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MICE Absorbers

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MICE meeting, Nov-01, 2003 at Abingdon

MTA/FNAL Oct-14 '03

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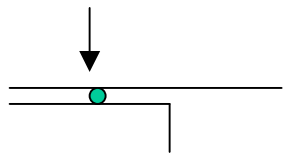
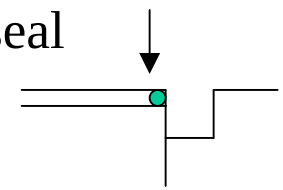
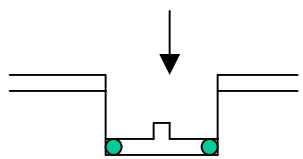
Bolt-Type Absorbers

Absorber	Diameter	Bolts	Seal	Flange structure
Absorber I (2001)	ϕ220 mm one loop He-flow	S-S 24 - ¼”	In ϕ1 mm single	flat seal 
Absorber II (2002)	ϕ210 mm two loop He-flow	S-S 24 - ¼”	In ϕ1 mm single	flat seal corner seal 
Absorber III MICE (2003)	ϕ300 mm two loop He-flow	S-S 24 - M6 Helisert	In ϕ1mm double Helicoflex	2 corner seals key structure 

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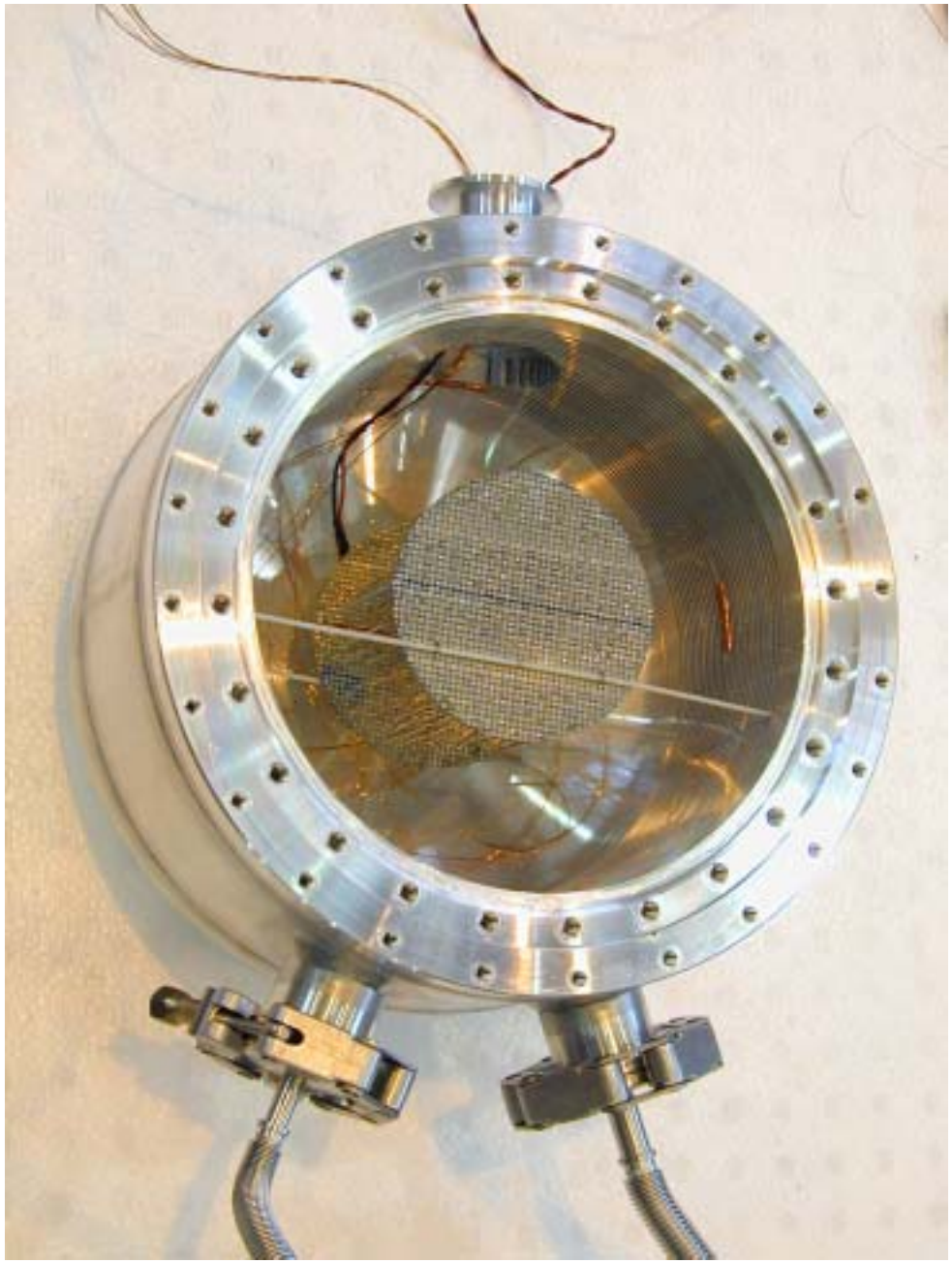
Absorber I

(2001)



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Absorber II

(2002)

