

# 入射器クライオモジュール開発の 現状と今後

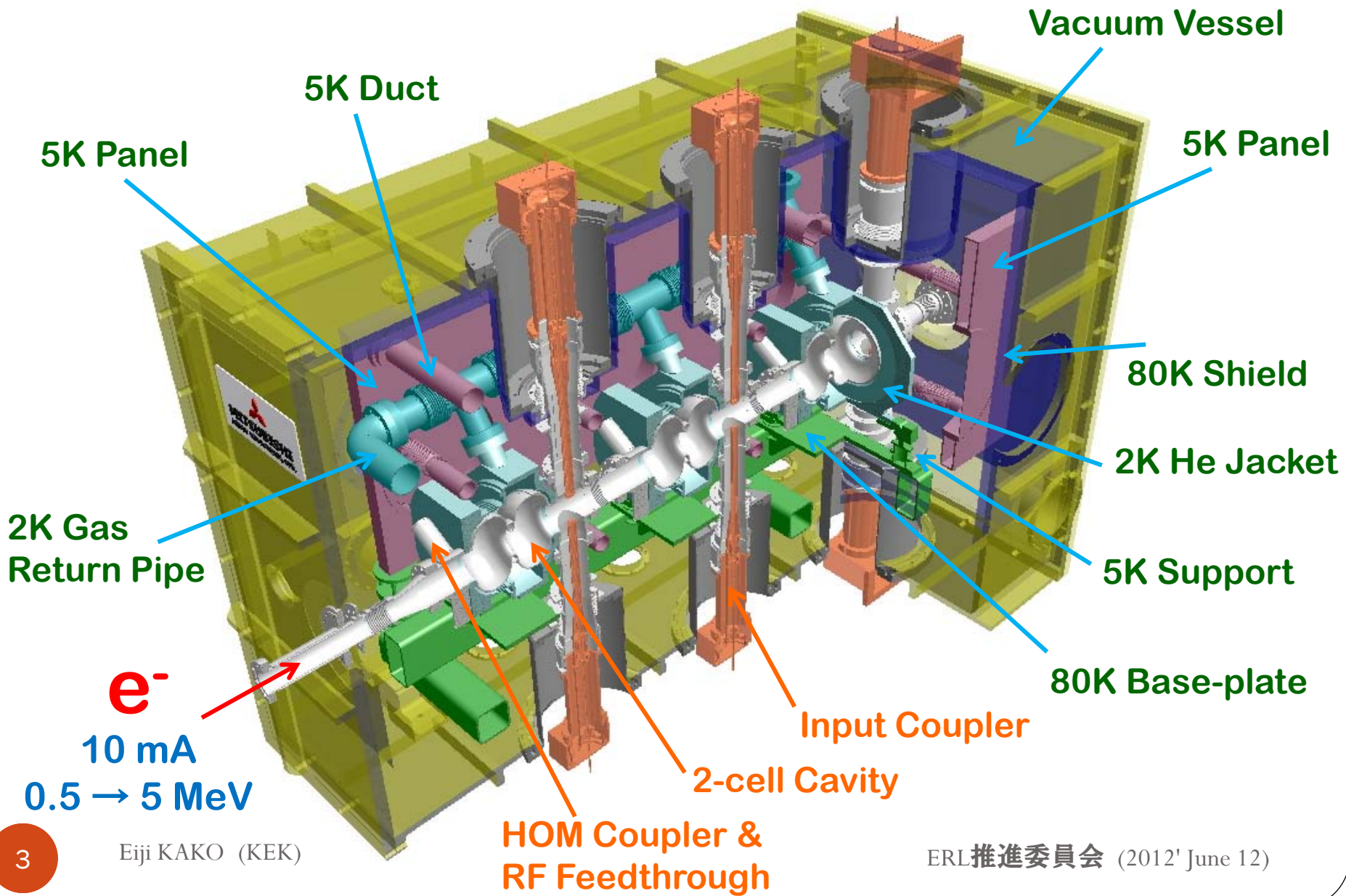
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(高エネルギー加速器研究機構)

