavities (#1, #2, #4 Cavity) covered with He Jacket



**Magnetic Shield
Inside**

March, 2007'

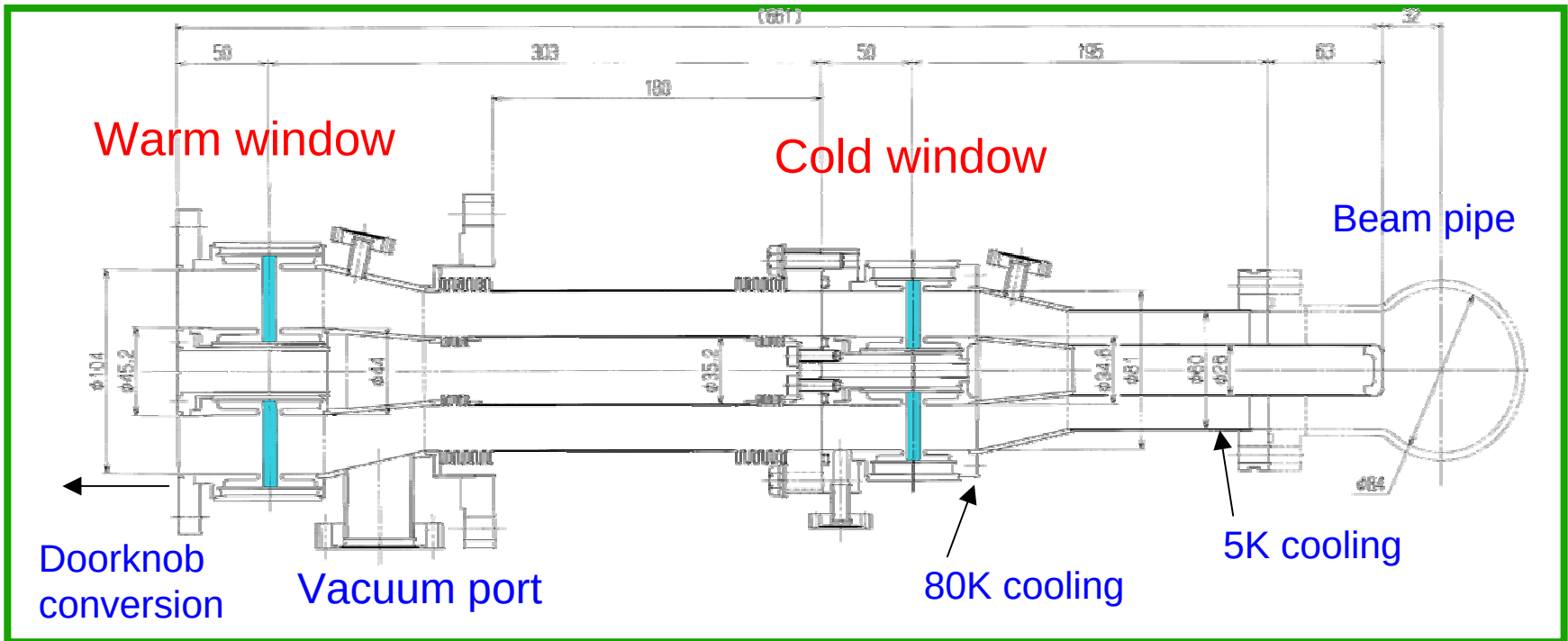


Input Coupler for STF Baseline Cavities

Improved design for simplicity with no tuning mechanism.

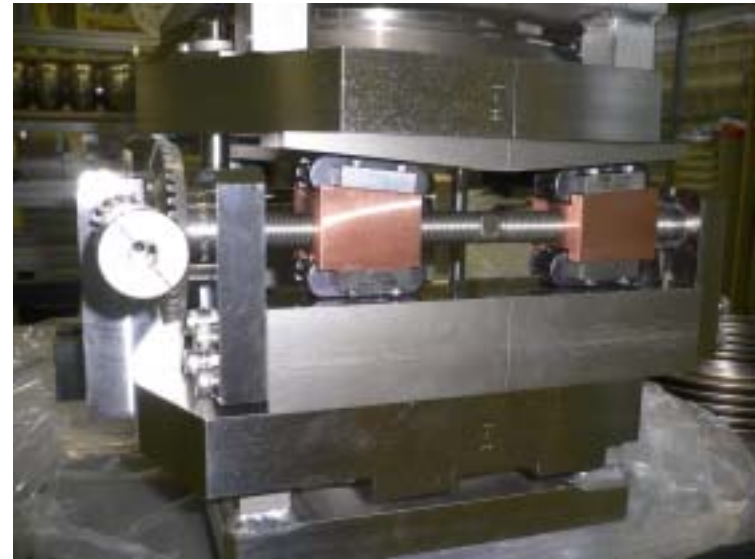
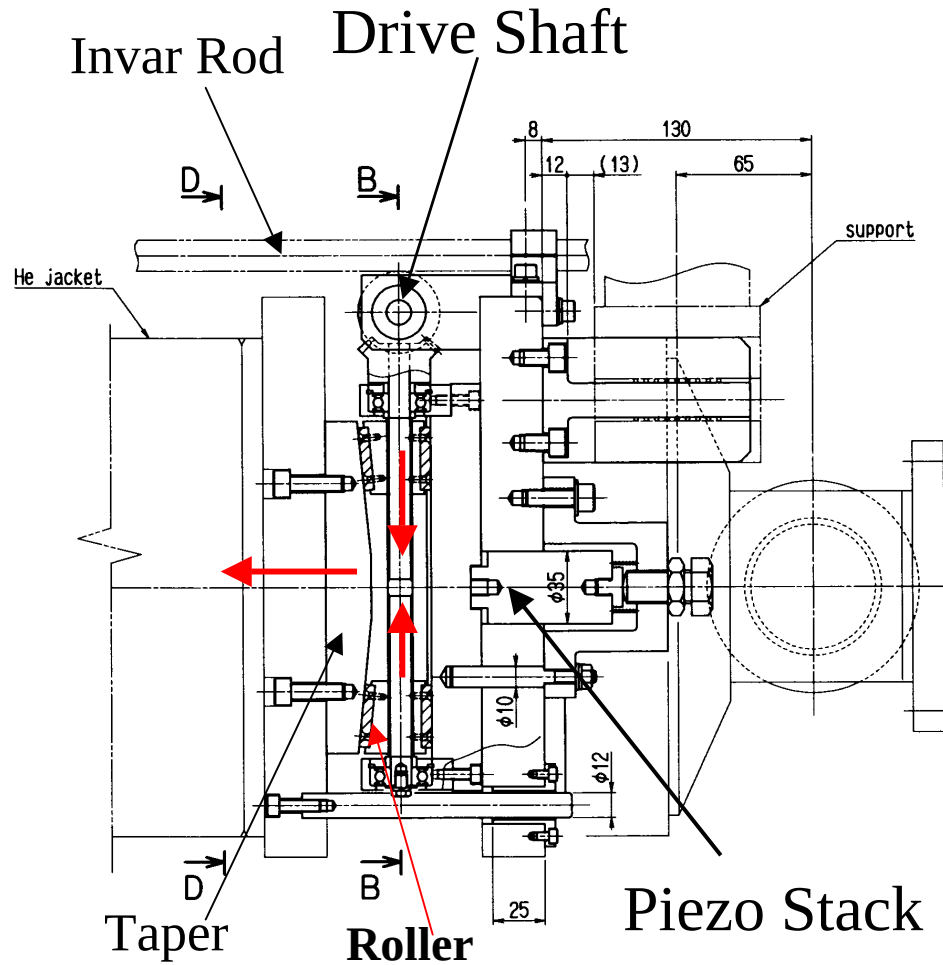
TRISTAN Type Coaxial Disk Ceramic ;