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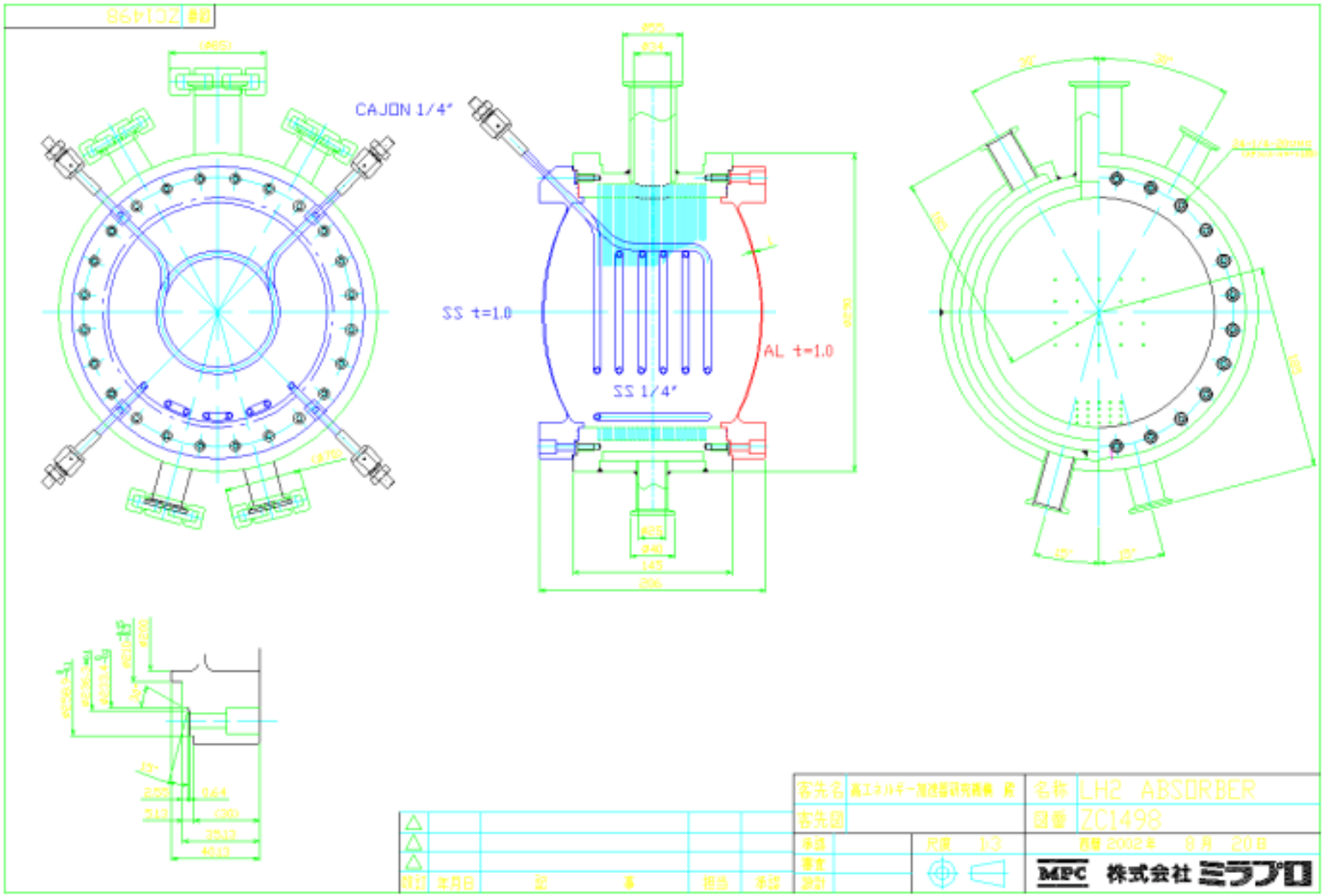
Absorber II



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Absorber II

Aluminum flange
T=1.0 mm

Indium corner seal

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Absorber II

Warm He heater

on S-S flange

Indium corner seal

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KEK Test Cryostat at MTA/FNAL

DRAFT VERSION

CRYOGENIC EQUIPMENTS AT MTA FOR KEK TEST

S.ISHIMOTO & C. DARVE - 9/30/03

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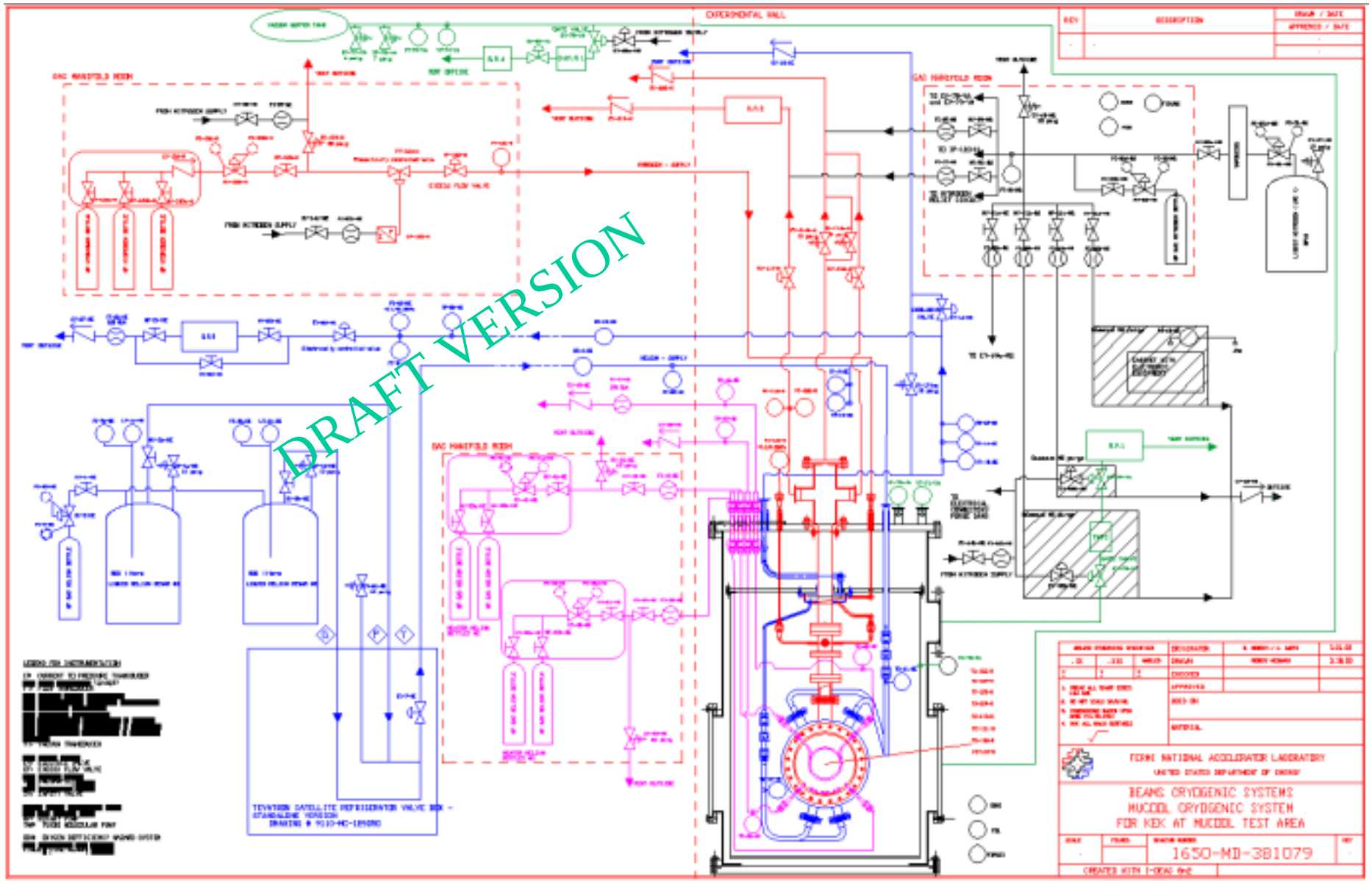
KEK Test Cryostat at MTA/FNAL



