KEK

Bolted Absorber

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MICE meeting, OCT-30, 2003 at Abingdon

MTA Cerebration

Contents

(1) D=300, MICE Absorber design

(2) Absorber and windows test cryostat

(3) Absorber test results for safety

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MICE Bolt-Type Absorber

Design principle

1. Based on Absorber I and Absorber II
2. D=300 mm, bolt-type flange
3. SS-bolt + Helisert (helical coil wire screw thread insert)
4. Double Indium-seal for absorber, and single seal for vacuum
5. Key structure to prevent the slip due to thermal expansion
6. Fit to MICE vacuum vessel 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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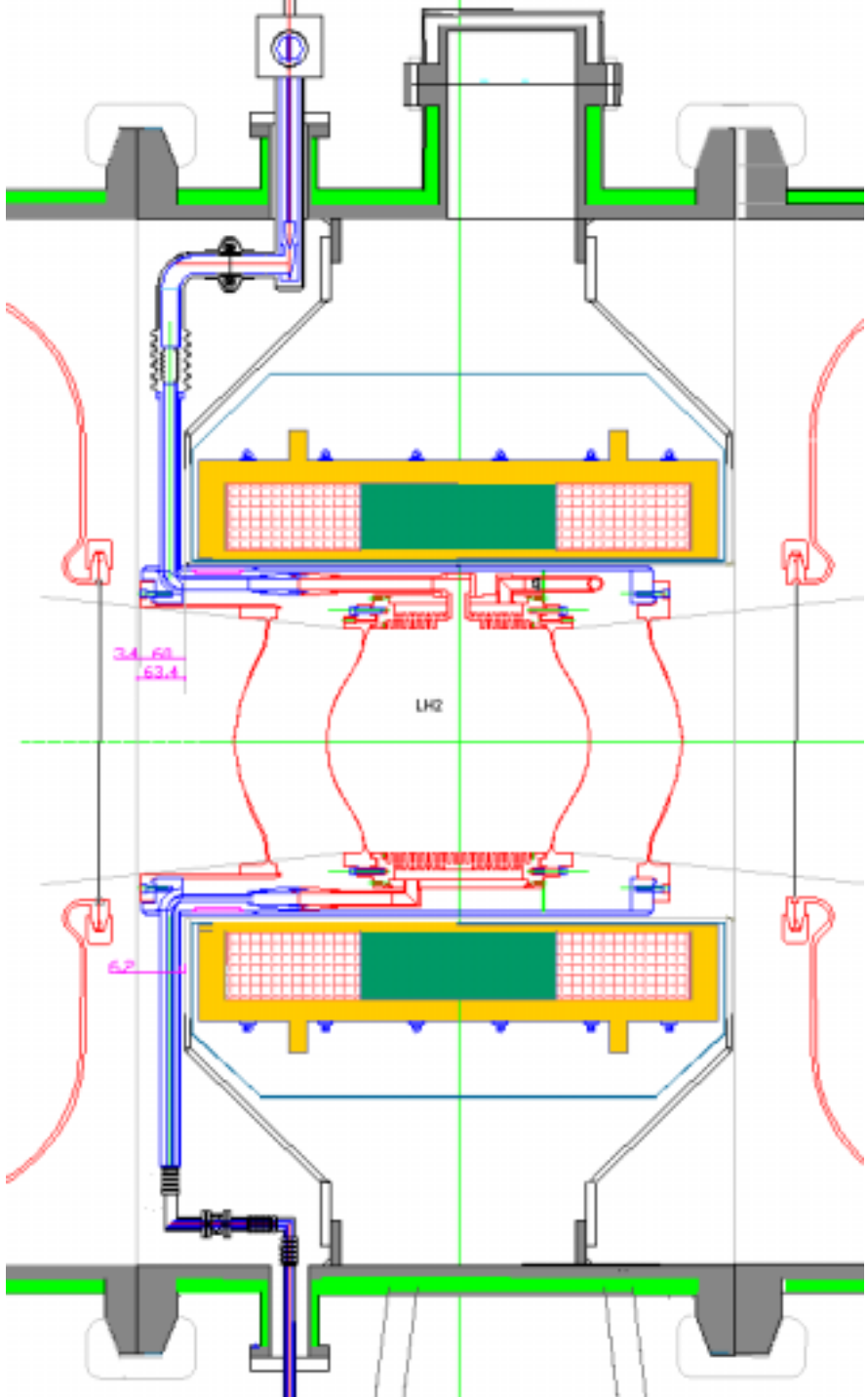
Absorber and Focus Coil Unit