(KEKB 1 MW/cw, JPARC-ADS 2.2 MW/pulse, SNS)



	80 K	5 K	2 K
Static Loss	5 W	1.1 W	0.05 W
Dynamic Loss	3 W	0.2 W	0.03 W

Slide Jack Tuner $290\text{N}/\mu\text{m}$



STF Phase-2 & GS1 Package

	Phase-1	Phase-2
Beam Pipe HOM Coupler	$\phi 84\text{mm}$	$\phi 80\text{mm}$
	Machining	Deep Drawing Hydro-forming
He Jacket End-cone	Machining	Press-forming
Tuner Position	Between Supports	Outside of Supports
Input Coupler	Fixed Coupling	Tunable

Deep-drawing of Pipes



Fe



Al

Deep-drawing of Pipes



ビームパイプ 鉄・1絞り

Fe



ビームパイプ 鉄・2絞り

Fe

Hydroforming of Coupler Port

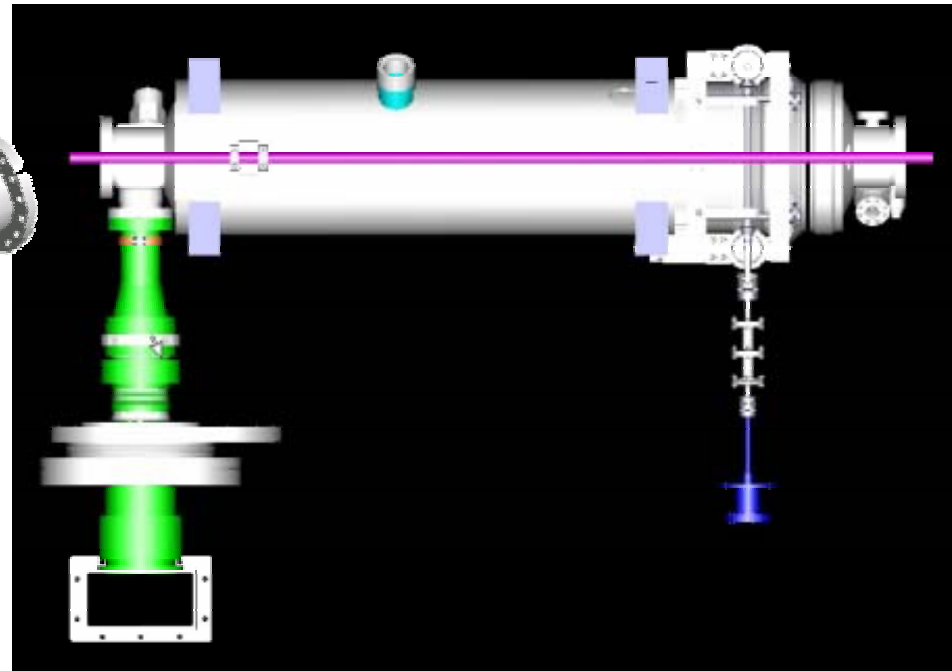
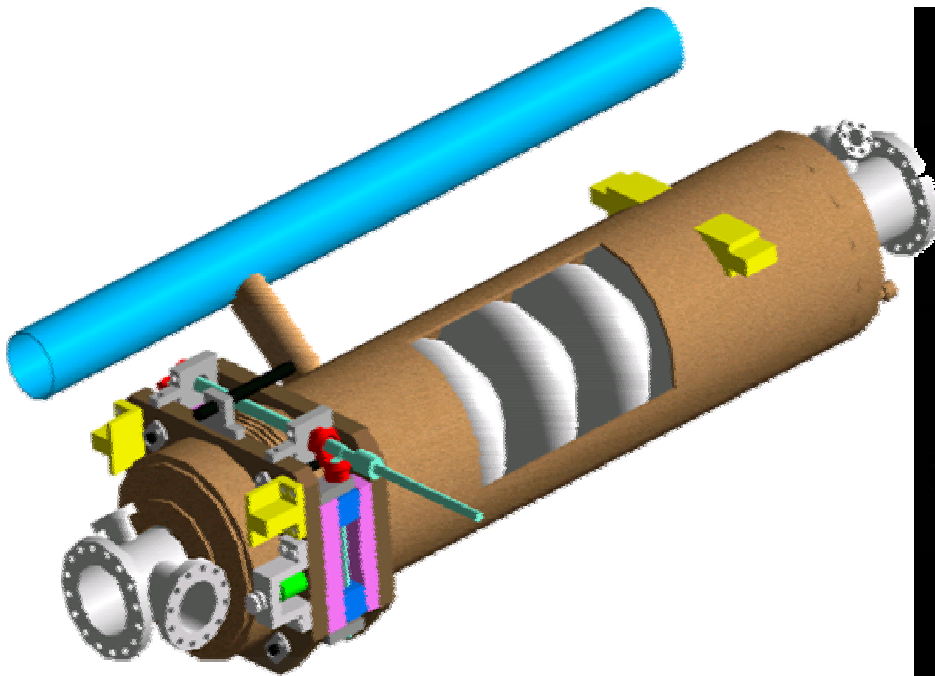