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Recent Test Results of Absorber II
(Bolt-type, In-seal at KEK/FNAL)

(1) L-Ne(28-30K) Test at KEK

Absorber & H2 Pipes; He leak test at R.T. and 80K; $< 1 \times 10^{-9}$ atm.cc/sec
Absorber & H2 Pipes; 13 hours at 1.0-2.0 bar, 28-30K -- OK (0.9-1.2 x 10^{-7} Torr)

(2) Pressure Test at Room Temperature (MAWP is 1.7 bar)

Absorber & H2 Pipes; 60min at 2.0 bar -- OK
He channel ; 60 min at 2.0 bar -- OK

(3) Helium Leak Test at Room Temperature

Absorber & H2 Pipes; $< 1 \times 10^{-9}$ atm.cc/sec *
He channel; $< 1 \times 10^{-9}$ atm.cc/sec *

(4) Pressure Test at 80K (LN2 flow in He Channel)

Absorber & H2 Pipes; 30 min at 2.5 bar -- OK

(5) Helium Leak Test at 80K

Absorber & H2 Pipes; $< 1 \times 10^{-9}$ atm.cc/sec *

(6) Vacuum Vessel Pressure Test at Room Temperature

Vacuum Vessel; 68 min at 2.5 bar -- OK

Absorber II
KEK → FNAL

(2)-(6) were tested on FNAL/US safety regulations at FNAL.

* Calibrated sensitivity < 10^{-9} , B.G.=1.3~4.4 x 10^{-9} atm.cc/sec

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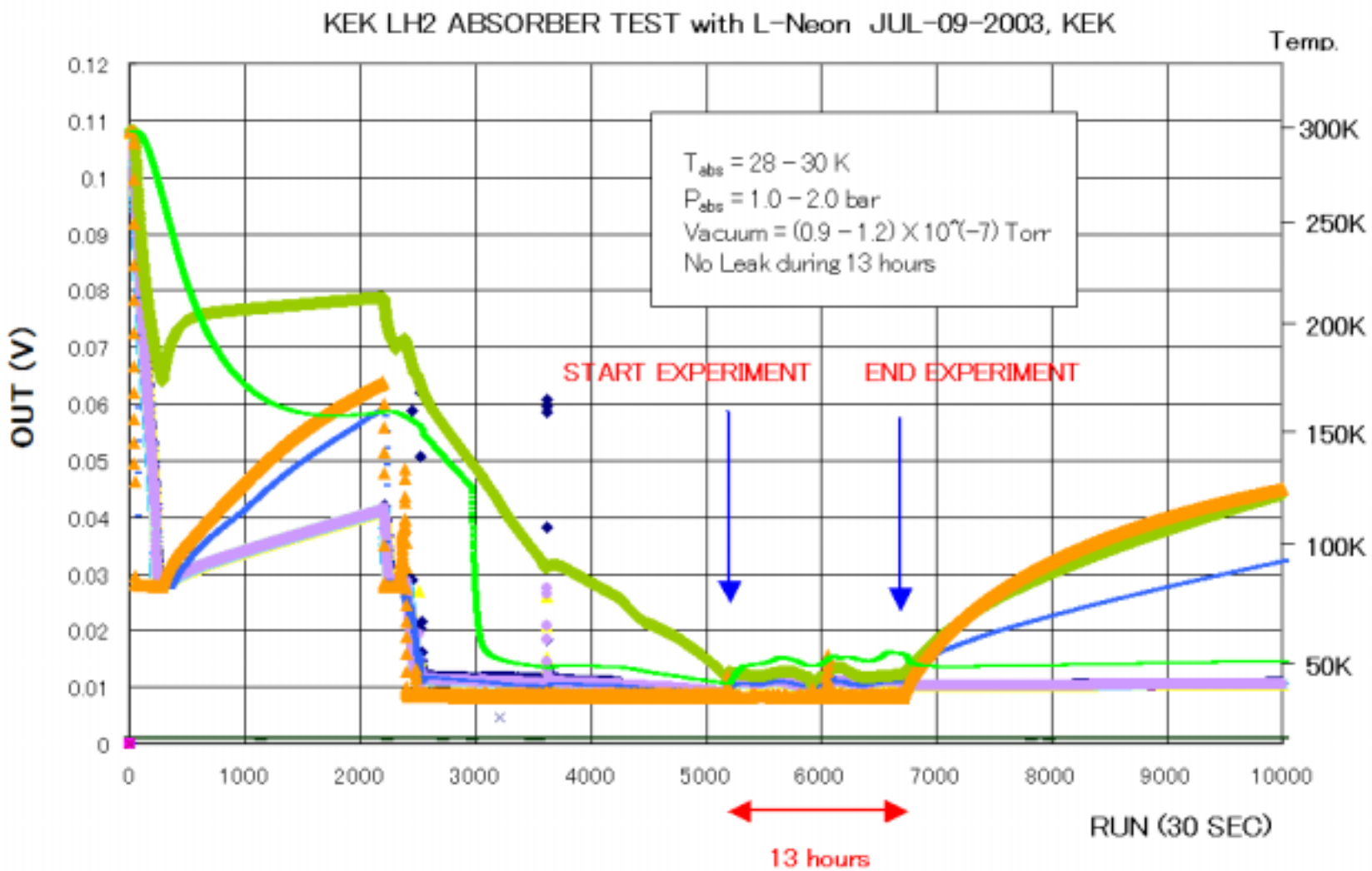
L-Ne Test Results of Absorber II at KEK



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MICE Absorbers

Design Guide Line

1. Based on Absorber I and Absorber II developed at KEK.
2. D=300 mm, bolt-type flange
3. SS-bolt + Helisert (helical coil wire screw thread insert)
4. Double Indium-seal for absorber with H2 gas leak monitoring port, and single seal for vacuum windows.
5. Key structure to prevent the slip due to thermal expansion.
6. Fit to MICE vacuum space and KEK test cryostat.
7. Diameter of vacuum window should be > 300 mm.
8. Absorber body support units (vertical and horizontal).