Bolt-type Absorber



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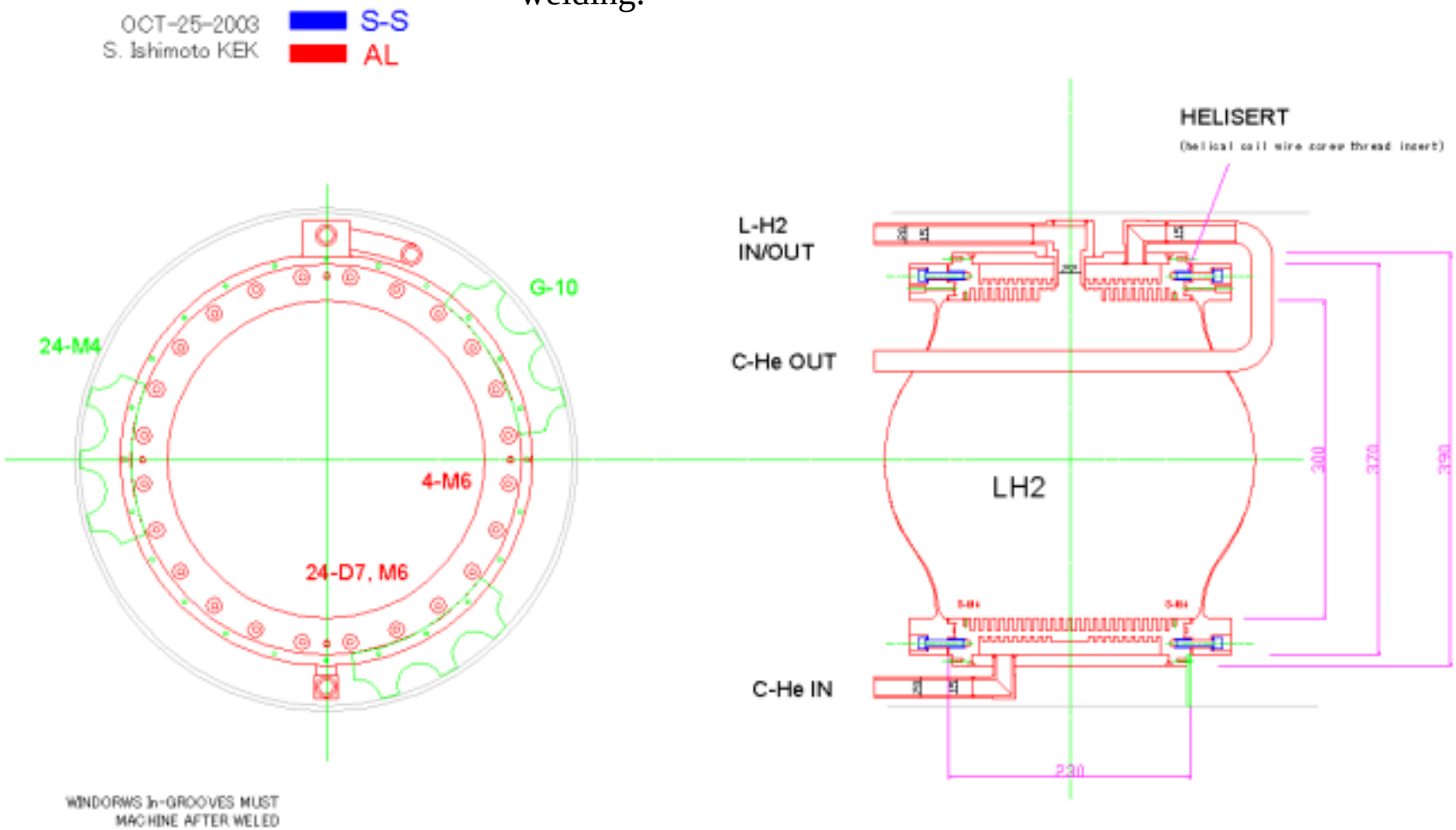
*Based on Absorber I/II (D=220/210)

*HELISERT on the aluminum body

*Key structure of double In-seal + H2 leak monitor

*The interface to windows should be machined after welding.



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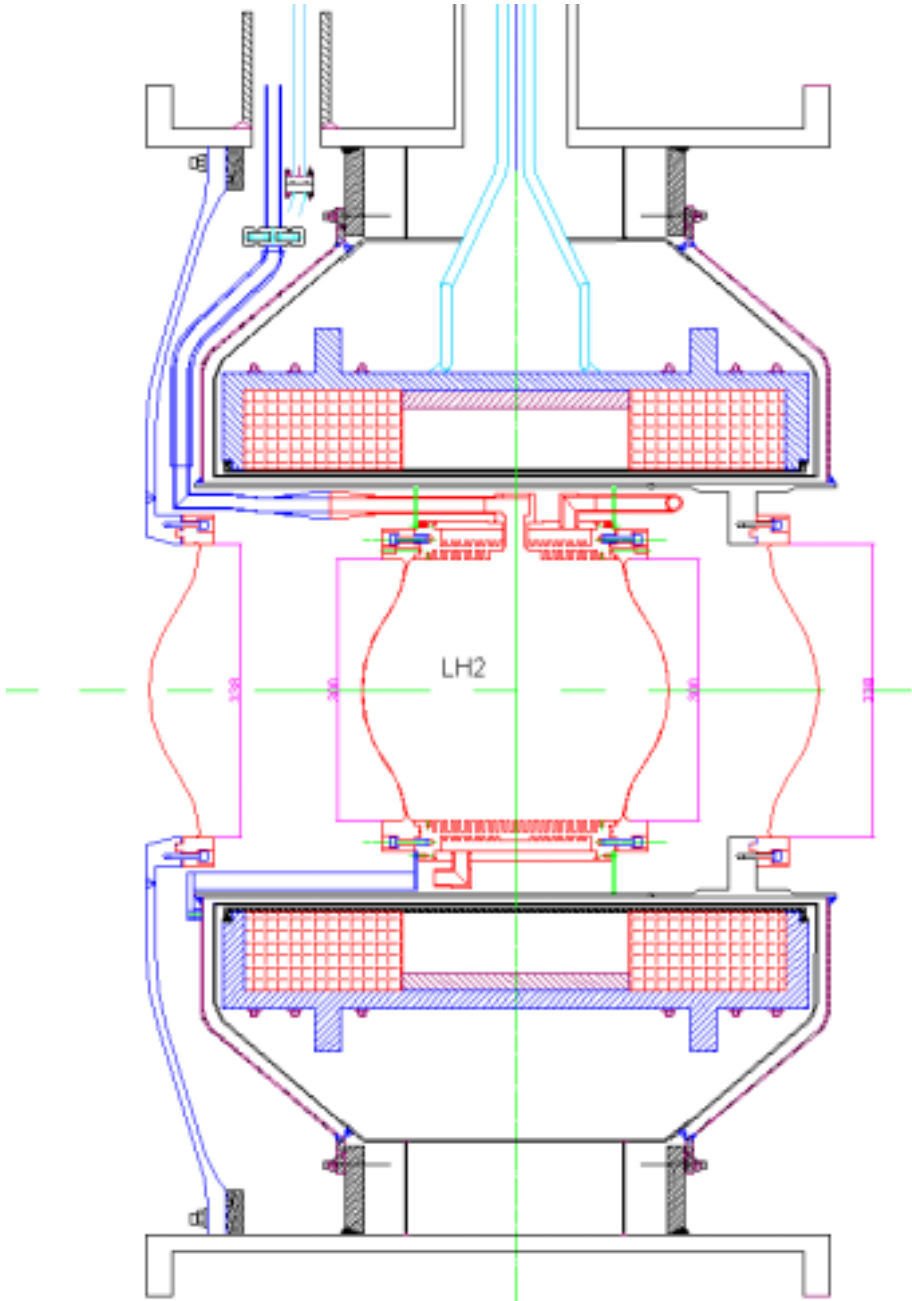
Absorber and Focus Coil Unit