Niobium



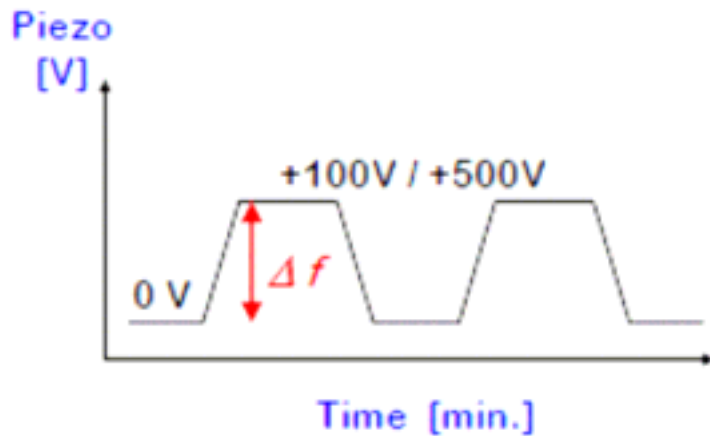
Niobium

New Tuner Configuration

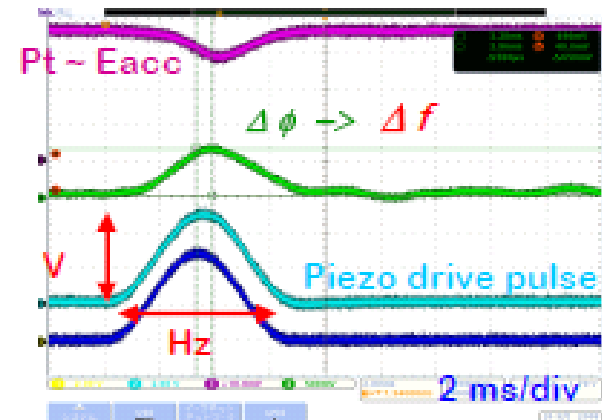


Piezo tuner performance in STF Phase-1.0

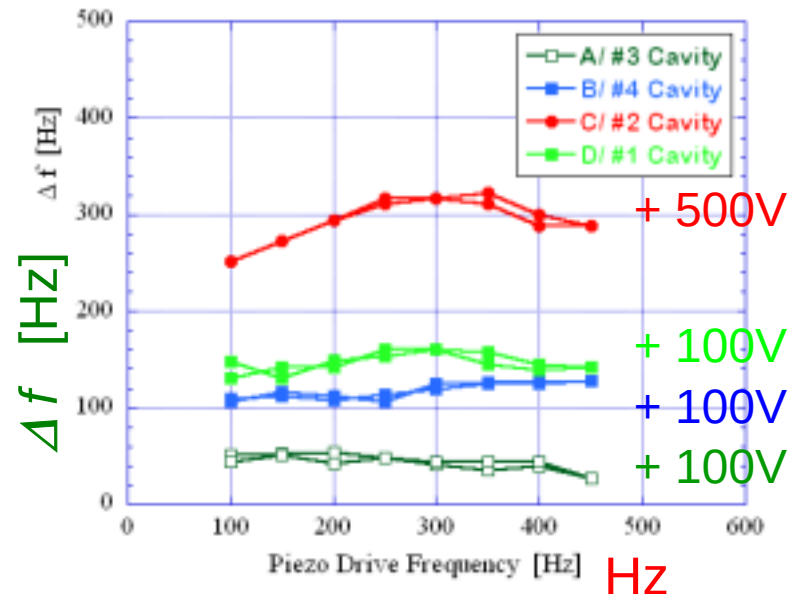
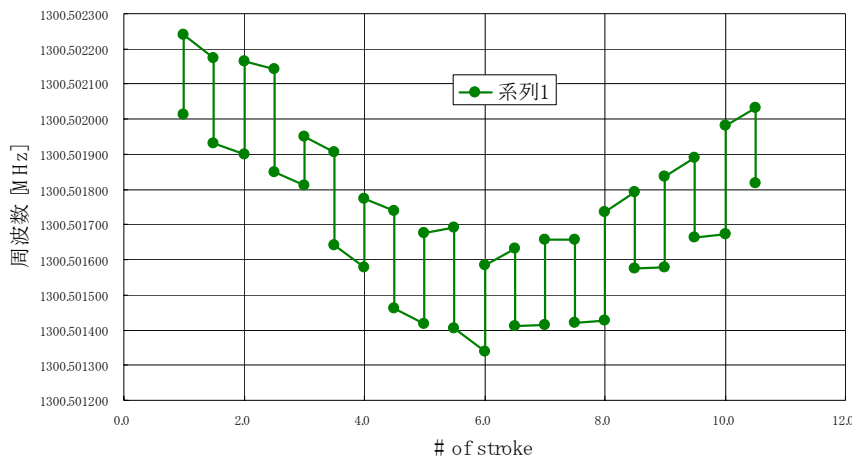
1. Static Stroke



2. One Pulse Response



C/#2 Cavity Piezo Stroke Test (2008/09/19)