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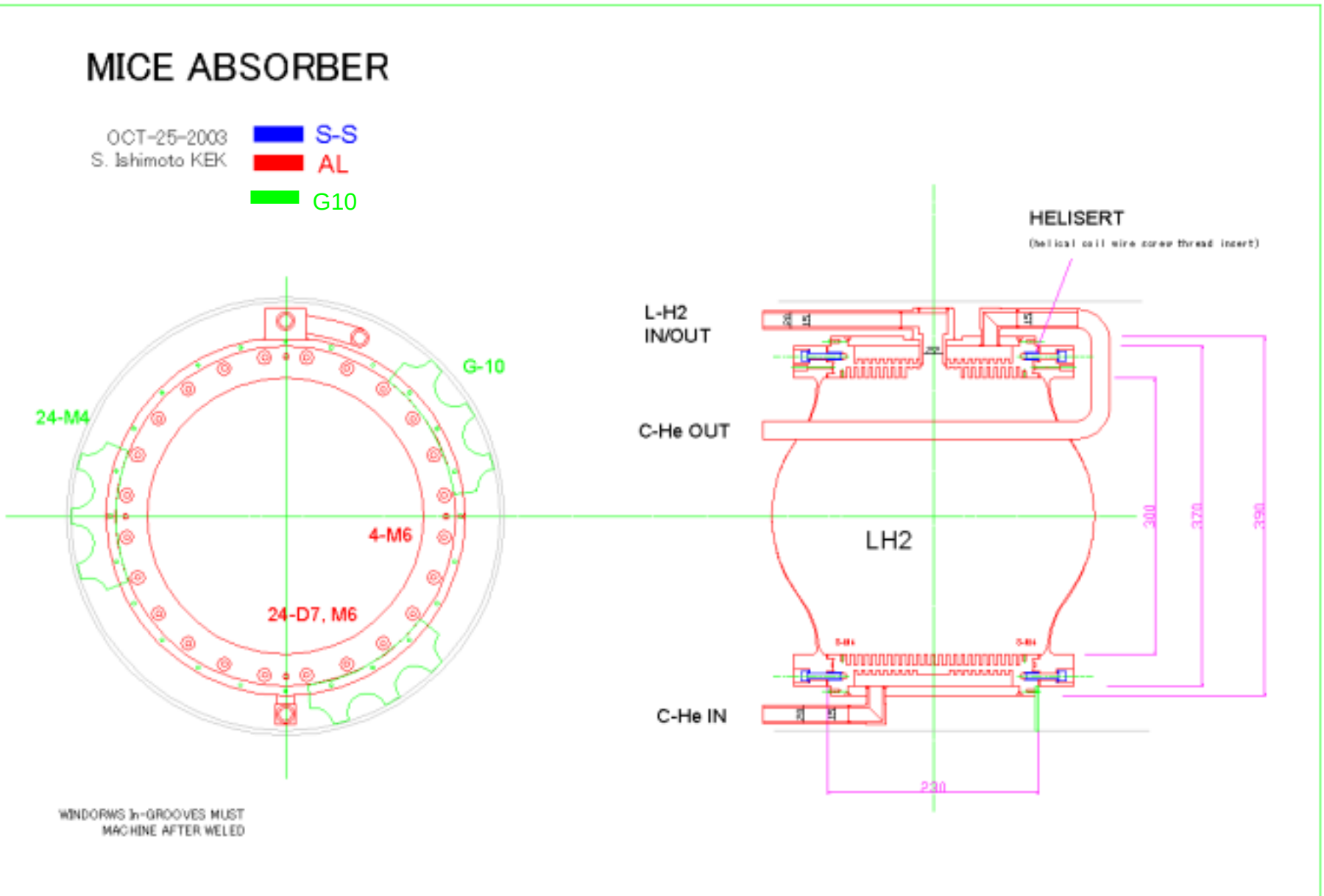
MICE Absorber (Absorber III) Design



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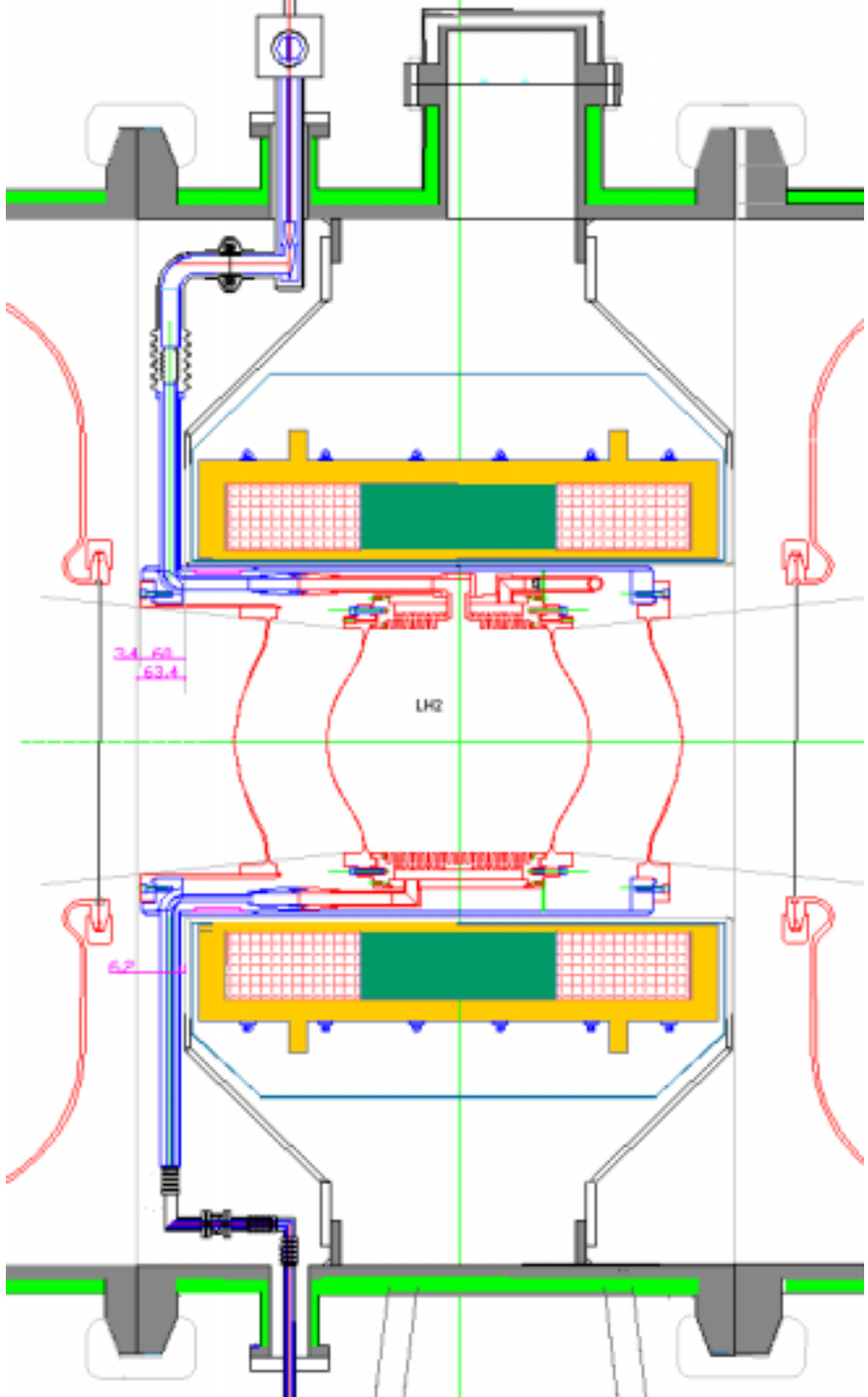
Absorber and Focus Coil Unit

