# Convection absorber status & plans

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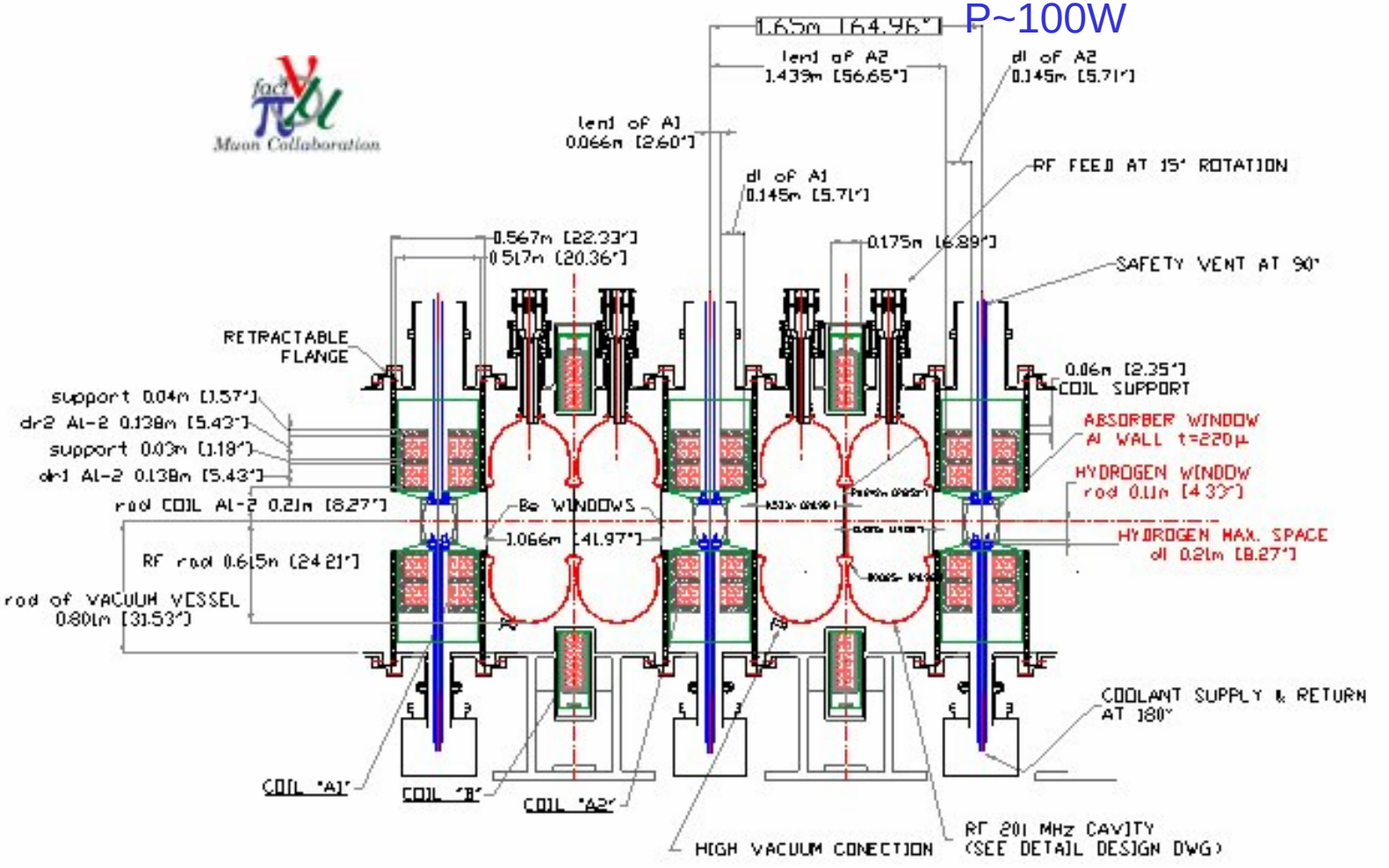
Yoshitaka KUNO, Akira SATO; *OSAKA Univ.*

MUCOOL REVIEW MEETING at FNAL
20-23 Feb, 2003

$LH_2$ Absorber

D=22cm, L=21cm →D=21cm

P~100W

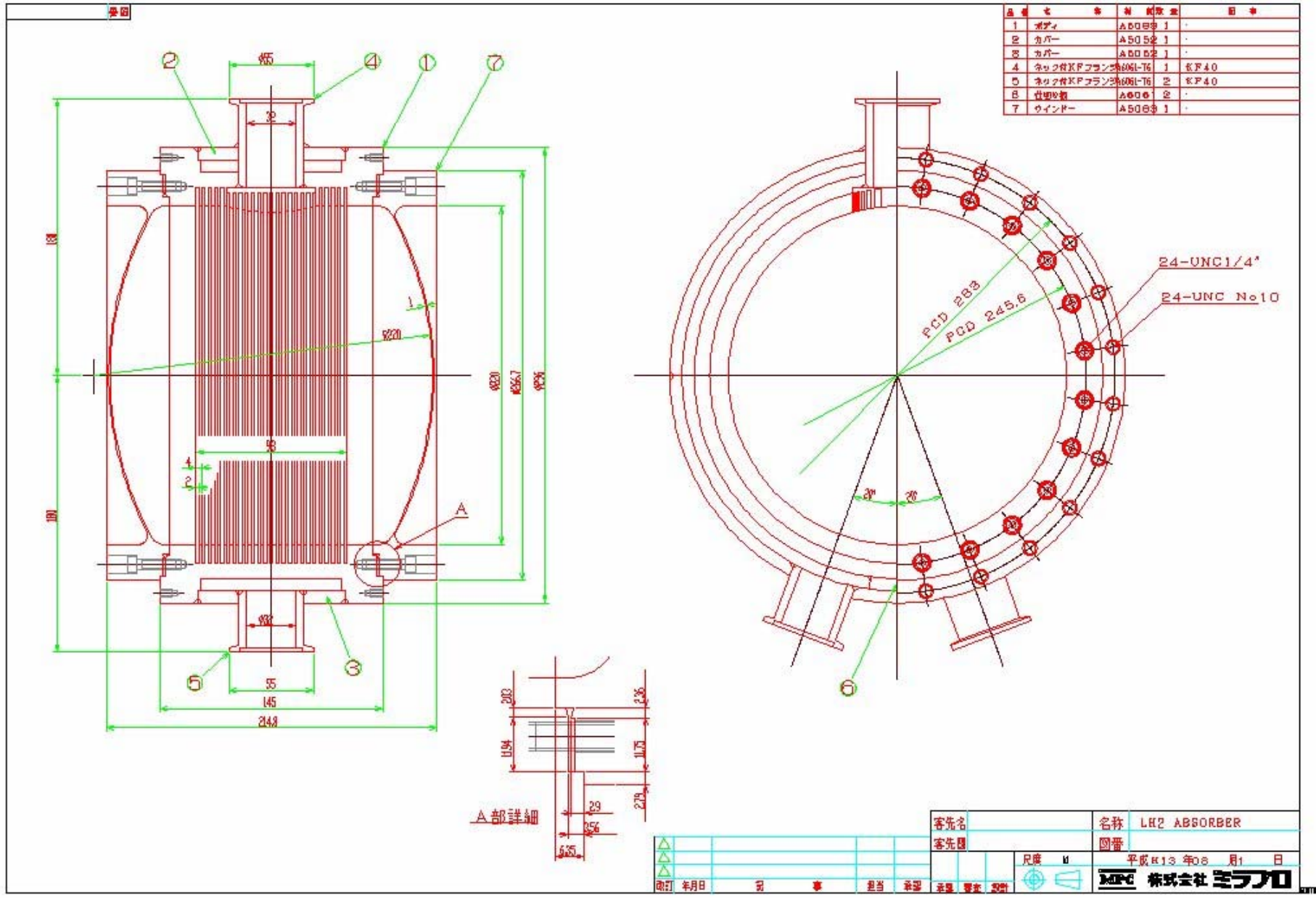



SFOFO 1.65 m LATTICE 2
SCTIONS: 2,1 TO 2,3
STUDY 2

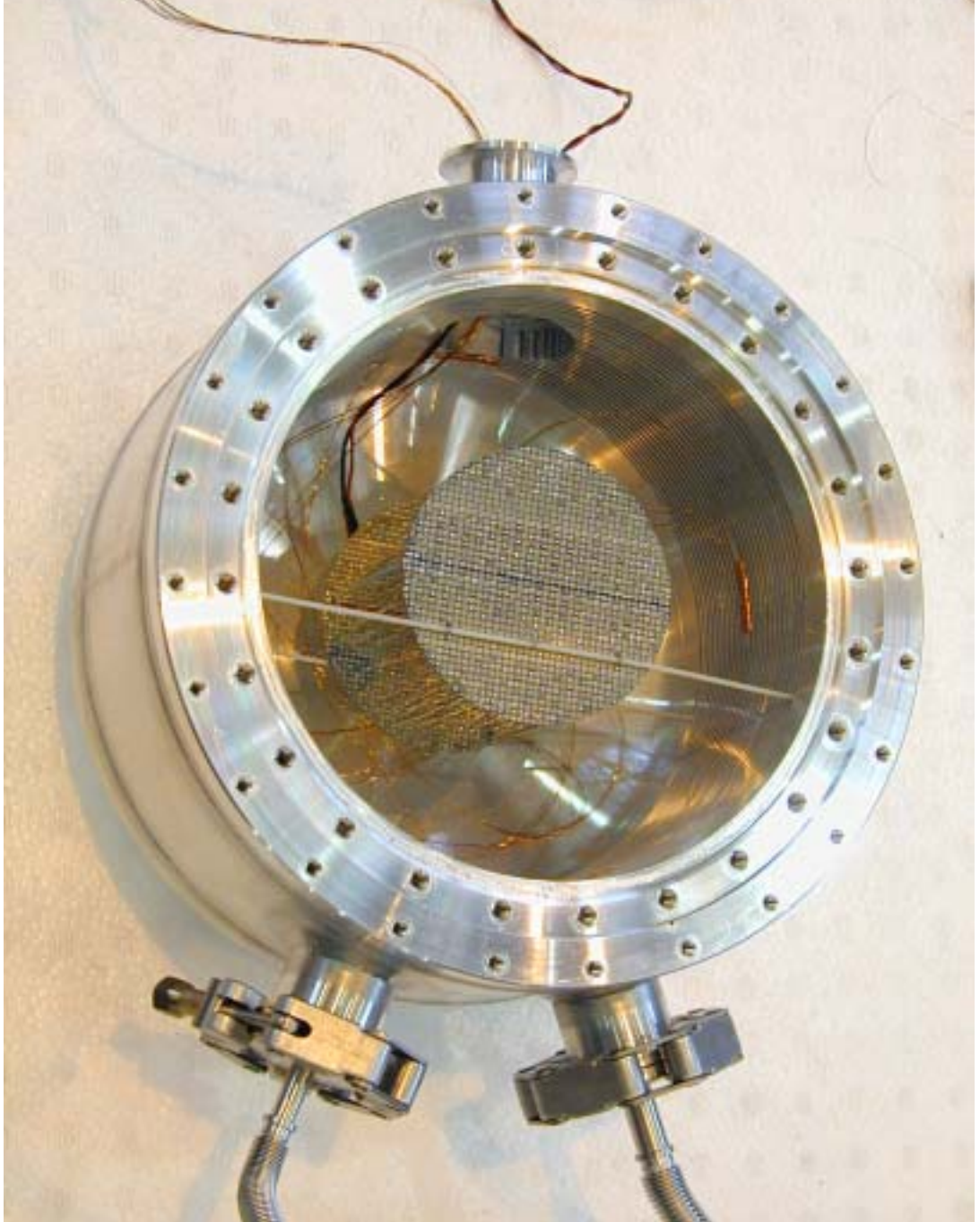
SFOFOLATTICE2rev7a

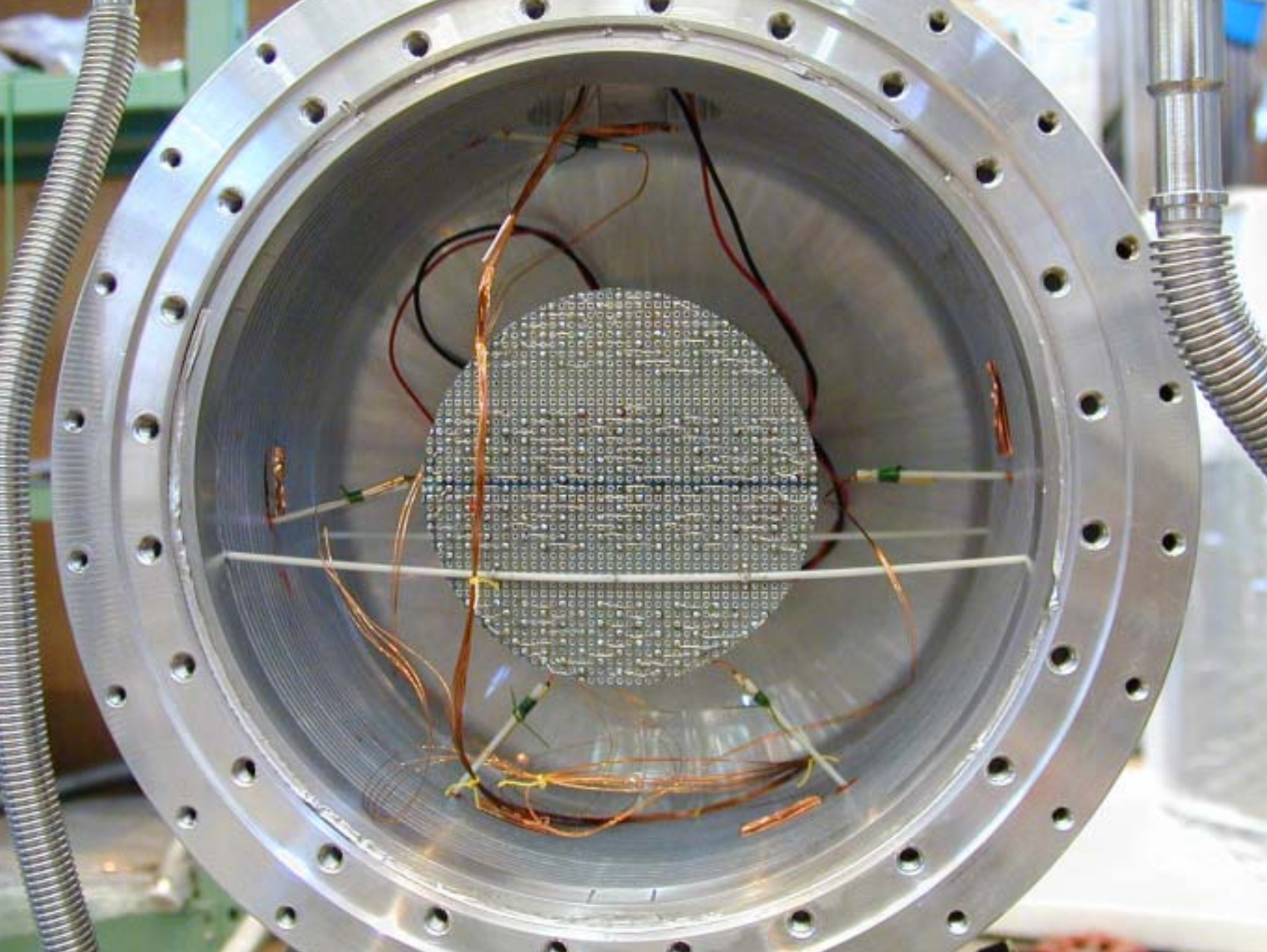
E.L.Bock 01/21/2001
Rev.7 GENERAL
Rev.7a N.Green design 03/06/2001