New vacuum concept

& Bolt-type Absorber



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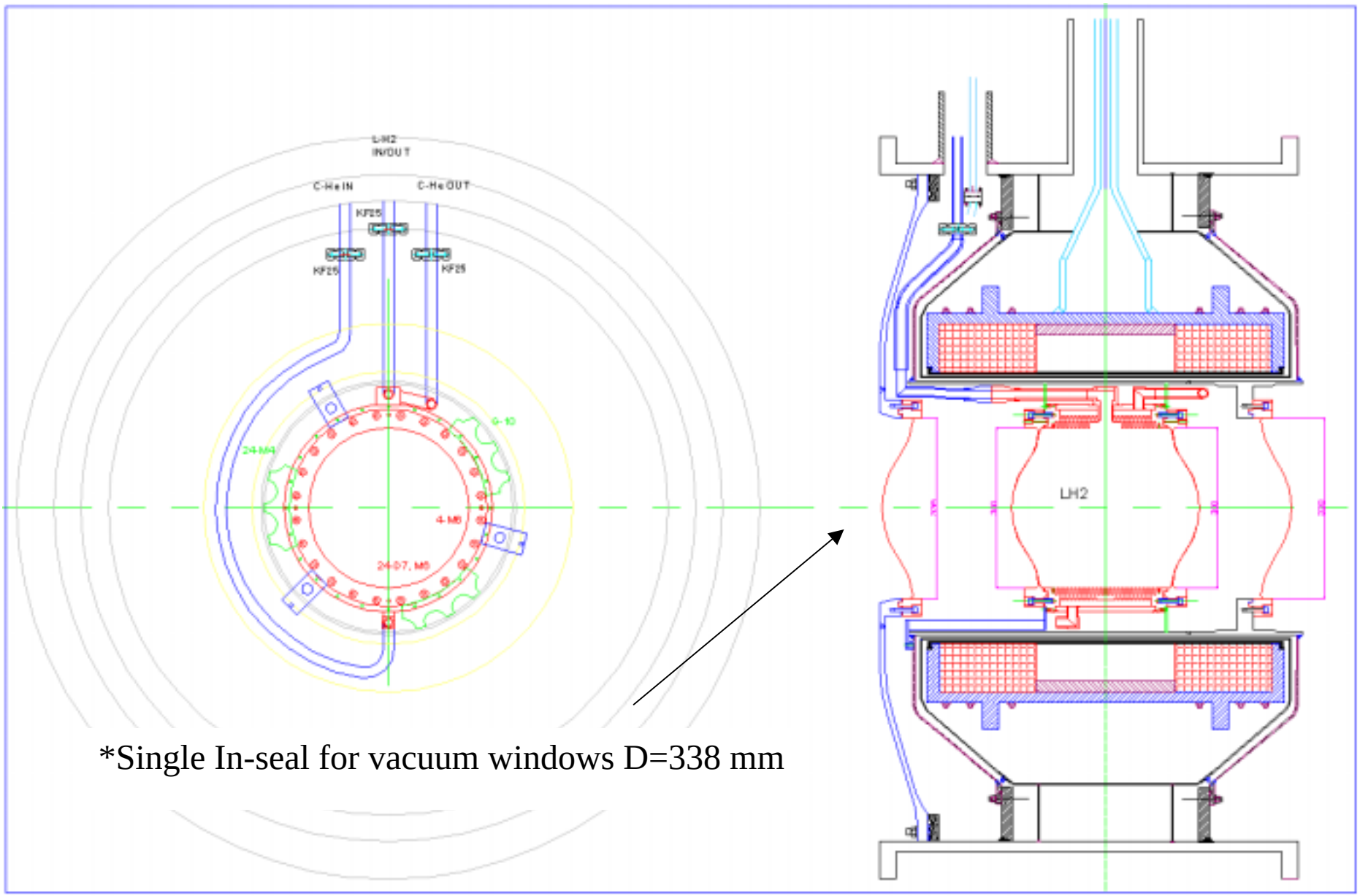
Absorber in the New Vacuum Concept