Bolt-type Absorber



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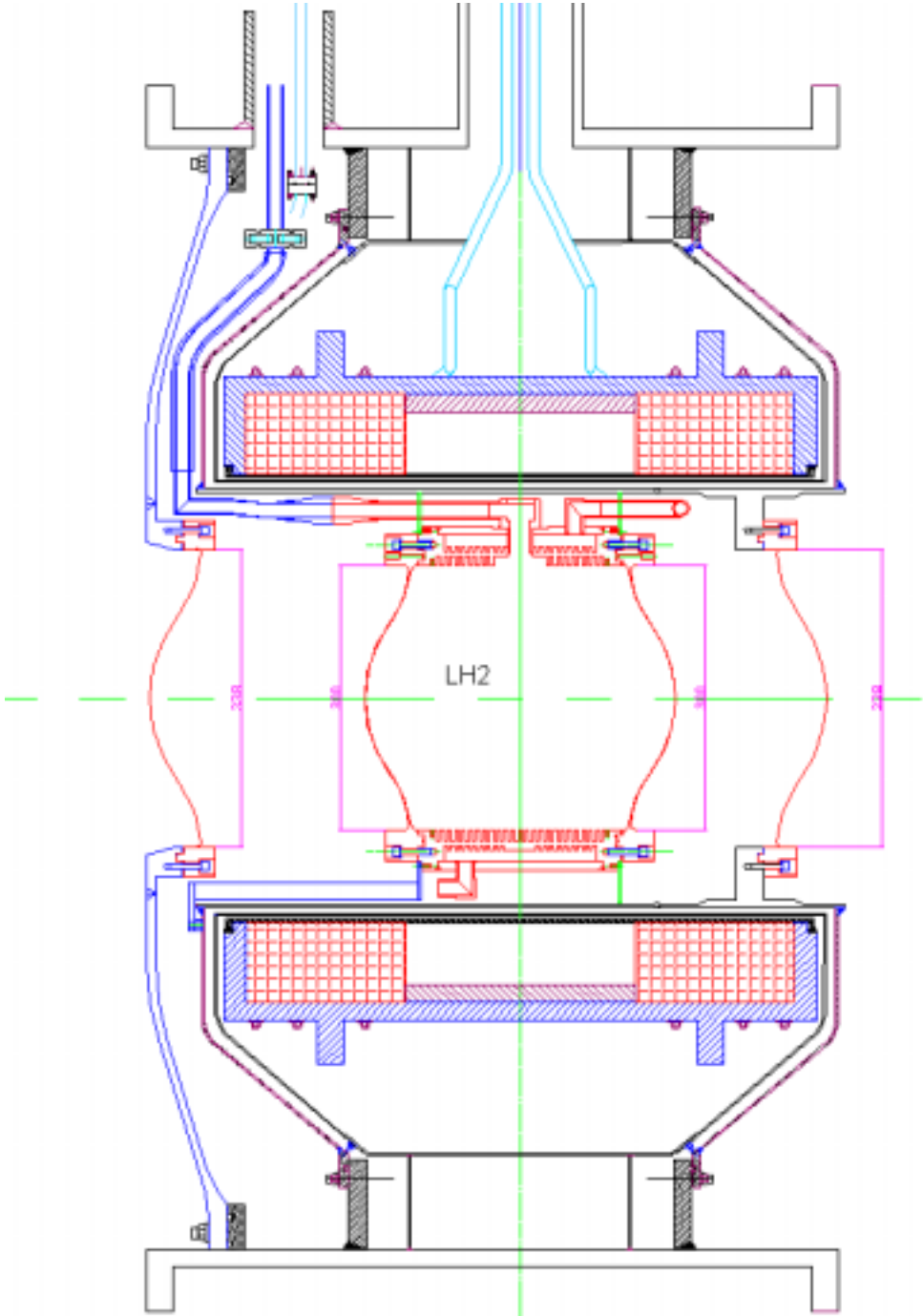
MICE Absorber and Focus Coil Unit

