New HOM coupler design Demountable Damped Cavity (DDC)

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Outline

1. Motivation
2. Design of Demountable Damped Cavity
3. Summary and conclusion

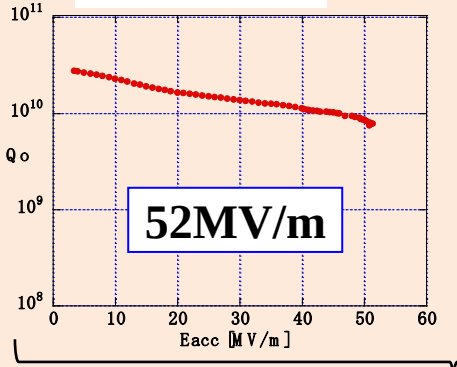
New Q-slope in End group

Single cell cavity yield test results of EP+Baking process.

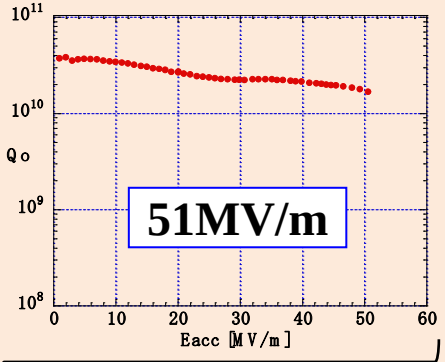
Just HOM cylinder

Full HOM

Center cell

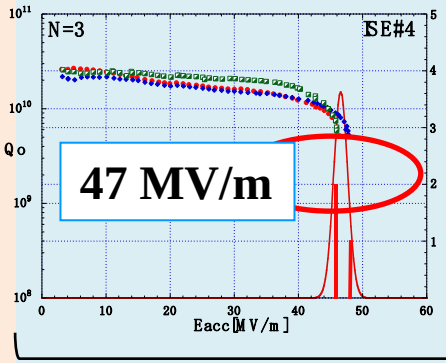


End Cell

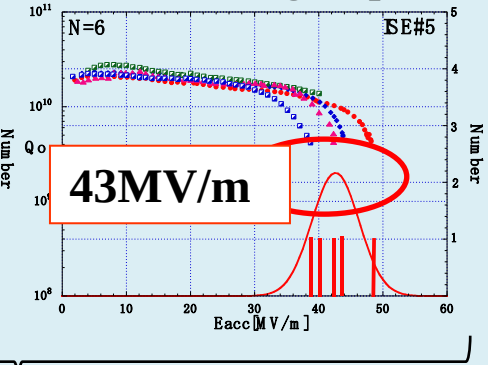


Ichiro center cell and End cell without HOM coupler and input coupler port have demonstrated 50MV/m.

Simple end group



Full end group



End cell with coupler has Q-slope from Eacc > 35MV/m.

Even if EP + Baking is done, Q-slope is not eliminated in the end group.
⇒ new Q-slope caused by HOM coupler heating.

Rinsing Difficulty around HOM

Demountable Acryl END cell cavity, Contaminate all inner surface by spraying " MOLYKOTE®(molybdenum disulfide)" which is often used as a lubricator.

Acryl amodel cavity

Splay MOLYKOTE

After HPR(15min)

HPR jets can not hit.

+After Ultrasonic(30min@28kHz)

Contamination in HOM coupler composed complexly cannot be cleaned enough by HPR or ultrasonic.