Shuichi Noguchi $\Delta f_{ave.} = 247 \text{ Hz}$

TTC Meeting at Delhi

Compatibility for ILC Cryomodule

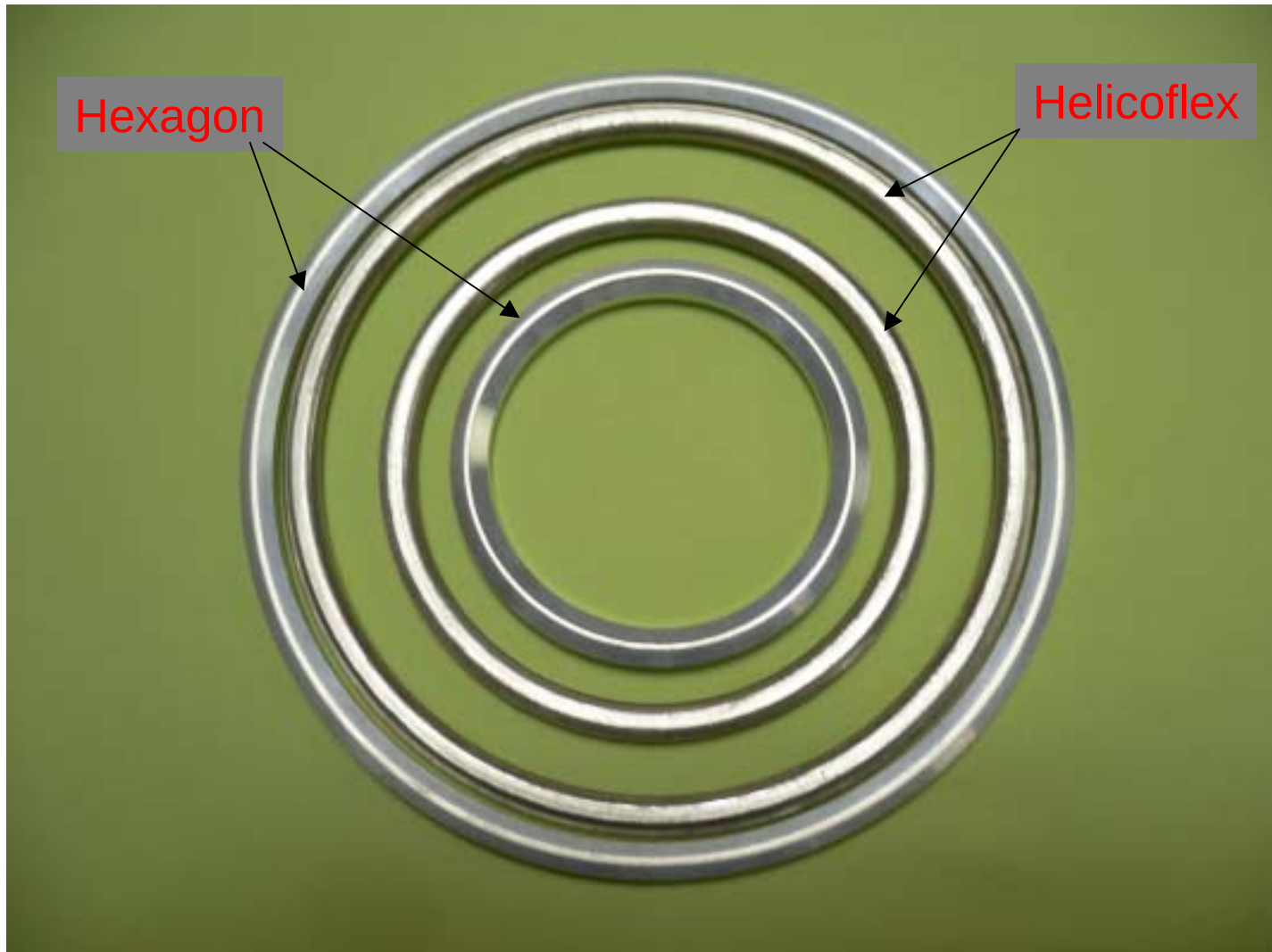
Major Alternative Components

	TESLA(BCD)	STF-BL	Others
Vac. Seal	Al Hexagon	Helicoflex	
Input Coupler Port Size	TTF-III ϕ 40mm	Tristan Type ϕ 60mm	TTF-V,TW60 ϕ 60mm
He Jacket	NbTi - Ti	Ti	SUS
Tuner		Slide Jack	Saclay-II Blade
Mag. Shield	Outside of Jacket	Inside	
Tuner Motor	Inside of Vessel	Outside	
Piezo	Not Accessible	Replaceable	
5k Shield	Yes	No	