New vacuum concept

& MICE Absorber



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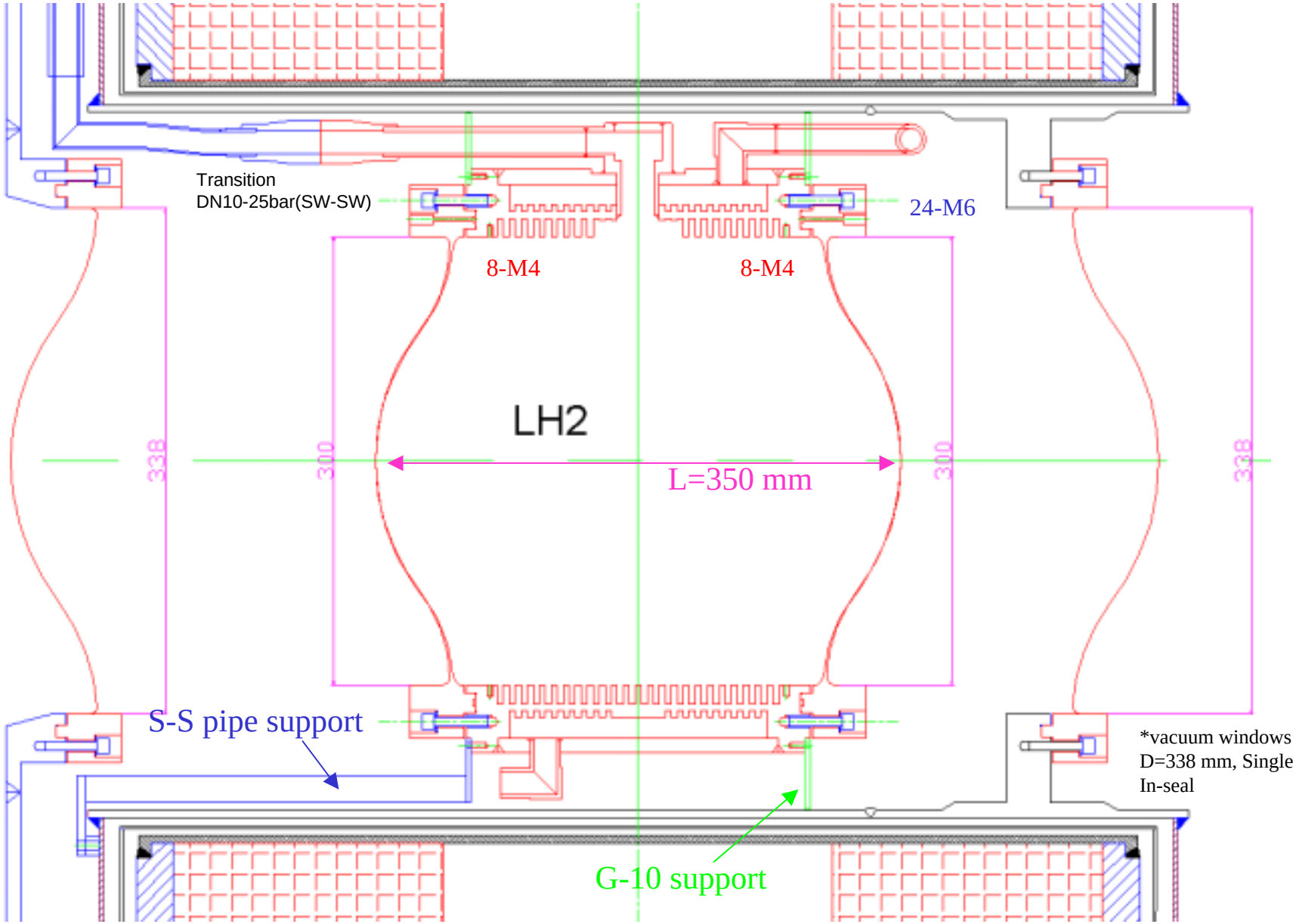
Detail of MICE Absorber



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Detail of MICE Absorber

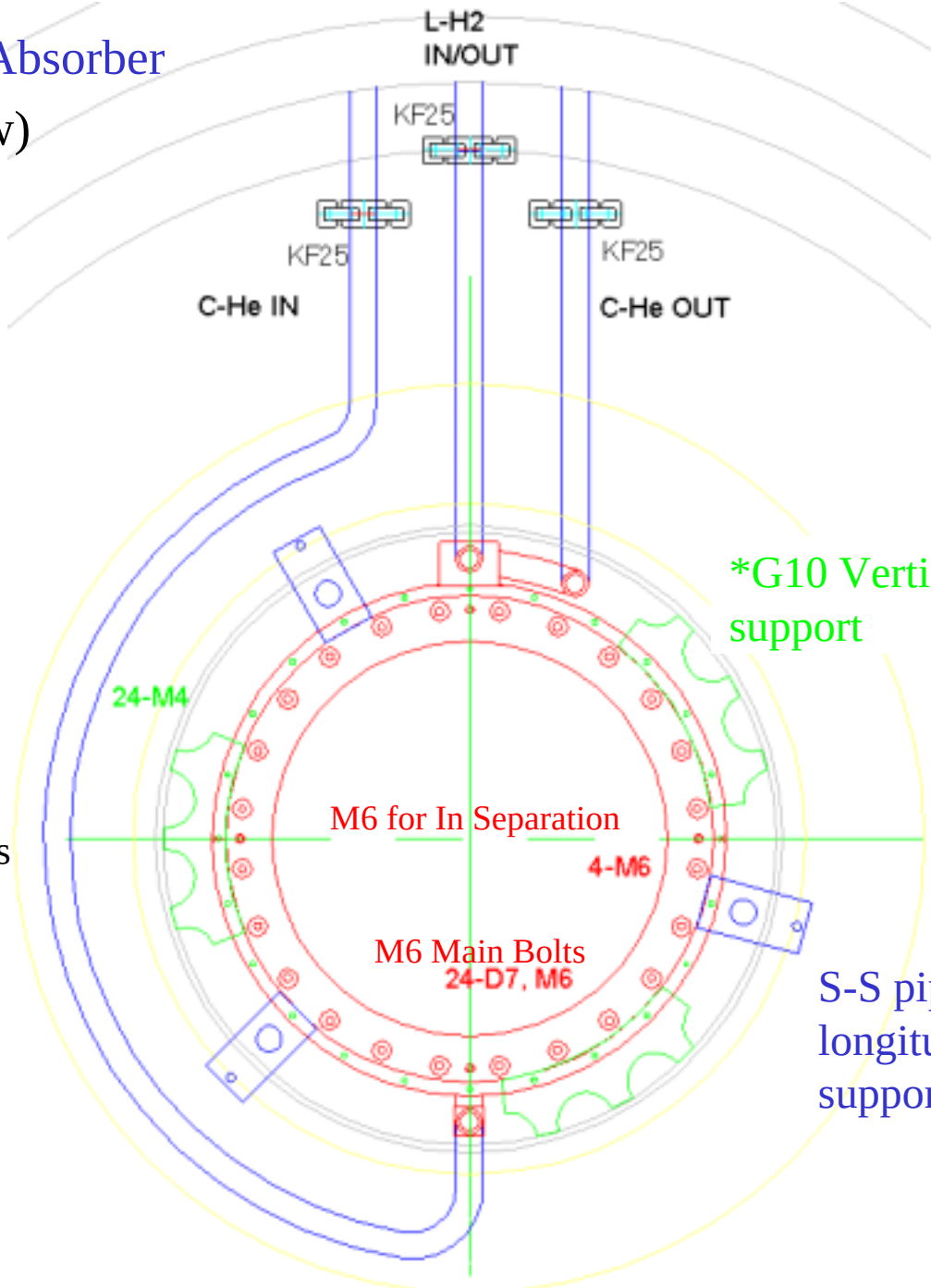
(front view)

