Absorber Review Meeting
FNAL
May 17, 2004

Status of MICE absorber

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(1) MICE Absorber Present Status
(2) MICE Absorber Test Process and Test Cryostat
(3) LH2 Level Sensor and Thermometers

LH2 Absorber R&D

- **Forced Flow Type** — **~ 500 W**
  - **MTA (FNAL)** ← High Power LH2 Target
- **Convection Type**
  - **Cooled by Cold He Flow** — **~ 100 W**
    - **MTA (KEK), MICE** ← L-He Continues Flow LH2 Target
    - ← LH2 Bubble Chamber
  - **Cooled by "Cryocooler"** — **~ 20 W**
    - ← Standard LH2 Target
- **Seal Method**
  - **Indium** — **FNAL, KEK**
  - **Helicoflex** — **KEK**
  - **Welding** — **Oxford**

Absorber heat deposit test

Absorber type	Where	Size (cm diam.)	Heat deposited	Date for test
Convection (Mucool test)	MTA	21	~ 50 W (GHe + ambient)	May 2004 (thick windows)
Convection (MICE 1st article)	MTA/KEK	30	~ 50 W (GHe or electric + ambient)	August 2004 (thick windows)
Convection (MICE experiment)	RAL	30	~ 20 W (MICE Stage 4)	June 2006 (thin windows)
Force-flow (Mucool test)	MTA	21	~ 350 W (LINAC p beam + ambient)	July 2006 (thin windows)

→ Neutrino factory absorber heat loads ~ few hundred watts

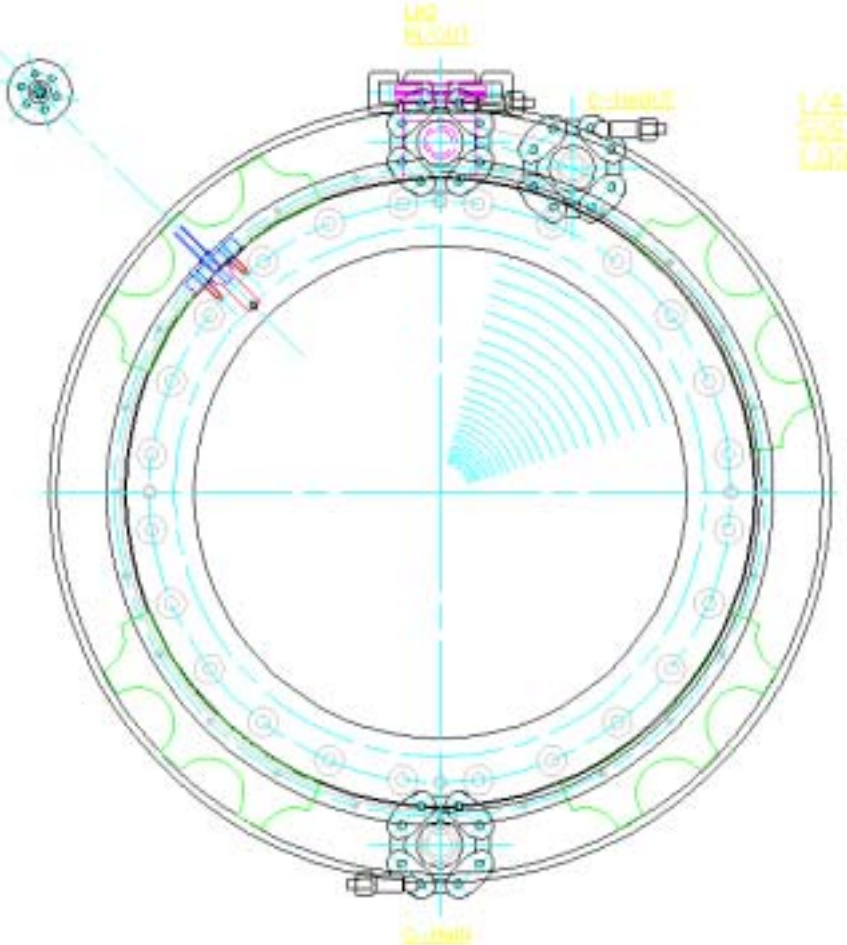
MICE Absorber Present Status

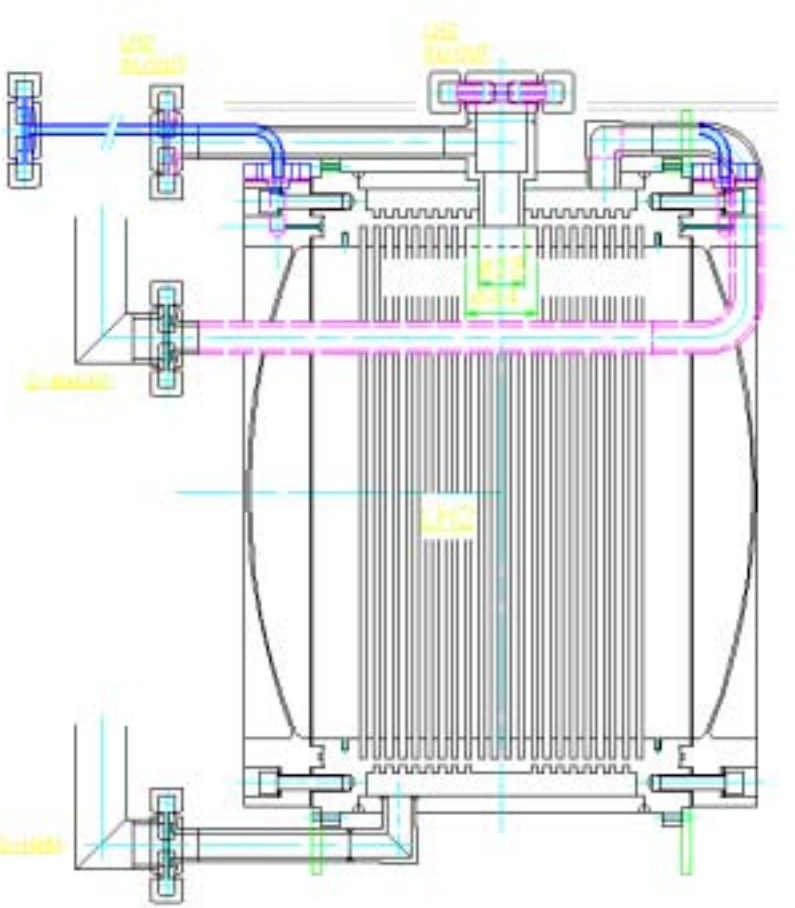
MICE Absorber (Absorber III)