*Single In-seal for vacuum windows D=338 mm

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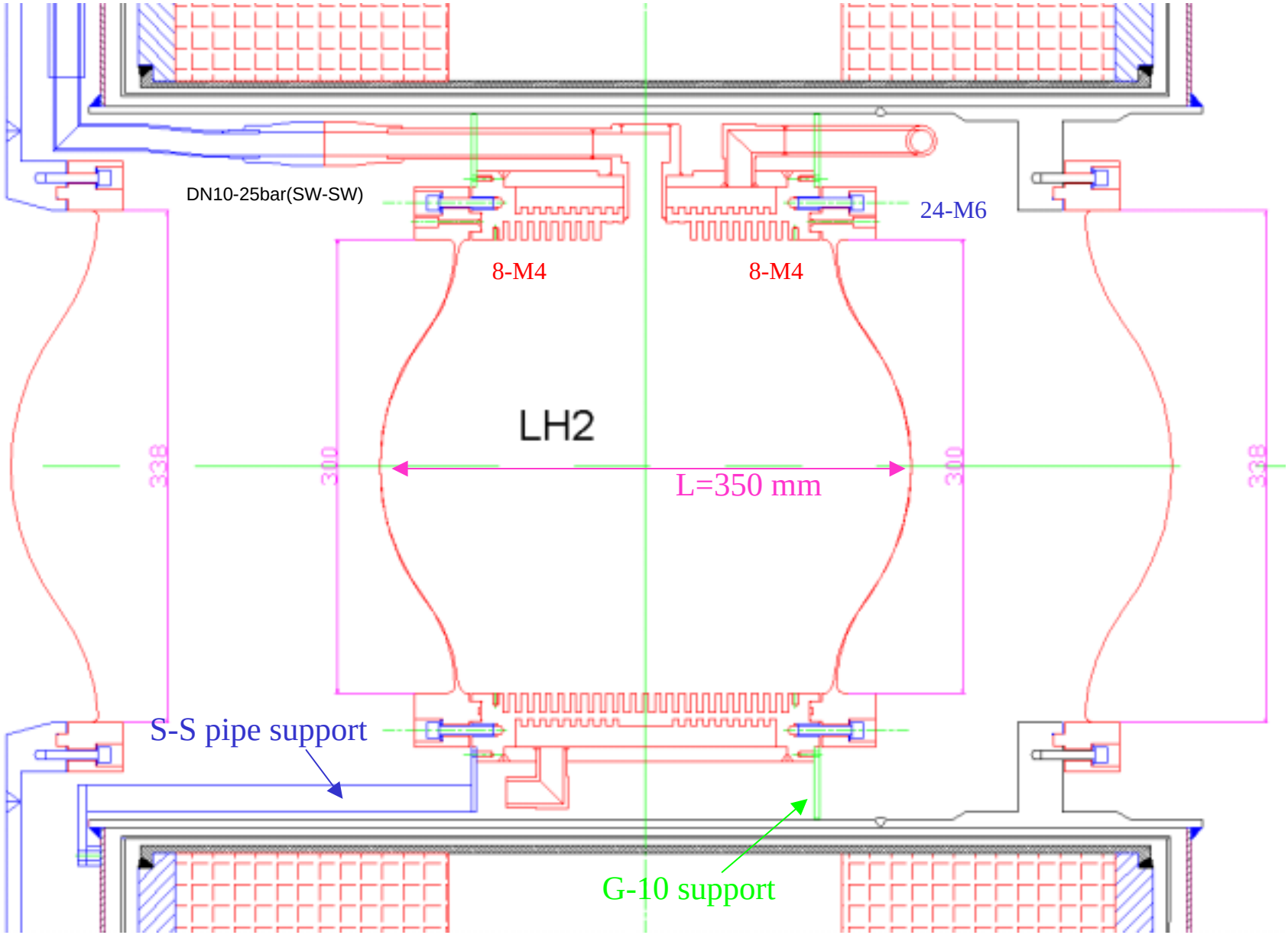
Detail of D=300 Absorber for MICE



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Detail of D=300 Absorber

(front view)

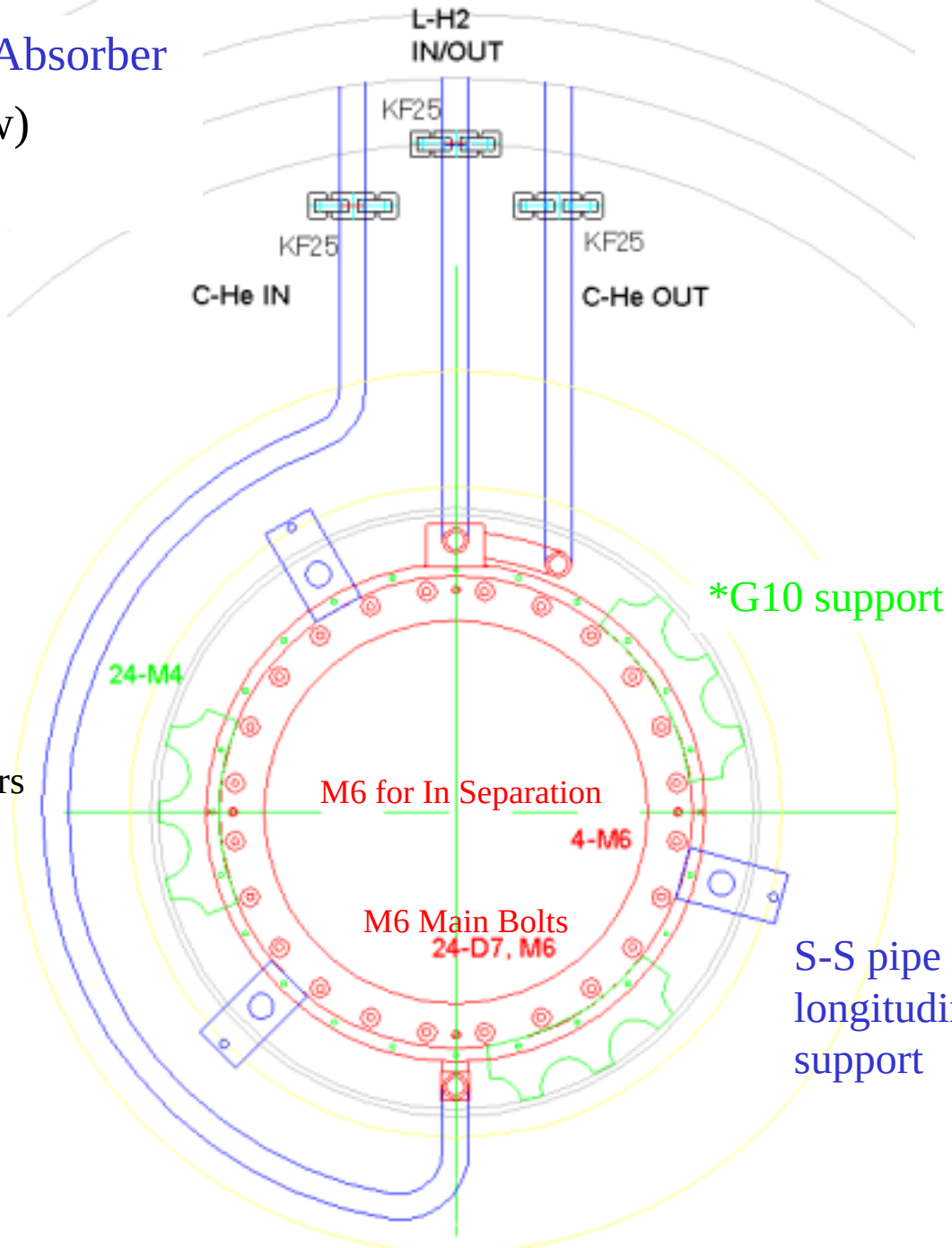
*KF25 Flange + Helicoflex(AL)

SS-AL

*Cajion+VCR for H2 leak monitors

SS-SS

VCR(Ni)