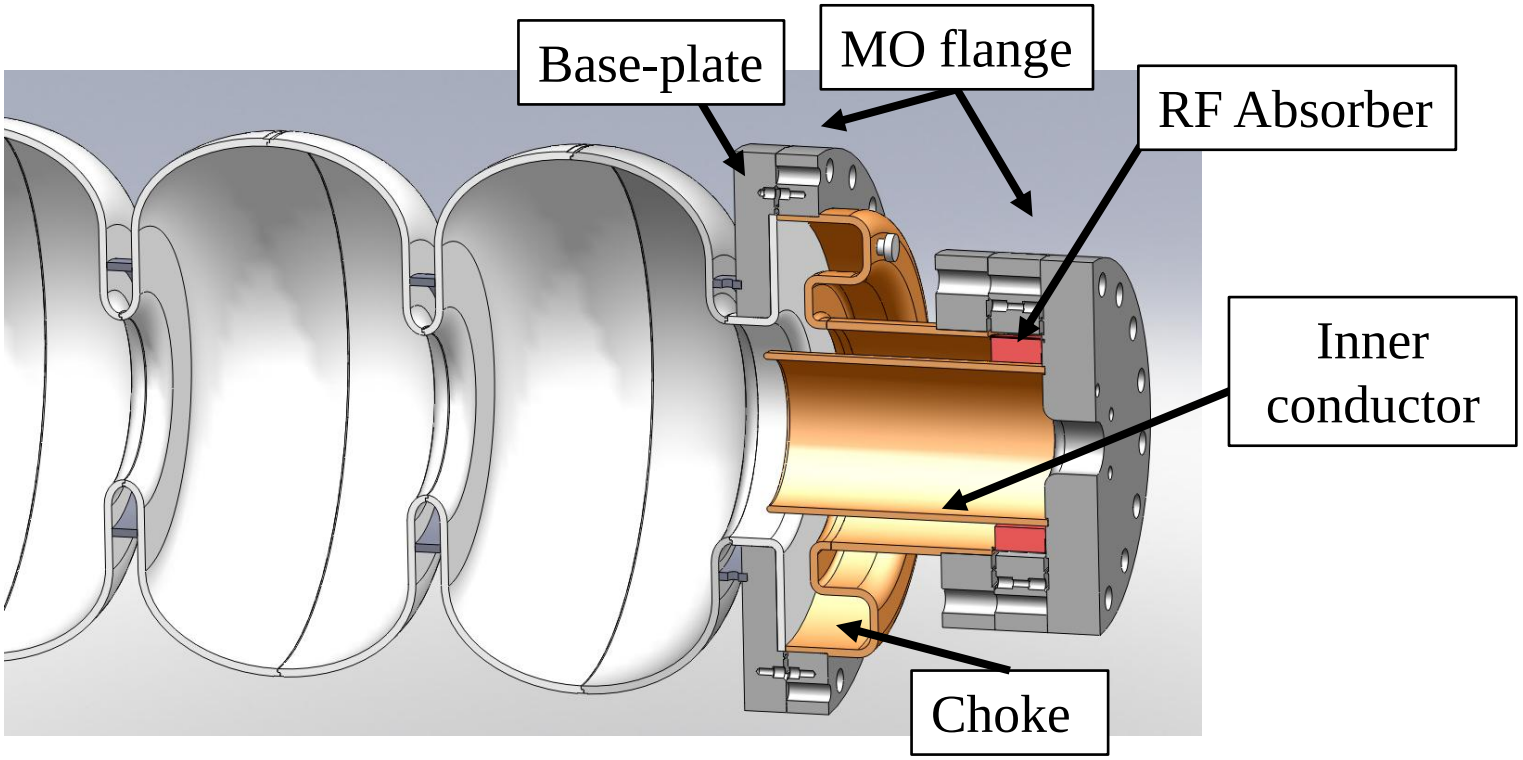
For the high gradient (>40MV/m)

Easy rinsing structure for the end group

→ End Group make "Demountable"

Demountable Damped Cavity(DDC)