Design Guide Line

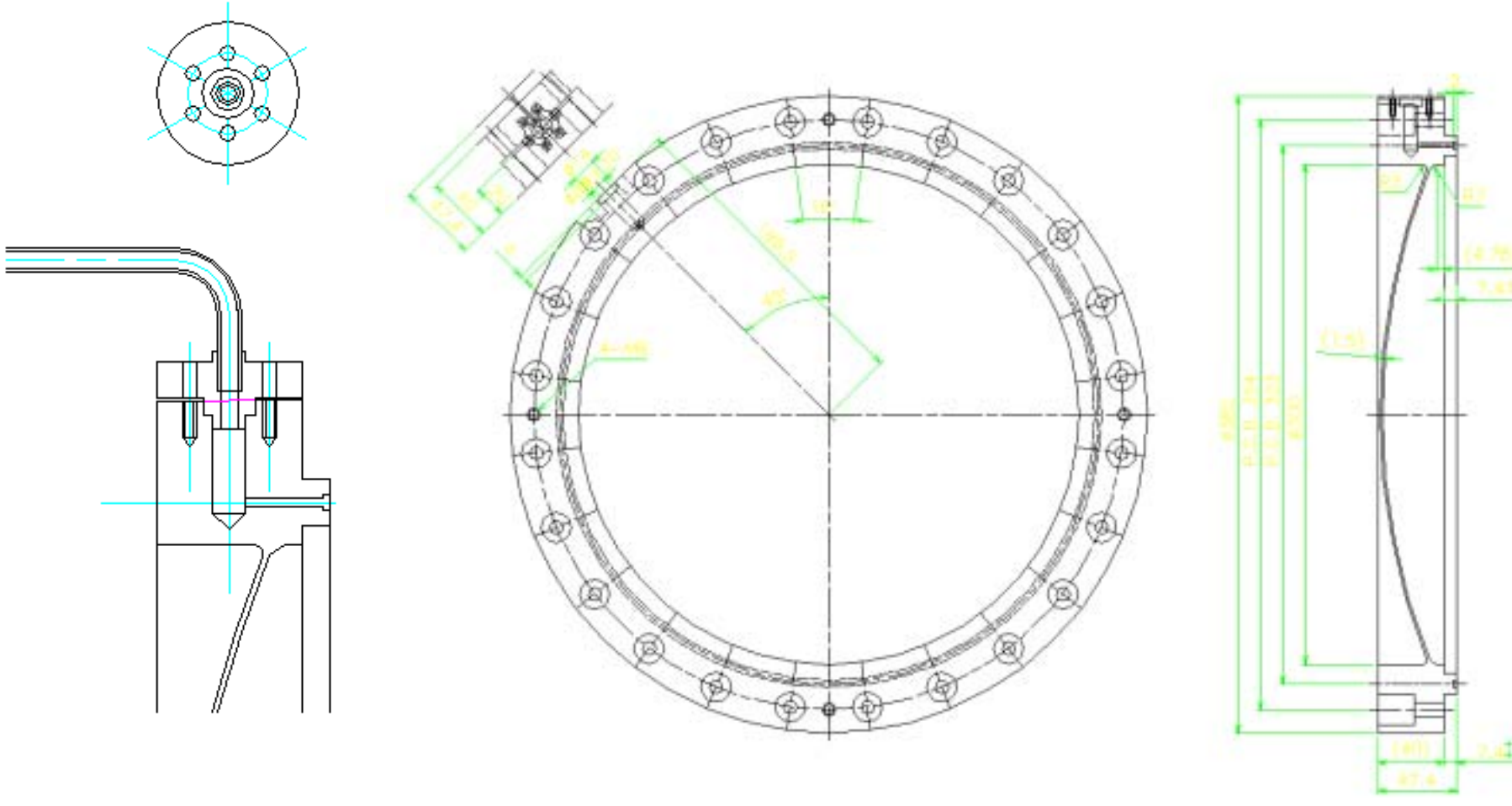
1. Based on Absorber I and Absorber II developed at KEK.
2. D=300 mm, bolt-type flange
3. SS-bolt + Helisert (helical coil wire screw thread insert)
4. Double Indium-seal for absorber with H2 gas leak monitoring port, and single seal for vacuum windows.
5. Key structure to prevent the slip due to thermal expansion.
6. Fit to vacuum space and KEK test cryostat.
7. Diameter of vacuum window is 320 mm (Stay off line)
8. Absorber body support units (vertical and horizontal).

