

Cold UHV Pipe & Preparation of Room Temperature Test with Electron Beam

Seoul National University

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Cold UHV Pipe for Antiproton Trap

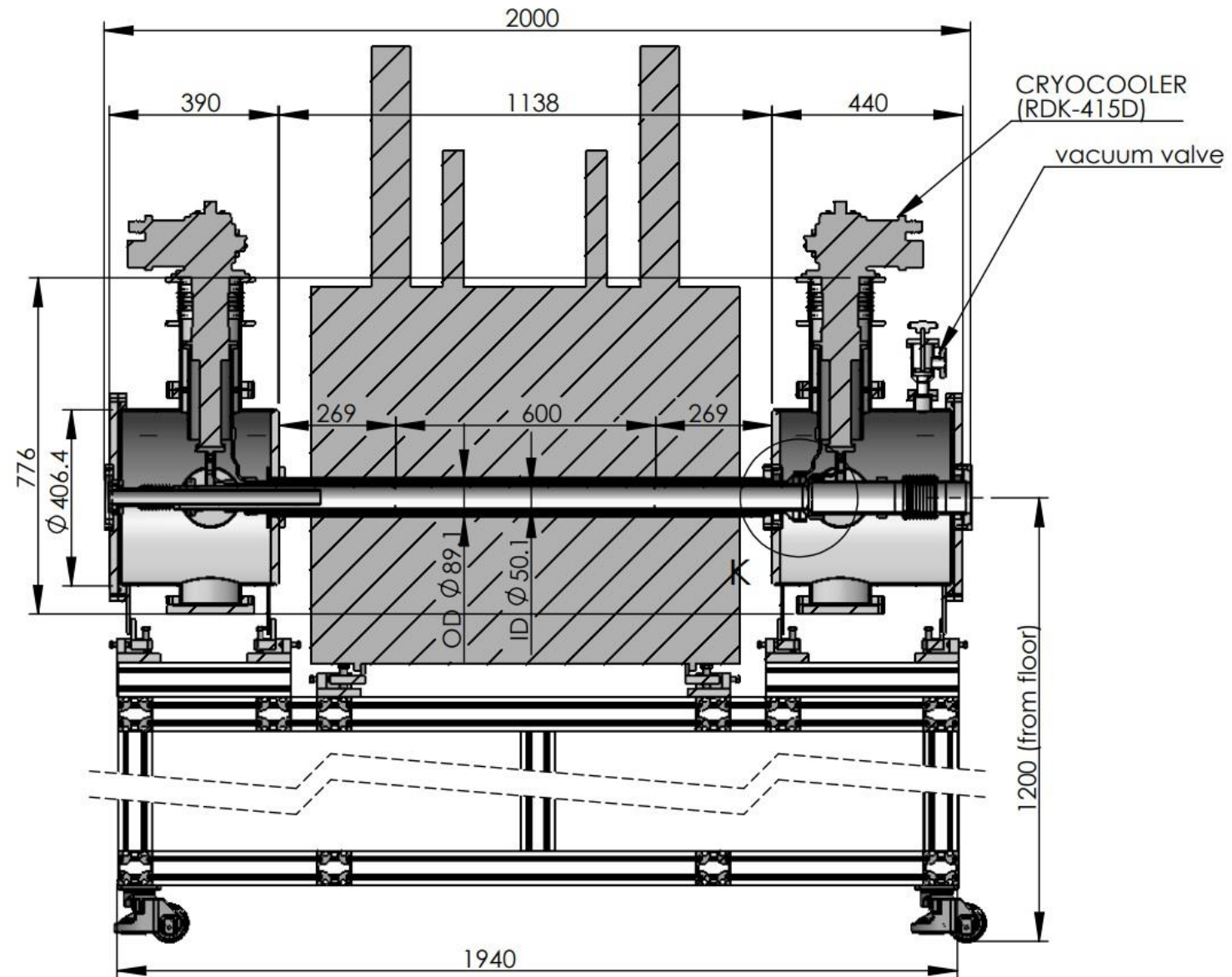
- Drawing of Cold UHV Pipe & MRE
- Components of Antiproton Trap
- Heat Loading and Radiation
- Cooling Test of CUHV Pipe without MRE in CVE
- Cooling Test of CUHV Pipe with MRE in Korea Univ.