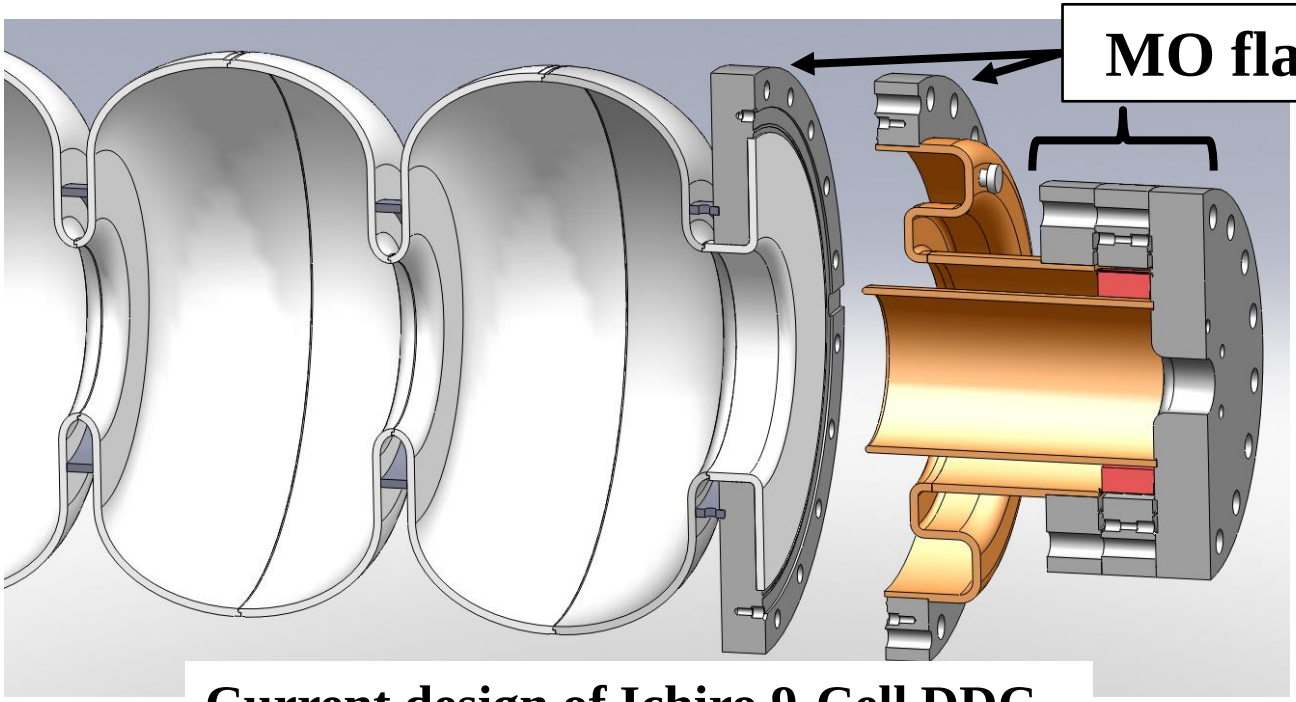
In 9-Cell, HOM damper will be mounted only to the one side of the cavity.
Input/Pickup couplers are under designing.



Current design of Ichiro 9-Cell DDC

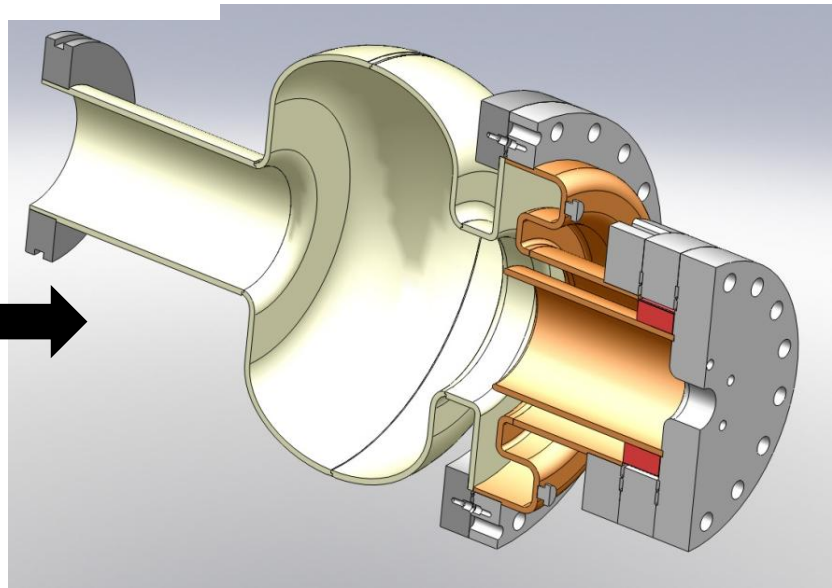
Cell, Choke, Absorber and Inner-conductor can be separated by zero Impedance flange, MOF (Matsumoto-Otsuka flange)