# ABSORBER I

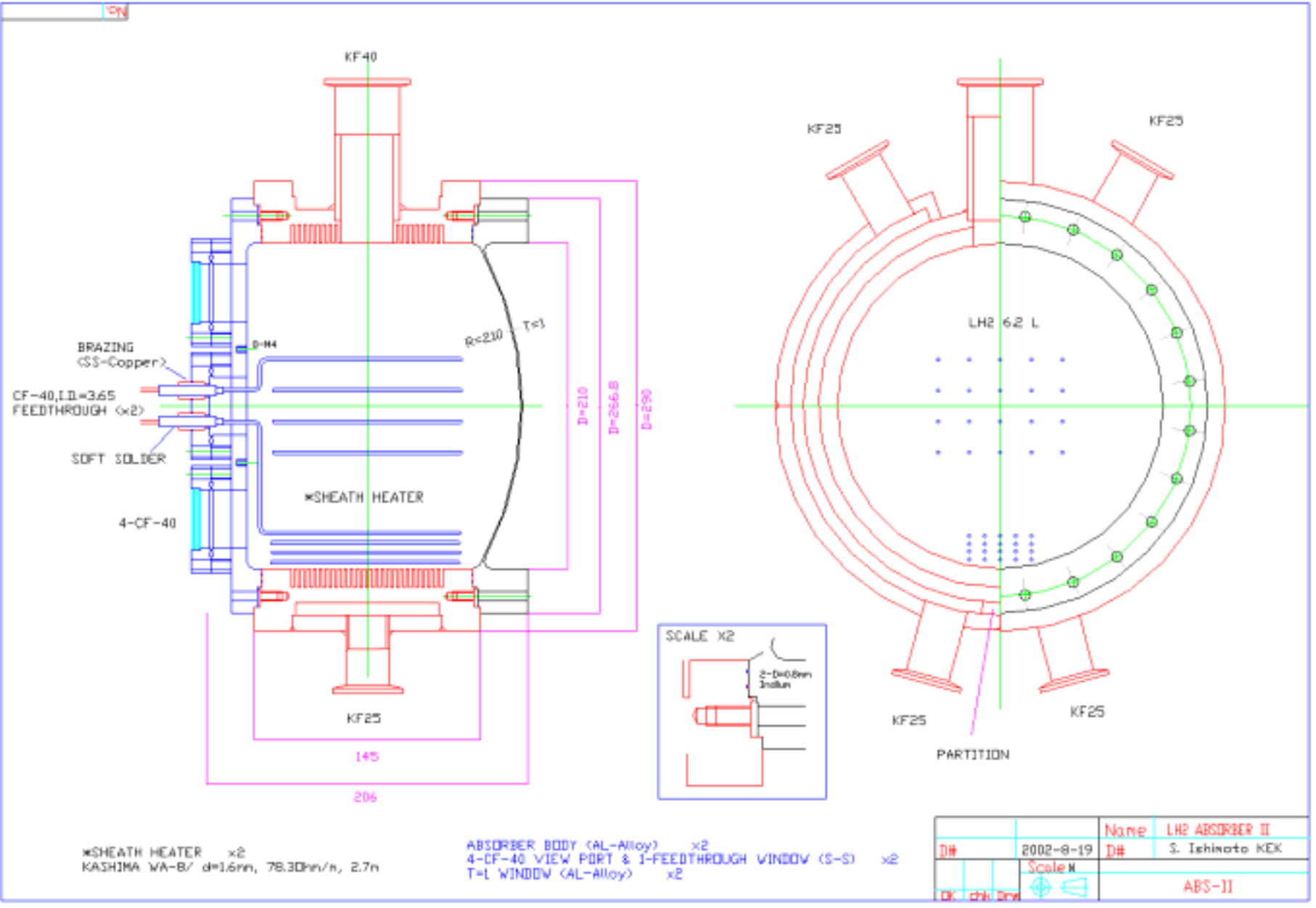

24-UNC1/4"
24-UNC No10
PCD 283
PCD 245.6
A部詳細
客先名
客先品
名称 LH2 ABSORBER
図番
尺度
平成13 年08 月1 日
株式会社 ミラプロ

# ABSORBER I

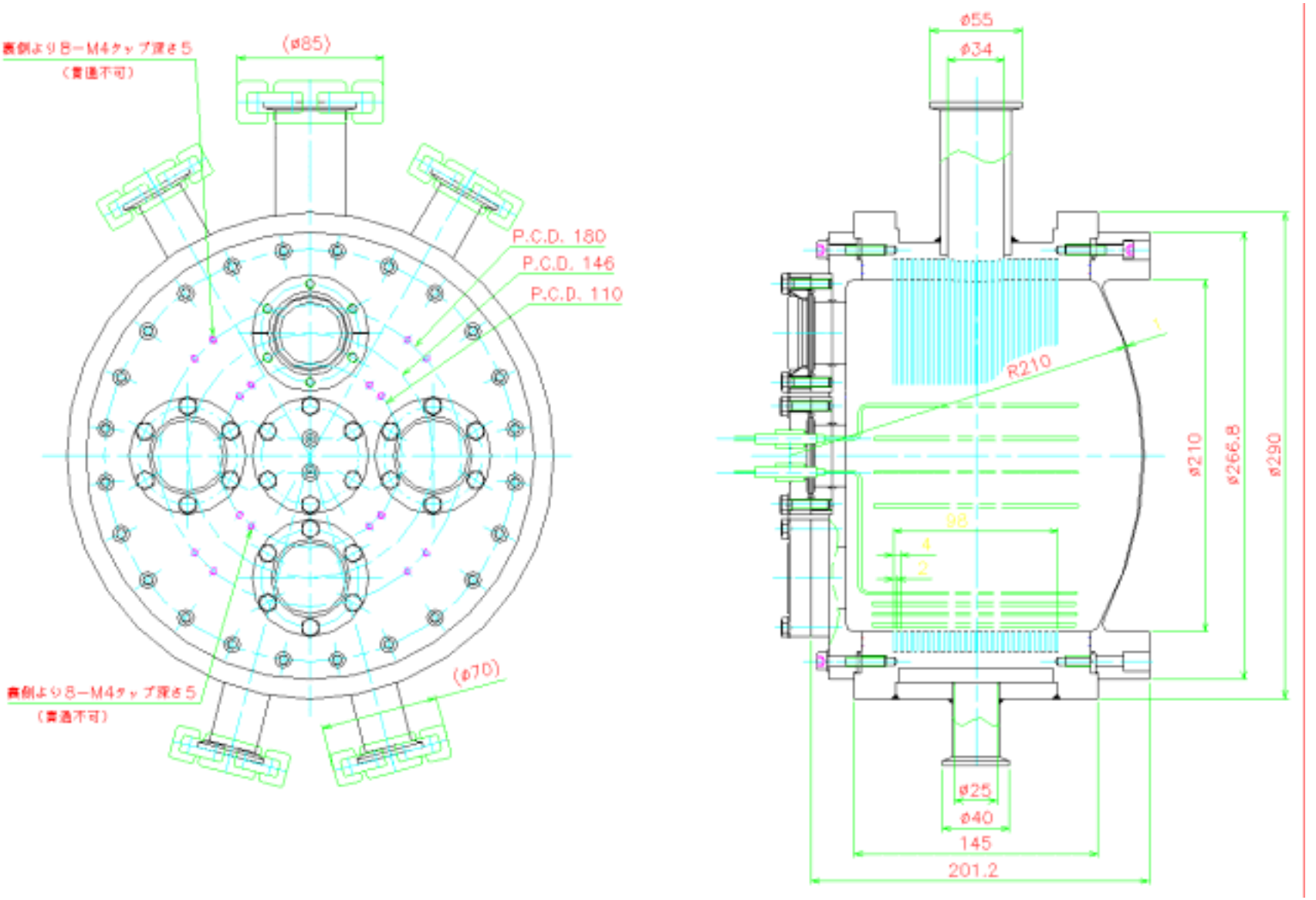




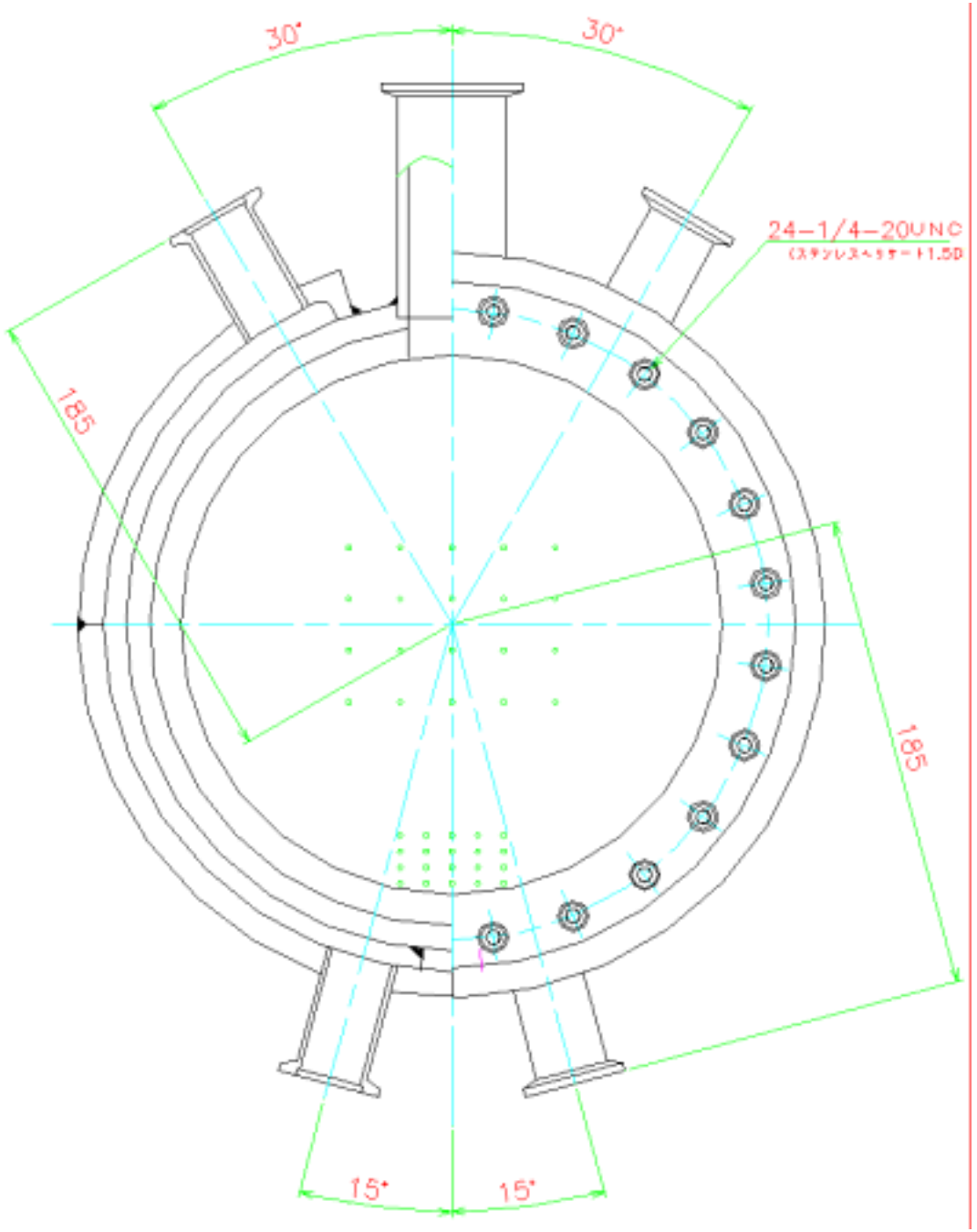
# ABSORBER II


KF40
BRAZING
(SS-Copper)
CF-40,I.D=3.65
FEEDTHROUGH (x2)
SOFT SOLDER
4-CF-40
*SHEATH HEATER
KF25
145
206
R=210
T=1
D=210
D=266.8
D=290
SCALE X2
KF25
KF25
LH2 6.2 L
KF25
KF25
PARTITION
*SHEATH HEATER x2
KASHIMA WA-B/ d=1.6mm, 78.3Ohm/m, 2.7m
ABSORBER BODY (AL-Alloy) x2
4-CF-40 VIEW PORT & 1-FEEDTHROUGH WINDOW (S-S) x2
T=1 WINDOW (AL-Alloy) x2
Name
LH2 ABSORBER II
D#
2002-8-19
D#
S. Ishimoto KEK
Scale N
ABS-II