*G10 support

S-S pipe
longitudinal
support

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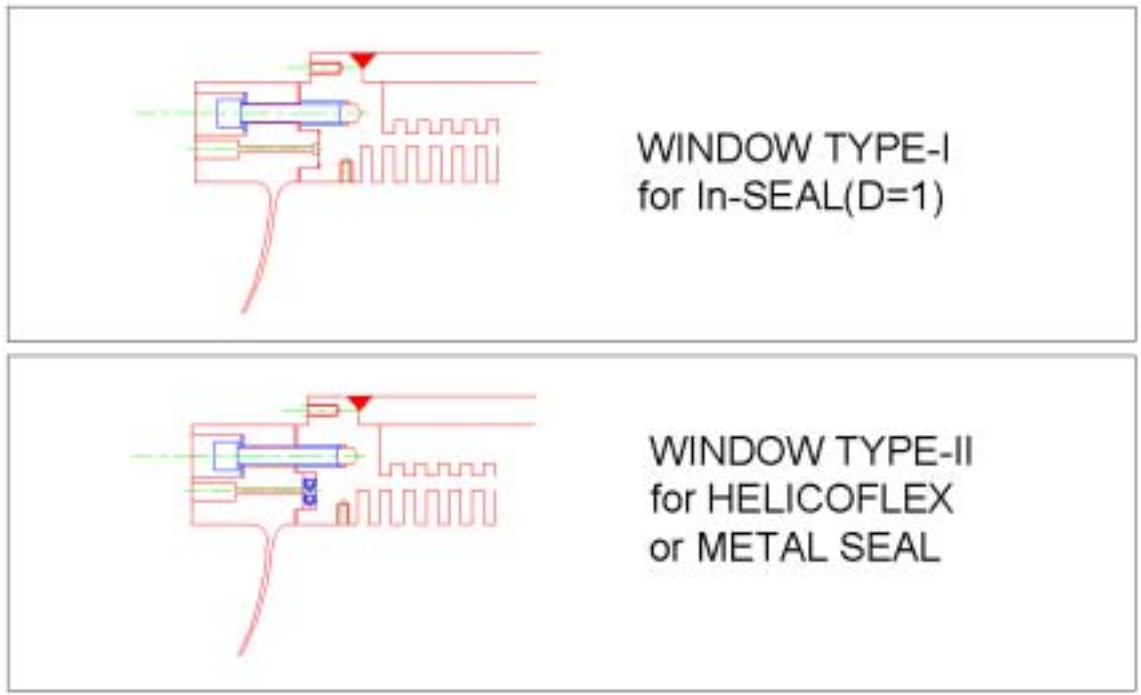
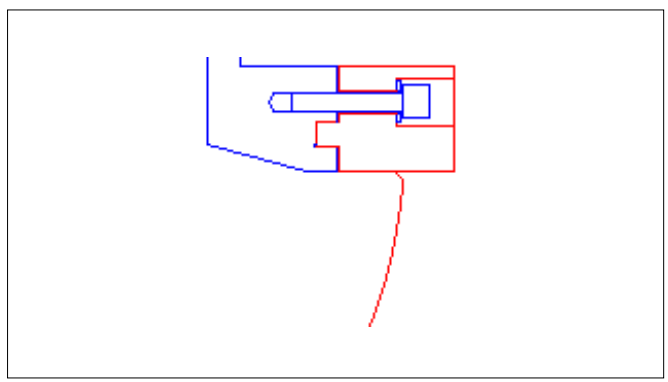
Window seal (LH2 body)



Window seal (vacuum)

Single In-seal



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Absorber II

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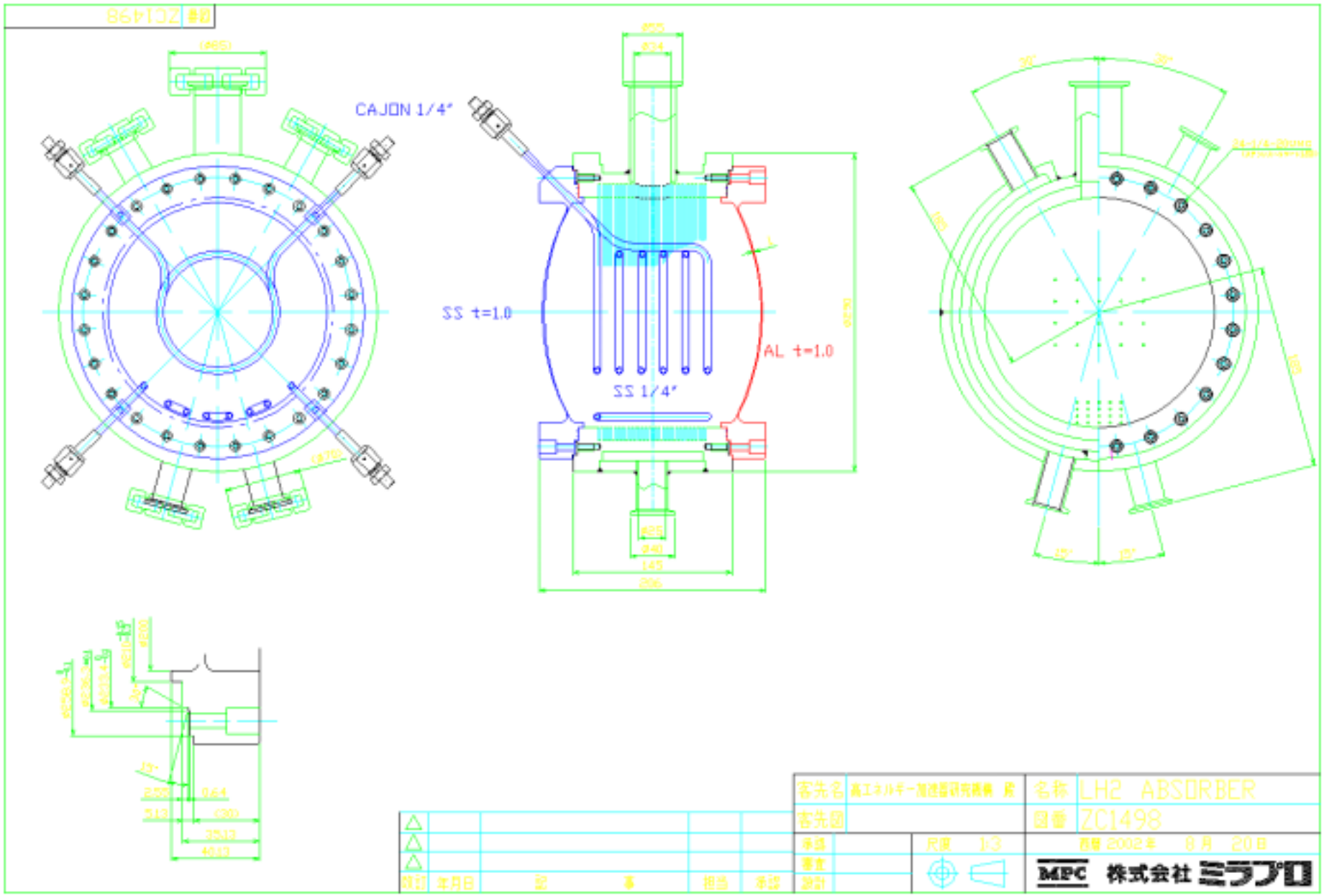
Absorber II



