Magnet and Electron Gun, MCP

Korea University
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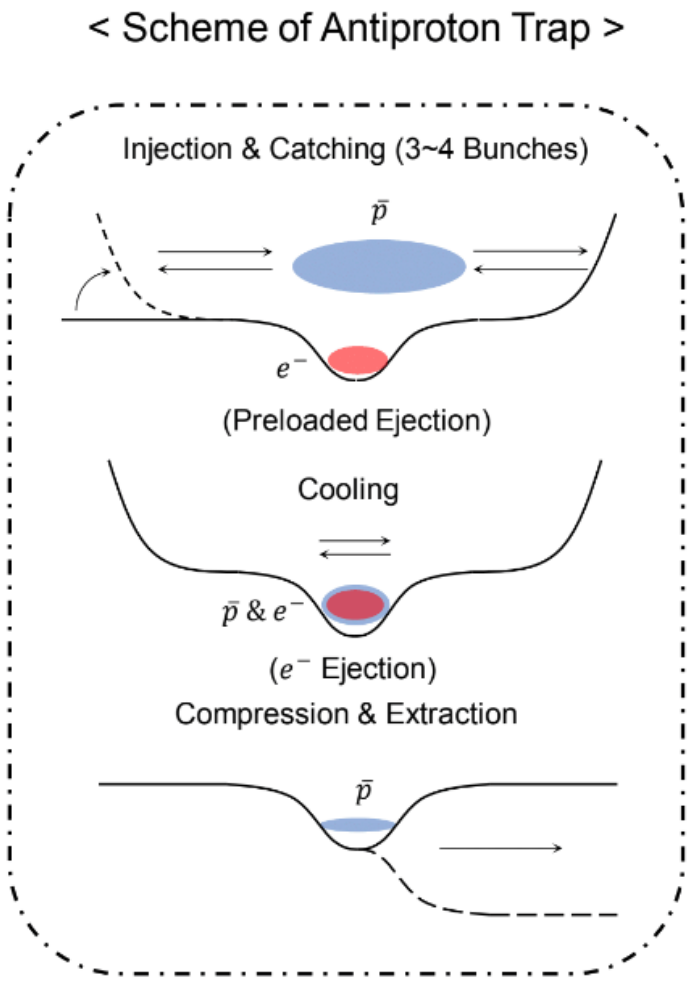
Electron Gun



- Reduces beam emiitance
  (better energy resolution)
- Reduces momentum spread
  (higher luminosity for experiments)
- Compensation of various heating effects
  acting on a circulating beam

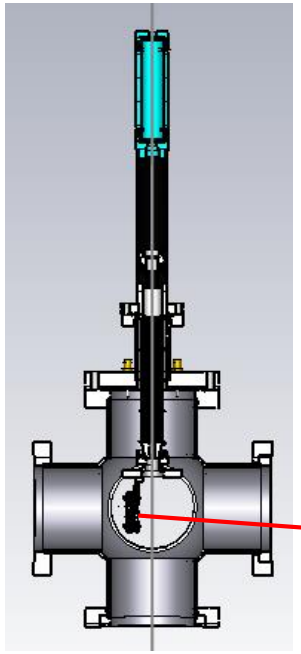
Rutherford Scattering

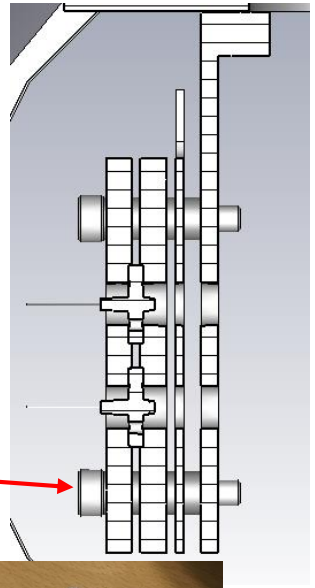
$$2\tan\left(\frac{\theta}{2}\right) = \frac{2Z_1 Z_2 e^2}{4\pi\epsilon_0 \Delta p v b}, \qquad Z_1 = Q(ion) Z_2 = -1(e^-)$$

Energy Transfer

$$\Delta E(b) = \frac{(\Delta p)^2}{2m_e} \cong \frac{2Q^2 e^4}{(4\pi\epsilon_0)^2 m_e v^2} \frac{1}{b^2}$$