MICE Absorber Design

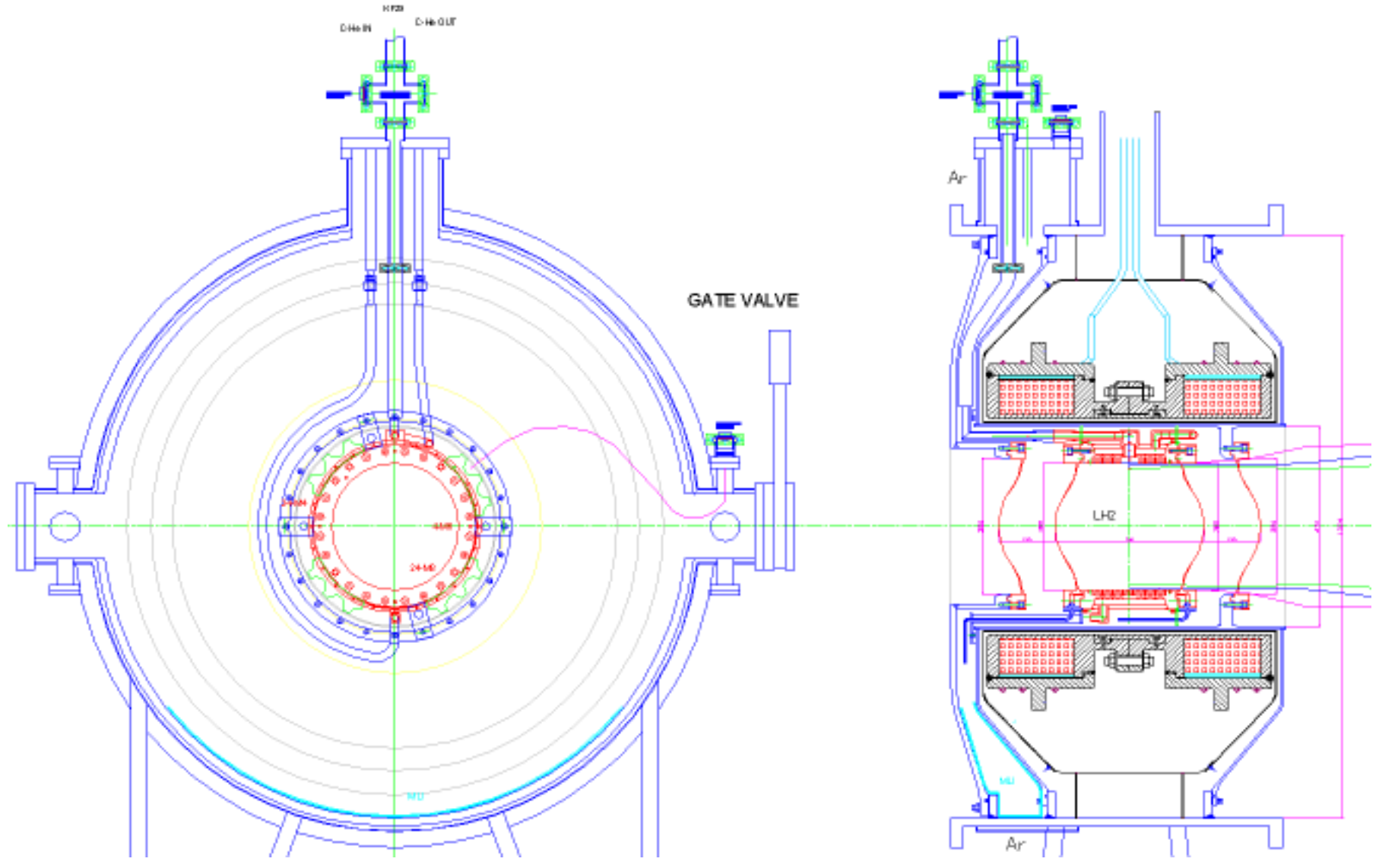


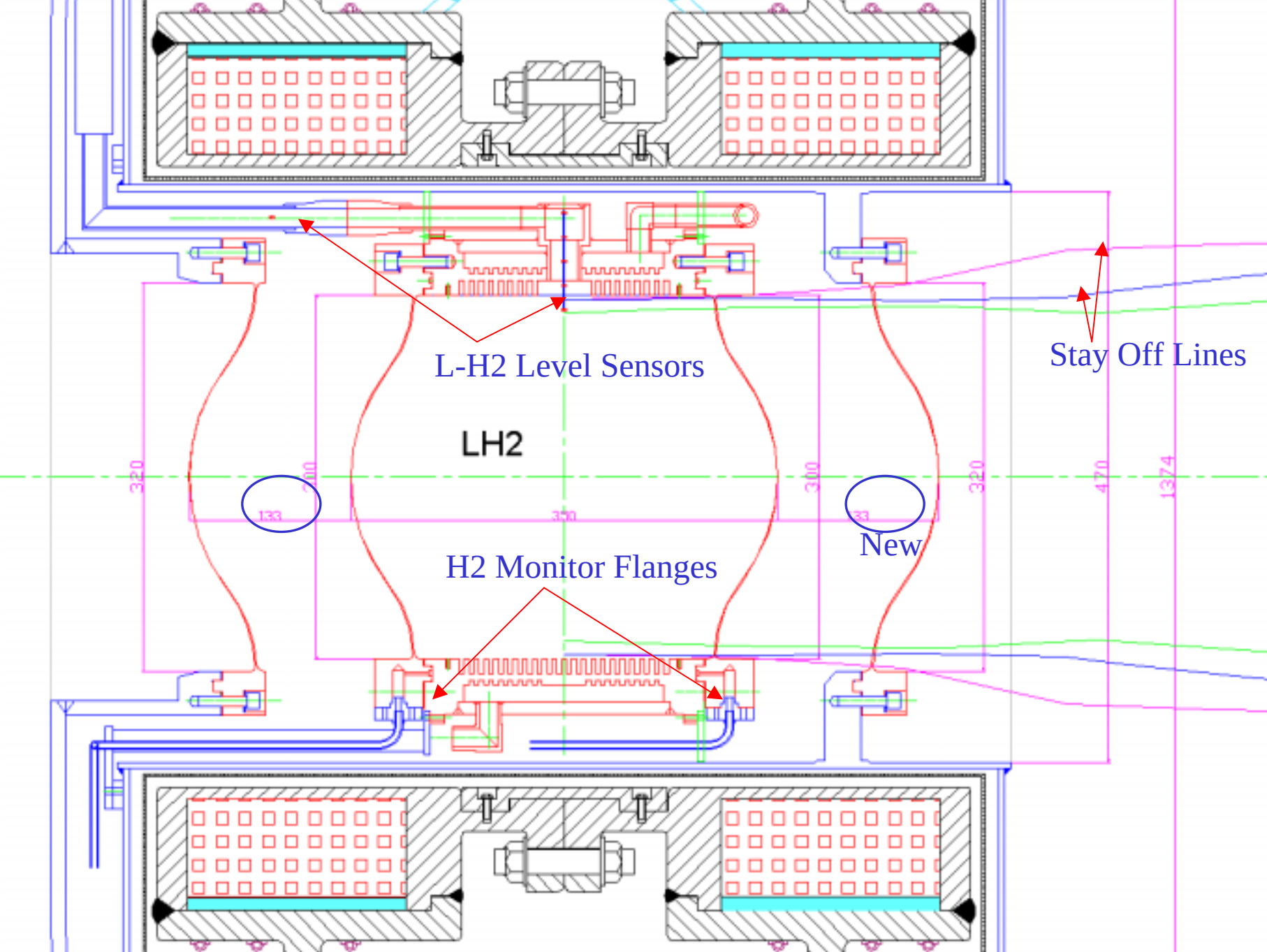


MICE Absorber Test Window with H2 Leak Monitor