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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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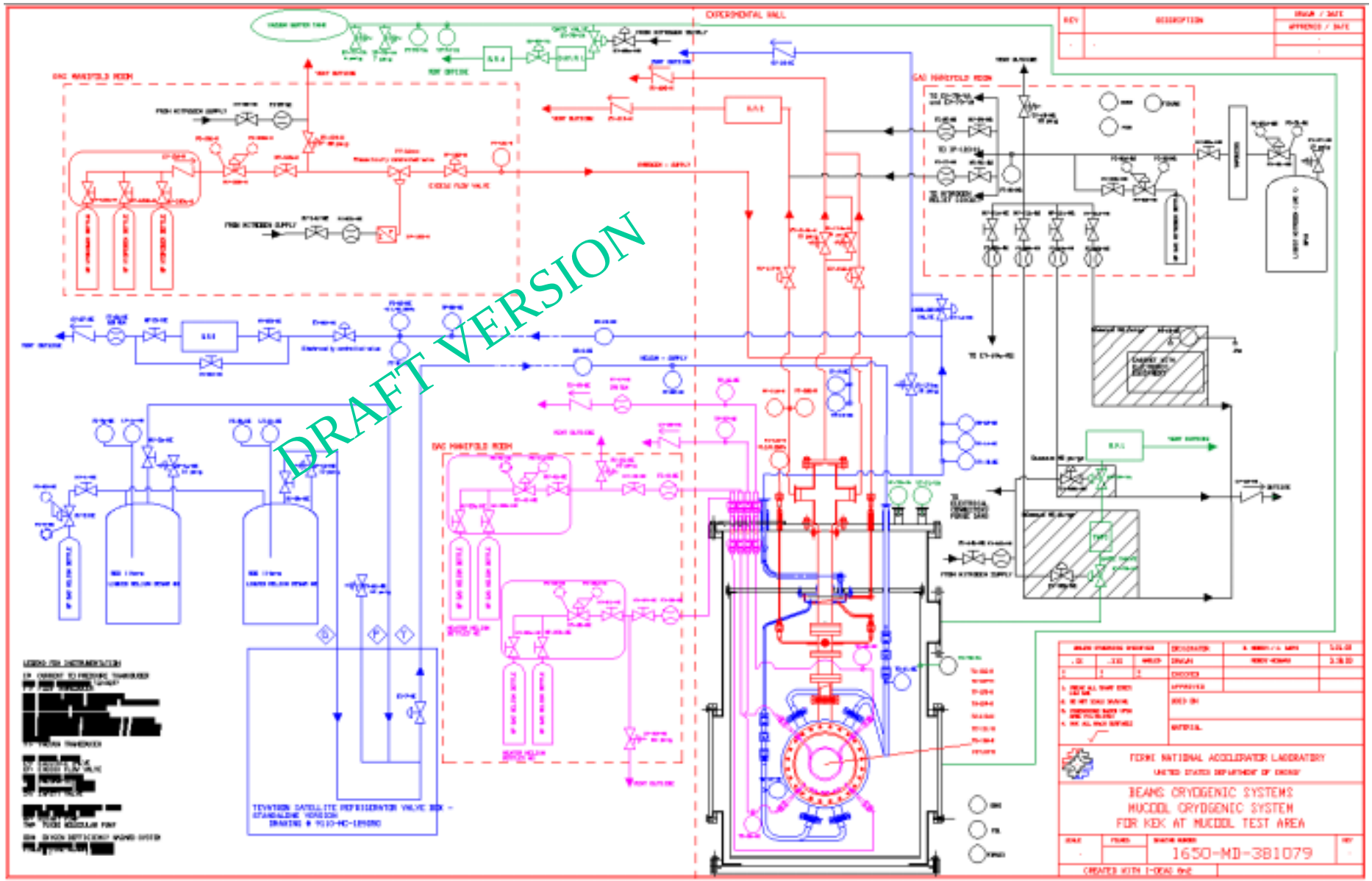
KEK Test Cryostat at MTA/FNAL