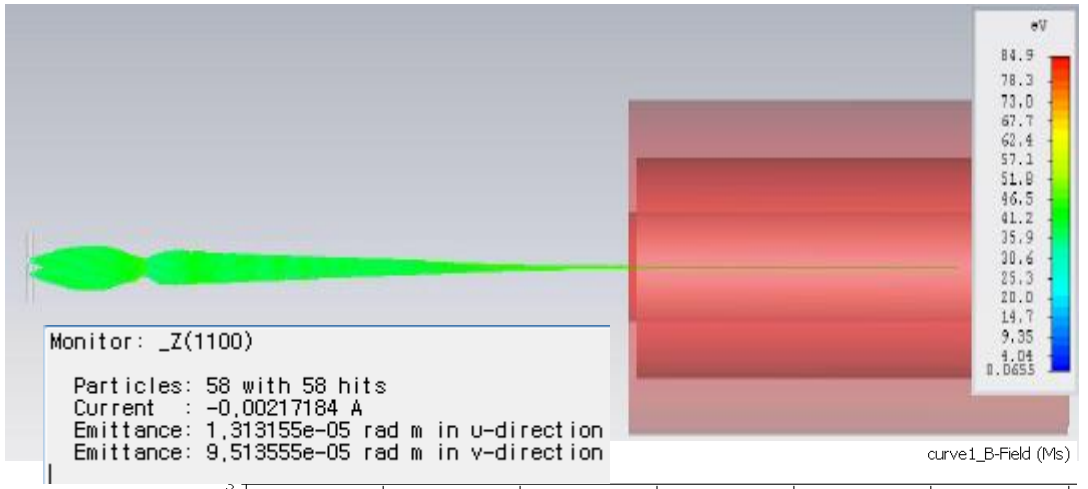
Electron Gun

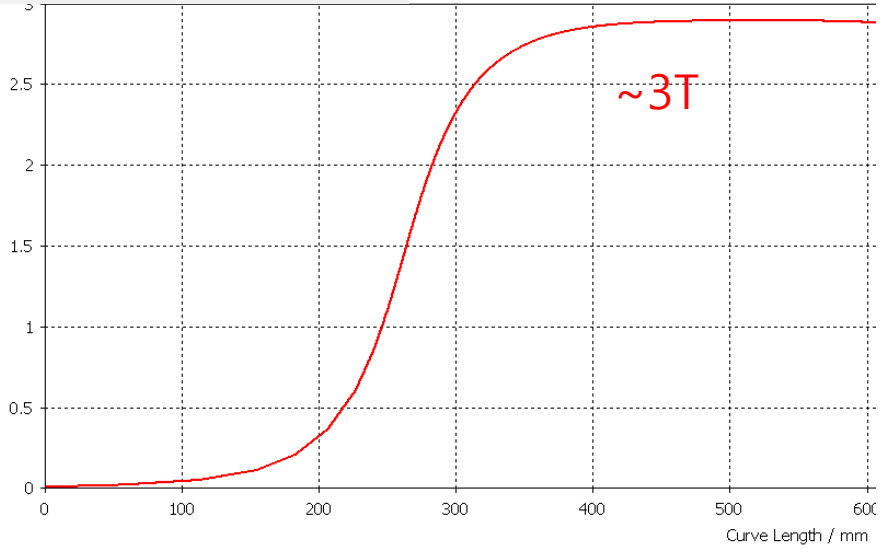




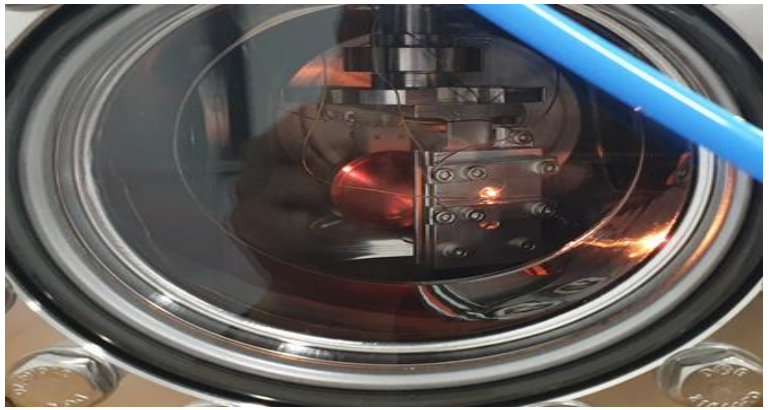
~80eV
Over 500uA

CST Tracking Simulation

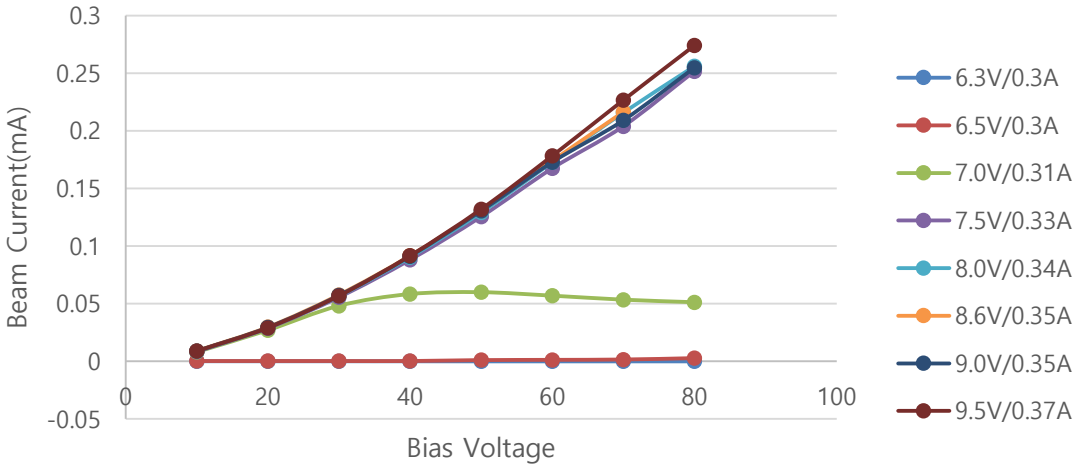




Electron Gun

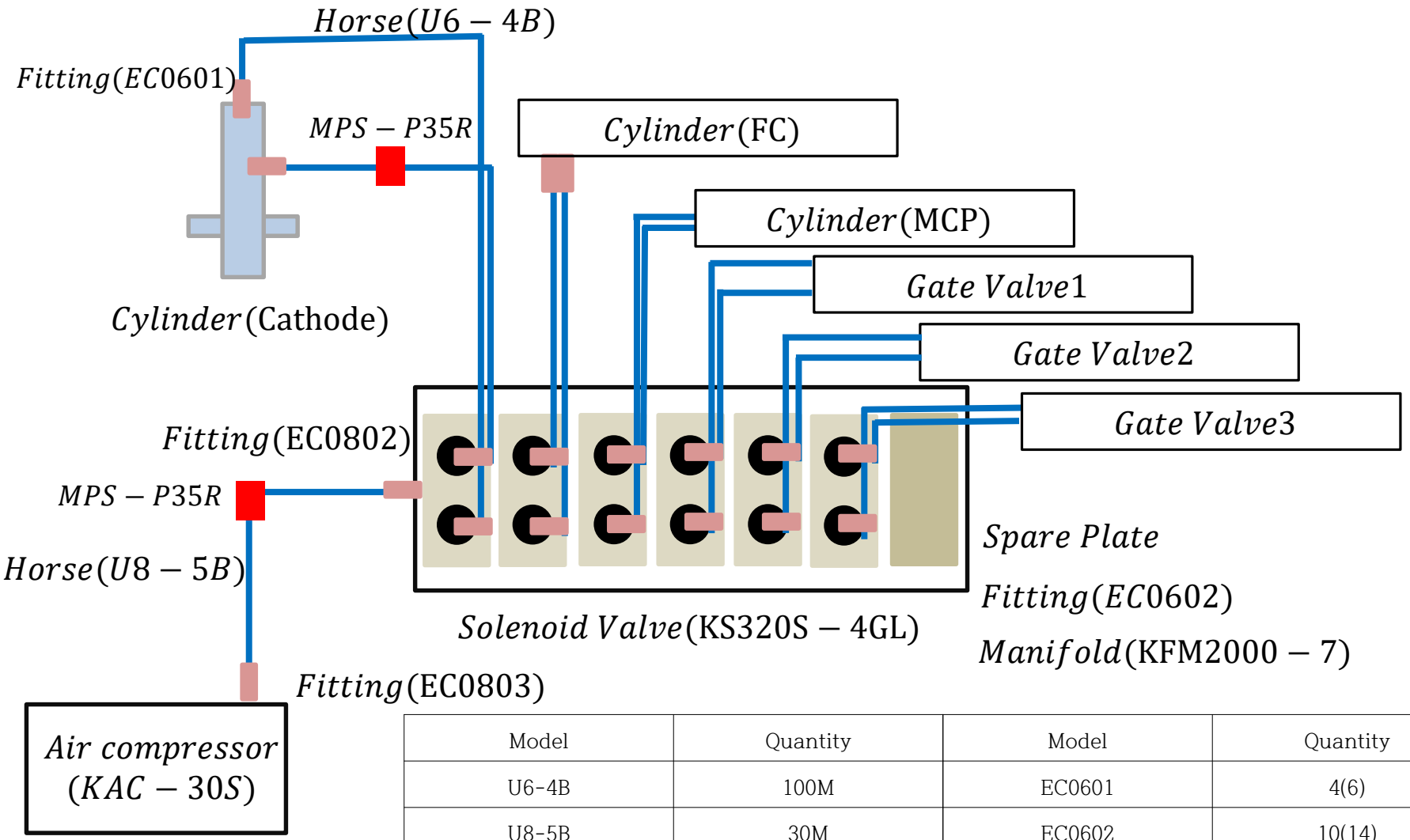


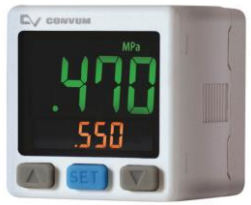