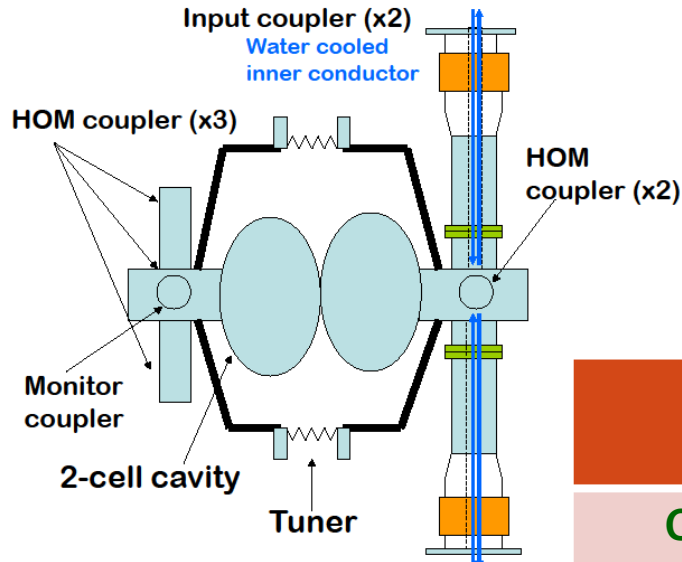
# 発表内容

1. 概要
2. 要素開発部品単体での性能試験
3. クライオモジュールの組立て
4. 今後のスケジュール

# Injector Cryomodule for cERL



# Main Specification for Injector Cryomodule



$Q_L$  /coupler,  
 $P_{rf}$  /coupler,  $I_{beam} = 10 \text{ mA}$ ,  $E_{beam} = 5 \text{ MeV}$

	Cavity - I	Cavity - II	Cavity - III
Cavity	#3 cavity	#4 cavity	#5 cavity
Input coupler	#3 & #4 couplers	#5 & #6 couplers	#7 & #8 coupler
Operational gradient	6.5 MV/m (1.5 MV)	7.5 MV/m (1.8 MV)	7.5 MV/m (1.8 MV)
Loaded Q ( $Q_L$ )	$10 \times 10^5$	$4 \times 10^5$	$4 \times 10^5$
RF Power ( $P_{rf}$ )	7.5 kW	10 kW	10 kW

Static Loss :  
 14 W at 2 K  
 33 W at 5 K

Dynamic Loss :  
 6 W at 2 K  
 4 W at 5 K

Total Heat Loss :  
 20 W at 2 K  
 37 W at 5 K

(#1 cavity, #2 cavity, #1 & #2 couplers : Prototype)