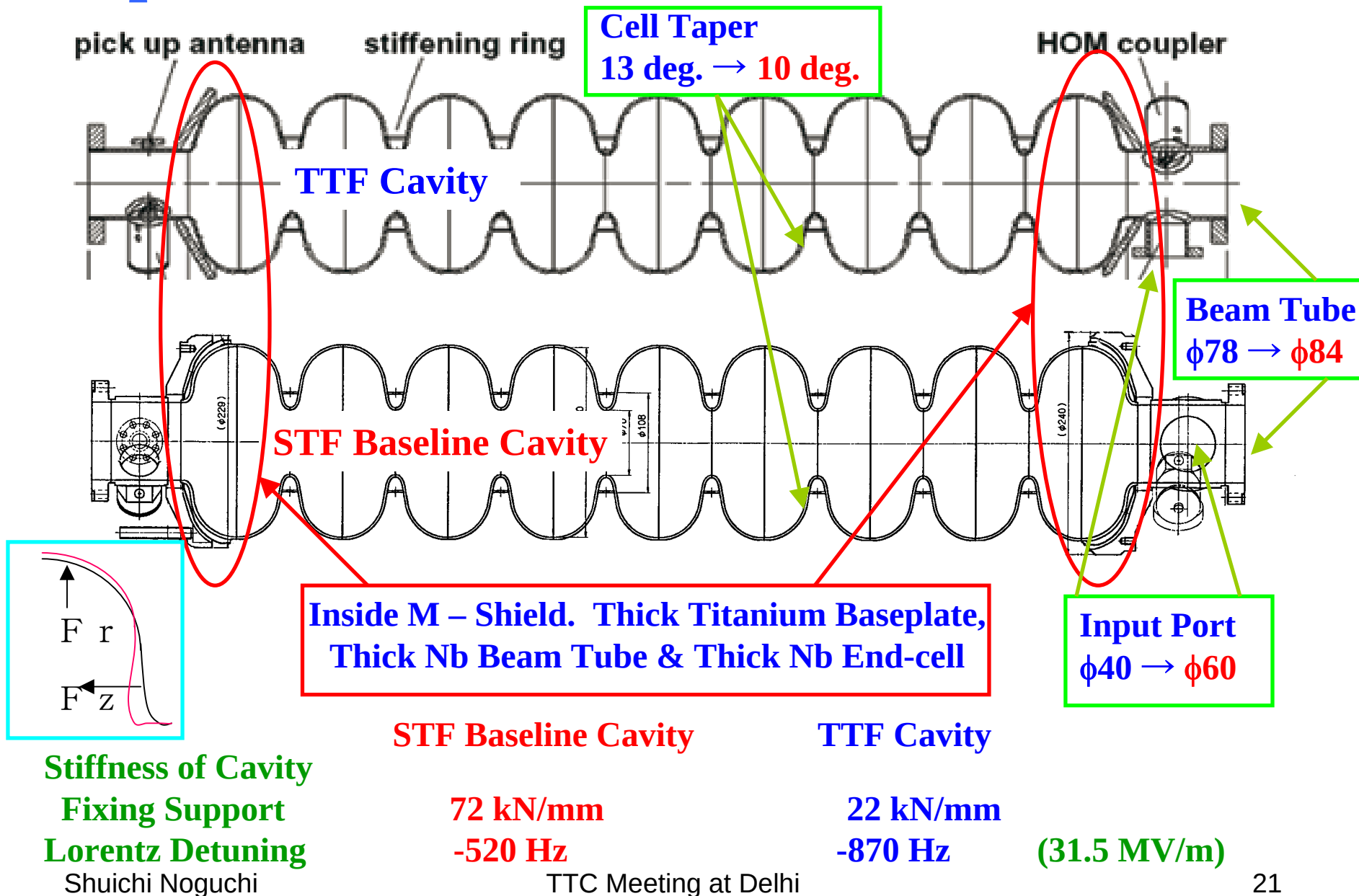
Specification / Concept

	T E S L	STF - BL	STF - LL
Operating Gradient, Width	23.4 MV / m Δ	31.5 MV / m 1.0 msec.	36 MV / m 1.0 msec.
Coupler Tune-ability	Yes (XFEL)	No / Yes	No / Yes
Surface Preparation	CP + 1400°C HT ↓	CBP (CP) + EP	CBP (CP) + EP
Piezo, Motor Maintainability	EP Poor	Easier	Poor