MICE Absorber



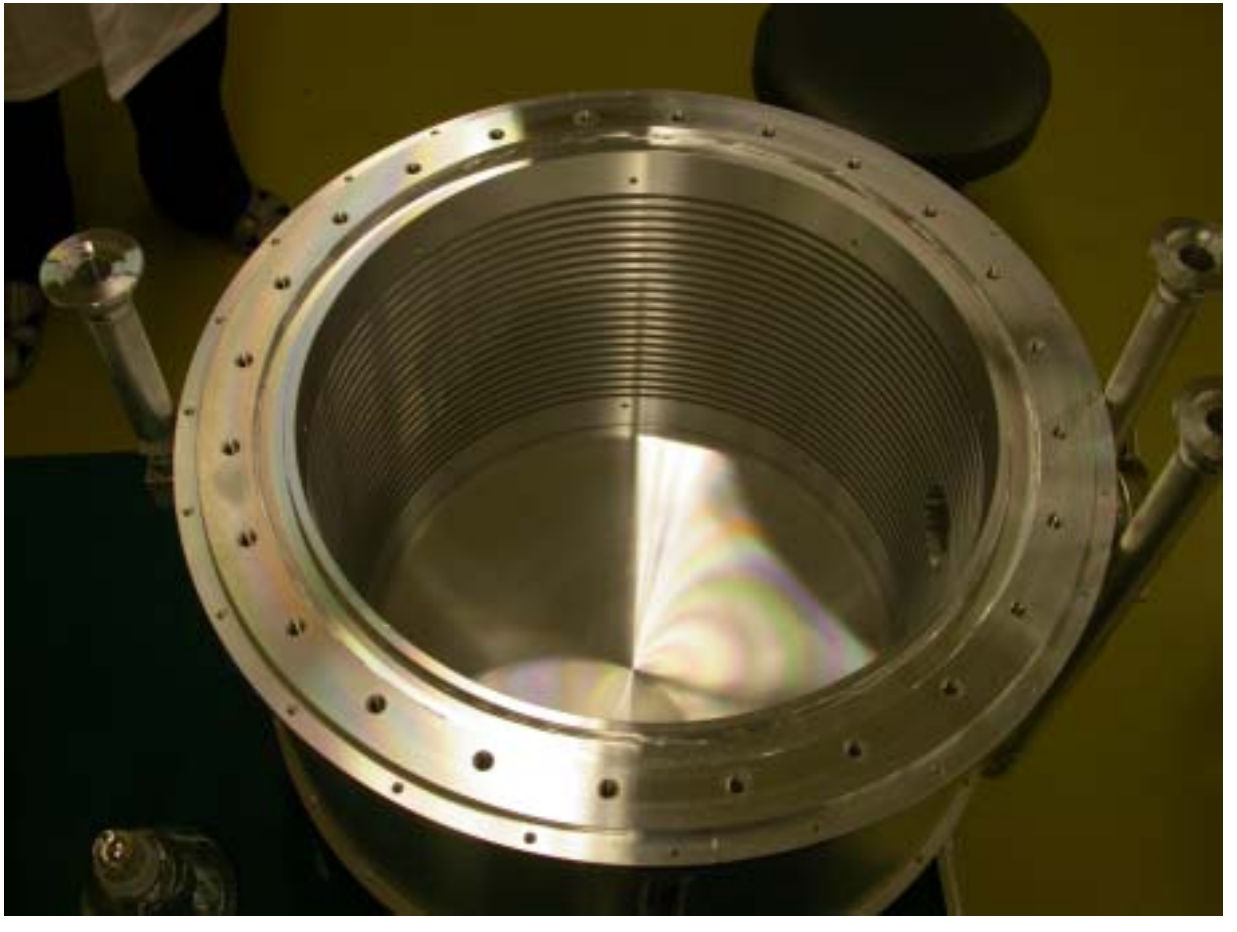

L-H2 Level Sensors
Stay Off Lines
LH2
H2 Monitor Flanges
New
320
300
133
350
33
300
320
470
1374