# Key Components for Injector Cryomodule



Three 2-cell Cavities



Six CW Input Couplers



Fifteen HOM Couplers



Fifteen RF Feedthroughs



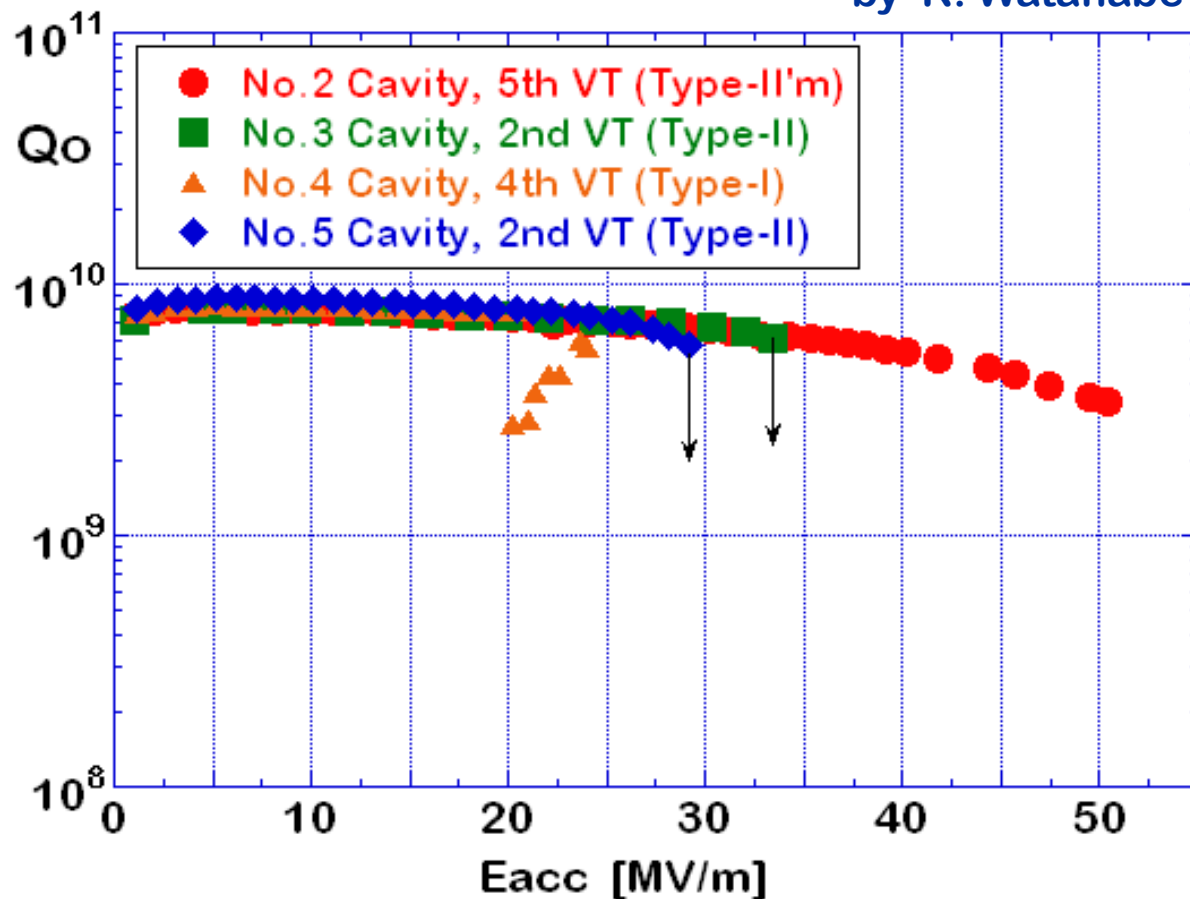
Slide-jack Tuner



# Cavity Vertical Tests Results (Final)

with 5 RF feedthroughs of HOM couplers

by K. Watanabe



# RF Feedthroughs with HOM pick-up antenna

by K. Watanabe



Type-0 (i.c: Kovar, o.c: Kovar)



Type-I (i.c: Mo, o.c: Kovar)