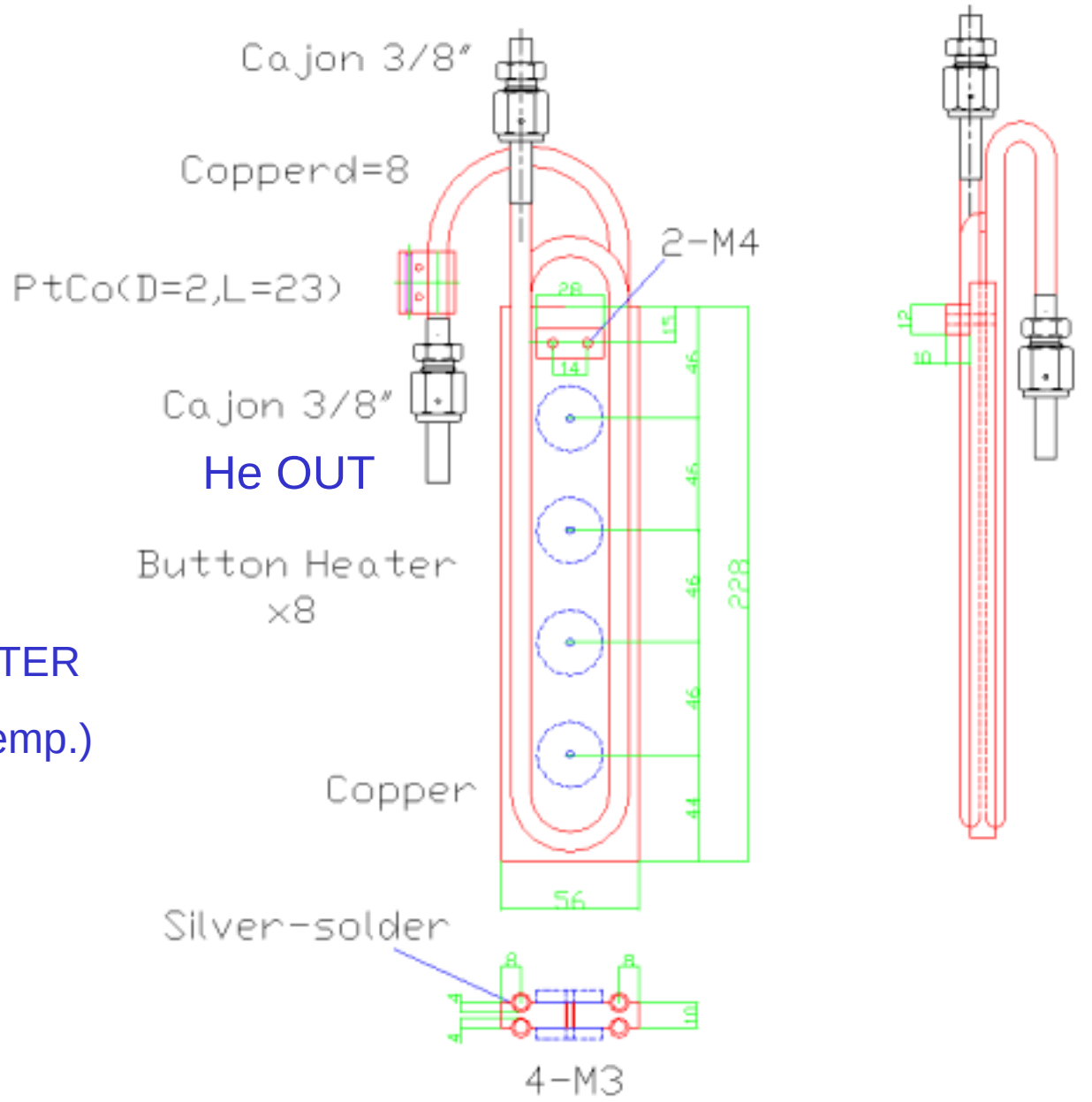
# ABSORBER II


裏側より8−M4タップ深さ5
(貫通不可)
(ø85)
P.C.D. 180
P.C.D. 146
P.C.D. 110
裏側より8−M4タップ深さ5
(貫通不可)
(ø70)
ø55
ø34
R210
ø210
ø266.8
ø290
98
4
2
ø25
ø40
145
201.2

# ABSORBER II



# LHe HEATER

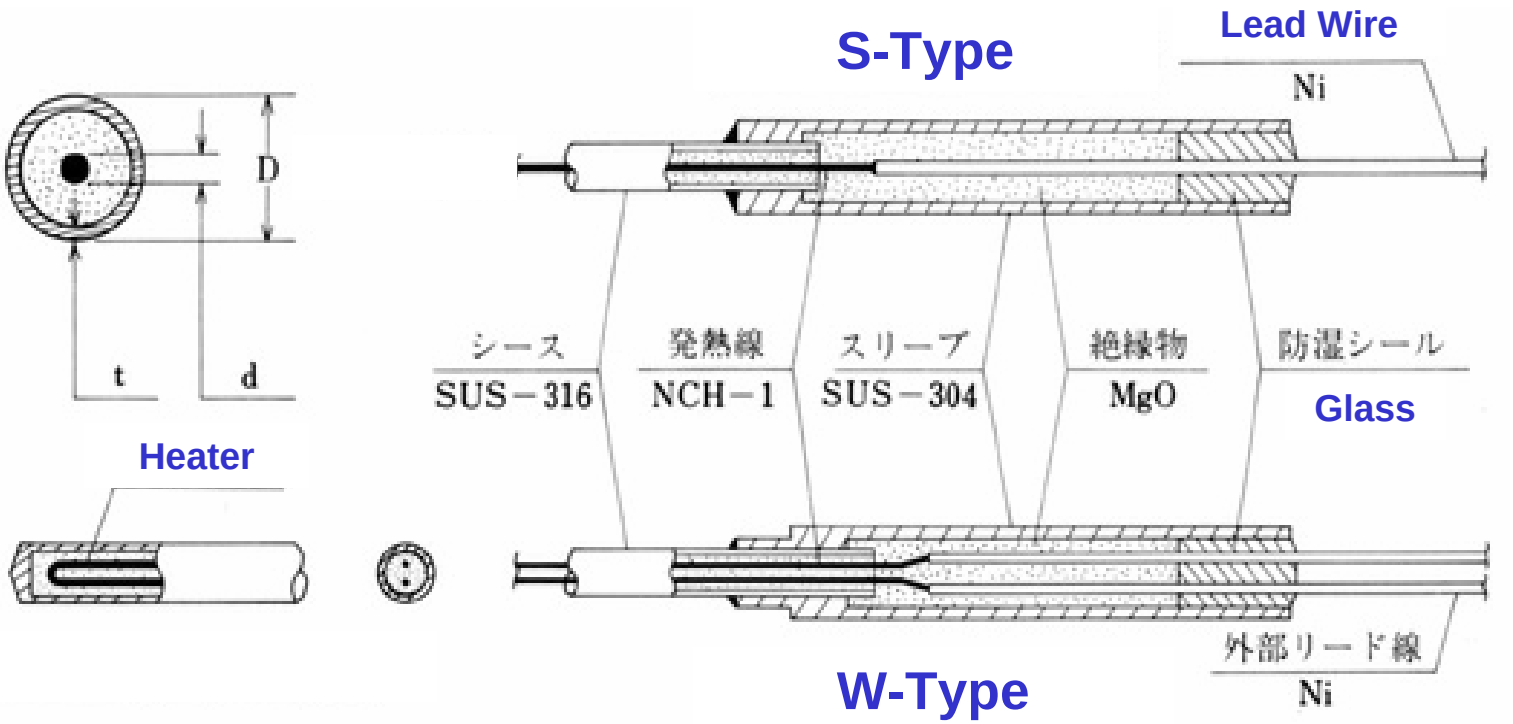



BUTTON HEATER

20 W (Room Temp.)

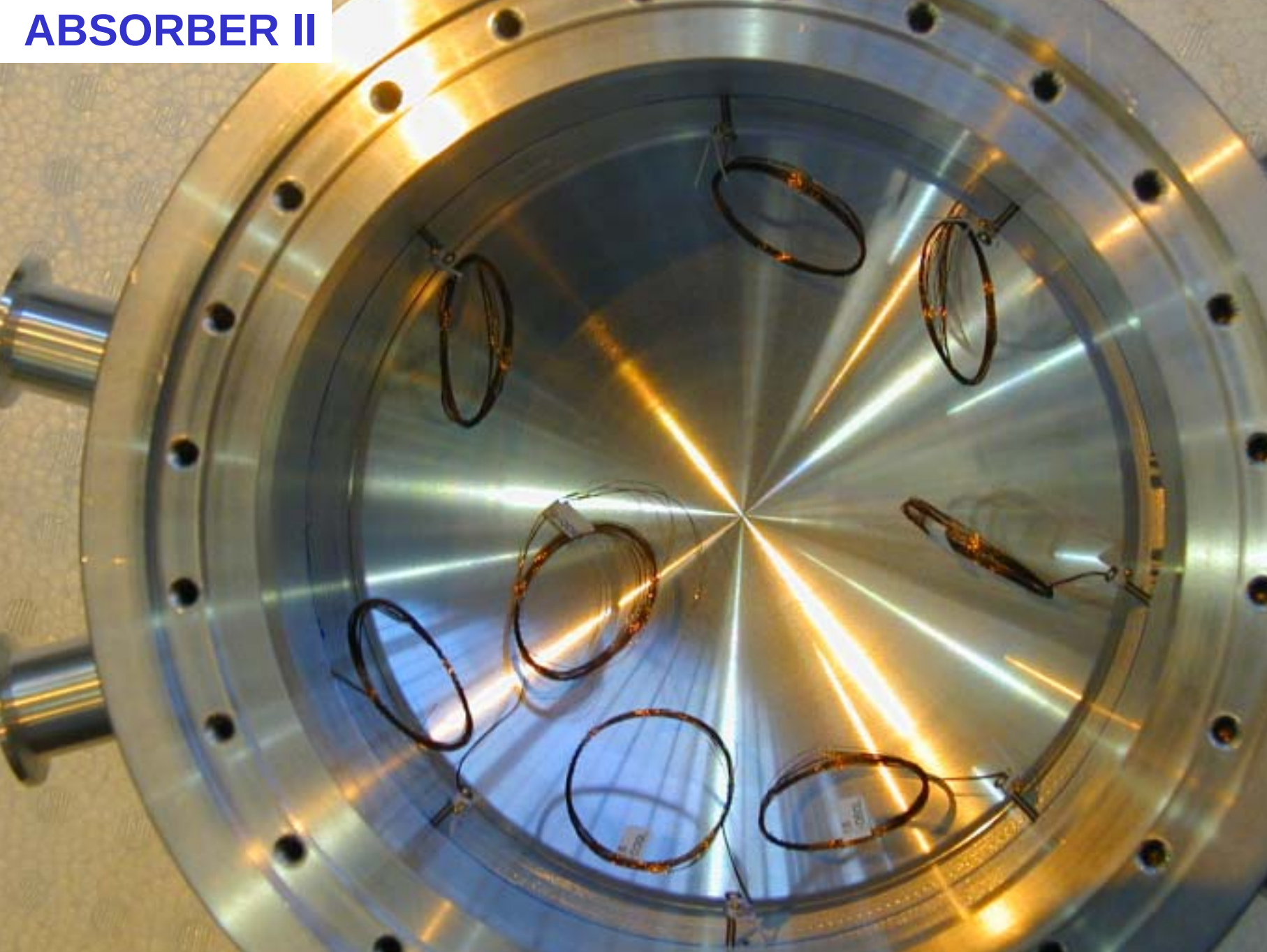
x 8

# ABSORBER II -- SHEATH HEATER




| シース外径 D φmm | 電　圧 （V） | 容　量 （W） | シース長さ L mm | 電力密度 W／cm² | 抵 抗 値 Ω／m | 耐電圧 （V） | d | 規格型式 |
|---|---|---|---|---|---|---|---|---|
| 1.6 | 100 | 100 | 1050 | 1.89 | 90 | 500 | 6.4 | WA－1 |
| | | 150 | 1100 | 2.71 | 60 | 〃 | 〃 | WA－2 |
| | | 200 | 1700 | 2.34 | 29 | 〃 | 〃 | WA－3 |
| | | 250 | 1350 | 3.68 | 29 | 〃 | 〃 | WA－4 |
| | 200 | 200 | 1960 | 2.03 | 100 | 500 | 6.4 | WA－5 |
| | | 300 | 2180 | 2.73 | 60 | 〃 | 〃 | WA－6 |
| | | 400 | 2400 | 3.33 | 42 | 〃 | 〃 | WA－7 |
| | → | 500 | 2700 | 3.69 | 29 | 〃 | 〃 | WA－8 |
| | | 100 | 900 | 1.47 | 110 | 600 | 8.0 | WA－9 |