MICE Absorber

March-24, 2004

MICE absorber #01 with double Indium seals

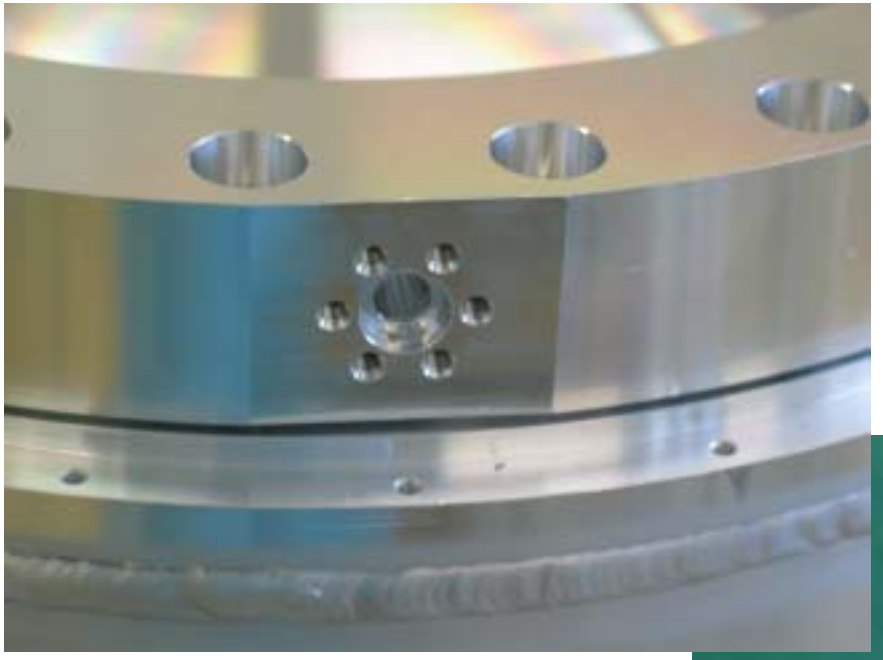
April-16, 2004



MICE absorber #01 with dummy windows

April-16, 2004

MICE absorber #01

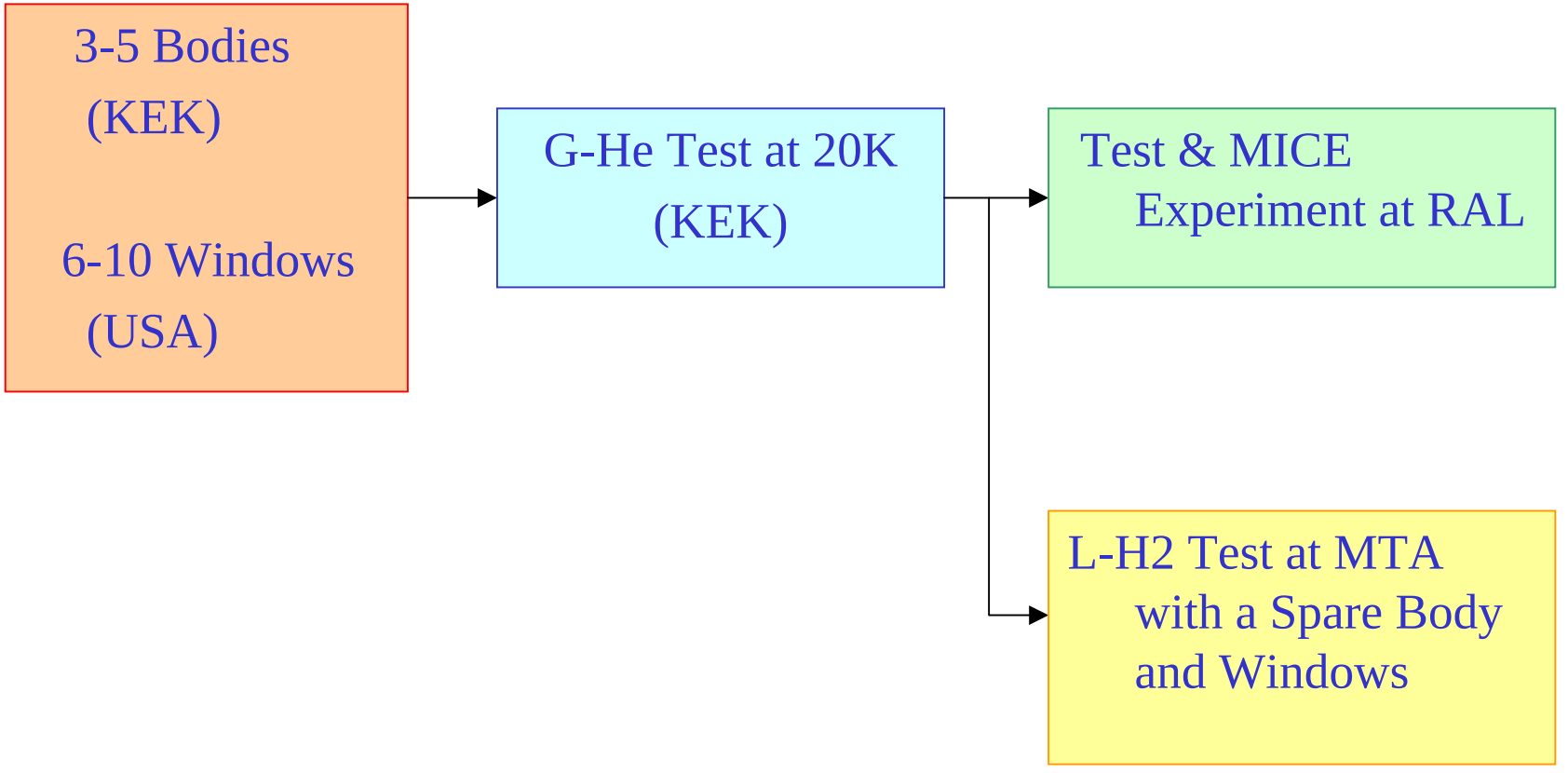


Flange for H2 Leak Monitor

April-16, 2004

MICE Absorber Test Process and Test Cryostat

MICE Absorber Test Process



Helium leak test of MICE absorber #01

April-16, 2004

Pressure and Leak Test of

MICE Absorber #01 at Room Temperature

April-16th, 2004 at MIRAPRO

(1) Helium Leak Test

a) Leak detector was connected to the H2 Pot, BG ~ 7.8 x 10^(-11) Pa*m3/sec

H2 pipes; OK

Windows; OK

Indium seal; OK

Space between Indium seals; OK

b) Leak detector was connected to the He pipe, BG ~ 1.4 x 10^(-10) Pa*m3/sec

He pipe and covers; OK

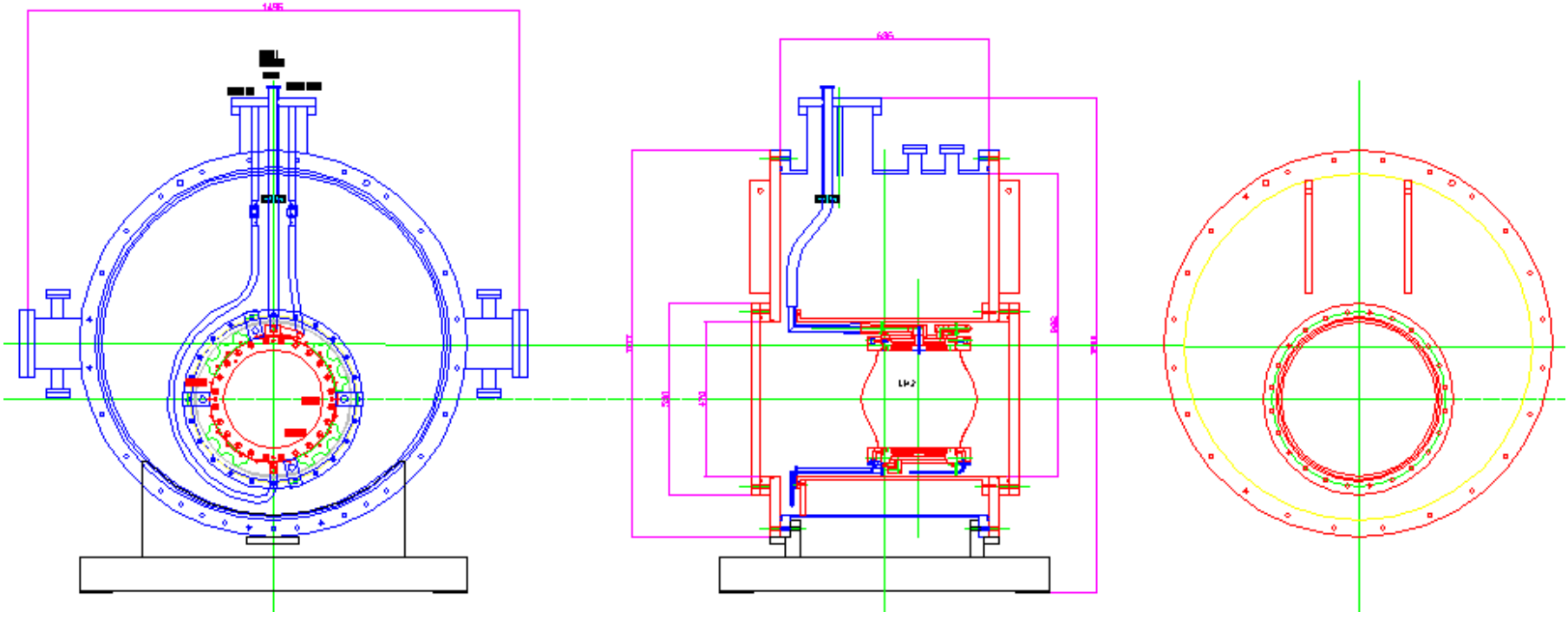
H2 pot to He pot; OK

(2) Pressure Test

a) He pot; +0.30 MPaG N2 gas in 15 min; OK

b) H2 pot; +0.27 MPaG N2 gas in 15 min; OK

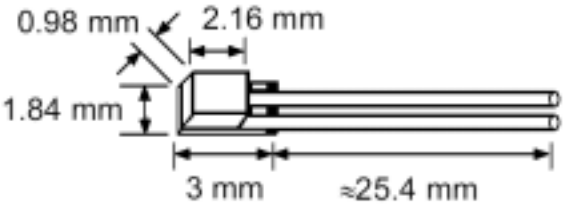
MICE Absorber Test Cryostat (Plan)