Electron Gun Test



- Saturation above 7.5V/0.33A (2.5W)
(But the reach time is different,
The higher the watt, the faster.)

Movable System Schematic





MPS − P35R
Pressure monitor

Model	Quantity	Model	Quantity
U6-4B	100M	EC0601	4(6)
U8-5B	30M	EC0602	10(14)
KMF2000-S.P	2	EC0802	1(2)
KMF2000-7	1	EC0803	1(2)
KS320S-4GL	5(7)		

KU Magnet

Vacuum level
2.0e-3 mbar
(~2days)

Vacuum level
3.8e-5 mbar

Vacuum level
1.4e-3 mbar
(Moment)

OVC Check

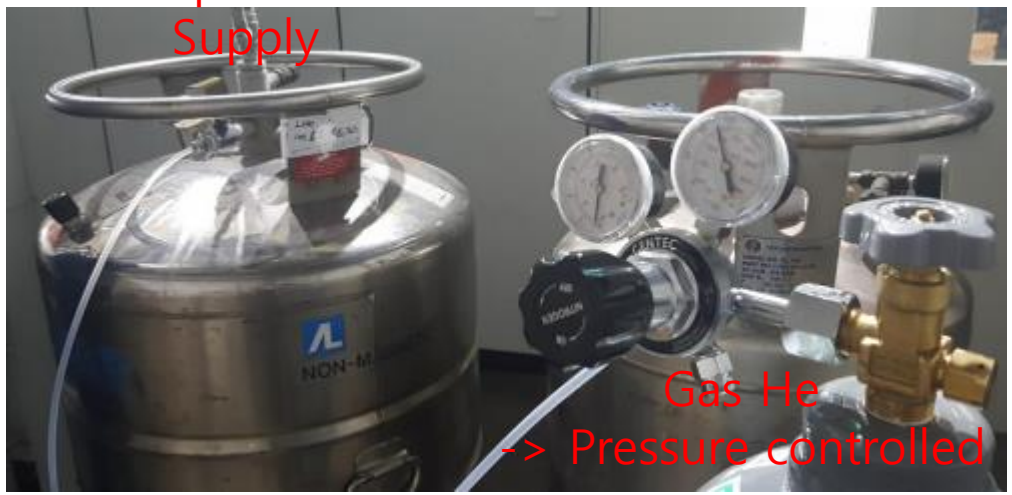
After leaving for several days at atmospheric pressure, open the valve

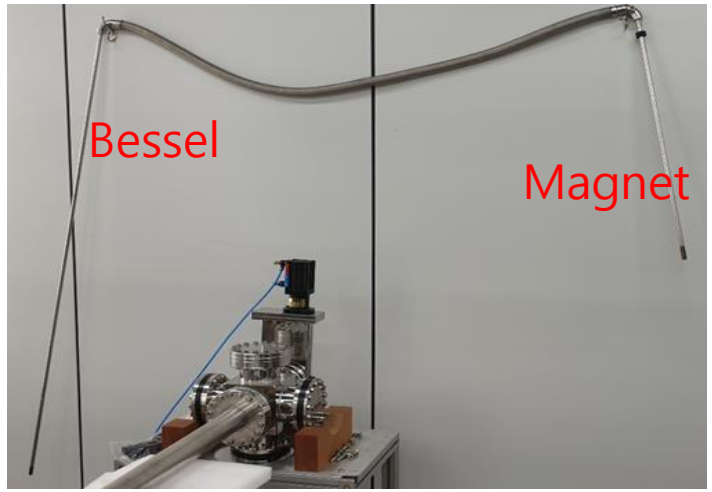
->The internal pressure is expected to be around 10e-3~-4.