Electron Test in Room Temperature

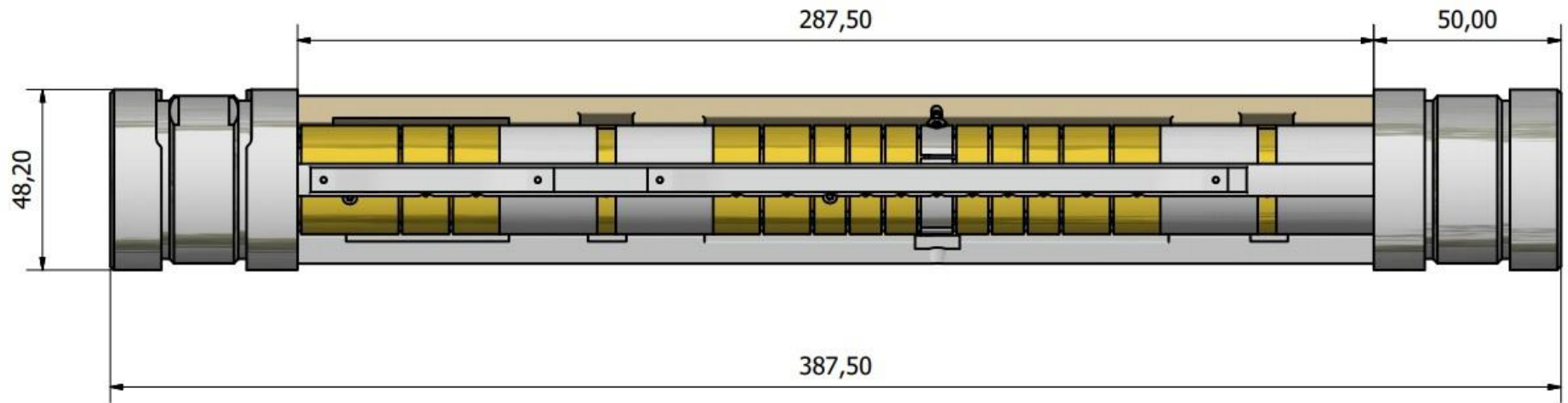
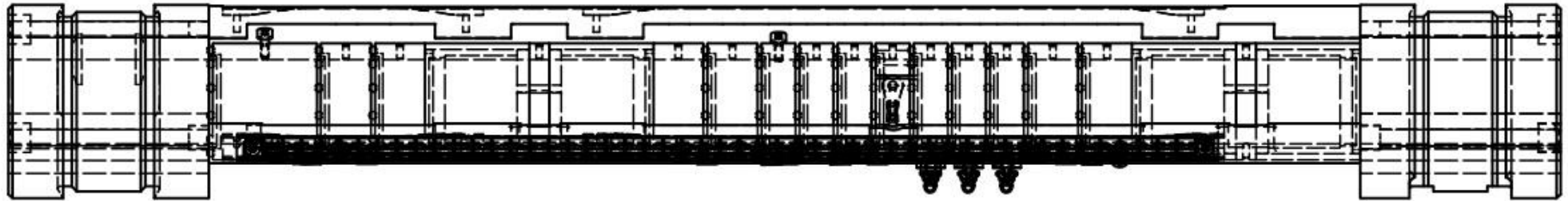
- Vacuum Test in Room Temperature
- Preparing Electron Test.