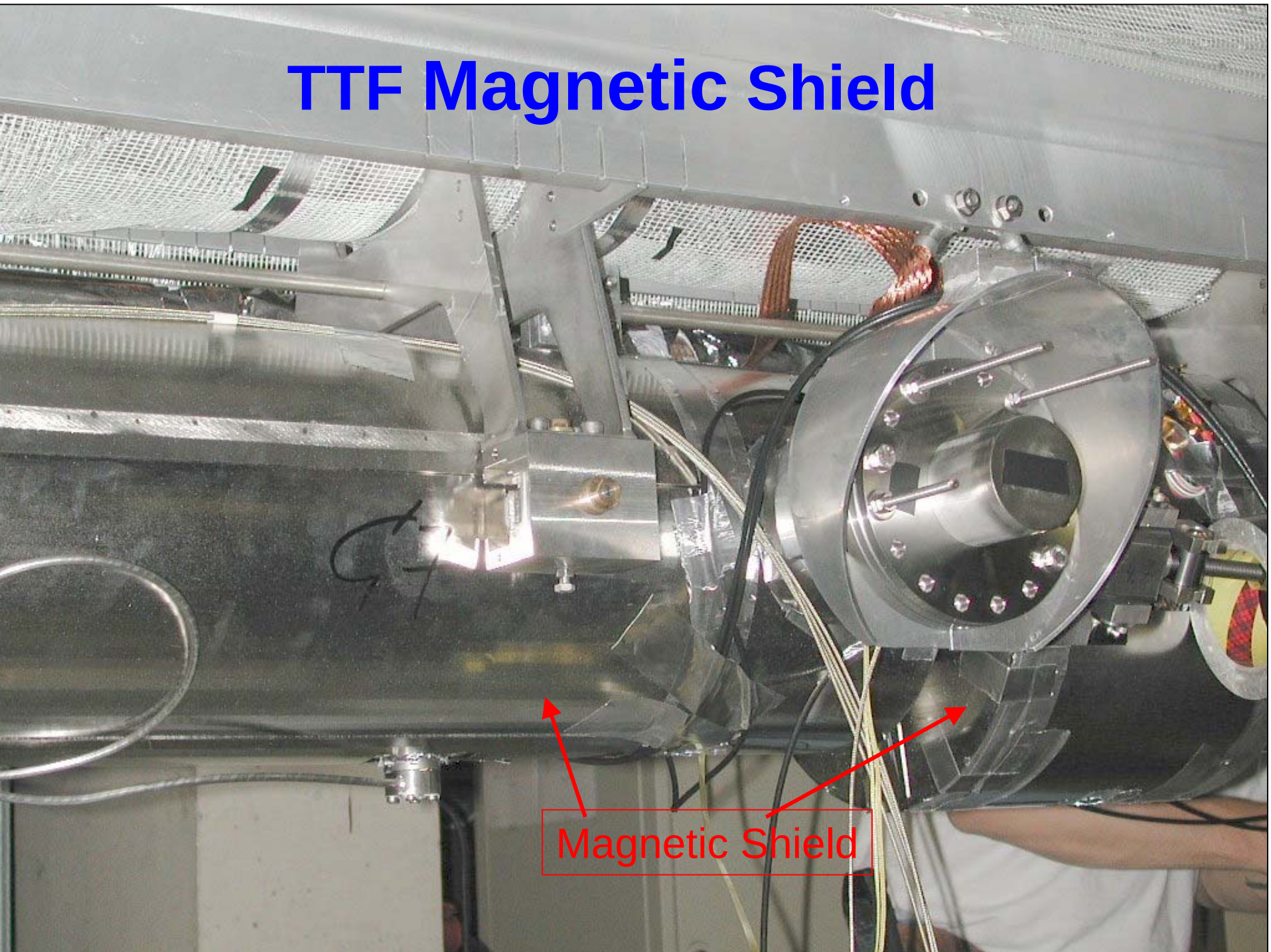
Seal & Flange



Improvement in the STF Baseline Cavities



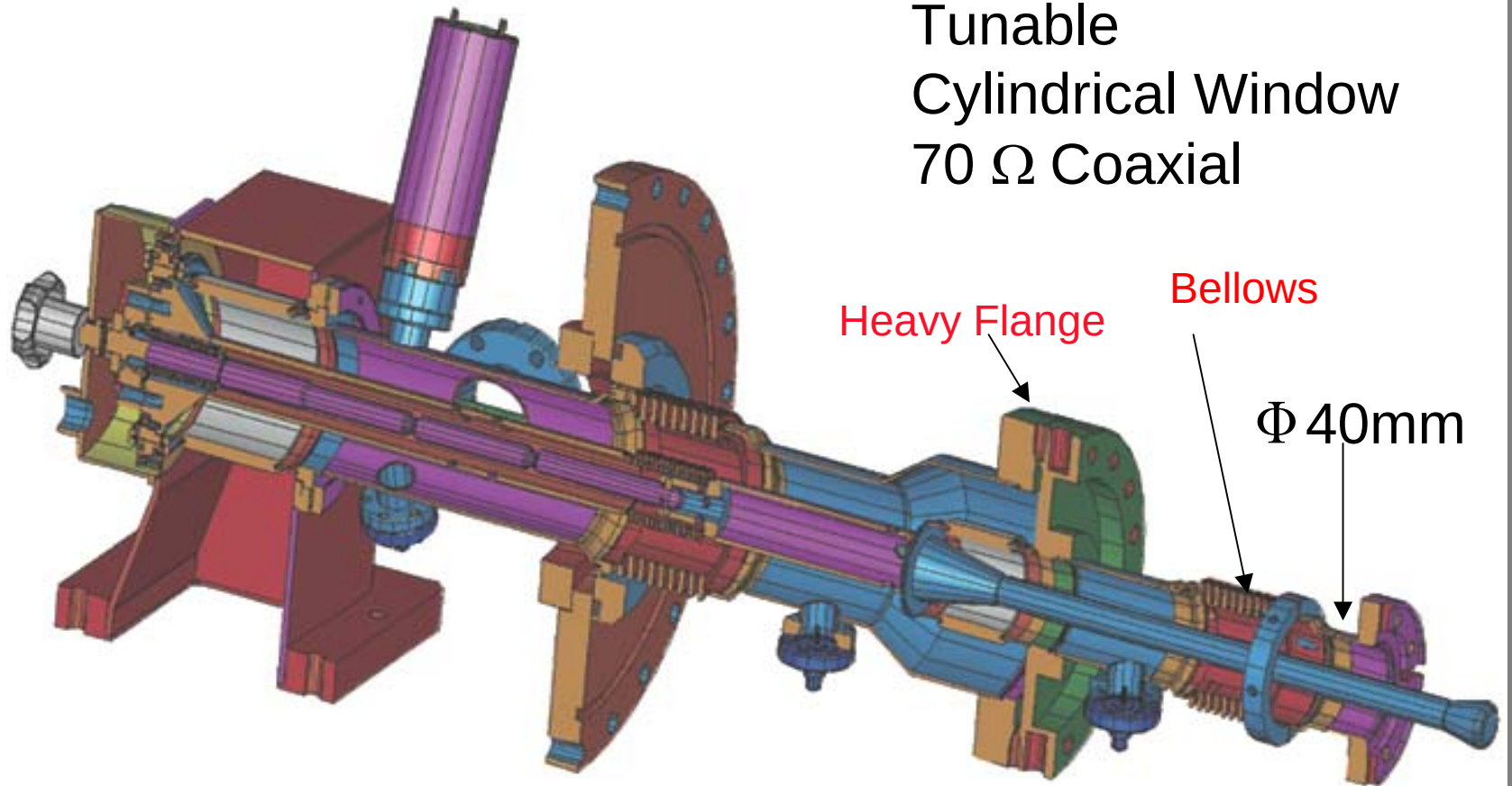
TTF Magnetic Shield



Magnetic Shield

TTF-3 Coupler

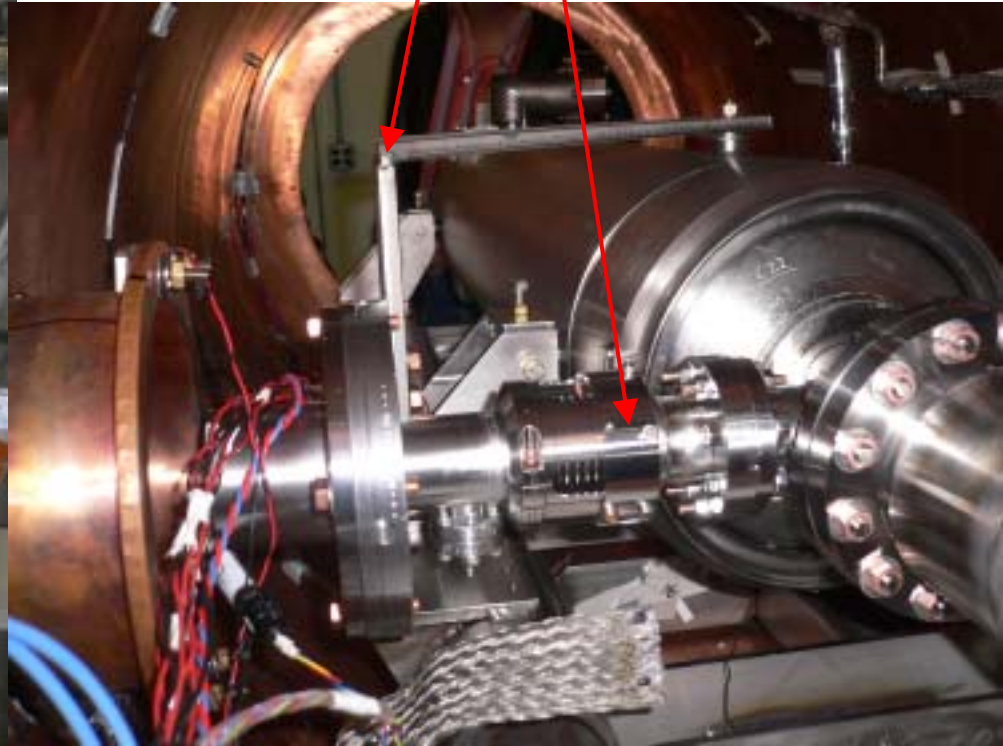
Tunable