KU Magnet

Liquid Helium Supply

Liquid He
Supply





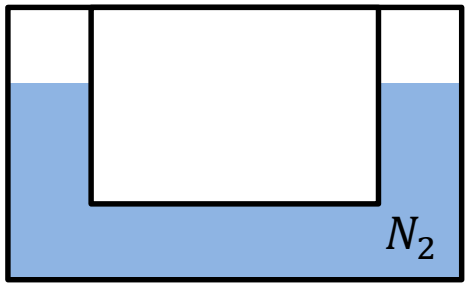
Liquid Nitrogen Supply

Table 3-2. Operating requirements for the magnet

LN2 Hold Time	Minimum of 7 days
LN2 Refill Volume	About 80 L
LN2 Yearly Consumption	About 4160 L
LHe Hold Time	Minimum of 100 days, expect 130
LHe Refill Volume	About 100 L
LHe Yearly Consumption	About 365 L

KU Magnet

1)



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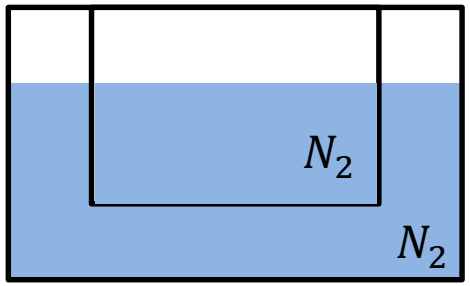
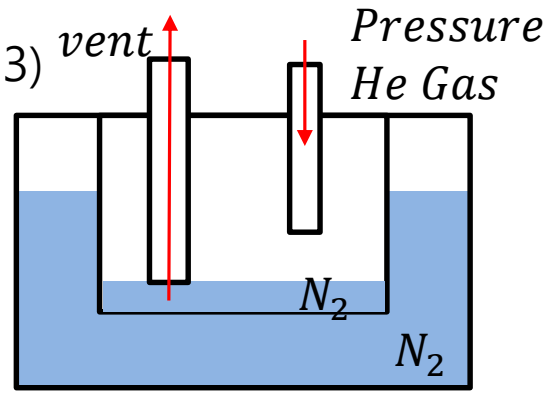
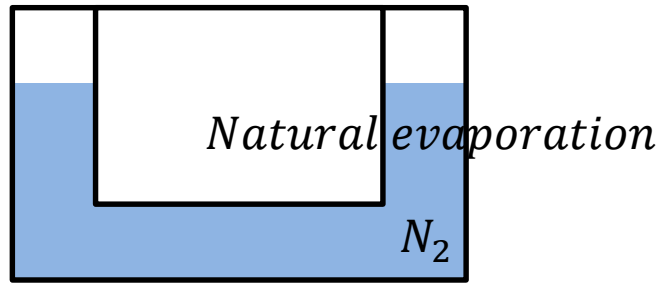


3)



4)