# ABSORBER II



# ABSORBER II

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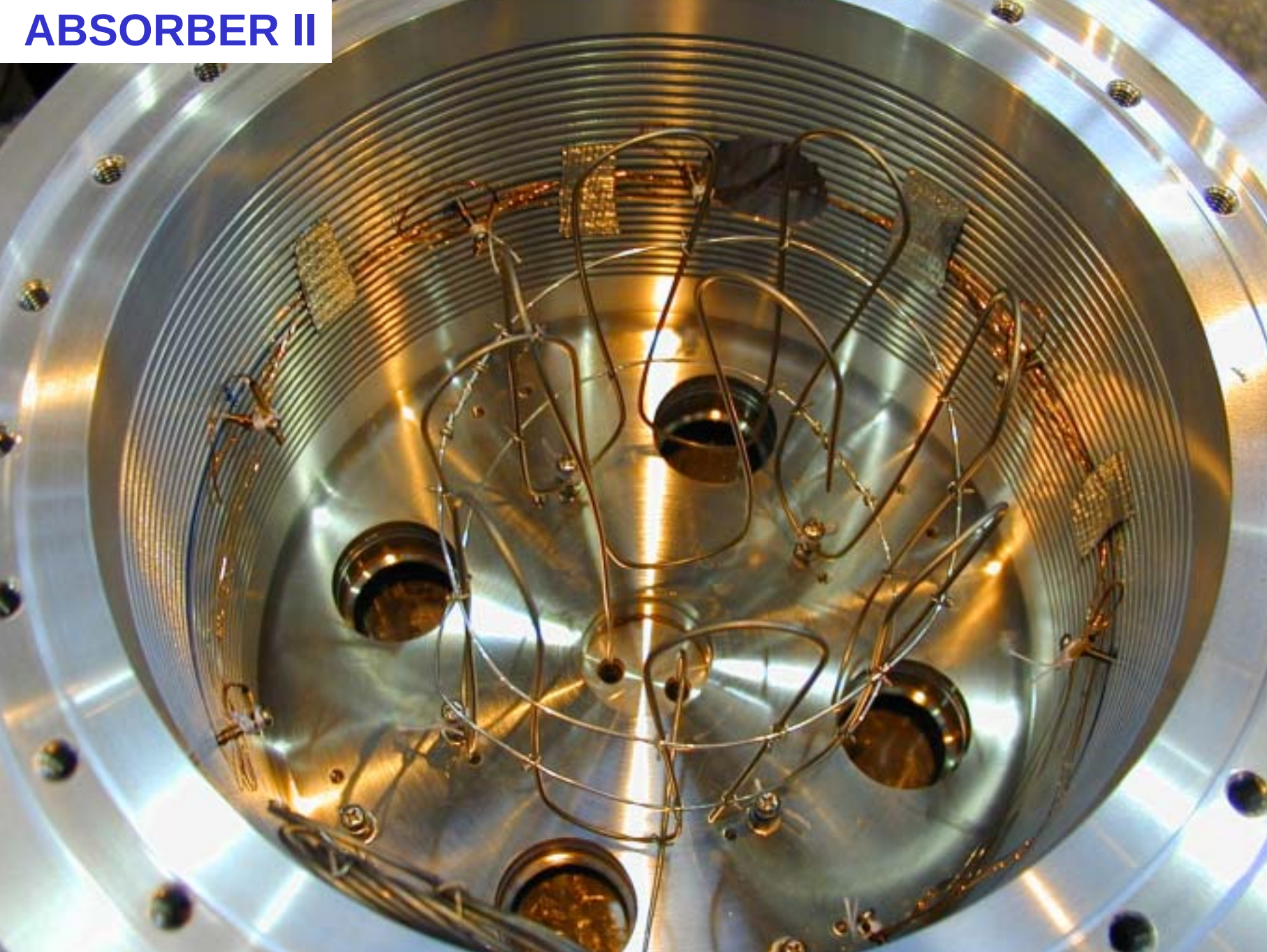
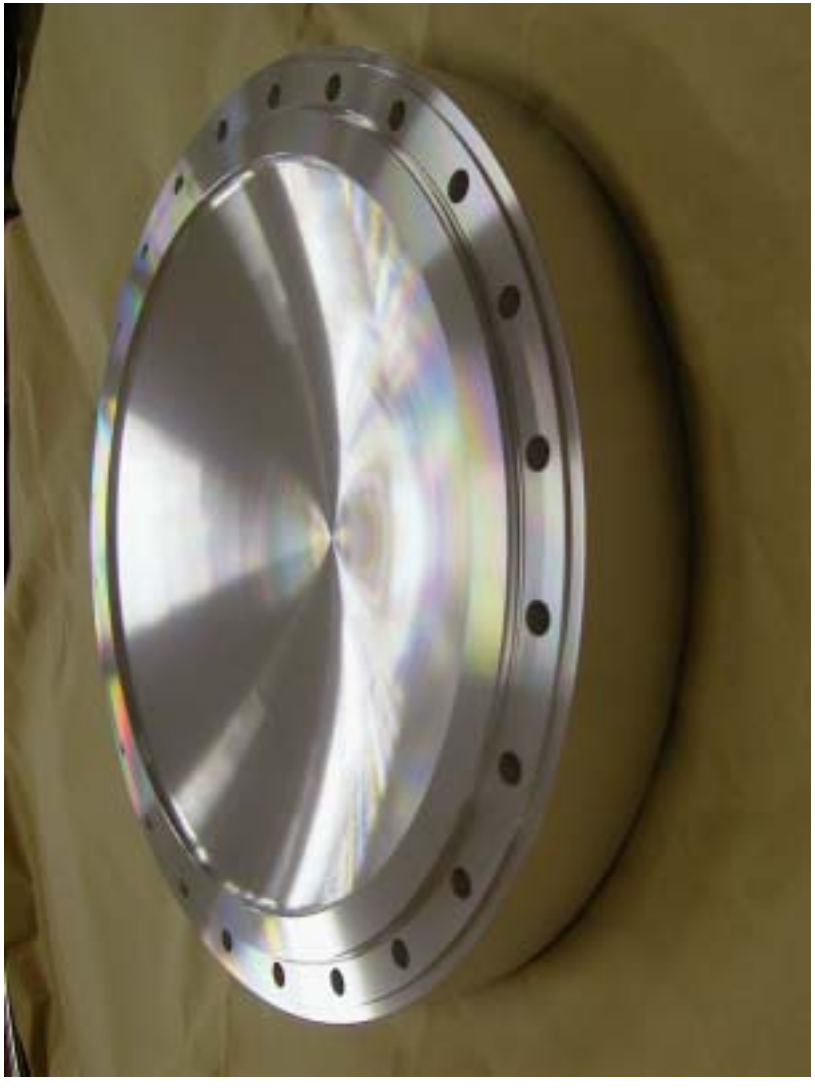
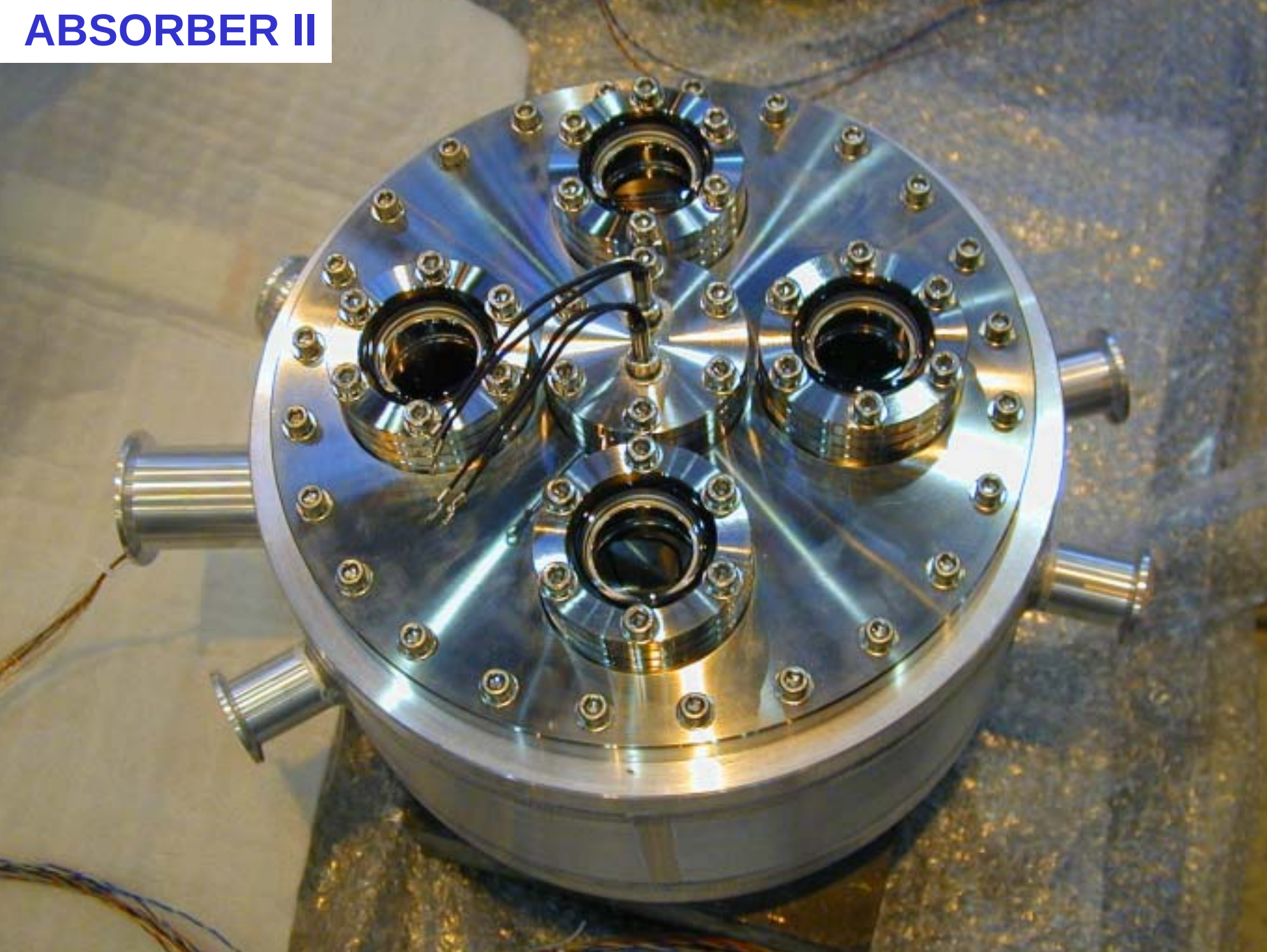