Cylindrical Window
70 Ω Coaxial



TTF-3 Coupler

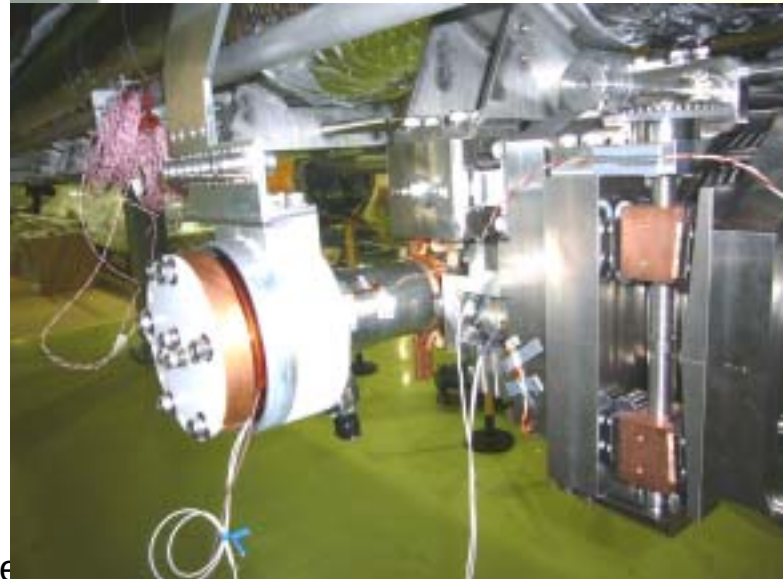


Coupler Support



Cavity Assembly (#3 Cavity) ; Installation of Cold Coupler and Tuner

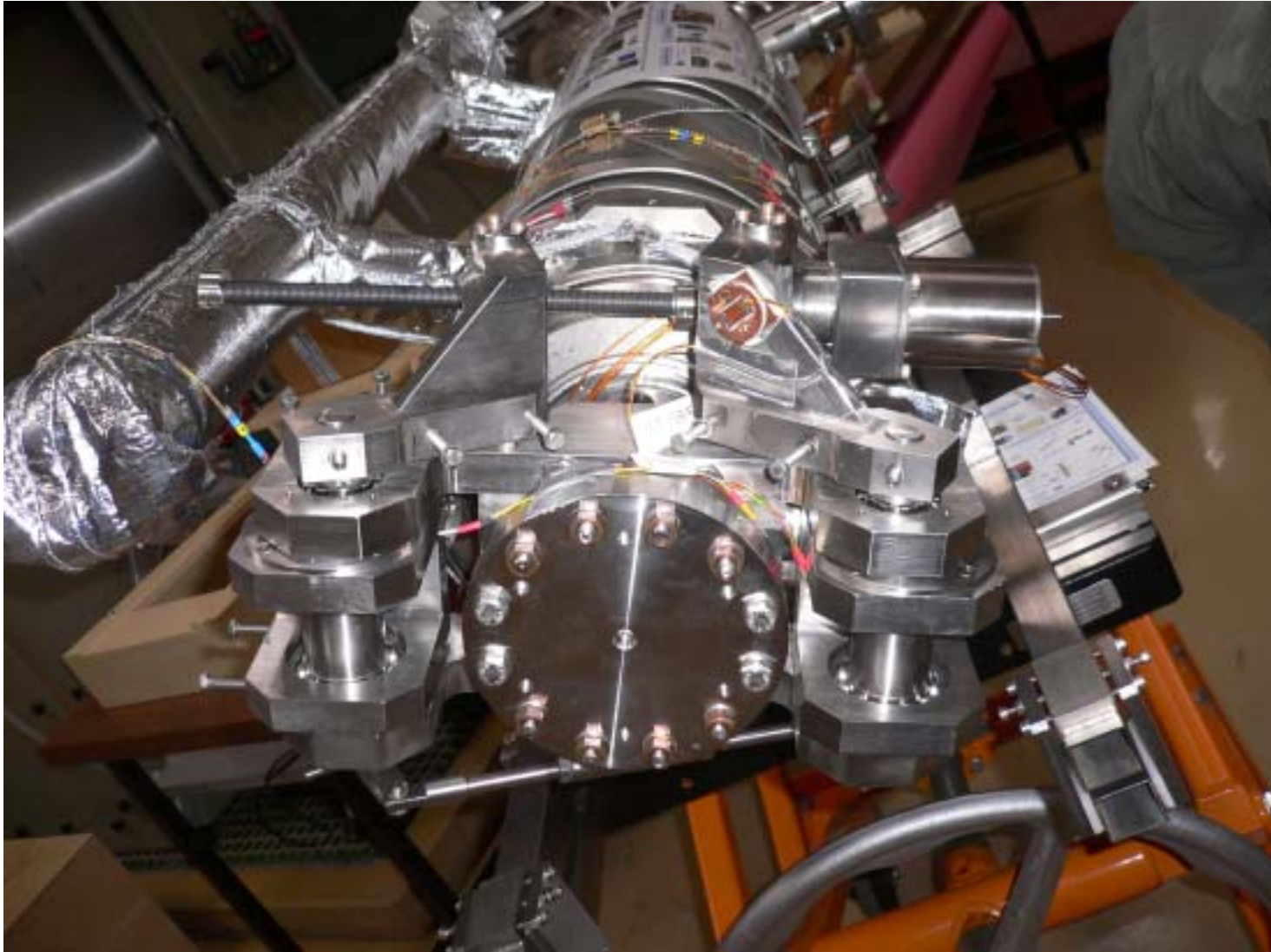
November, 2006'