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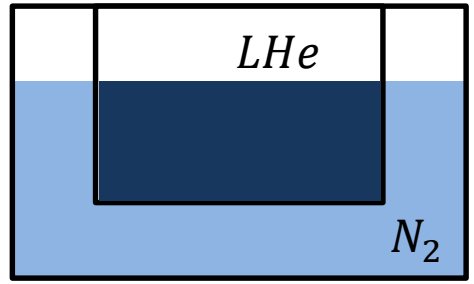
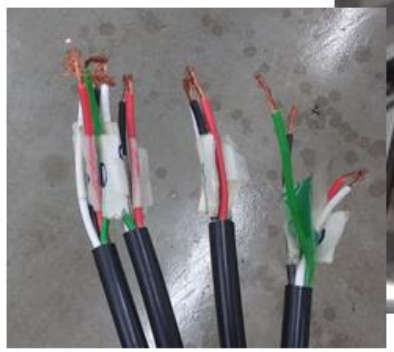
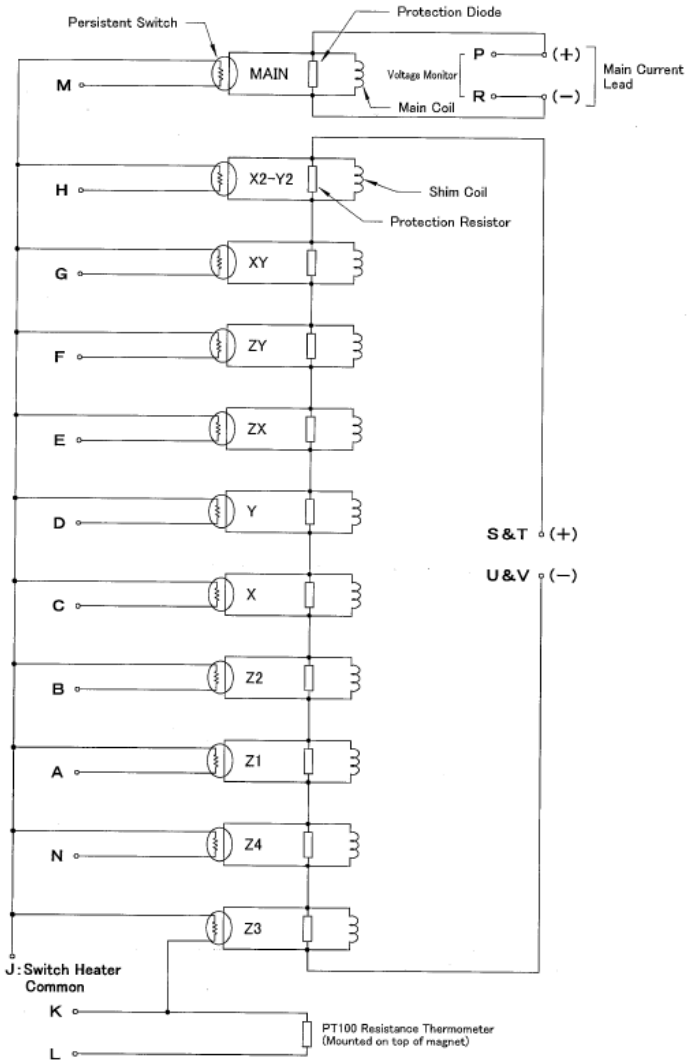


2) Schedule

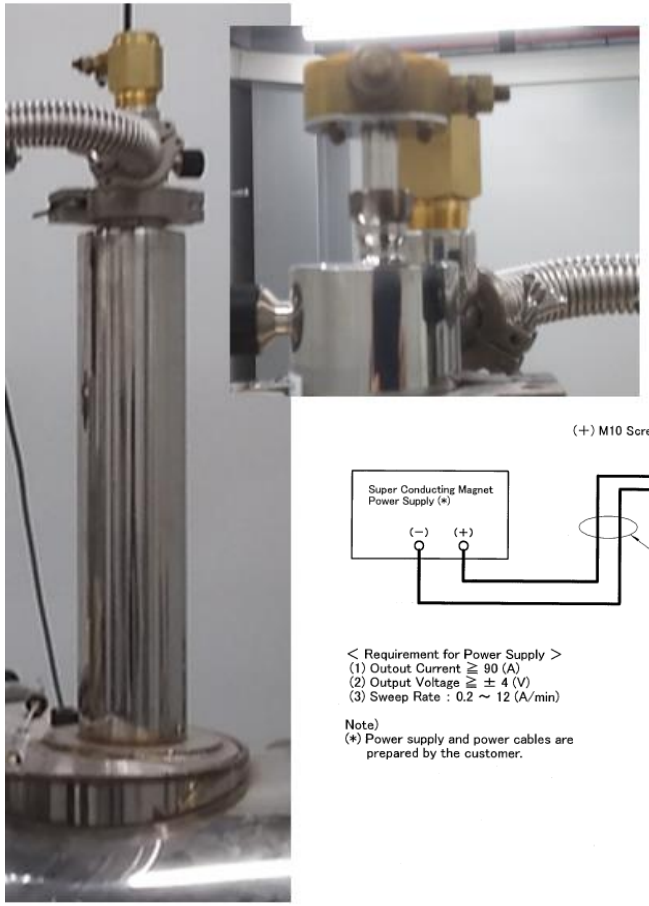
Day 1	Travel (from Japan to Korea)
Day 2	Vacuum leak check
	Pre-cooling with using L. N2
Day 3	L. N2 discharge
	Pump & Flash
Day 4	L. He cooling
Day 5	Main coil excitation
	* Shim coil excitation is not carried out
Day 6	Travel (from Korea to Japan)