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Recent Test Results of D=210 mm Absorber (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 (VAC; 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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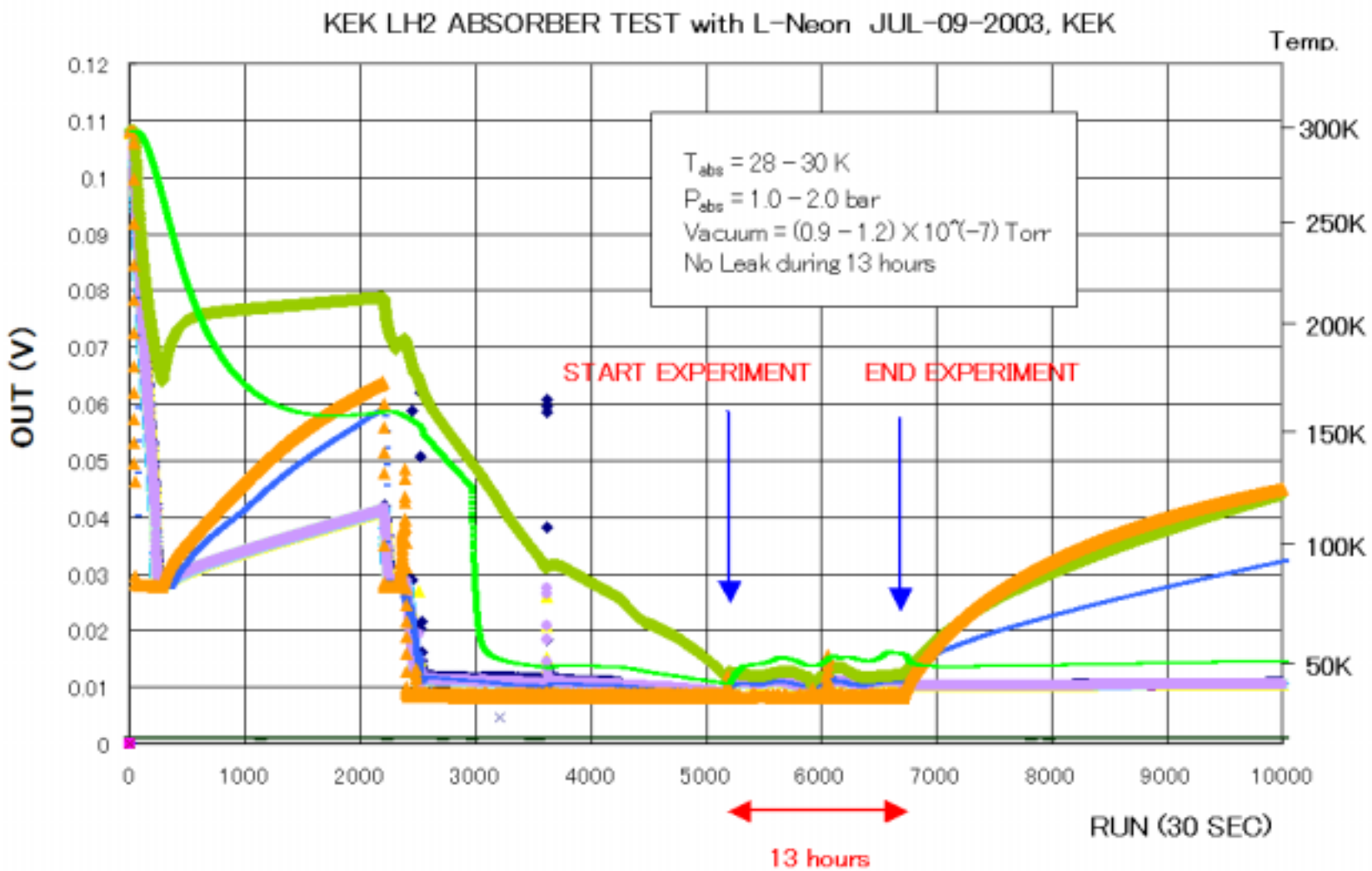
L-Ne Test Results of D=210 mm Absorber II

(Bolt-type, In-seal at KEK)



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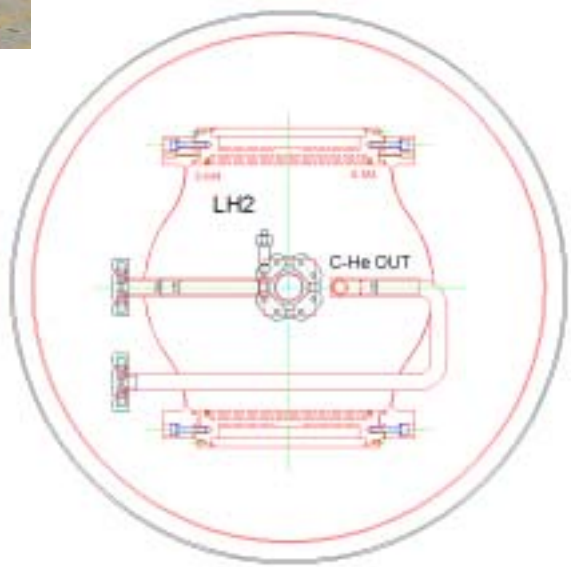
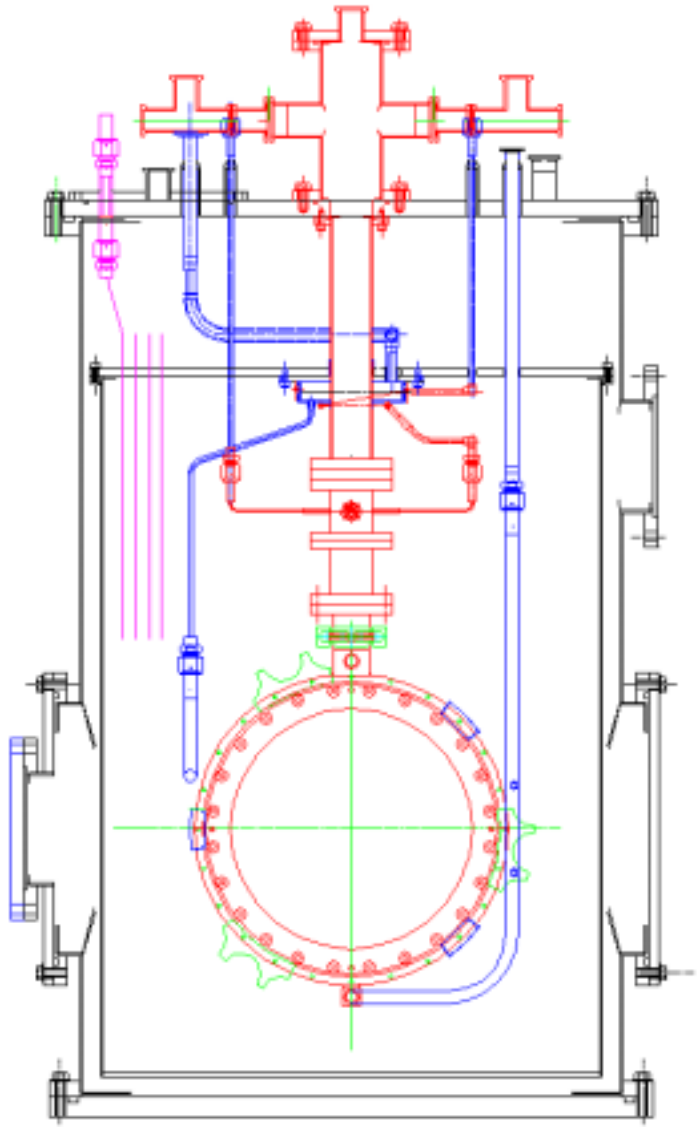
MICE Absorber Test Plan in KEK Cryostat