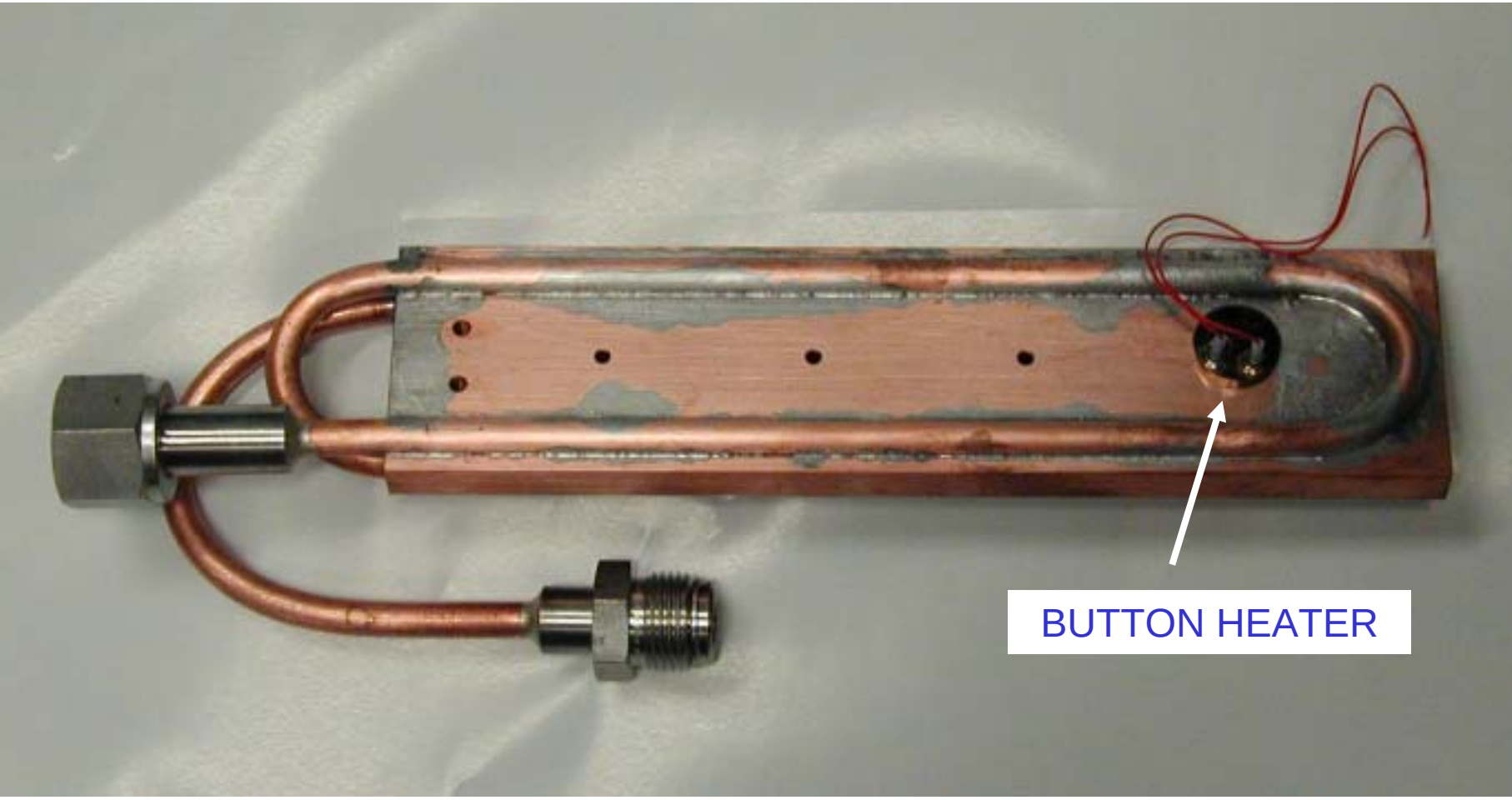
# ABSORBER II



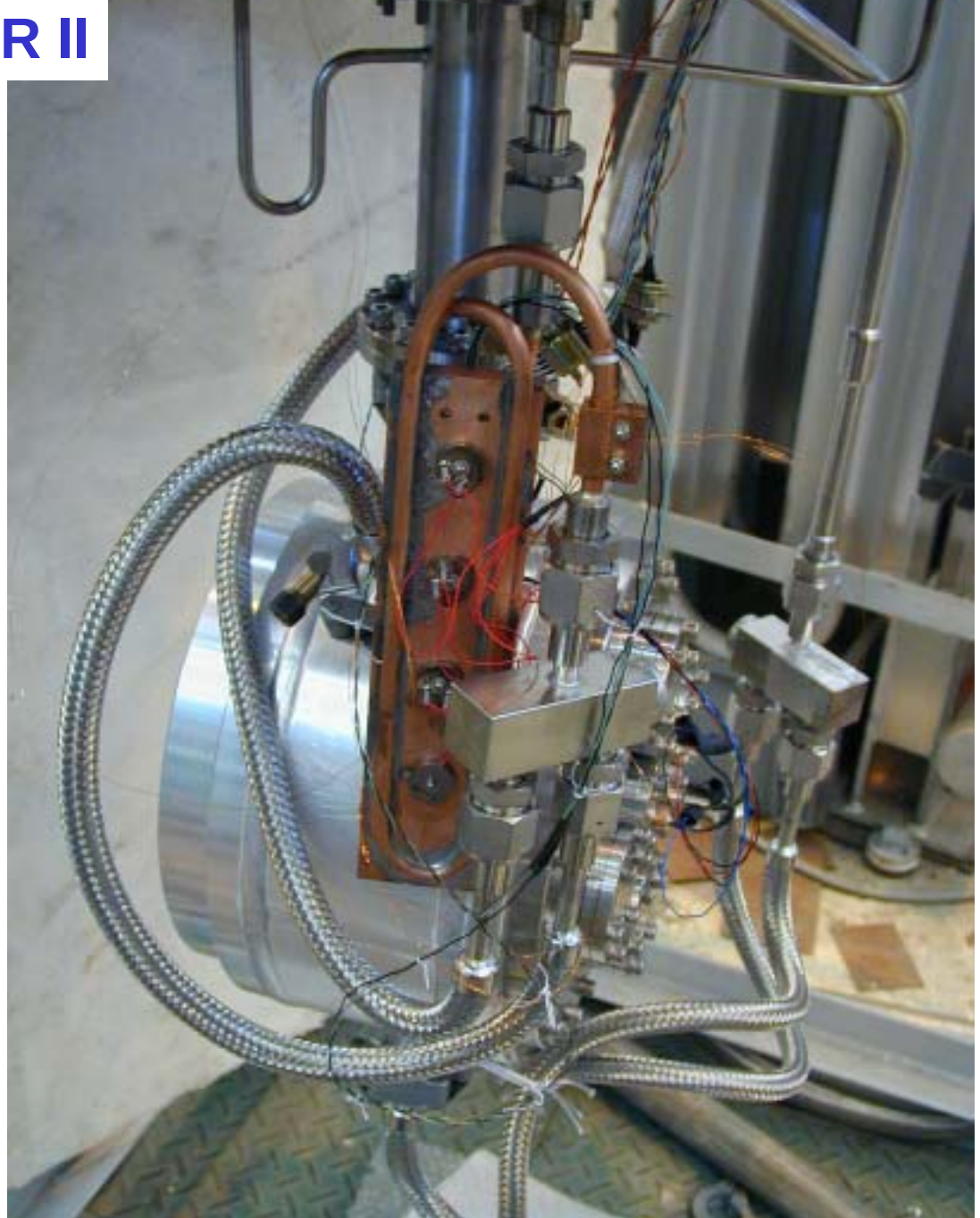
# ABSORBER II



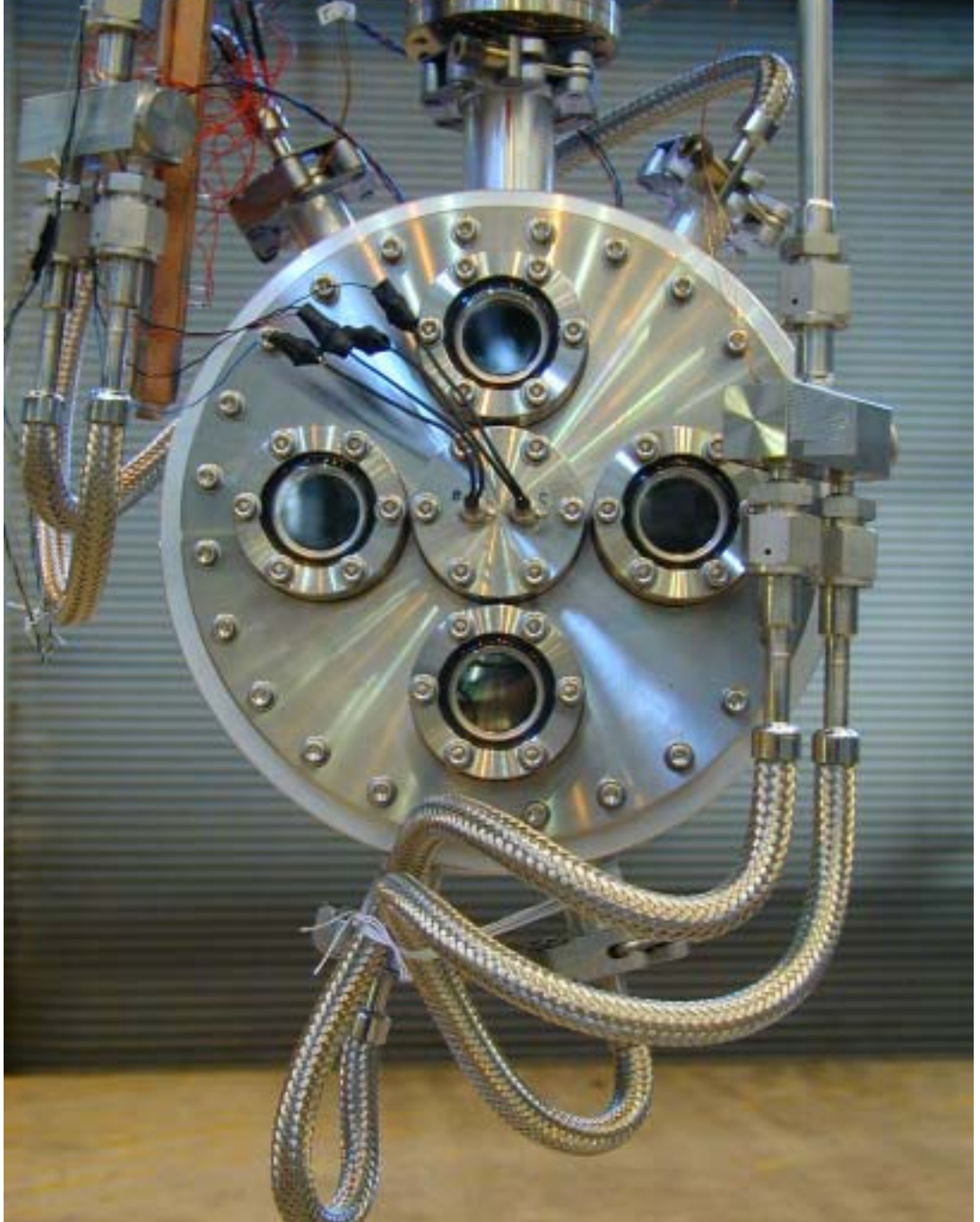
# LHe HEATER



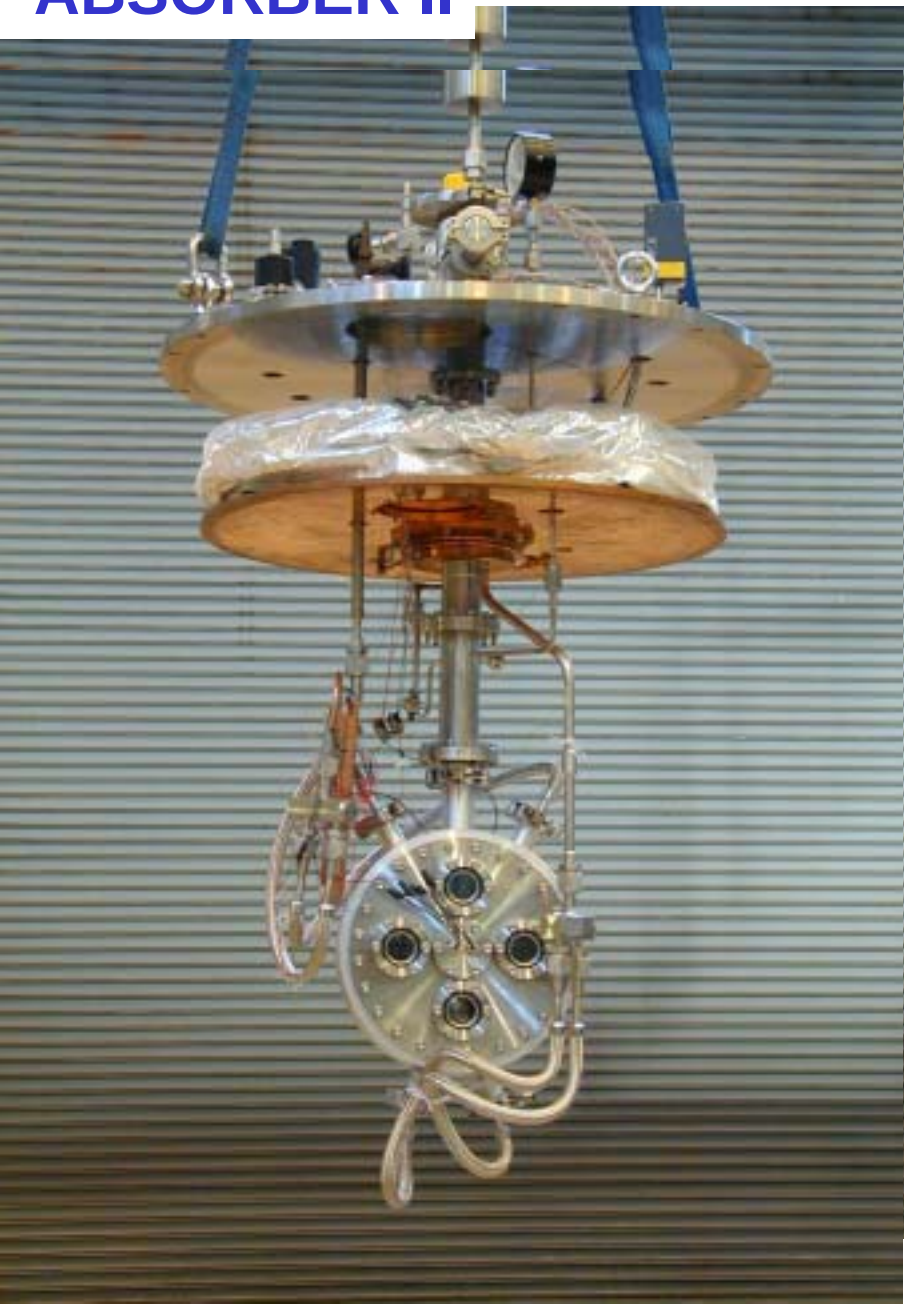
# ABSORBER II



# ABSORBER II



# ABSORBER II



# Test Cryostat for $LH_2$ Absorber

# Dummy Heater

Stainless Steel Wire

d = 0.34 mm

Resistance;

r = 7.5 Ohm/m at R.T.