Demountable Damped Cavity(DDC)



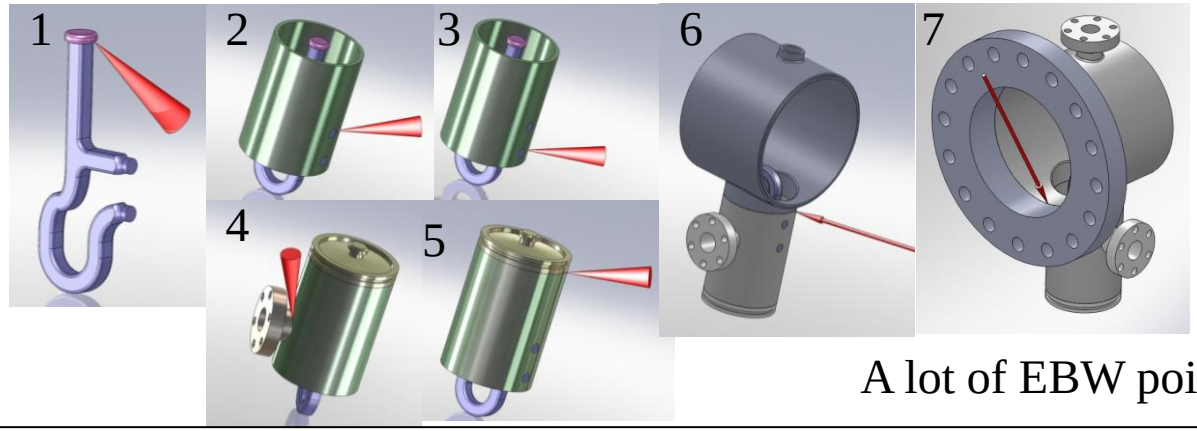
Current design of Ichiro 9-Cell DDC

First, we will demonstrate the idea of DDC with single cell DDC.



Easier Fabrication for DDC

Current end group occupies the half of the cavity manufacturing cost.

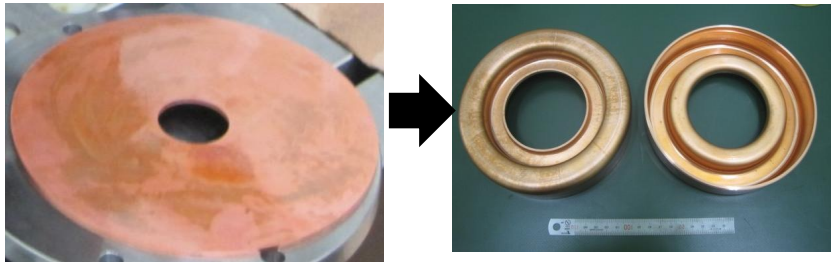


=7points

A lot of EBW point makes to rise the cost.