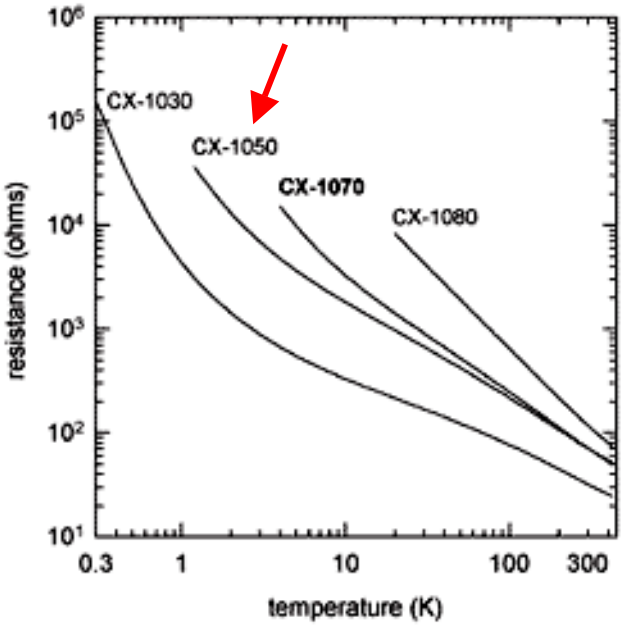
LH2 Level Sensor and Thermometers

LH2 Level Sensor and Thermometers

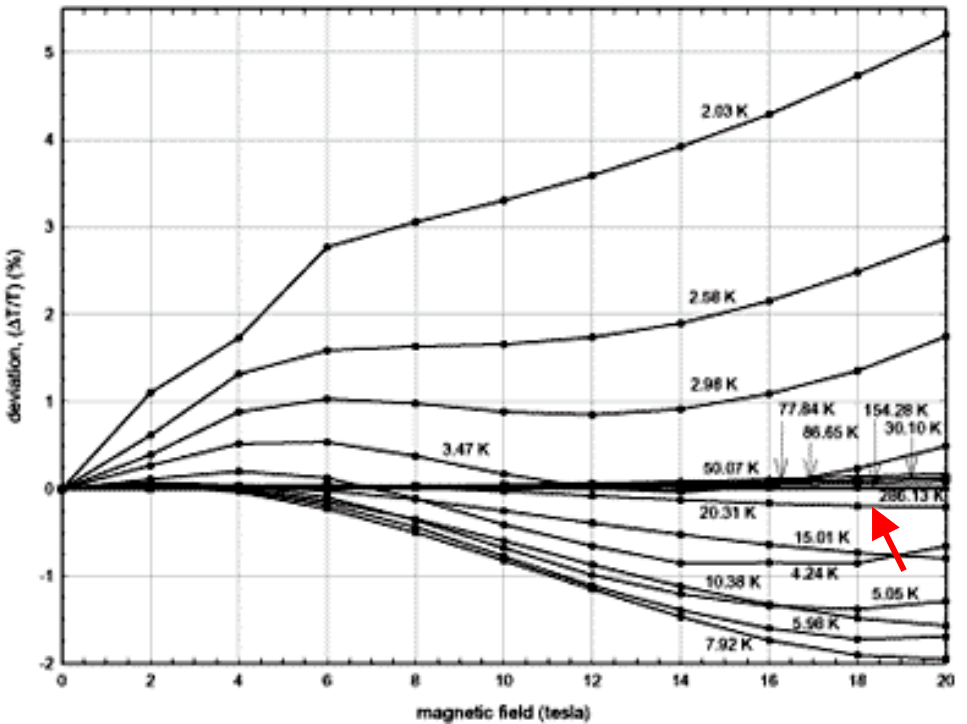
LakeShore CX-1050SD

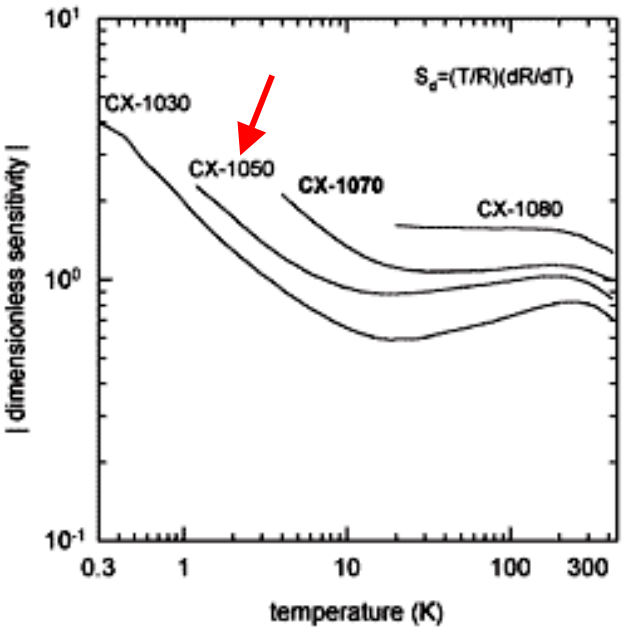


Leads: 32 AWG
(0.2 mm diameter)
Phosphor-Bronze
Sensor Mass: 0.03 gram



Magnetic Field Dependence





LH2 Level Sensor

Needs LH2 Level Monitor

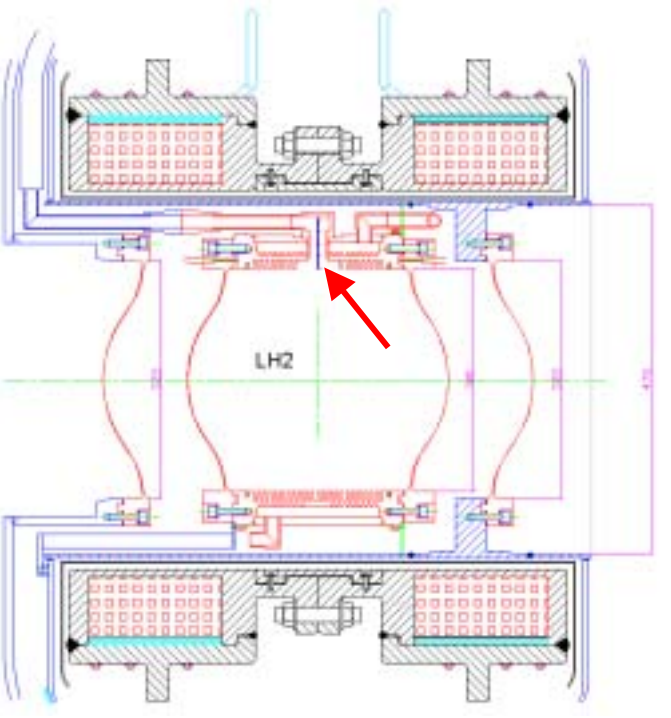
- Cooling Experiment
- Operation Requirement
- Safety Requirement

↓

No Space for Capacitance Level Sensor (AMI)
D= 1/2”, L > 5”

↓

Level Monitor by Resistance Thermometer with high current $I \sim 10 \times I_{NORMAL}$