*KF25 Flange + Helicoflex(AL)
+ Metal Flexible Hose

SS-AL

*Cajion+VCR for H2 leak monitors

SS-SS
VCR(Ni)



*G10 Vertical support

S-S pipe longitudinal support

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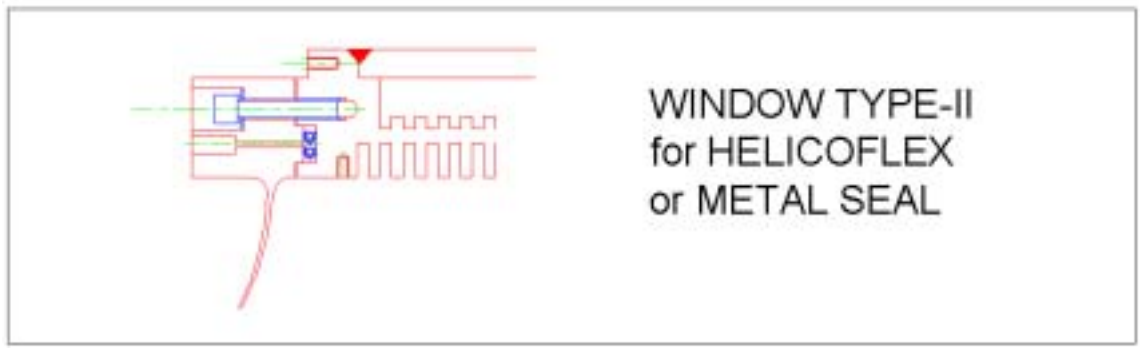
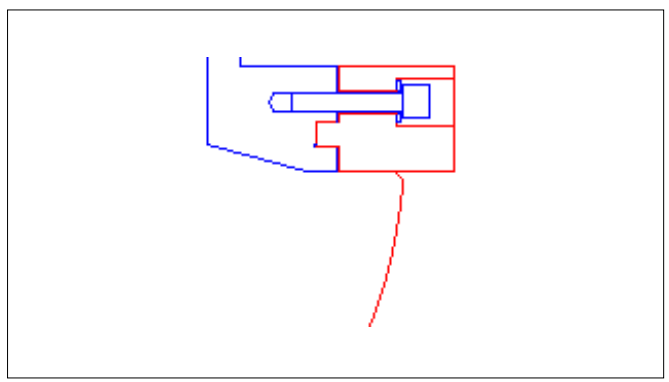
MICE Window seals

Double In-seal +
H2 monitor port



Vacuum Window seal

Single In-seal



MICE Absorber Test Plan in KEK Cryostat

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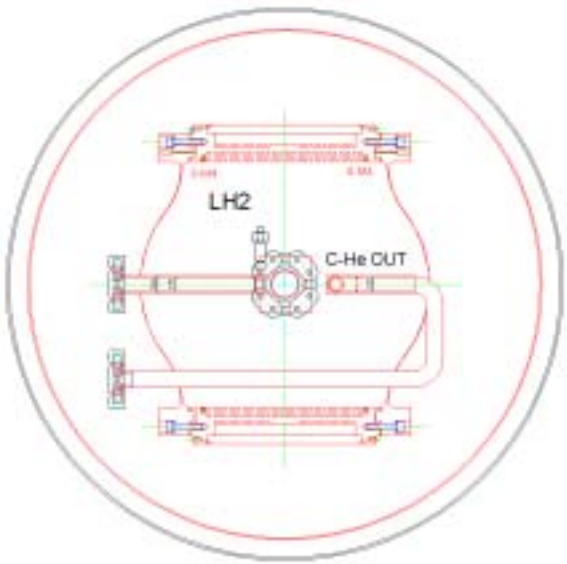
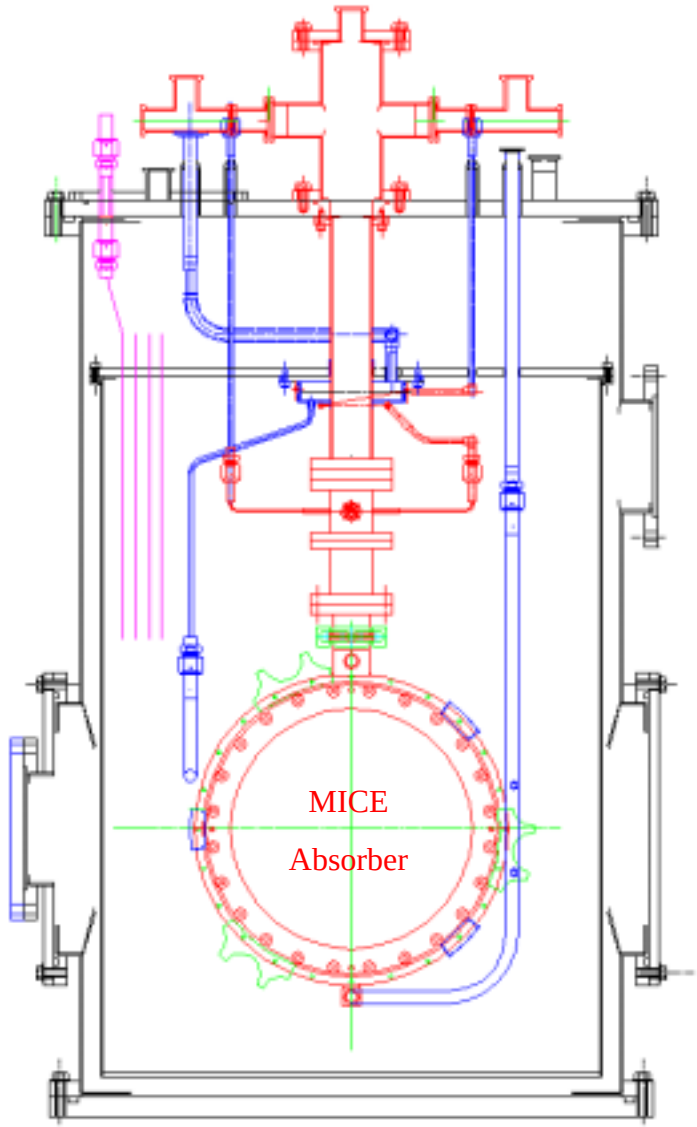
KEK test cryostat at MTA