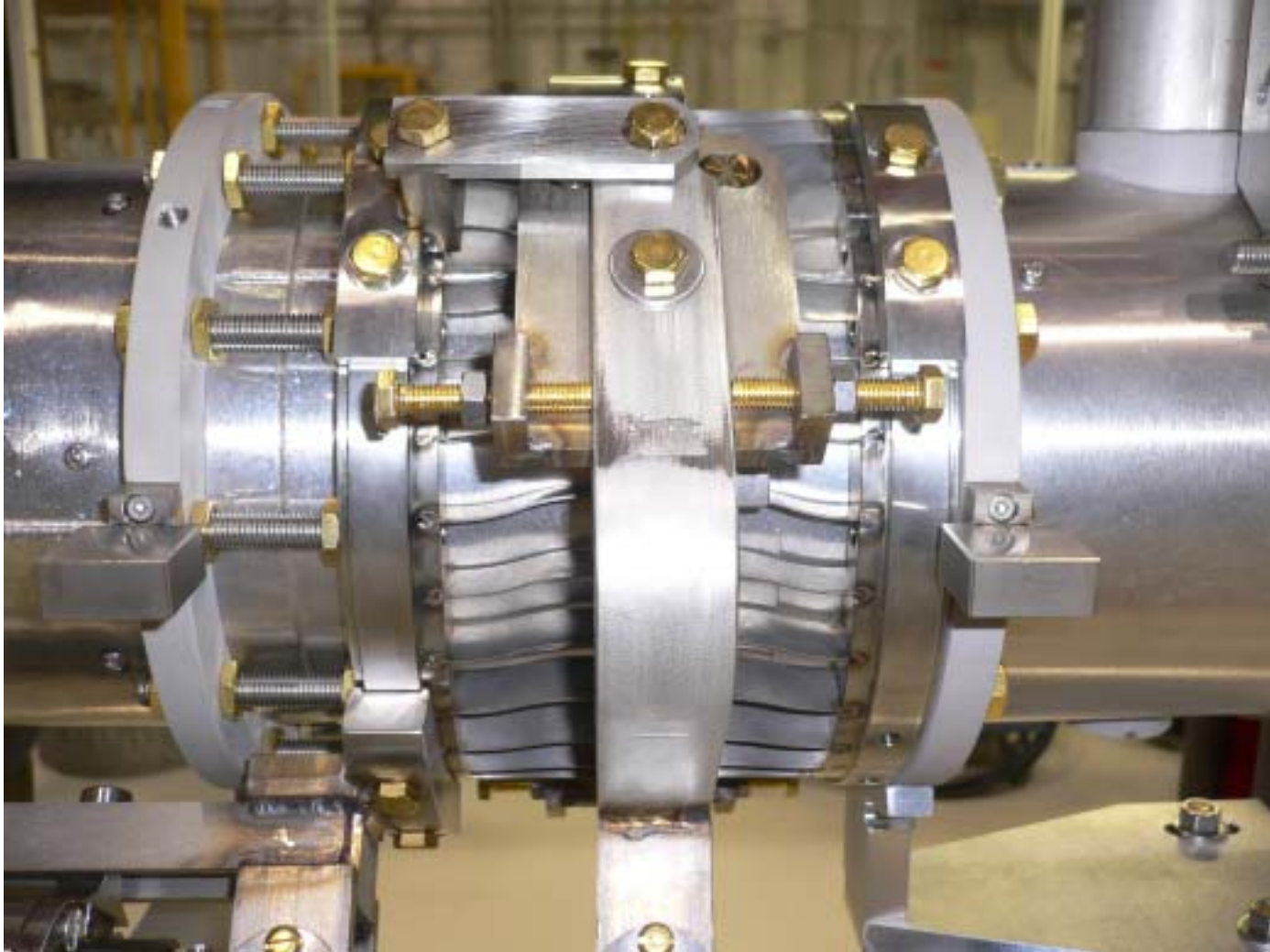
Shuichi Noguchi

TTC Meeting

Saclay-2 Tuner



Blade Tuner



Possible Choice

- Unified Design
- Compatible Cryomodule
- Something between above two Cases

Undividable Sets of Components

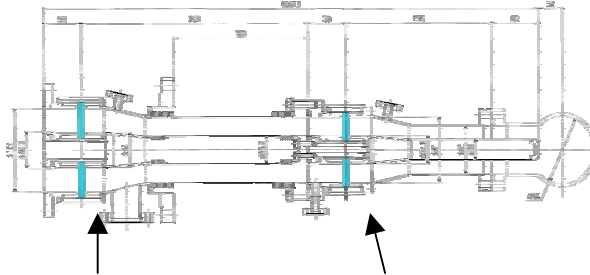
- Flange (Cavity) + Seal + Input Coupler
- Jacket Cylinder (Tuner Flange) + Tuner
- Jacket Endplate + Magnetic Shield
- Piezo + Driver
- Motor + Driver

Levels of Compatibility

Level	Level 1	Level 2	Level 3
	Cryo-Module	Cryostat + Cavity Package	
Interface	Vacuum Vessel Flange Cooling Pipes Beam Pipe Wave-Guide Feedthroughs	Vacuum Vessel Coupler Flange Cavity Hanging Arms from GRP Precooling Line 2k Pipe Inver Rod Thermal Anchor	

Tesla-like STF Baseline Cavity Package

Two Disk Window Input Coupler



Warm Window

Cold Window



a Cavity covered with Ti Jacket



3 Cavities
(Vertical test)

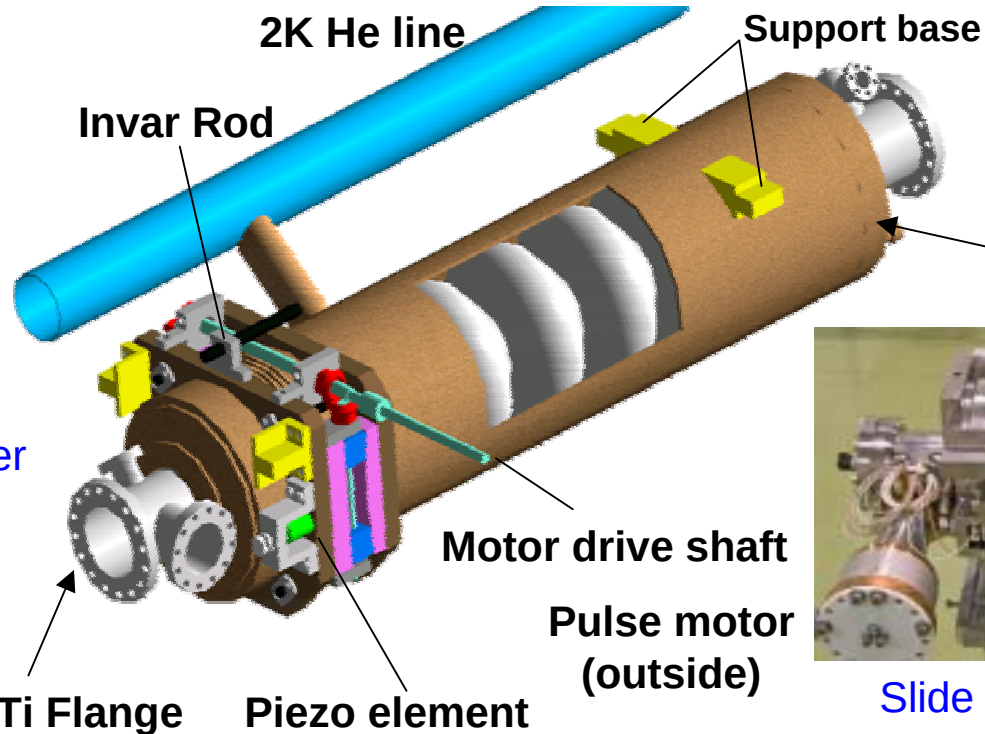


Warm Coupler & Cold Coupler



HOM Coupler

Shuichi Noguchi



Titanium
Jacket



Slide Jack Tuner

Nb/Ti Flange

Piezo element

Motor drive shaft

Pulse motor
(outside)

TTC Meeting at Delhi