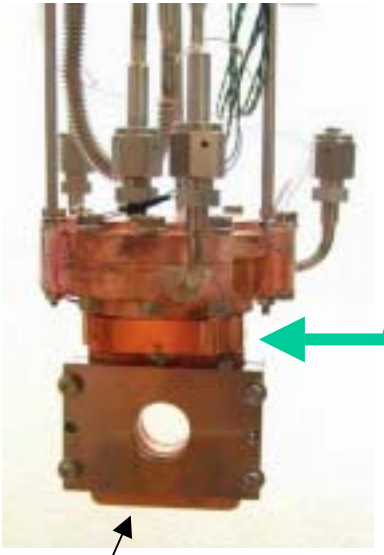
Resistance Thermometer

- $T = T_B + \delta T,\ R = R_B + \delta R$

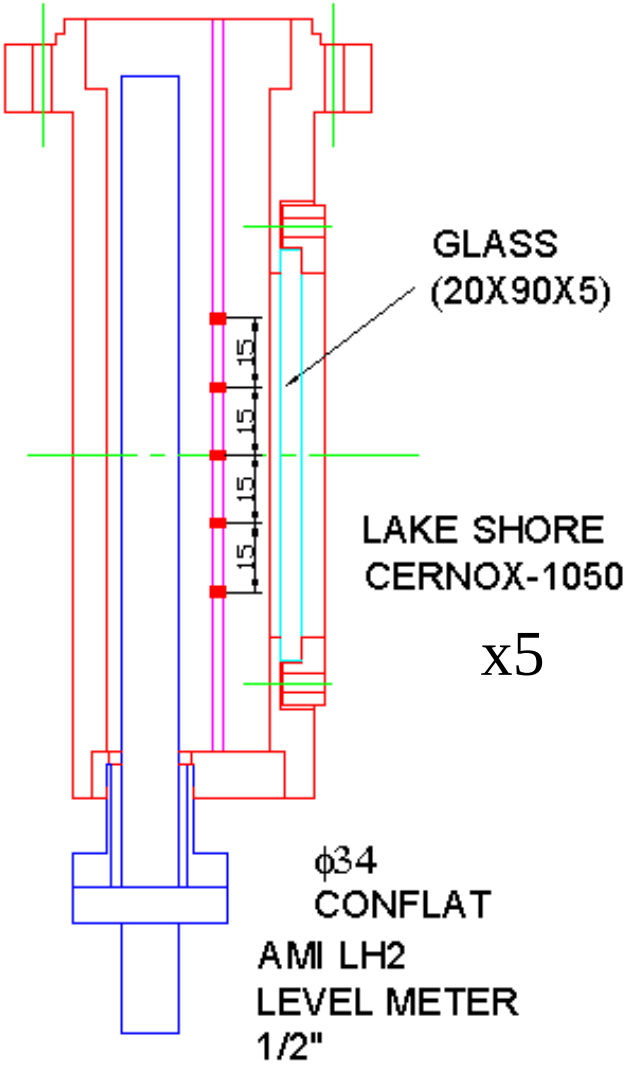
Liquid Level

- $T = T_B,\ R = R_B$

Calibration of LH2 Level Sensor



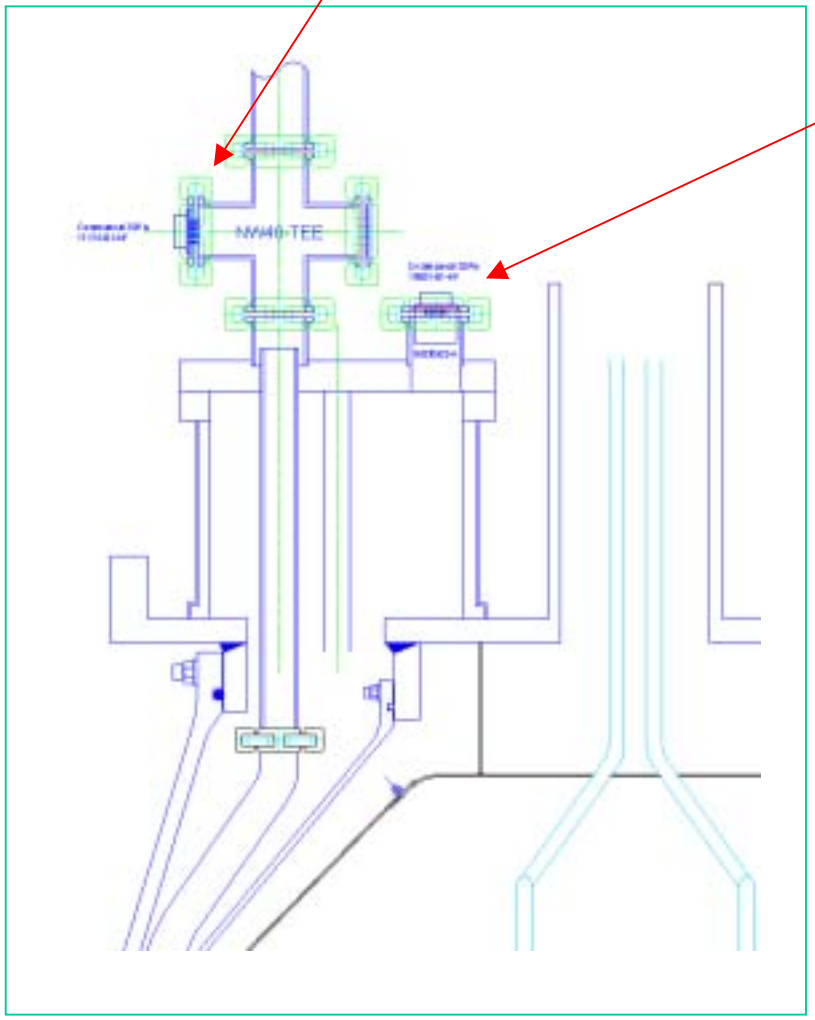
Down parts are for
the Solid H2 Target



Wiring and Connecters

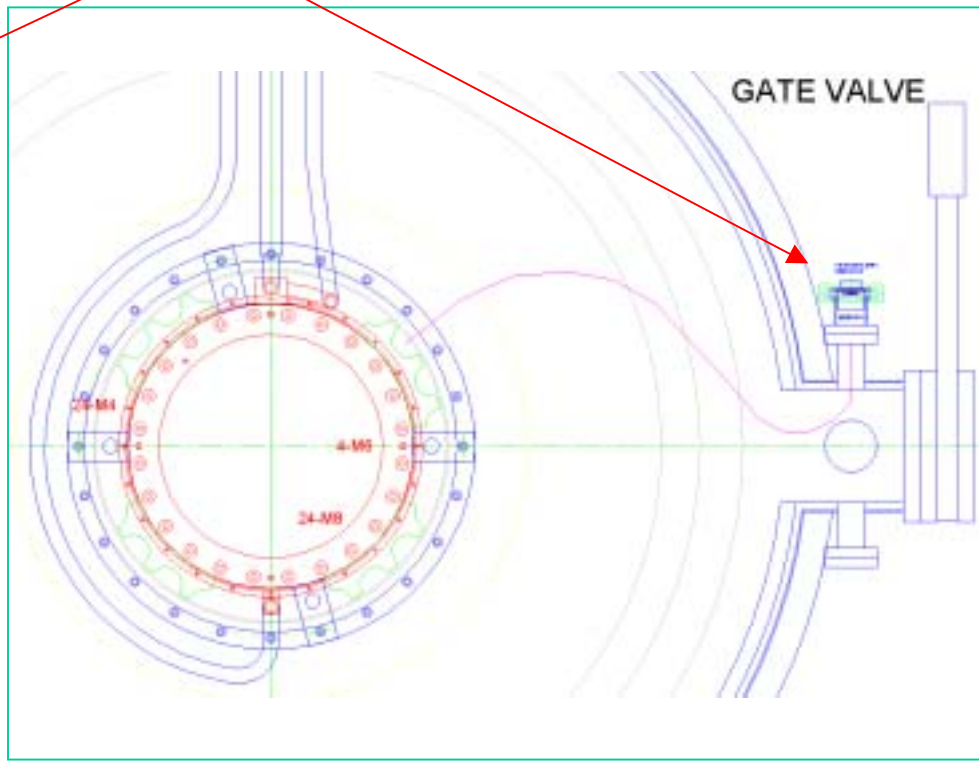
Thermometers and Level Sensor in LH2

32 pin Connecter on KF40



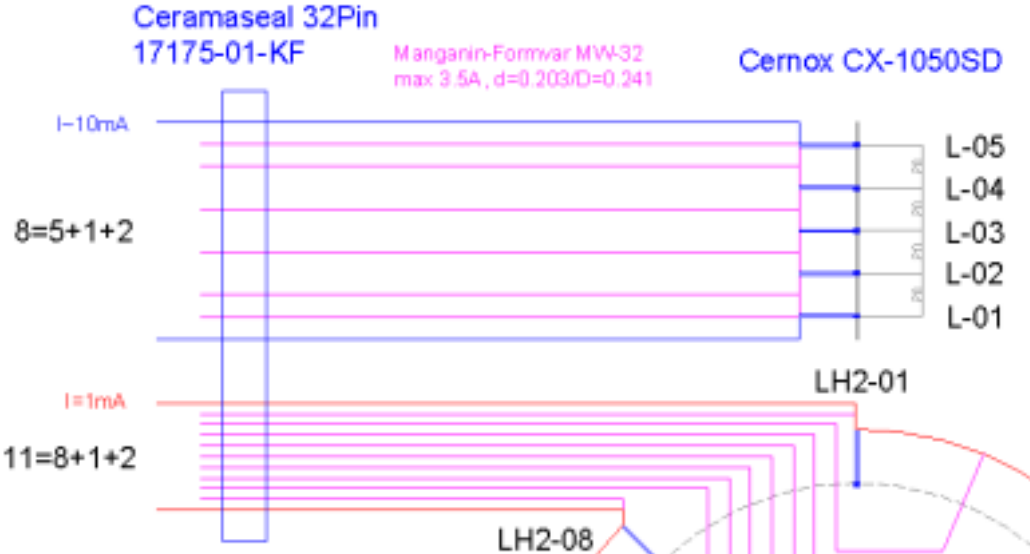
Thermometers in Vacuum

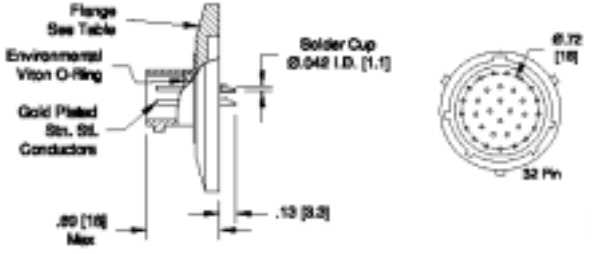
32 pin Connecter (1 of 2) on KF40

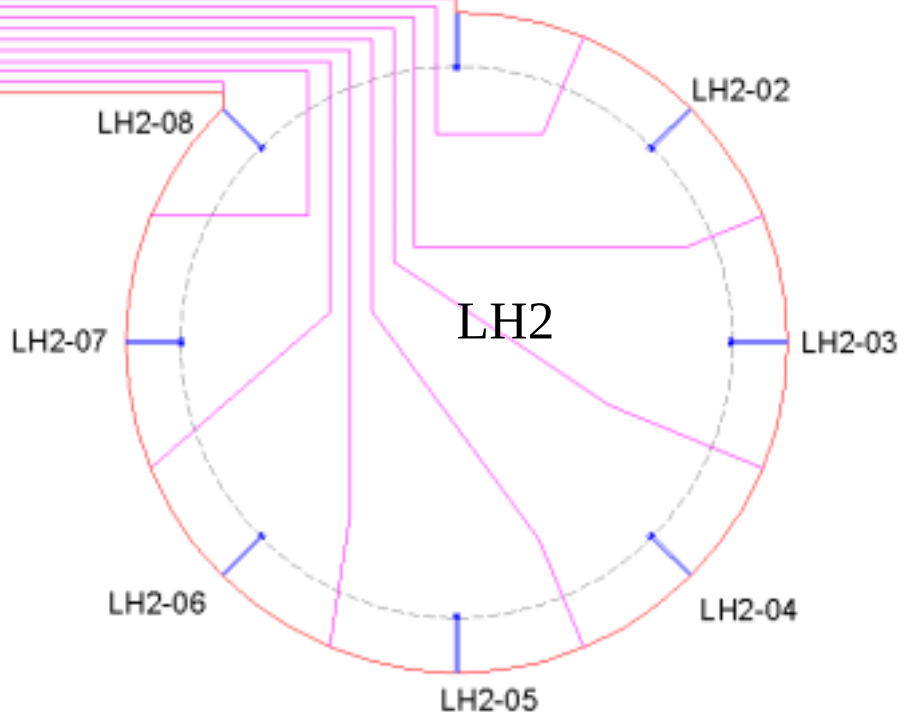


Wiring and Connecters (I)