Absorber II



MICE Absorber (Absorber III)



MICE Absorber Test Plan in KEK Cryostat

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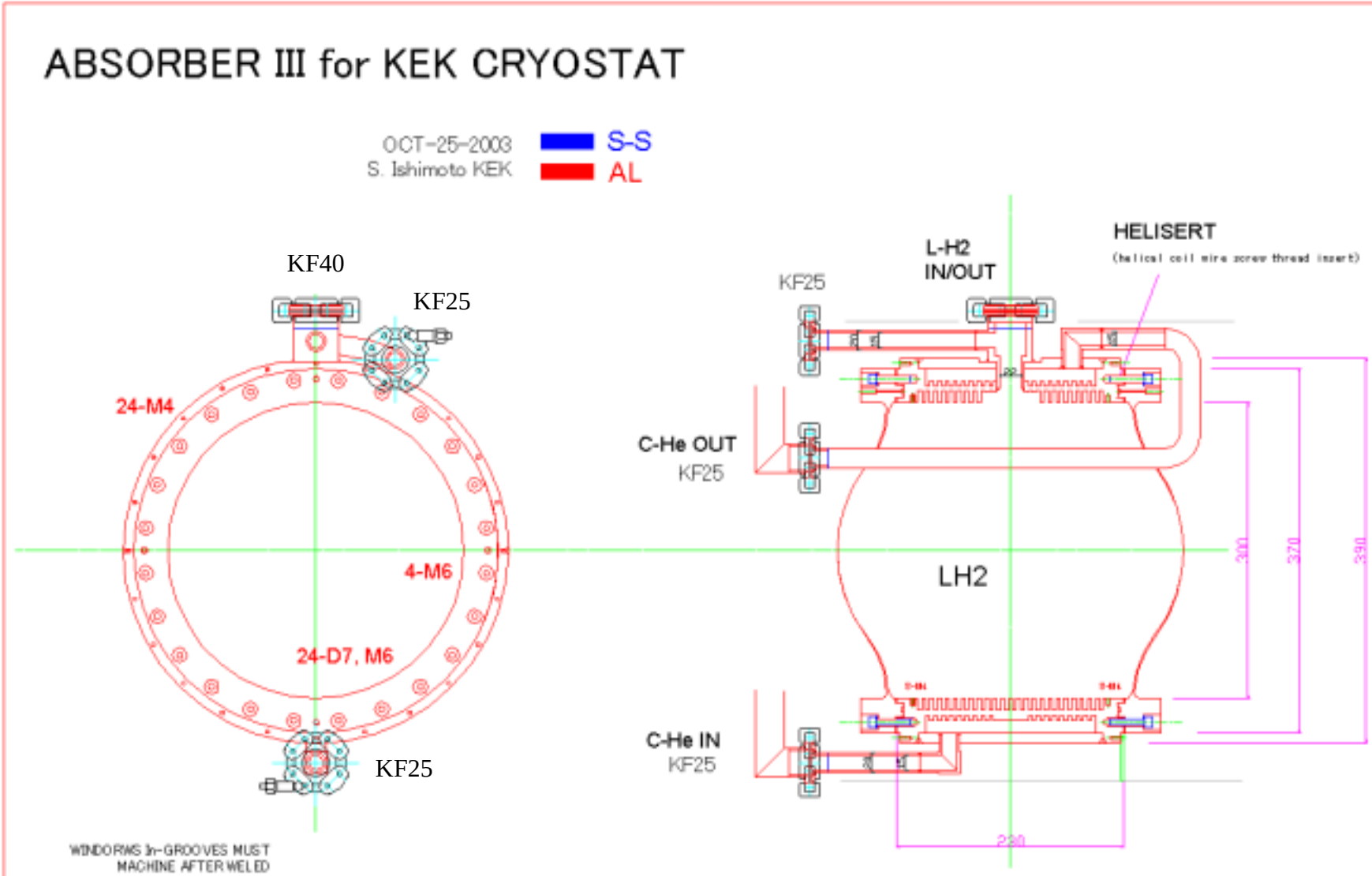

KF25/KF40 flanges >> cut and welded for MICE

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MICE Absorber Schedule & Plan

FY2003 (~ March '04)

(1) Absorber II, LH2 test at MTA/FNAL (by Dec-24, 2003)

(2) Fabricate MICE Absorber #01 and Test at KEK, sent to FNAL

FY2004 (April '04 ~)

(1) MICE Absorber #01 LH2 Test at FNAL

(2) Fabricate MICE Absorber #02/03 and Test at KEK, sent to FNAL

(3) MICE Absorber #02/03, LH2 Test at FNAL

(4) MICE Windows test start using MICE Absorber #01

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Summary

1. D=220 mm and D=210 mm bolt-type In-seal windows (Absorber I/II) have been developed and operated more than 30 times at 28K and 80K in 3 years, including thermal cycle tests.
2. New bolt type D=300 absorber was designed for MICE, based on Absorber I/II experimental results. This design is in accordance with safety standards. This MICE Absorber will be fabricated in Japan soon.
3. The double In-seal and key structure will improve the seal performance.
4. The screw with HELISERT and S-S bolts will increase the maximum clamping force to the flange, and improve the seal performance.
5. The KEK cryostat can be used for MICE absorber and windows test.
6. Absorber II tests of FNAL/US regulations were performed at MW9/FNAL. Integration of KEK cryostat and Absorber II into MTA/FNAL in under process for a LH2 test at 20K by December 2003.