Absorber II
D=210 mm



Absorber III
D=300 mm
(MICE)



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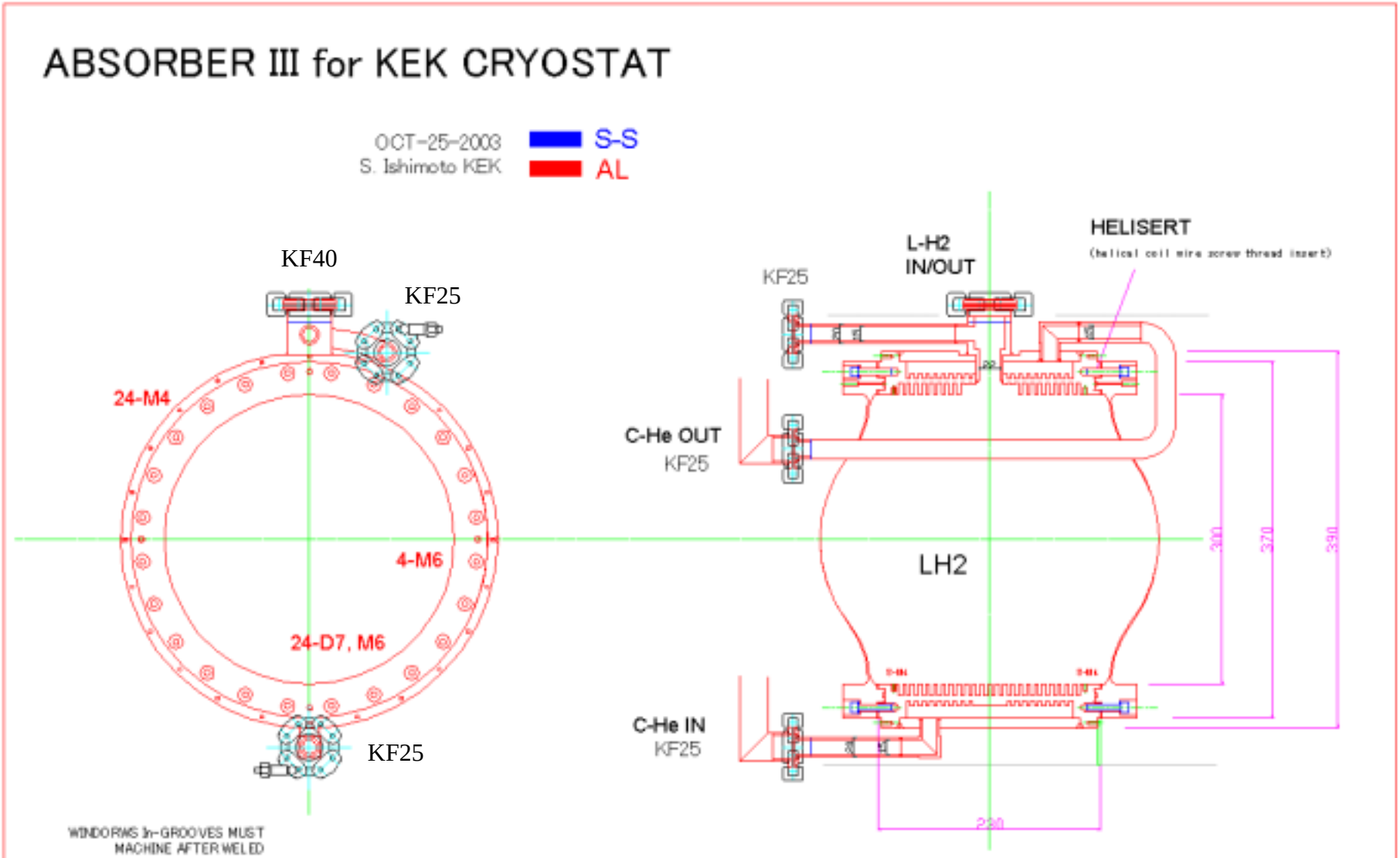
D=300 Absorber (will be ordered soon)



KF25/KF40 flanges >> cut and welded for MICE

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Bolt-Type Absorber

Advantages

- Can disassemble and reassemble – i.e. change one part at a time.
- Design and technology already used – i.e. no more R&D: cost, time, people.
- Certified leak tight system – i.e. double indium seal approved by safety committee at FNAL.
- Existing suppliers available. Japan
- Window and manifold can be machined separately. US, Japan
- No risk of window rupture during welding and handling.
- Easy to mount and dismount parts in the absorber – thermometers, level sensor, heater.

Disadvantages

- Need more axial and radial spaces – – It is better by new vacuum concept.
- Thermal contraction and stress to be considered – – solved by In-seal with key structure.

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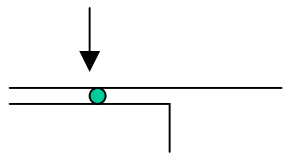
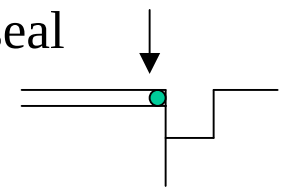
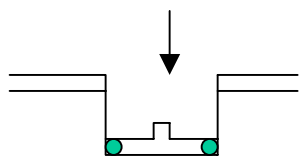
Bolt-Type Absorbers

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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Summary

1. D=220 mm and D=210 mm bolt-type In-seal windows (Absorber I/II) have been 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. Absorber III 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.