~ 6 Ohm/m at 27 K

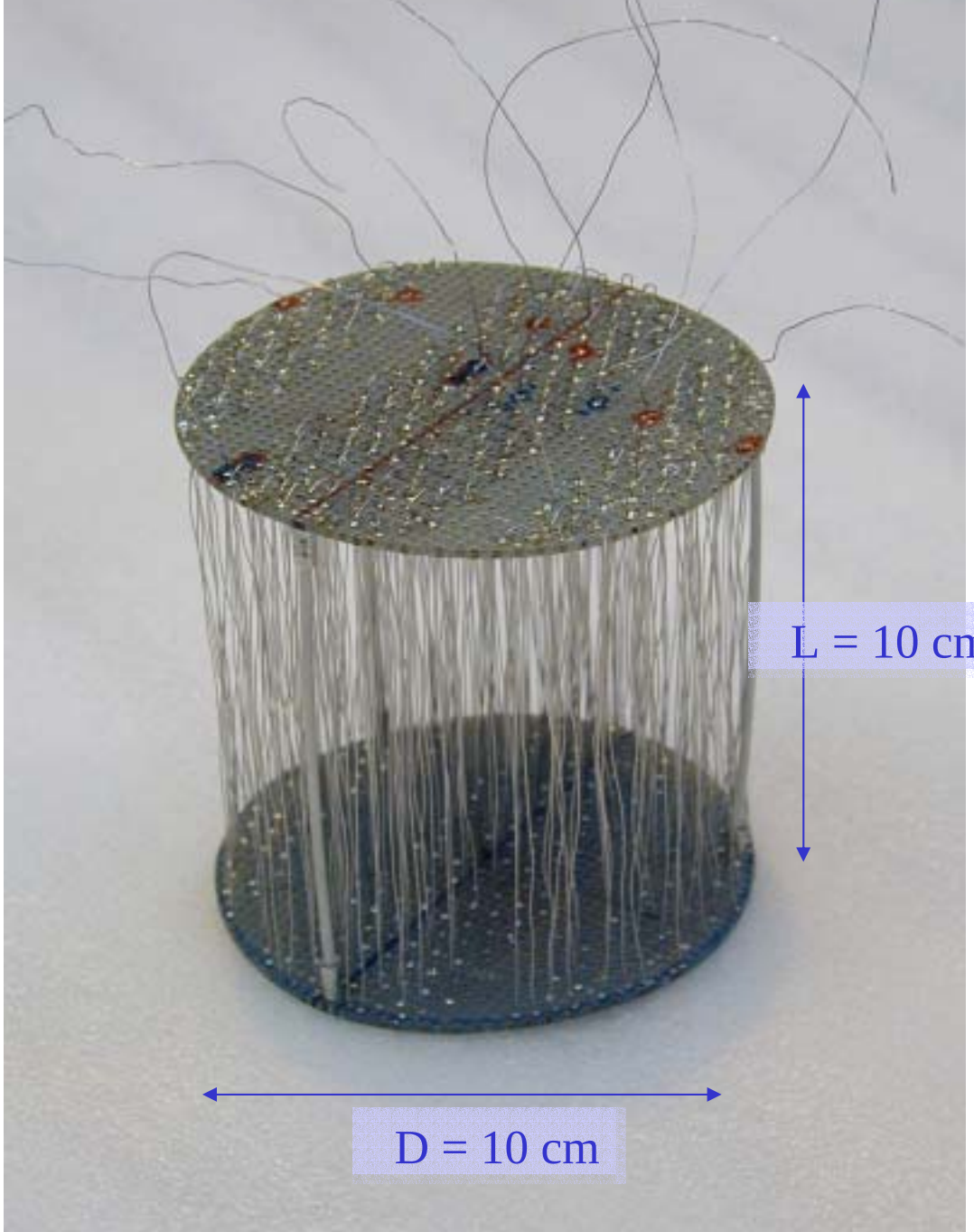
< TEST at FNAL >

Unit; 10V-2.5W with Zenner

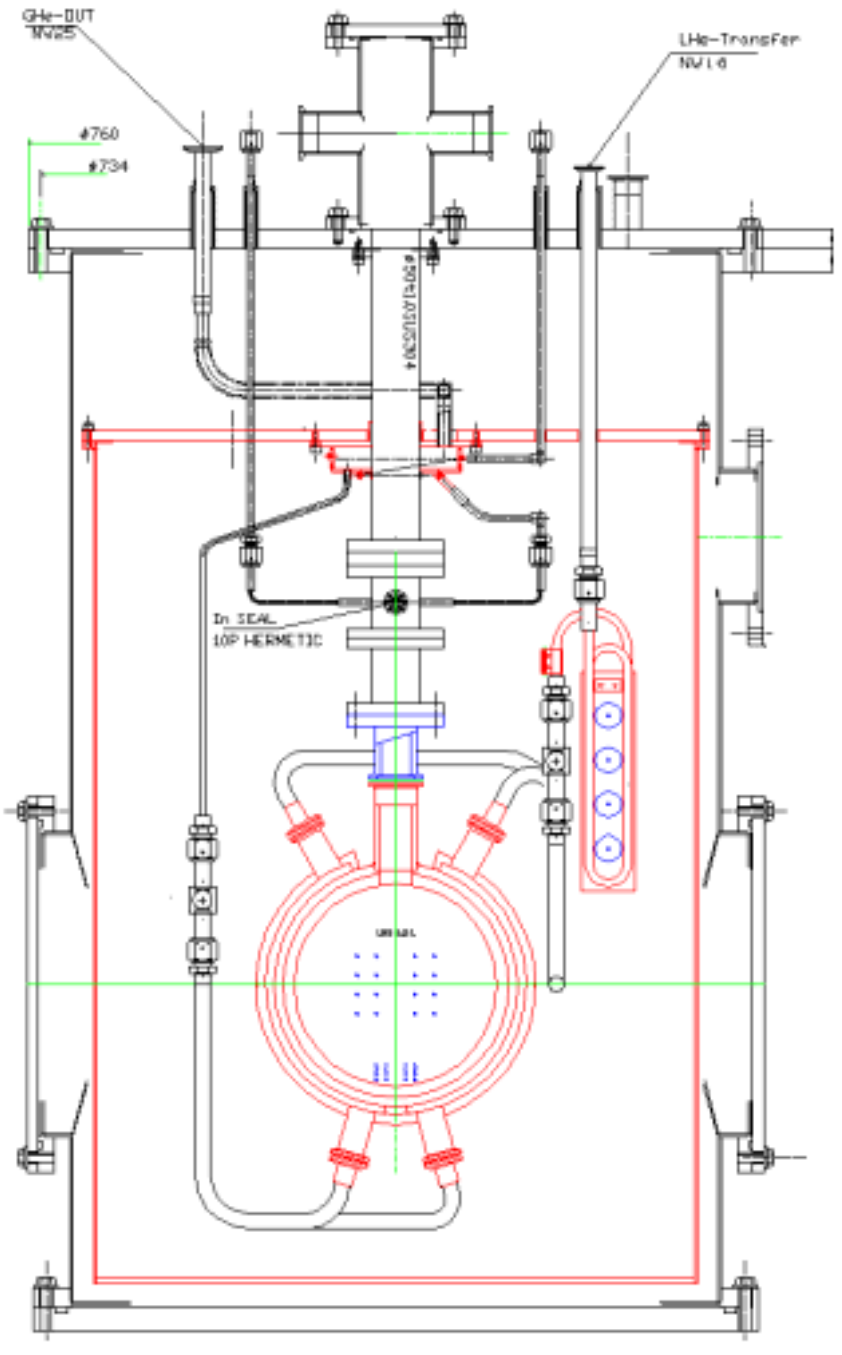
~ 4 Ohm/0.67 m

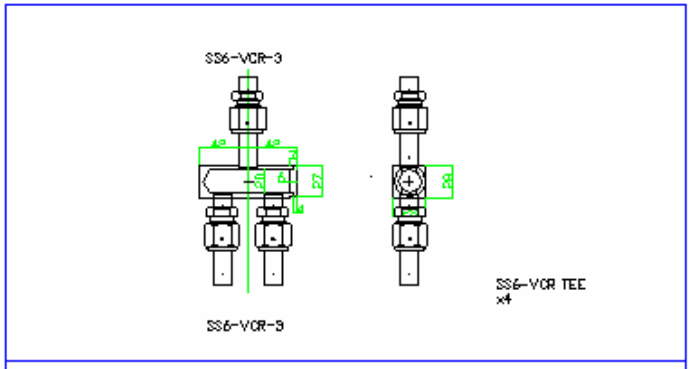
7 path of L=10 cm

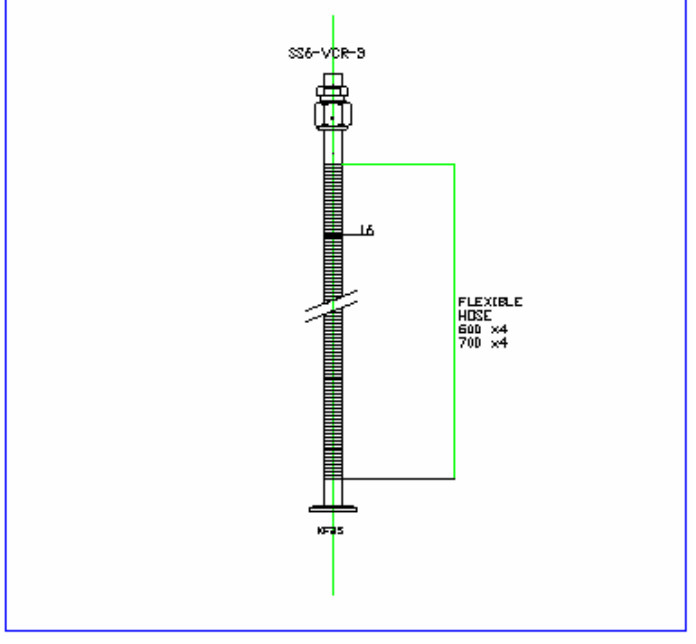
100 W; 40 x 7 = 280 path



# ABSORBER II


GHe-OUT
NW25
LHe-TransFer
NW16
ϕ760
ϕ734
In SEAL
10P HERMETIC


SS6-VCR-3
SS6-VCR-3
SS6-VCR TEE
x4


SS6-VCR-3
L6
FLEXIBLE
HOSE
600 x4
700 x4
KF25

# TEST CRYOSTAT

## SAFTY VOLUME

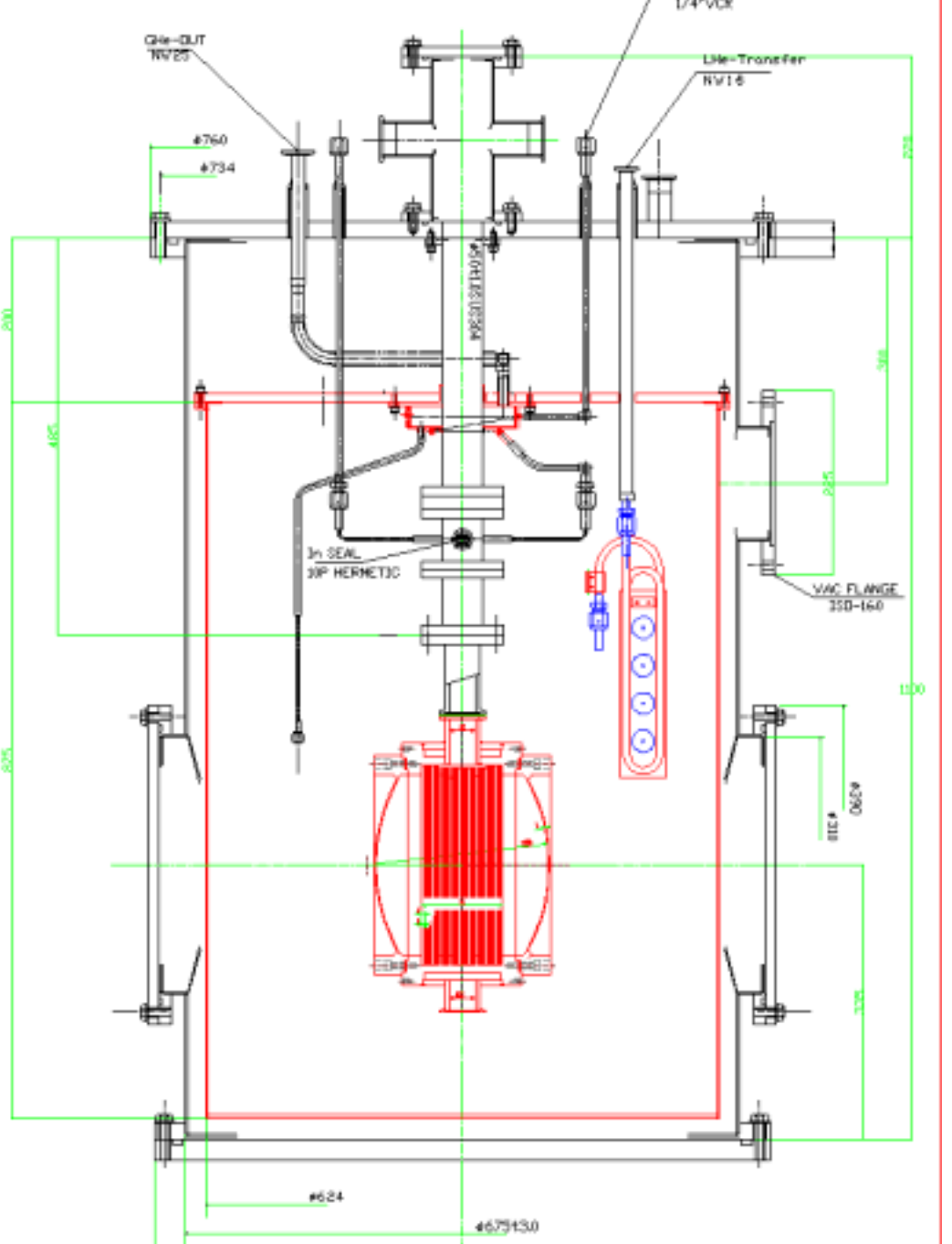
$V_{H2}$ = 6.2 L

$V_{vac}$ = 386 L

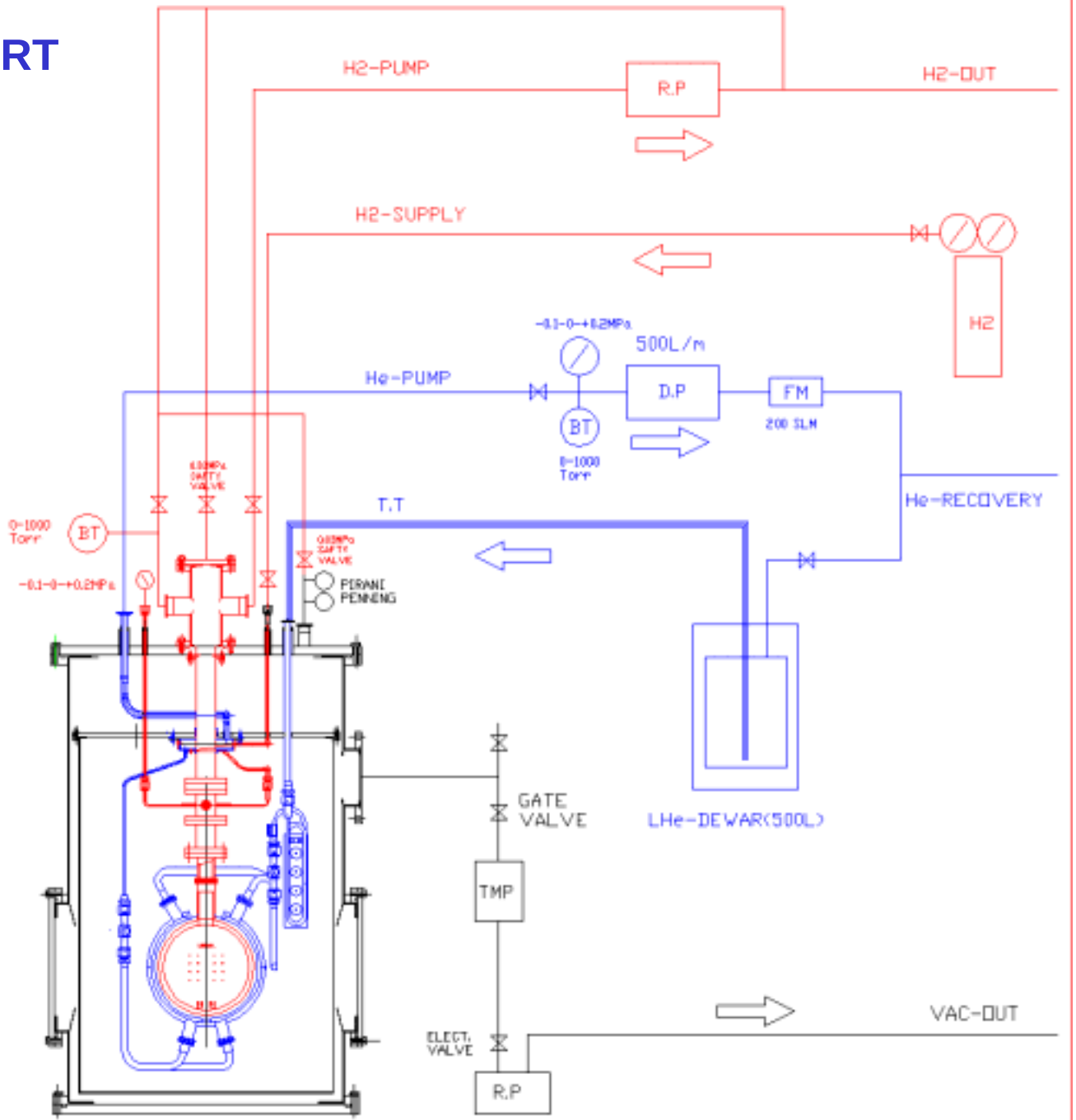
$V_{H2} / V_{vac}$ = 62.3

> 52

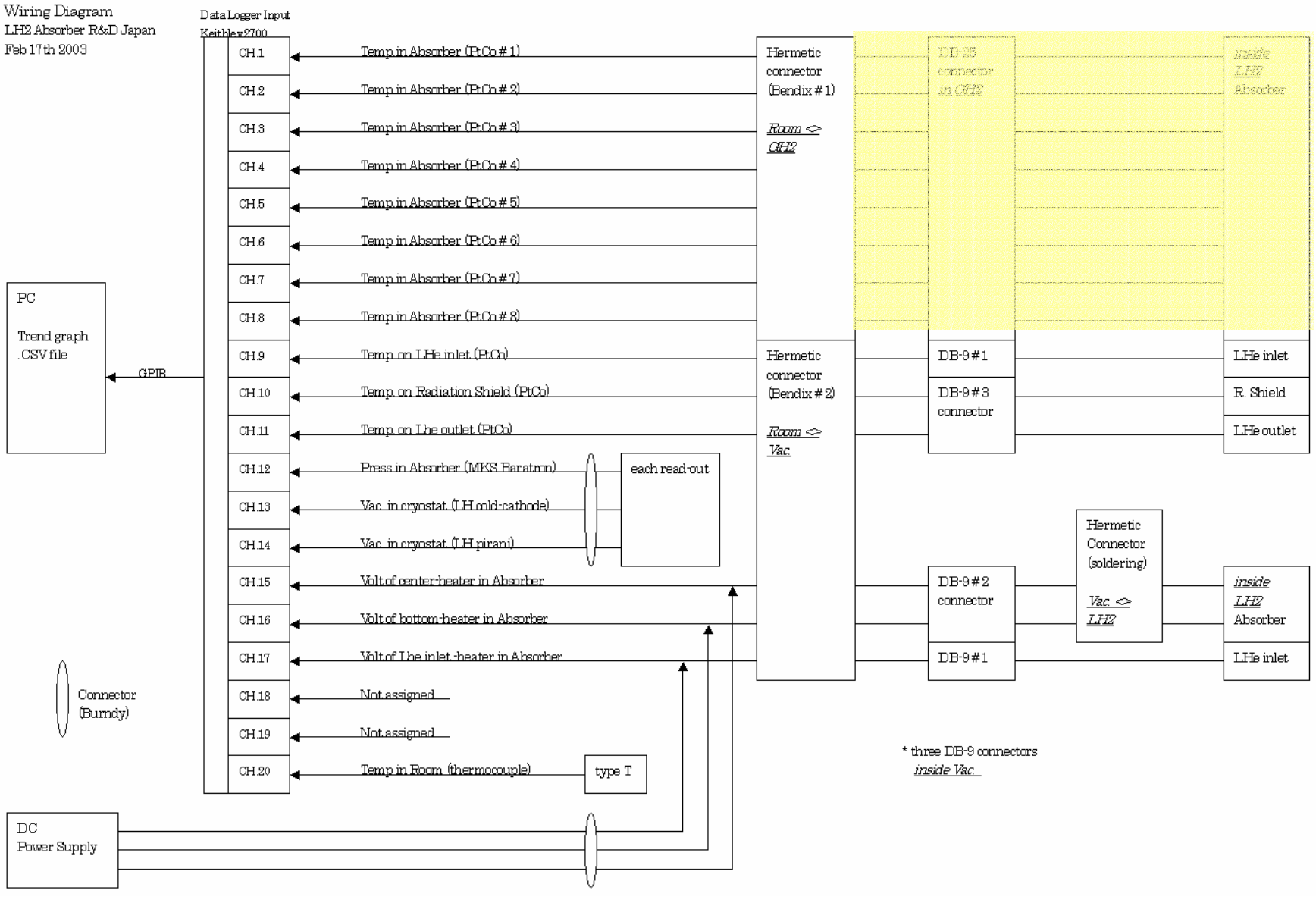
(FNAL required)



# GAS FLOW CHART



# WIRING DIAGRAM

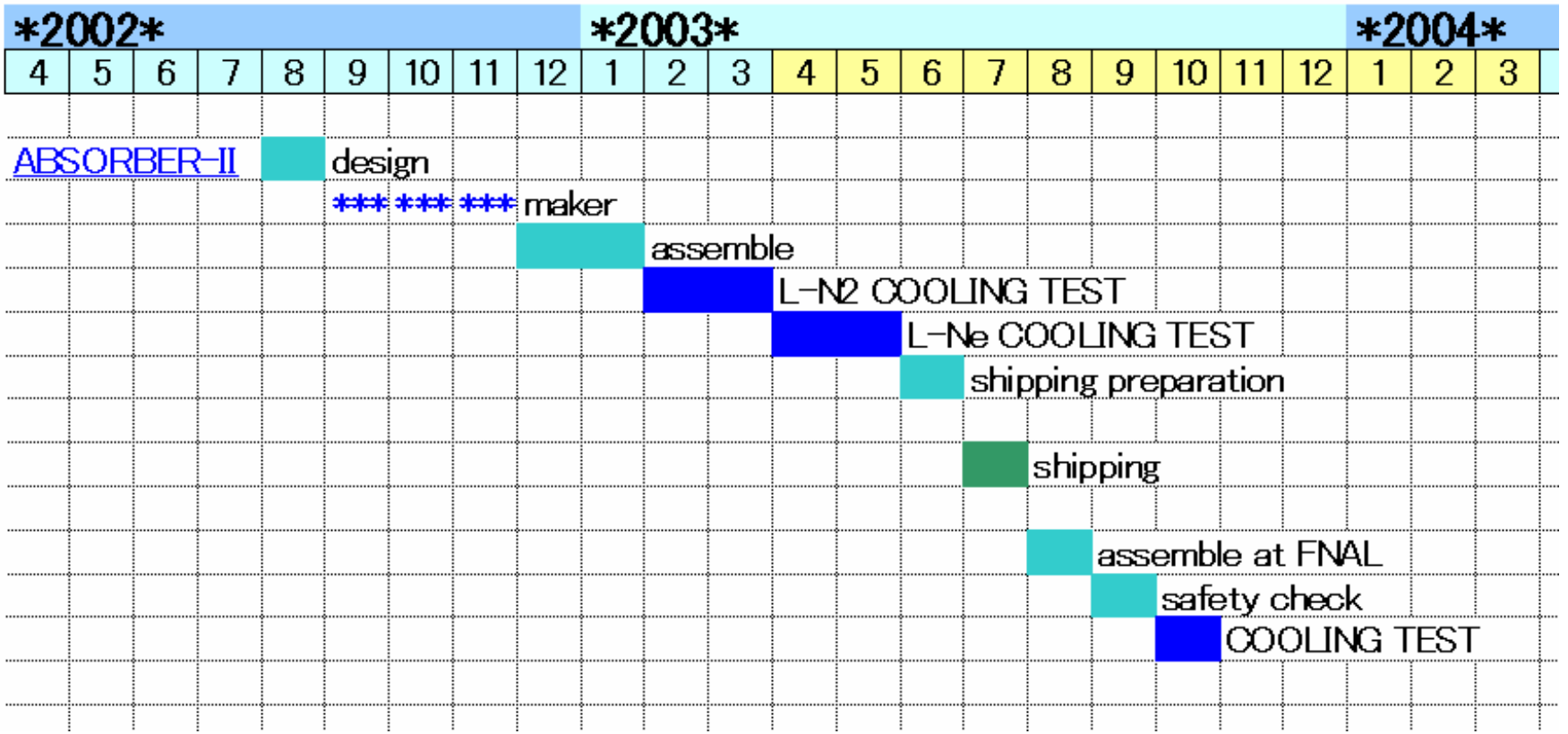


# PACKING LIST

| acking list for Mu-Cool Absorber from KEK | | | | | | | revised on Jan. 6th 2003 | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| o. | name | packed size | Kg | qt. | use | maker | model | spec |
| 1 | Absorber | 0.3, 0.3, 0.45 | | 1 | | | | |
| 2 | Cryostat (incl. Vac. Chamber | 0.8, 0.8, 1.55 | 600 | 1 | | | | |
| 3 | Turbo Pump | 0.35, 0.25, 0.25 | 20 | 1 | vac. cryostat | Leybold | TurboVAC 340M | 340 l/sec, in ISO-K 100/out NW25 |
| 4 | Turbo Controller | 0.35, 0.25, 0.15 | | 1 | vac. cryostat | Leybold | Turbotronik NT340M | |
| 5 | Rotary Pump | 0.65, 0.25, 0.3 | 35 | 1 | vac. cryostat | Leybold | TriVAC D25B | 492/590 l/min, in NW25/out NW25 |
| 6 | Rotary Pump | 0.55, 0.2, 0.4 | | 1 | vac. hydrogen | Alcatel | 12012H | in NW25/out NW16 |
| 7 | Scroll Pump | 0.55, 0.35, 0.45 | | 1 | LHe transfer | Varian | TriScroll 600, PTS06001 UN | 420/500 l/min, 7.0E-3 Torr ultimated, in NW40/out NW25 |
| 8 | Scroll Pump | 0.35, 0.25, 0.3 | | 1 | | Varian | DryScroll SH-100, SH01001 | 83/100 l/min, 5.0E-2 Torr ultimated, in NW25/out NW16 |
| 9 | Rotary Pump | 1.1, 0.45, 0.7 | 250 | 1 | | Alcatel | 2100 SD | 2000 l/min, in NW50/out NW50 |