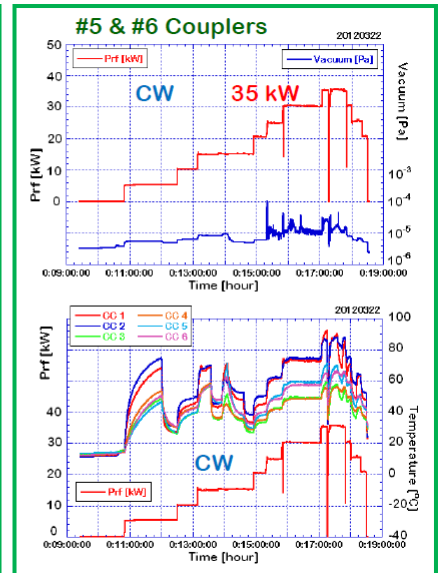
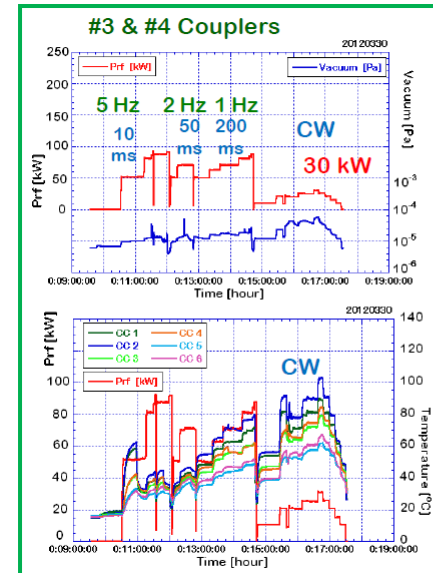
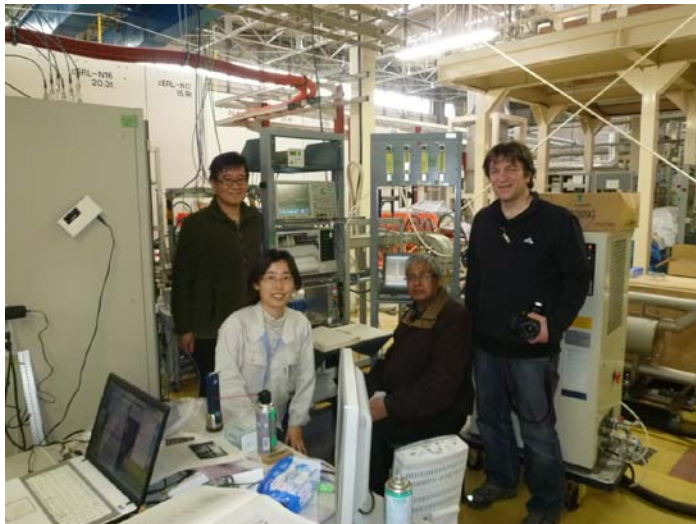
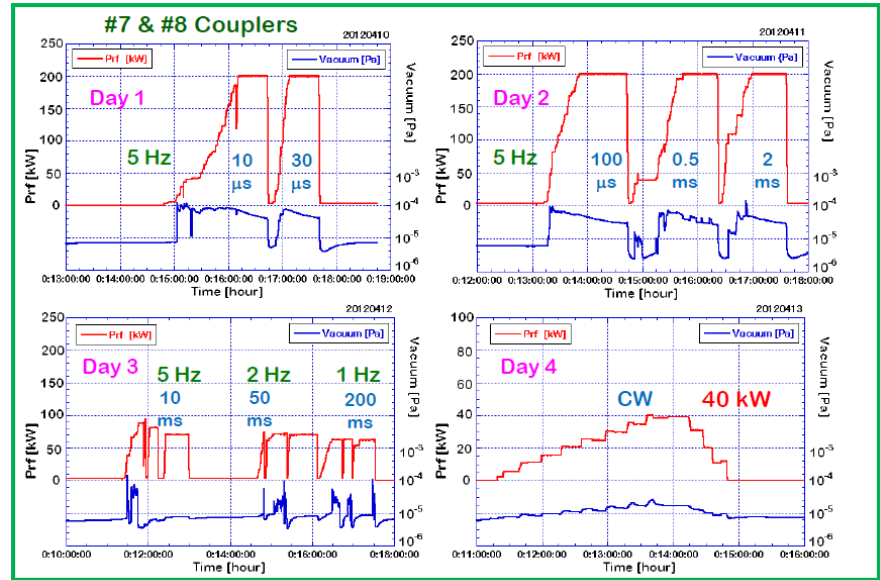
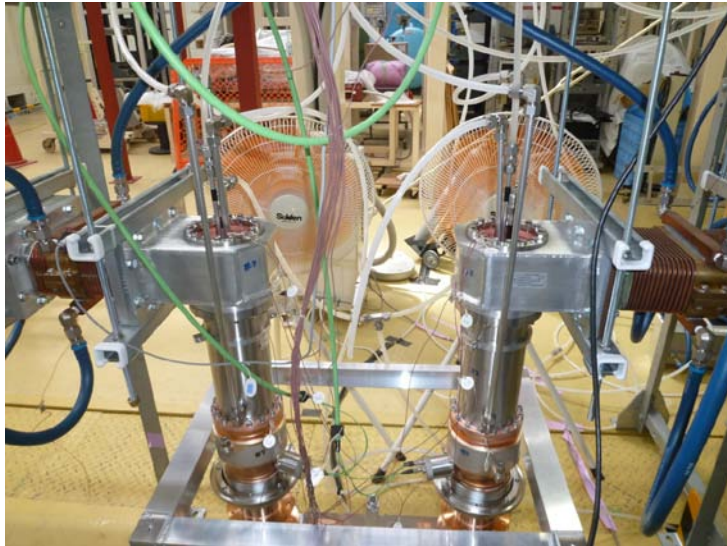