KU Magnet



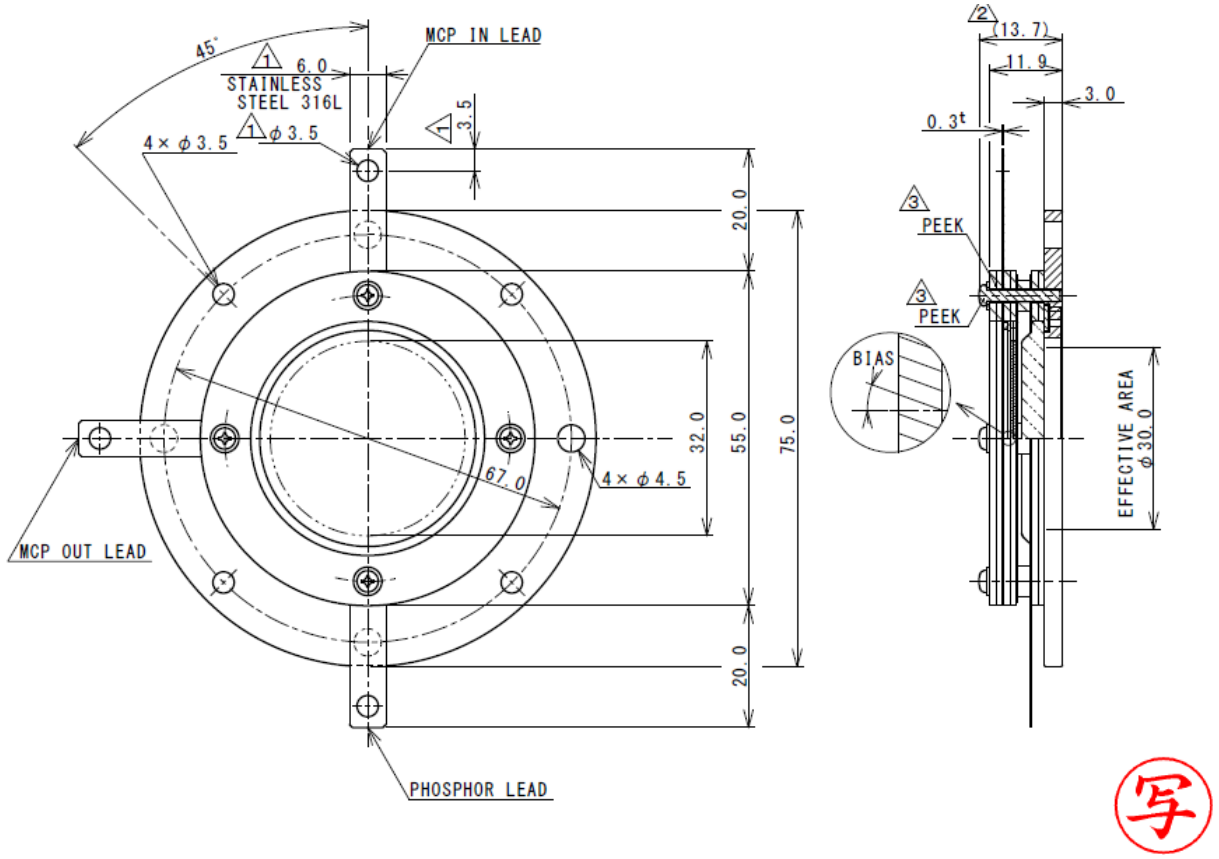


Sim Coil & heater line



Main coil line

MCPPS



MCP: F1208-01G
CD: 12 um
L/D: 40
BIAS ANGLE: 8 DEGREES
2 STAGE

PHOSPHOR SCREEN
: P47 (ITO)

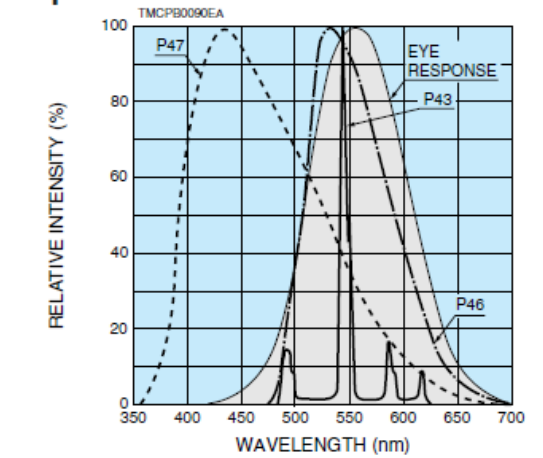
MAXIMUM VOLTAGE RATING
MCP IN-SUBSTRATE : 6.0 kV
MCP IN-MCP OUT : 2.0 kV
MCP OUT-PHOSPHOR : 4.0 kV
PHOSPHOR-SUBSTRATE: 6.0 kV