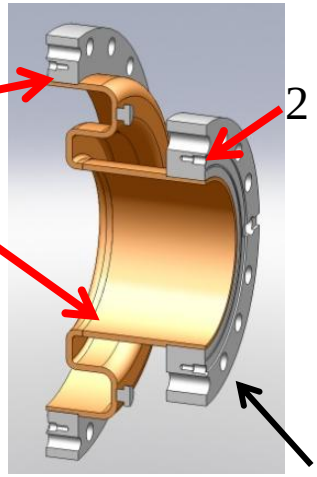
DDC might be reduce the fabrication cost.

Thin plate working



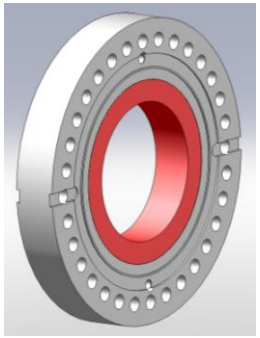
Nb/Cu Film coating technology can be use

Choke

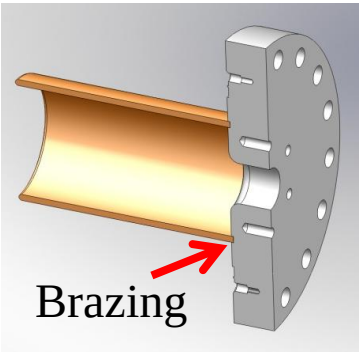


DDC has Only 3 points EBW

Absorber

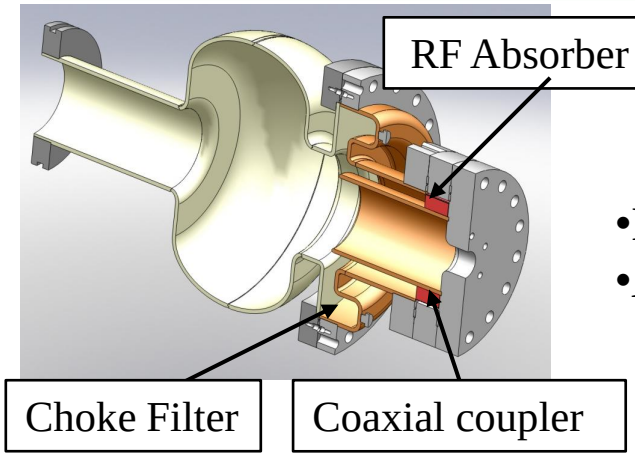


Inner conductor



As for DDC, it is possible to fabricate with the thin plate working, and the number of EBW points are a little.
⇒The fabrication cost will be reduced.

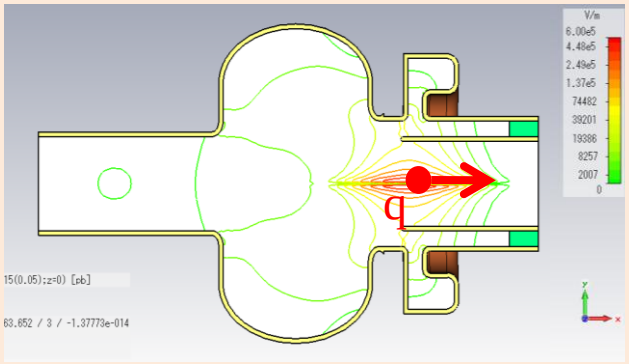
RF advantages in DDC



RF structure of DDC

•HOMs are damped at RF absorber through coaxial waveguide.
•Accelerating mode rejected by choke filter.

1, beam axis symmetry



Symmetry structure of DDC does not occurred the

2,Strong coupling with HOM

	TE111		TM110		TM011
	Low freq	High freq	Low freq	High freq	
DDC simulation	100		$7x10^2$		$8x10^2$
DDC with Ferrite	**$1.4x10^2$**		**$2.0x10^2$**		**$5.1x10^3$**
STF Baseline STF coupler x2	$1.8x10^4$	$5.5x10^2$	$3.4x10^3$	$4.9x10^3$	$2.9x10^4$

STF date from Dr K.Watanabe Dr. thesis

Compare DDC Qext with TESLA type HOM coupler at room temperature.
The DDC absorber shape is not best.