| | | | | | | | | |
| | [monitoring] | | | | | | | |
| 1 | Sensor | assembled | | 10 | temp. | Chino | R800-7 | Pt-Co Alloy, 7.792 ohm (4 K), 99.947 ohm (273 K), 109.419 |
| 2 | Constant DC Power Supply | 0.4, 0.3, 0.15 | | 1 | temp. constant cur | Advantes | R6142 | use 1.0 mA |
| 3 | Transducer | 0.2, 0.1, 0.1 | | 1 | press. sensor | MKS | Baratron 627B13TBC2B | 0-1000 Torr (0-133320 Pa), Swagelok VCR 1/2 inch |
| 4 | Indicator | 0.2, 0.1, 0.1 | | 1 | press. read-out | MKS | 660B30 | rec. DC 0-10 V |
| 5 | Sensor | 0.15, 0.1, 0.1 | | 1 | vac. cold-cathode | Leybold | PR35 | 1E-2 - 1E-9 Torr, NW40 |
| 6 | Sensor | 0.15, 0.1, 0.1 | | 1 | vac. pirani | Leybold | TR211 | 760 - 1E-3 Torr, NW16 |
| 7 | Indicator | 0.35, 0.15, 0.15 | | 1 | vac. read-out | Leybold | CM31 | rec. DC 0-10 V (c.c: 1.43 V/decade, pirani: 1.67 V/decade) |
| 8 | Transducer | 0.25, 0.1, 0.2 | | 1 | flow sensor | Stec | SEF-4600 | He 100 std l/min, Swagelok VCR 1/2 inch |
| 9 | Indicator | 0.15, 0.1, 0.1 | | 1 | flow read-out | Stec | PAC-1K/DU-102KS | rec. DC 0-5 V |
| 0 | Transducer | 0.25, 0.1, 0.2 | | 1 | flow sensor | Stec | SEF-623 | He 200 std l/min, Swagelok VCR 1/2 inch |
| 1 | Indicator | 0.25, 0.1, 0.15 | | 1 | flow read-out | Stec | PAC-D1 | rec. DC 0-5 V |
| 2 | Regulated DC Power Supply | 0.45, 0.15, 0.25 | 15 | 2 | heater | Takasago | DG0110-2 | DC 0-110 V, 0-2 A |
| 3 | Digital Multimeter | 0.4, 0.3, 0.15 | | 1 | data acquisition | Keithley | 2700 | incl. 7700 (20ch multiplex board), PC interface: GPIB or RS23 |

# MUCOOL TIME LINE

2003-Feb-21



# ABSORBER II TEST PLAN at FNAL (~2 W + assemble time)

**G-He TEST**

Test A. at 14K
heater power, He flow rate vs. temp.
Test B. at 4.2K+
heater power, He flow rate vs. temp.

< 1 day >

H2 Condensation

< 1 day >

**L-H2 TEST**

Test A. at 14K
heater power, He flow rate vs. temp.
Test B. at 4.2K+
heater power, He flow rate vs. temp.

< 2 days >

< G-H2 remove > < 1 day >

< warm up > ( 1 day )