Cold UHV Pipe for Antiproton Trap

Drawing of Cold UHV Pipe



Drawing of Multi-Ring Electrodes

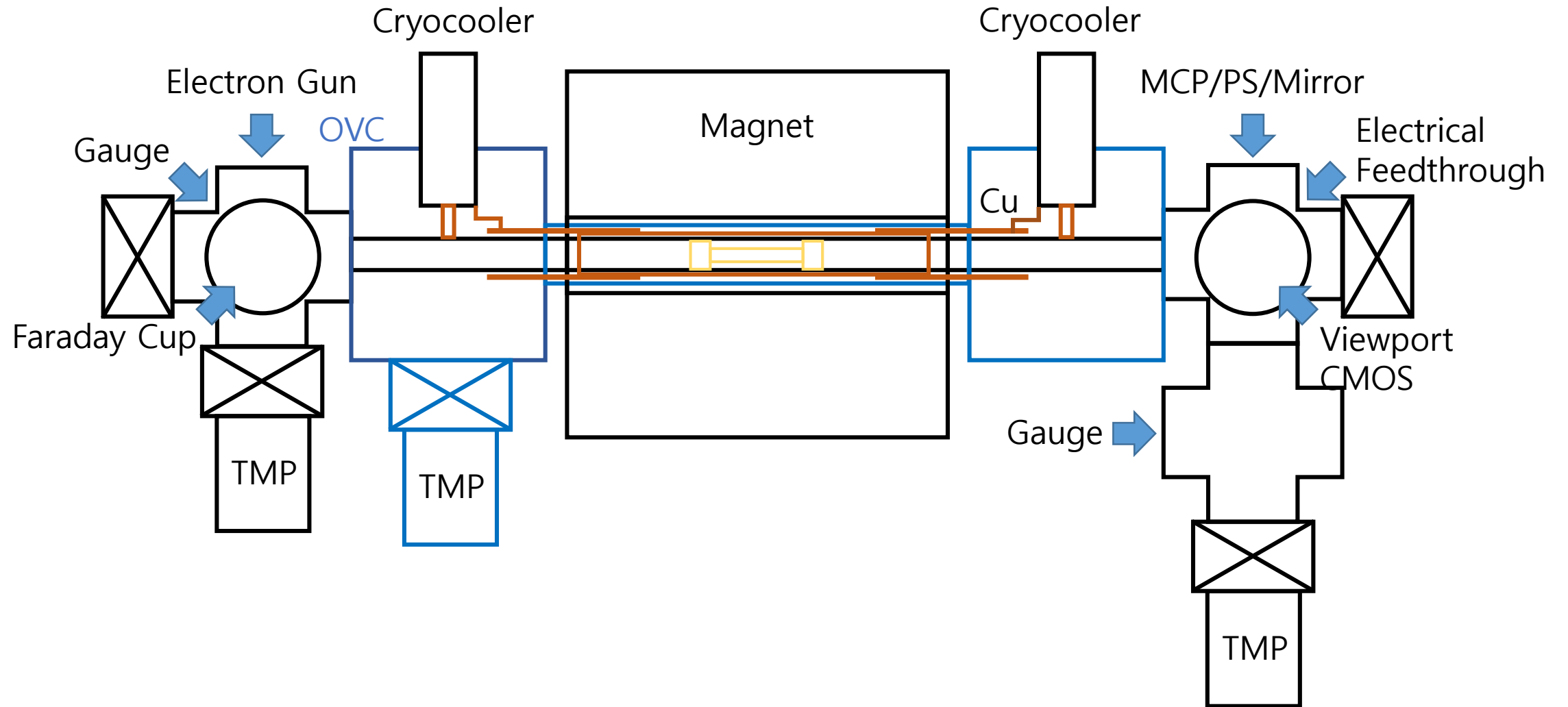




Schematic Drawing of Antiproton Trap

Upstream

Downstream



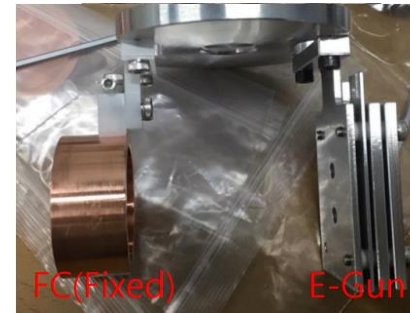
Components of Antiproton Trap



7T Superconducting Solenoid Multi-Ring Electrodes



TMP : HIPACE 300H
TMH-262



Electron Gun
~mA / 50eV



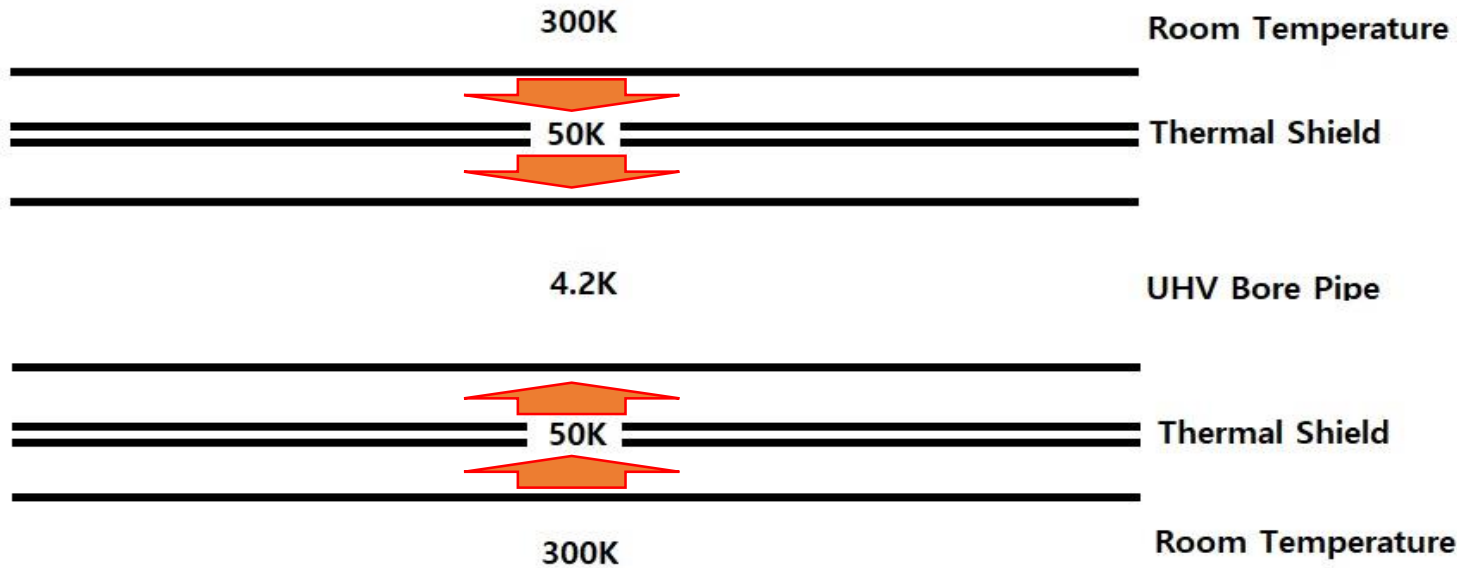
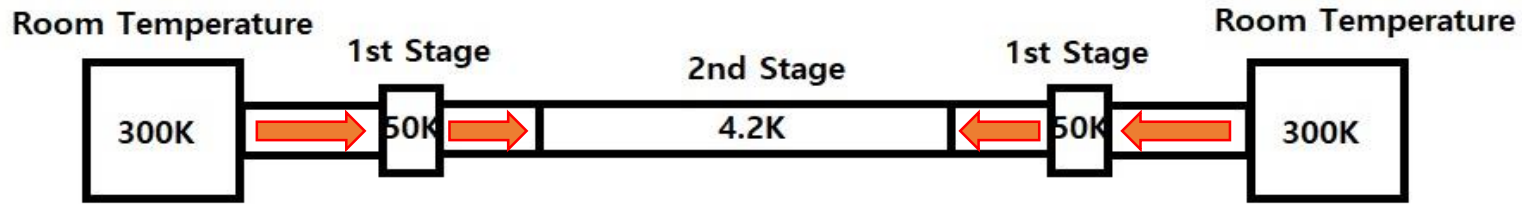
Cryocooler : RDK-415D



MCP : F2224-21P, 2 Stage
PS : P47

Almost all components are ready. We are preparing tests of each components and control system in room temperature. The partner company(CVE) is in the process of manufacturing the cold UHV chamber, and it is expected to be completed in next week.

Heat Loading and Radiation



$$Q_{Heat Load} = \frac{kA(T_H - T_C)}{L_t}$$

$$Q_{H_300K_50K} = 0.894$$

$$Q_{H_50K_4.2K} = 0.817$$

$$Q_{Radiation} = \sigma * A * E * (T_H^4 - T_C^4)$$

$$E_{300K_50K} = \frac{1}{\frac{1}{\epsilon_2} + \frac{A_2}{A_1} \left(\frac{1}{\epsilon_1} - 1 \right)} = 0.109$$