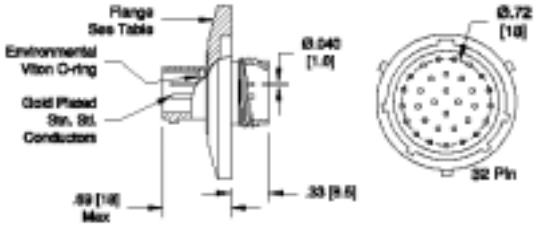
Thermometers and Level Sensor in LH2







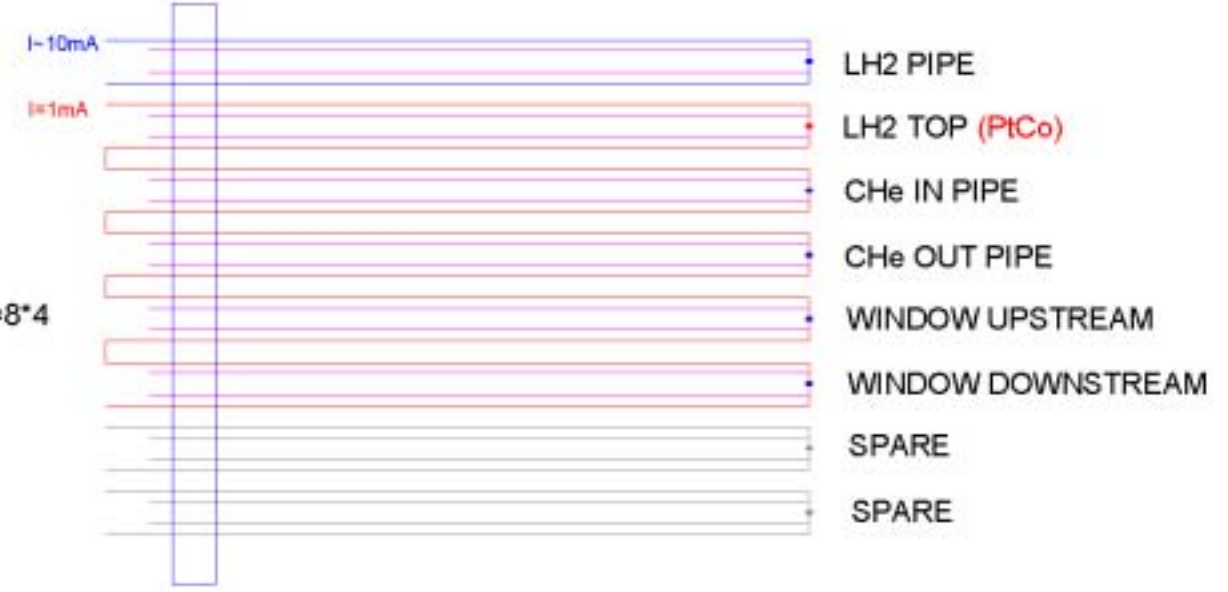
Wiring and Connecters (II)

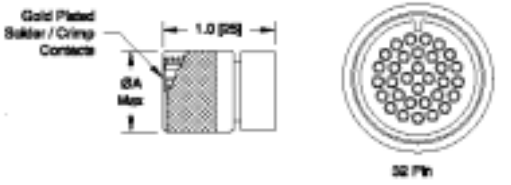


Thermometers in Vacuum

Ceramaseal 32Pin
18901-01-KF

vacuum (CX-1050SD except “LH2 TOP”)





Summary

(1) MICE absorber (#01) has arrived.
(2) Horizontal test cryostat will be designed and fabricated at KEK.
(3) MICE absorbers will be tested at KEK by cold G-He at 10-20K.
(4) MICE absorbers will be shipped to RAL with sensors and real windows (ready to use).

← Planning

(5) L-H2 test at FNAL/MTA by a spare MICE absorber.

← Planning