POTENTIAL (-)
MCP IN : -6.0 kV Max.
MCP OUT : -4.0 kV Max.
PHOSPHOR : GND
SUBSTRATE : GND

POTENTIAL (+)
MCP IN : GND
MCP OUT : +2.0kV Max.
PHOSPHOR : +6.0kV Max.
SUBSTRATE : GND

UNIT: mm

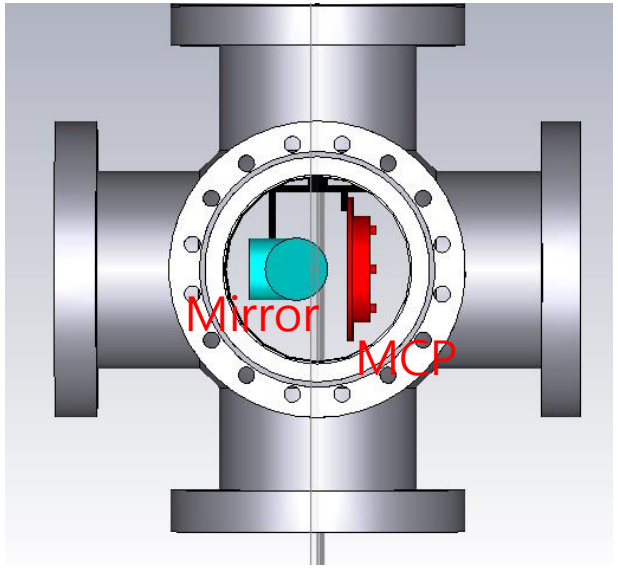
■Spectral emission characteristics

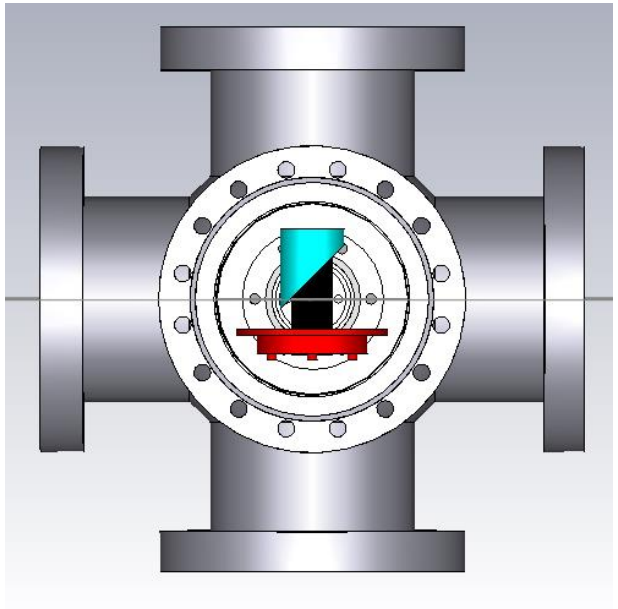


Phosphor screen type	Peak emission wavelength (nm)	Emission color	Relative energy efficiency ①	10 % decay time	Remarks
P43	545	Yellowish green	1	1 ms	Standard type
P46	510	Yellowish green	0.3	0.2 µs to 0.4 µs ②	Short decay
P47	430	Purplish blue	0.3	0.11 µs	Very short decay

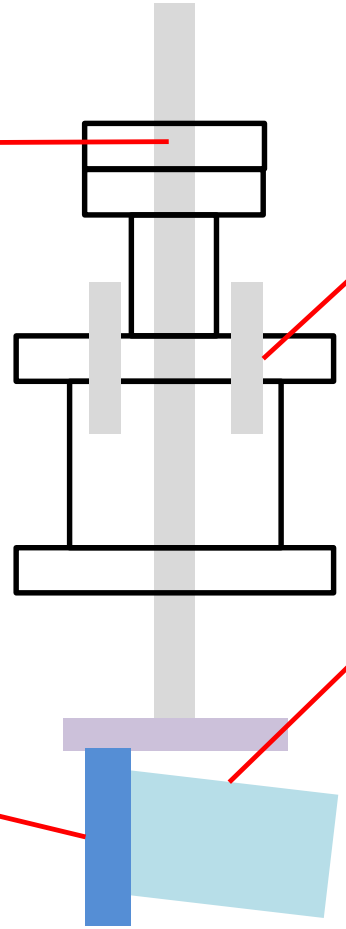
NOTE: ①Supply voltage: 6 kV. Value relative to P43 which is specified as 1. ②Varies depending on the input pulse width.

MCPPS





Air Cylinder
(L2271-4)



Feedthrough
SHV type ~10kV

Mirror
(38.1X53.9mm, Al coated)

MCP + PS
(F2224-21P)