$$Q_{R_300K_50K} =$$

$$(5.67 \times 10^{-8}) * (0.31) * (0.109) * (300^4 - 50^4)$$

$$= 15.514$$

$$E_{50K_4.2K} = \frac{1}{\frac{1}{\epsilon_2} + \frac{A_2}{A_1} \left(\frac{1}{\epsilon_1} - 1 \right)} = 0.1884$$

$$Q_{50K} =$$

$$(5.67 \times 10^{-8}) * (0.26) * (0.1884) * (50^4 - 4.2^4)$$

$$= 0.017$$

Heat Loading and Radiation

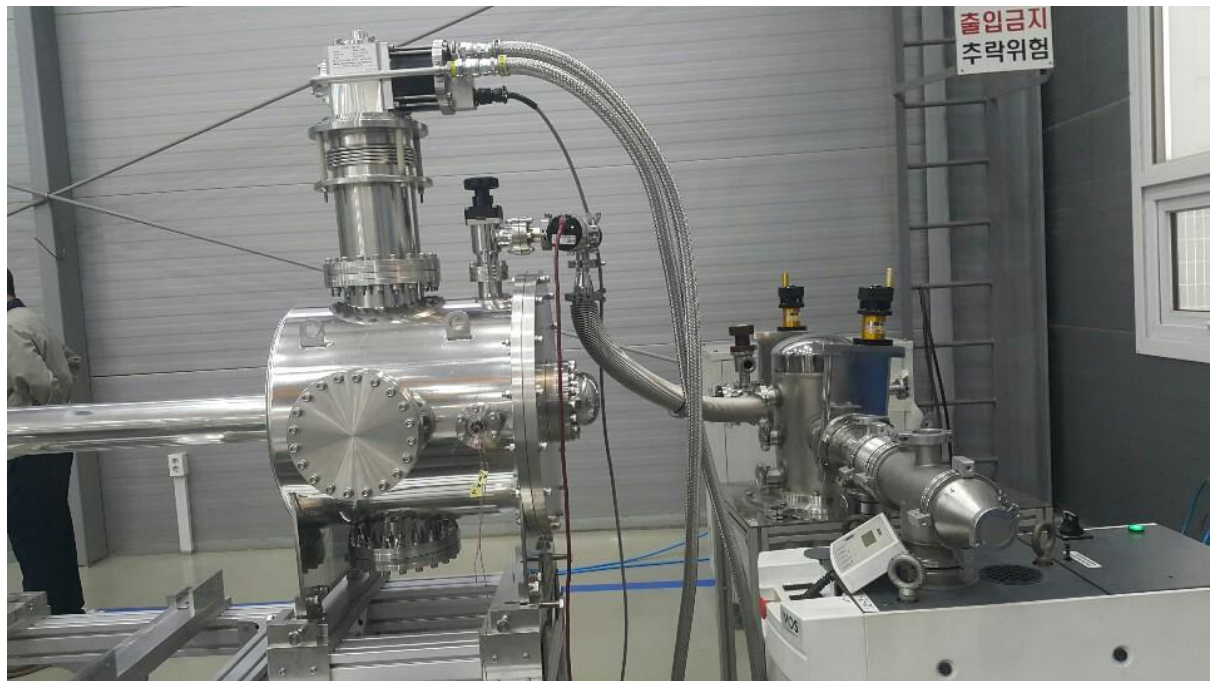
구분			온도(K)		열전도율(W/m.K)	Pipe 외경(m)	두께(m)	면적(m2)	전체길이(m)	열부하(W)	수량	총 열부하(W)	비고	
					k	OD	t	A	Lt	Q		Qt		
50K Thermal shield	전도	Left 측	300	-	50	9.76	0.0532	0.00015	2.49992E-05	0.2	0.304991	1	0.305	
		Right 측	300	-	50	9.76	0.077	0.0002	4.82549E-05	0.2	0.588709	1	0.589	
	합계(전도)											0.894		
	복사	표면적	300	-	50								15.514	단열재 효과 무시
		합계(복사)											15.514	
합계(Total)												16.408		

구분			온도(K)			열전도율(W/m.K)	Pipe 외경(m)	두께(m)	면적(m2)	전체길이(m)	열부하(W)	수량	총 열부하(W)	비고
						k	OD	t	A	Lt	Q		Qt	
4.2K	전도	Left 측	50	-	4.2	3.24	0.0532	0.002	0.000321699	0.144	0.331511	1	0.332	
		Right 측	50	-	4.2	3.24	0.077	0.002	0.000471239	0.144	0.485612	1	0.486	
	합계(전도)												0.817	
	복사	표면적	50	-	4.2								0.017	단열재 효과 무시
		합계(복사)												0.017
합계(Total)													0.835	