< change He flow direction > < 1 day >

**G-He TEST** < 1 day >

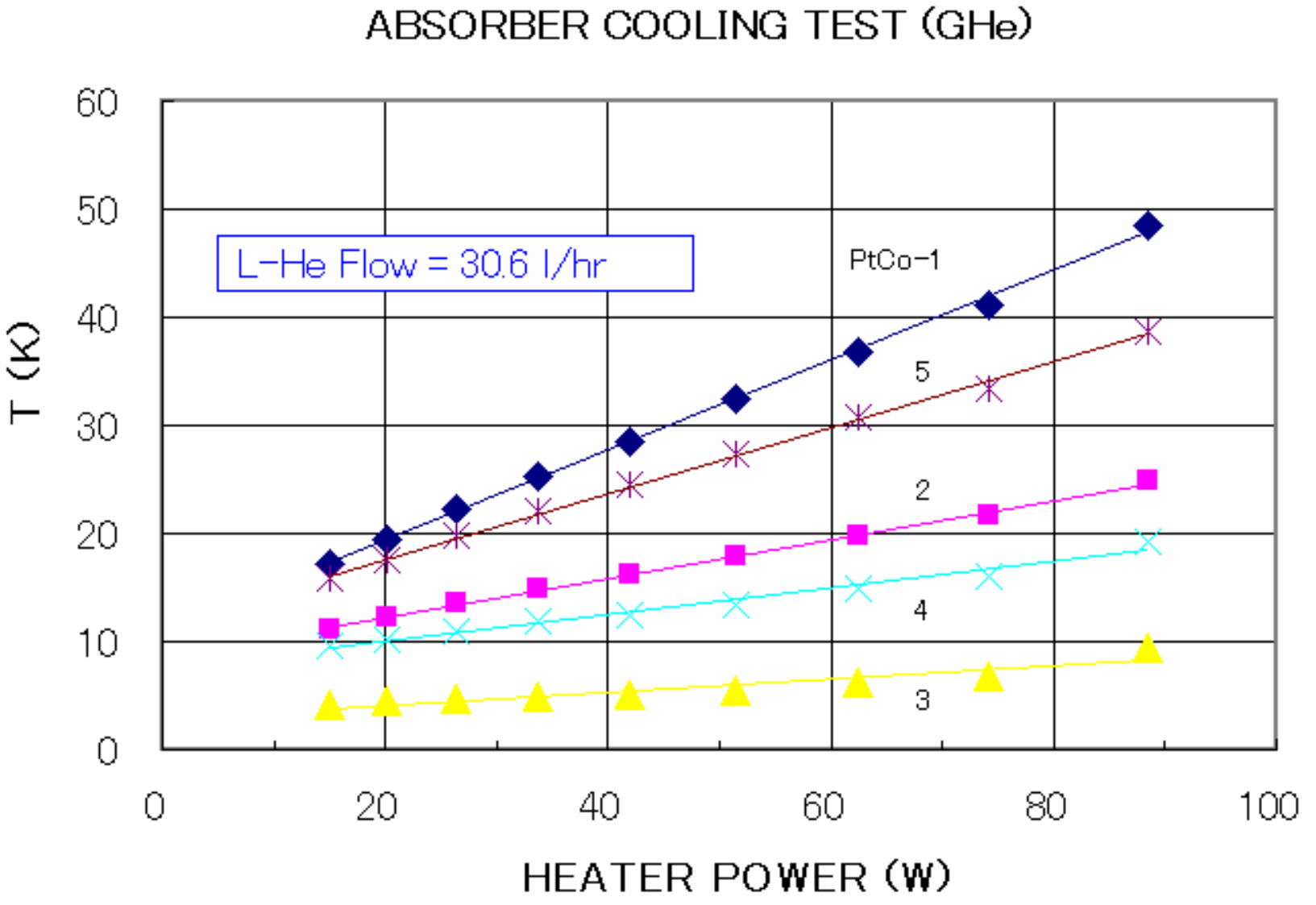
H2 Condensation < 1 day >

**L-H2 TEST** < 2 days >

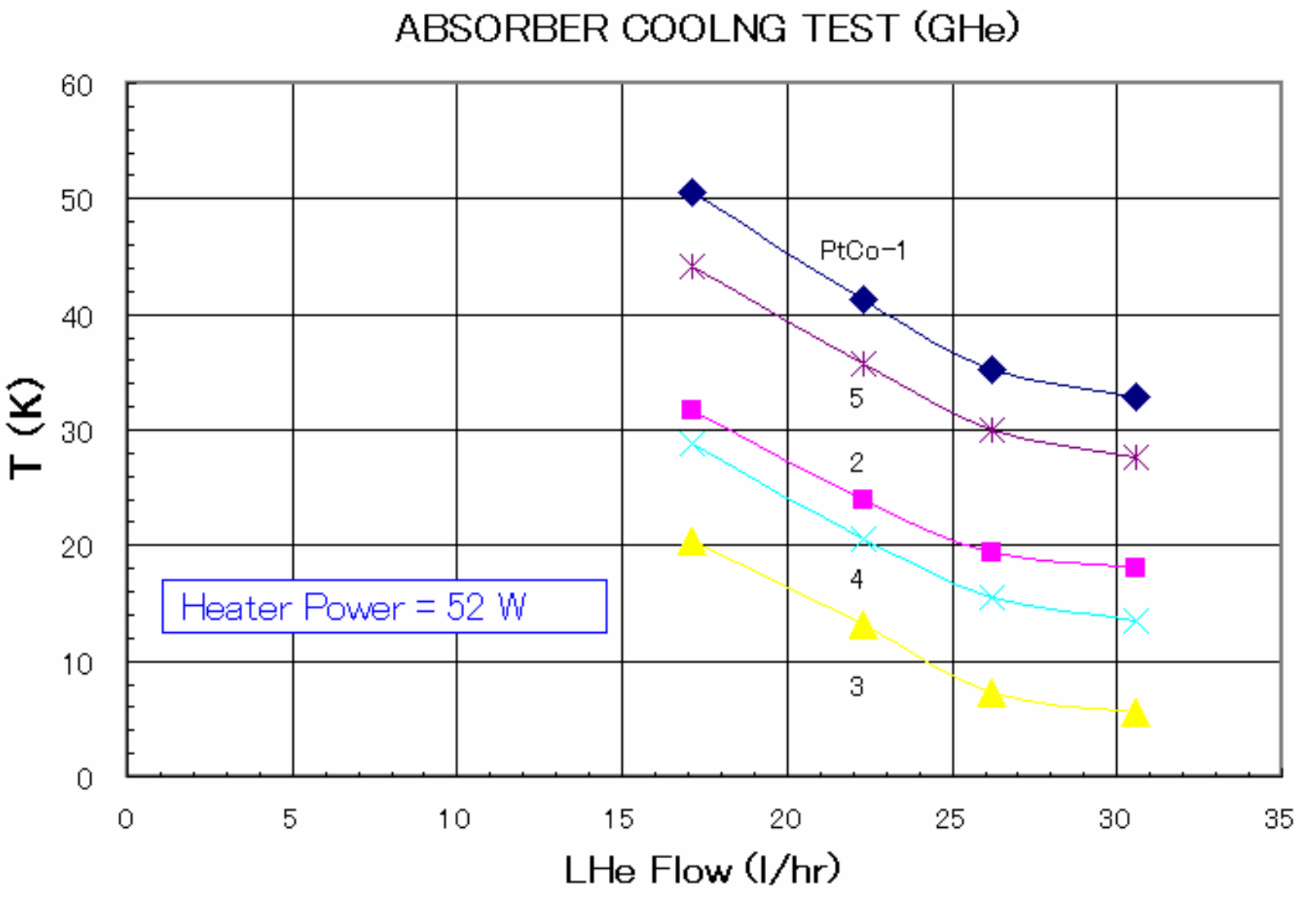
< G-H2 remove > < 1 day >

< warm up > ( 1 day )

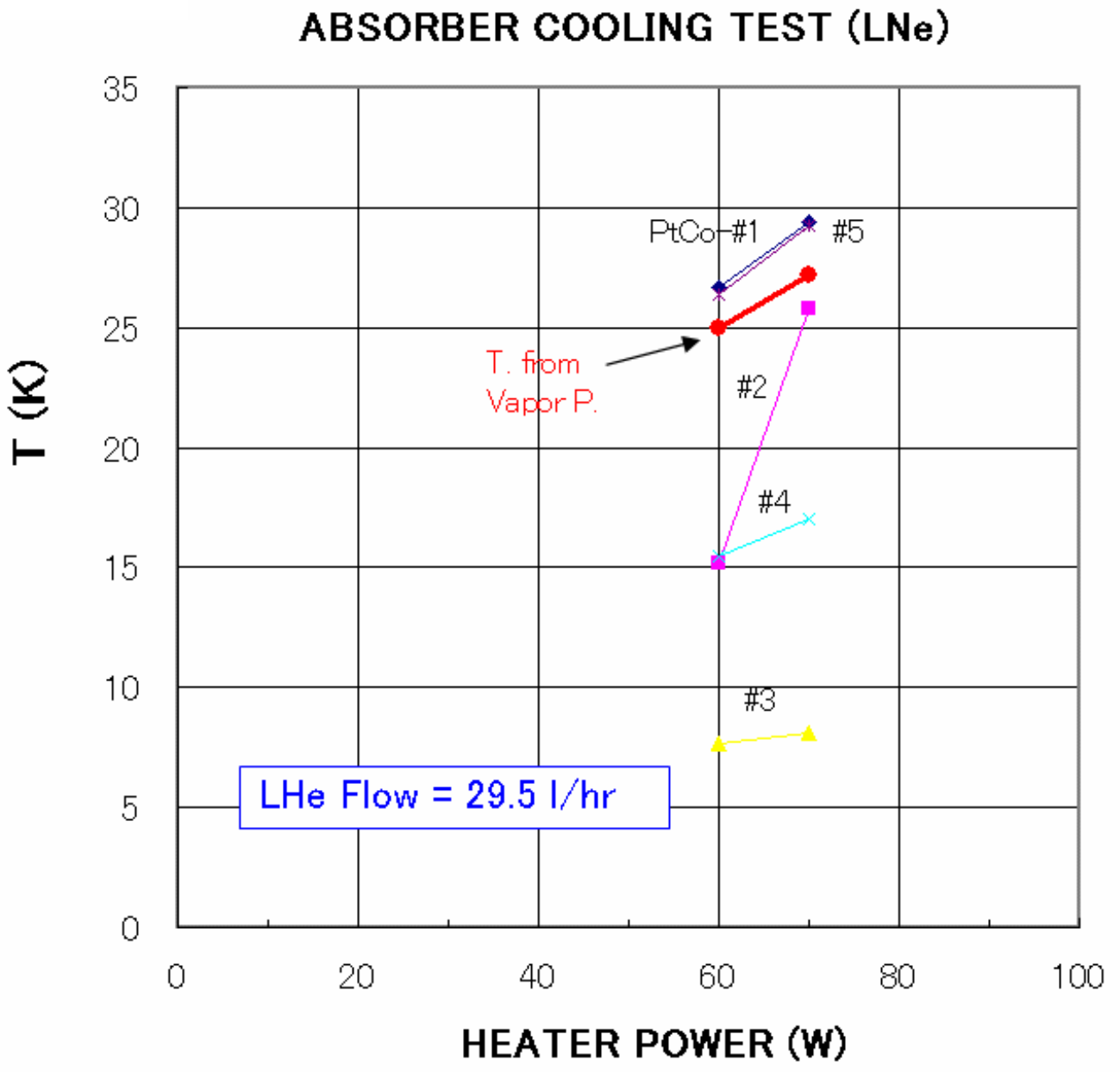
# ABSORBER I


ABSORBER COOLING TEST (GHe)
L-He Flow = 30.6 l/hr
PtCo-1
5
2
4
3
T (K)
HEATER POWER (W)
0
10
20
30
40
50
60
0
20
40
60
80
100

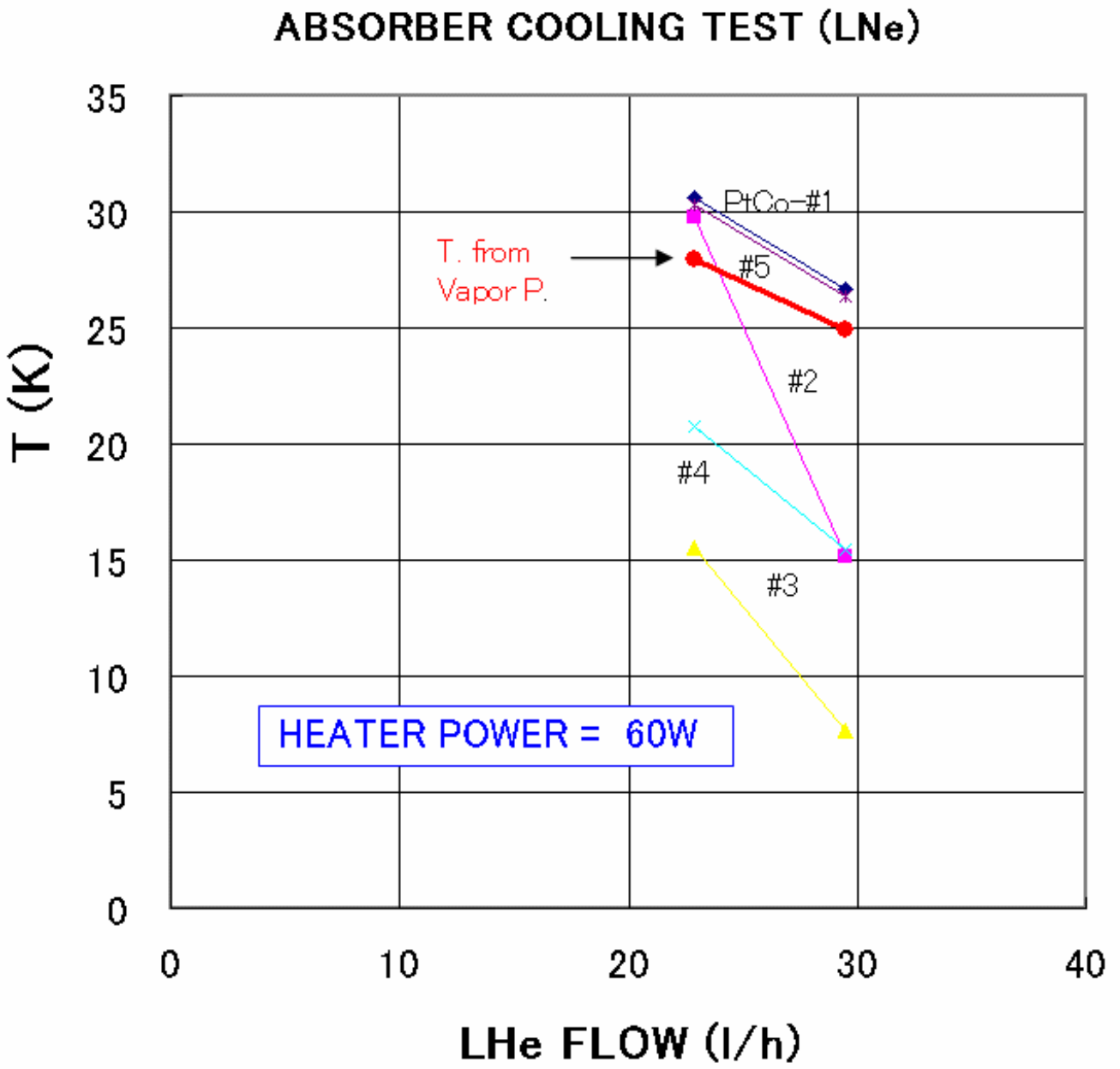
# ABSORBER I


ABSORBER COOLNG TEST (GHe)
T (K)
LHe Flow (l/hr)
PtCo-1
5
2
4
3
Heater Power = 52 W
0
10
20
30
40
50
60
0
5
10
15
20
25
30
35

# ABSORBER I


ABSORBER COOLING TEST (LNe)
T (K)
HEATER POWER (W)
0
5
10
15
20
25
30
35
0
20
40
60
80
100
PtCo
#1
#5
#2
#4
#3
T. from
Vapor P.
LHe Flow = 29.5 l/hr

# ABSORBER I


ABSORBER COOLING TEST (LNe)
T (K)
35
30
25
20
15
10
5
0
0
10
20
30
40
LHe FLOW (l/h)
PtCo-#1
T. from
Vapor P.
#5
#2
#4
#3
HEATER POWER = 60W


EXIT
SULZER

# 20 Feb Meeting of KEK Absorber Test at FNAL

## (1) Test site

- ventilation tube with G-$N_2$ flow (FNAL)
- hand crane at the test area with linear motion (FNAL)
- crane at the preparation area (FNAL)
- transportation from the preparation area to the test site (FNAL)

## (2) Parts

- T.M.P. and vacuum pipe (FNAL; if possible)
- 2 or 3 TV-cameras and monitors (FNAL; if possible)
- needs 4 wheals with stoppers on the test cryostat (KEK)
- 3 or 4 air-operation valves (KEK)
- 40 (2.5 W heater + Zener diode) + feed through (KEK)
- 10V-100W DC-PS (KEK)
- PC for monitoring (KEK)

# Summary

**Testing Absorber II at KEK**

- At present, $LN_2$ testing at KEK, but we have to fix cold leak.

- Continue $LN_2$/LNe test at KEK by June or July, and start packing.

- Shipping on July ( or August)

**Test Plan at FNAL**

- Detail test plan of absorber II at FNAL

  flow chart, packing list, wiring sheet, parts drawings, …

- Test procedure at FNAL

- Meeting report of absorber test

  requirements, safety problems, …