Type-II (i.c: Mo, o.c: Cu)



Type-II'm (i.c: Mo, o.c: Cu) "male pin"

# RF Conditioning of CW Input Couplers



Collaboration with HZB/Triumf/KEK



# Assembly of Injector Cryomodule (1)

April 25<sup>th</sup>, 2012



Exchange of RF feedthroughs



Attachment of input couplers



Cavity string assembly in clean room

# Assembly of Injector Cryomodule (2)



Assembly of tuner system



Adjustment of HOM filter properties

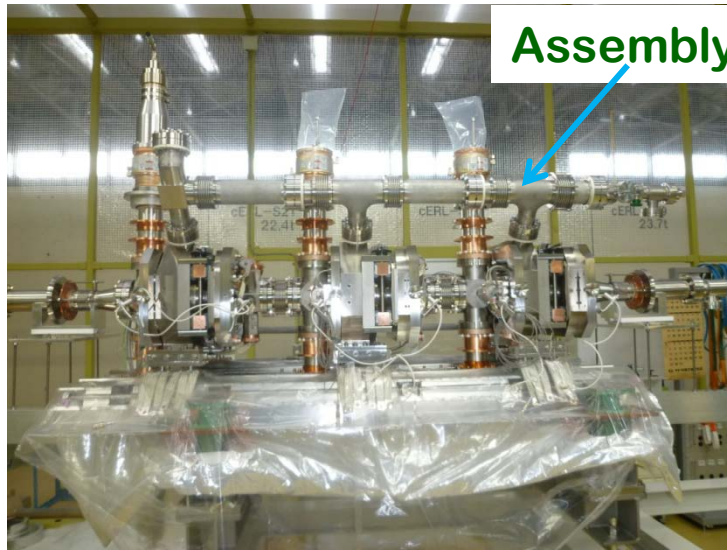


Alignment of three cavities

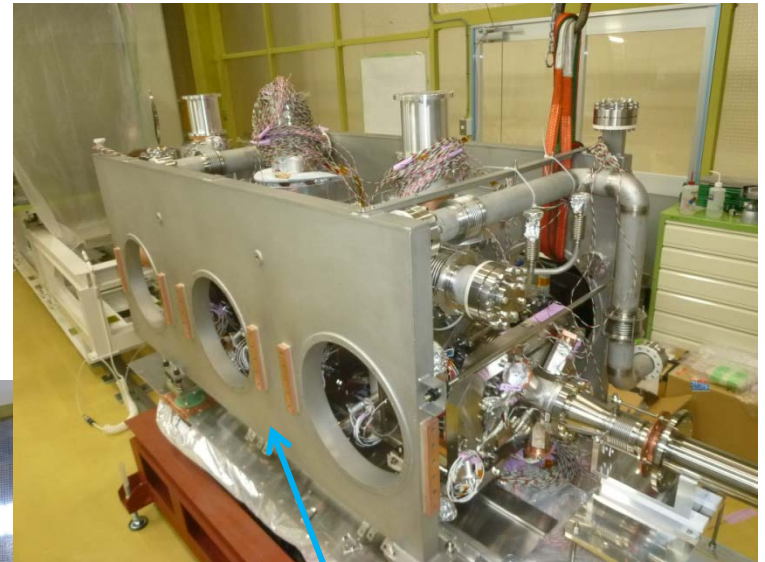




# Assembly of Injector Cryomodule (3)



Assembly of 2K-He line



Installation of 5K-He panels

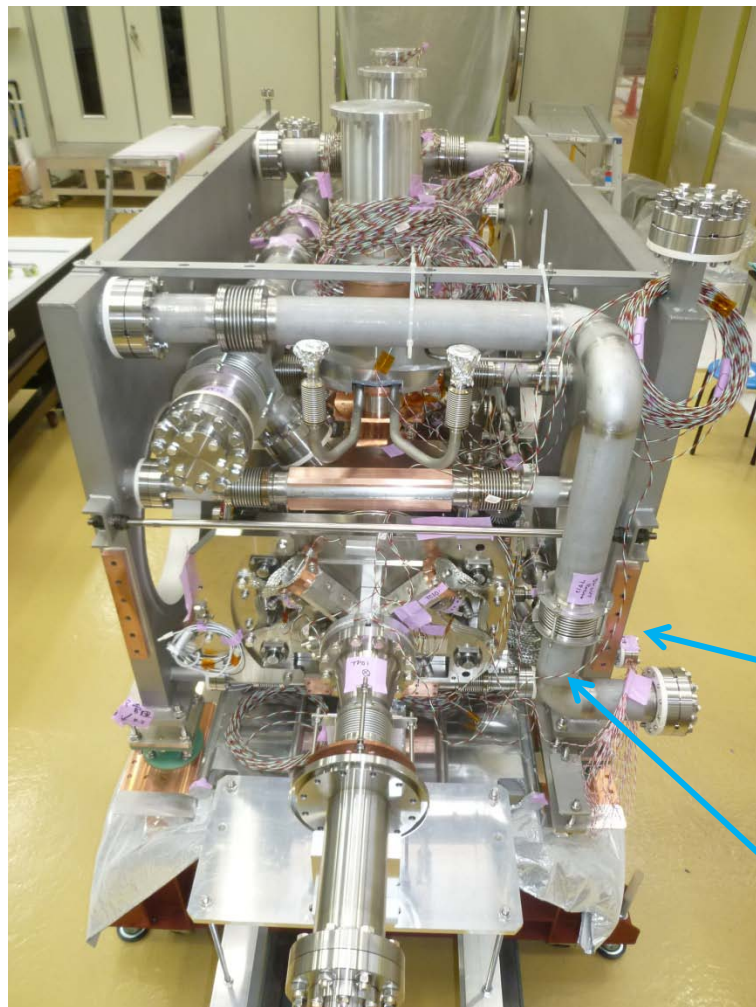


Vacuum vessel

# Assembly of Injector Cryomodule (4)

2K-He, 5K-He, 80K-N<sub>2</sub> Cooling Line

May 23<sup>rd</sup>, 2012



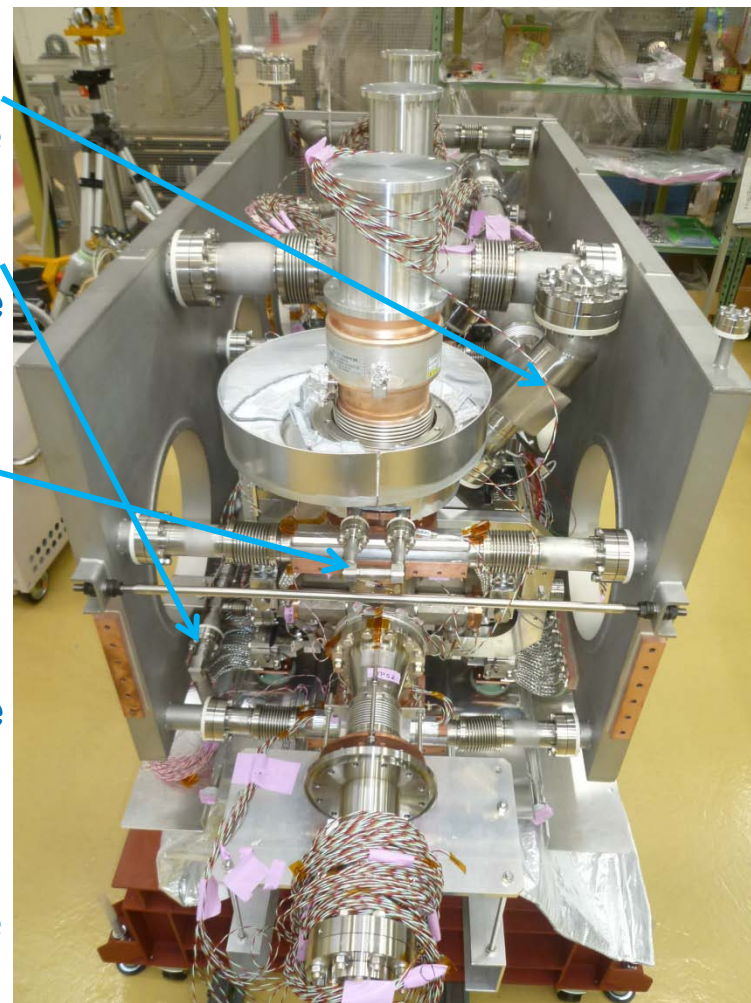
2K-He Gas  
Return Line

Liq. 2K-He  