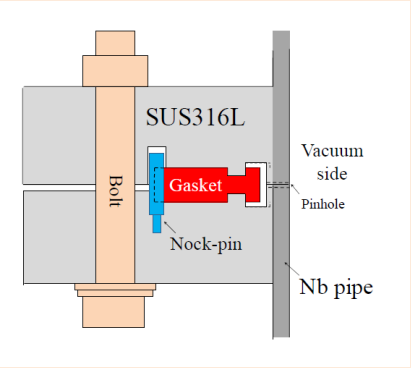
DDC RF Features

- **Beam kick effect is suppressed by the symmetry structure.**
- **HOMs are strongly dumped by coaxial waveguide**

Current Status of DDC

DDC needs many technology

MO seal test done

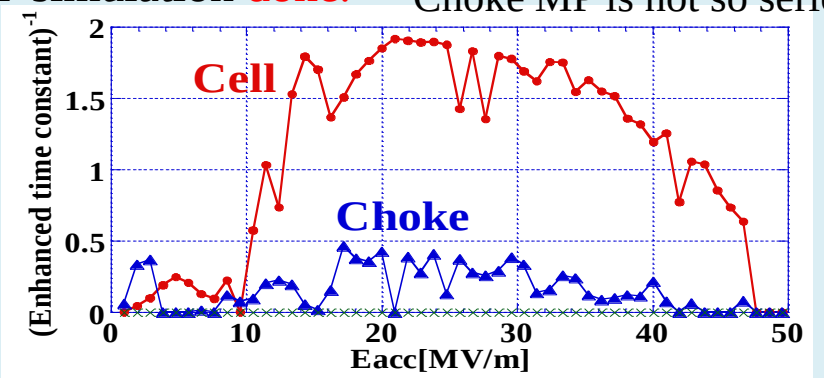


Cu choke fabrication done

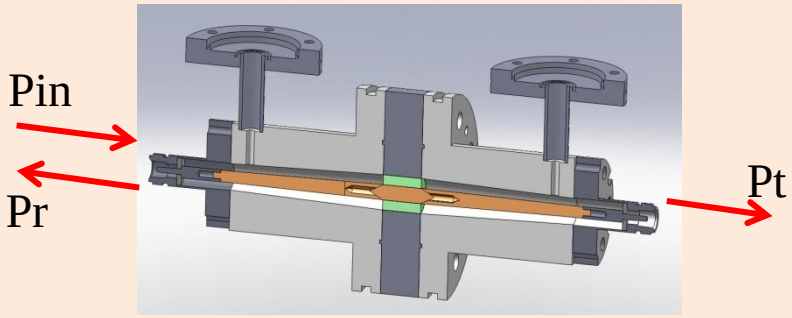
Cu forming is OK. Nb is under consideration

MP simulation done.

Choke MP is not so serious



Absorber property measure at 2K preparing



We will measure by Transmit-Reflection method.

Single cell DDC preparing

Other technologies

- Thermal structure design is under way
- Nb/Cu film coating cavity under preparing

Summary

- Current end group has Q-Slope at high gradient even if EP + Baking are done, because of the difficulty on the HOM cleaning.

- DDC has been designed to solve the problem.
  - Demountable structure for easy cleaning
  - Symmetrical structure for RF advantages
  - Easy fabrication for cost reduction

- Single cell DDC is under fabrication.
- The idea of DDC will be proved first with single DDC.
- Then 9-Cell with DDC will be fabricated and demonstrated.

※ More details were presented at IPAC10 and LINAC10

IPAC10 WEPE 014 ”Design and Model Cavity Test of The Demountable Damped Cavity”, http://accelconf.web.cern.ch/AccelConf/IPAC10/papers/wepe014.pdf

LINAC10 MOP 113 “Multipacting Simulation of The Demountable Damped Cavity”,