Supply Line

Liq. 80K-N<sub>2</sub>

Liq. 5K-He  
Supply Line

5K-He Gas  
Return Line

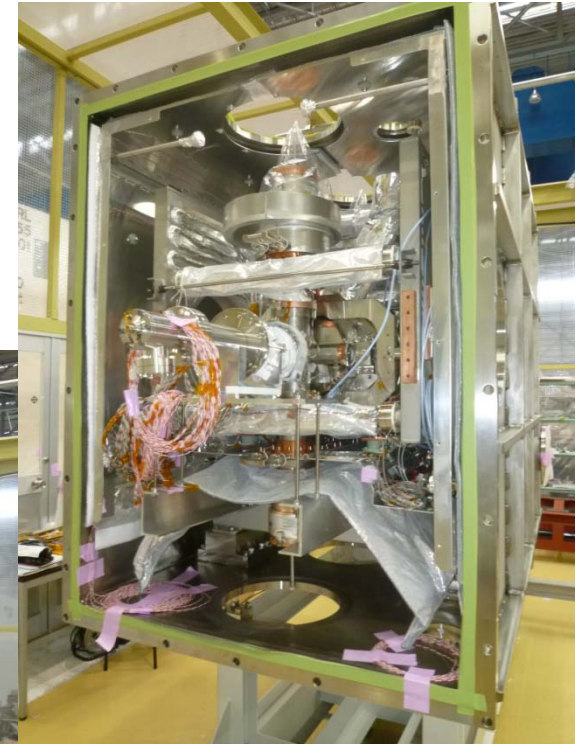




# Assembly of Injector Cryomodule (5)



Insertion of  
Cold-mass into  
Vacuum vessel



June 6<sup>th</sup>, 2012

Eiji Kako (KEK)

# 入射器クライオモジュール： 今後のスケジュール

- 6月末： 組立完了、ビームライン設置
- 7月末： 冷凍機側バルブボックス接続
- 8月10日： 完成検査
- 9月： 第1回冷却試験、低電力RF試験
- 10-11月： 入力カップラー室温エージング
- ~12月末： 第2回冷却試験、大電力RF試験
- ??????： ビーム試験運転開始