Sumitomo Cryocooler : RDK-415D		2대 적용
Cooling power@4.2K	1.5W	3 W
Cooling power@30K	15W	30 W

Cooling Power @ 4.2K 0.835W < 3W : Enough

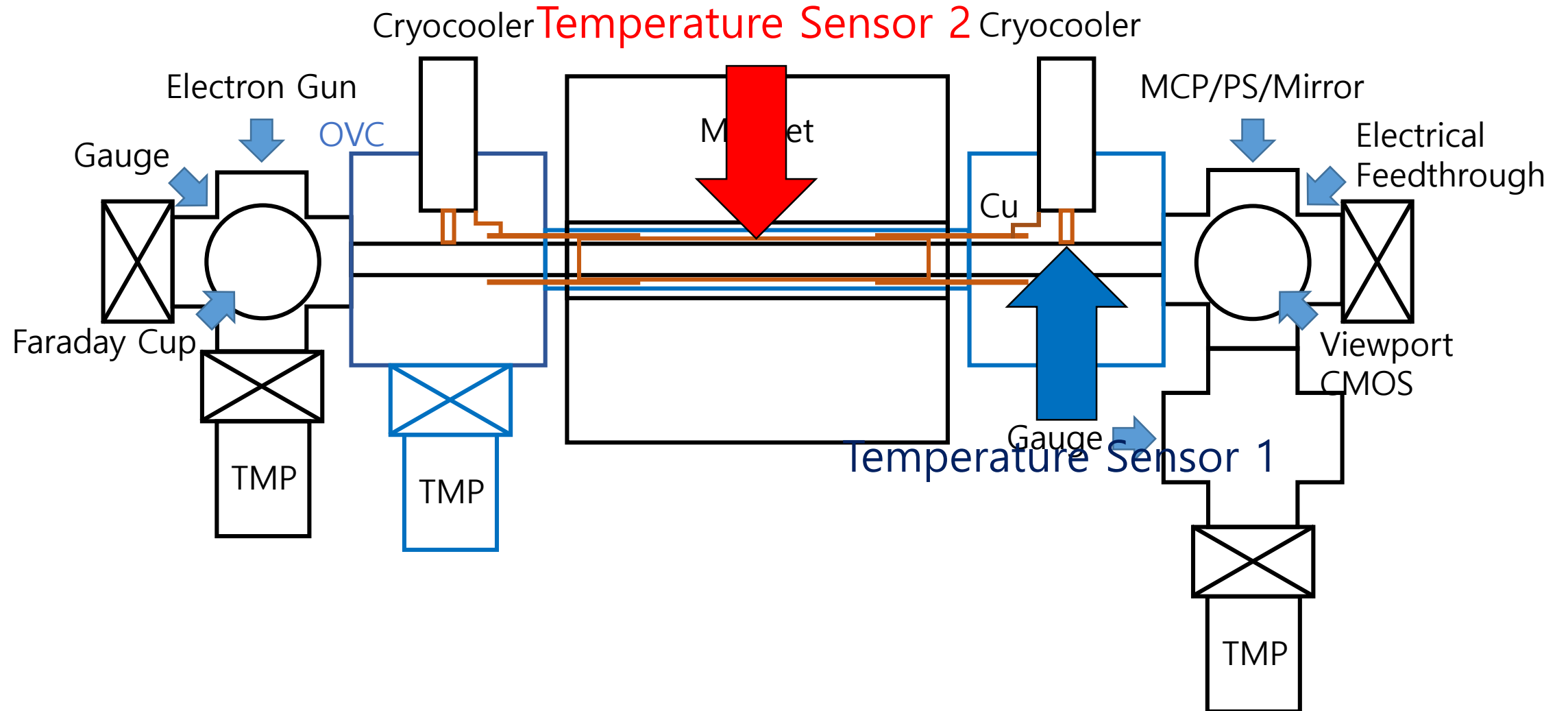
Cooling Power @ 30K 16.408W < 30W : Enough



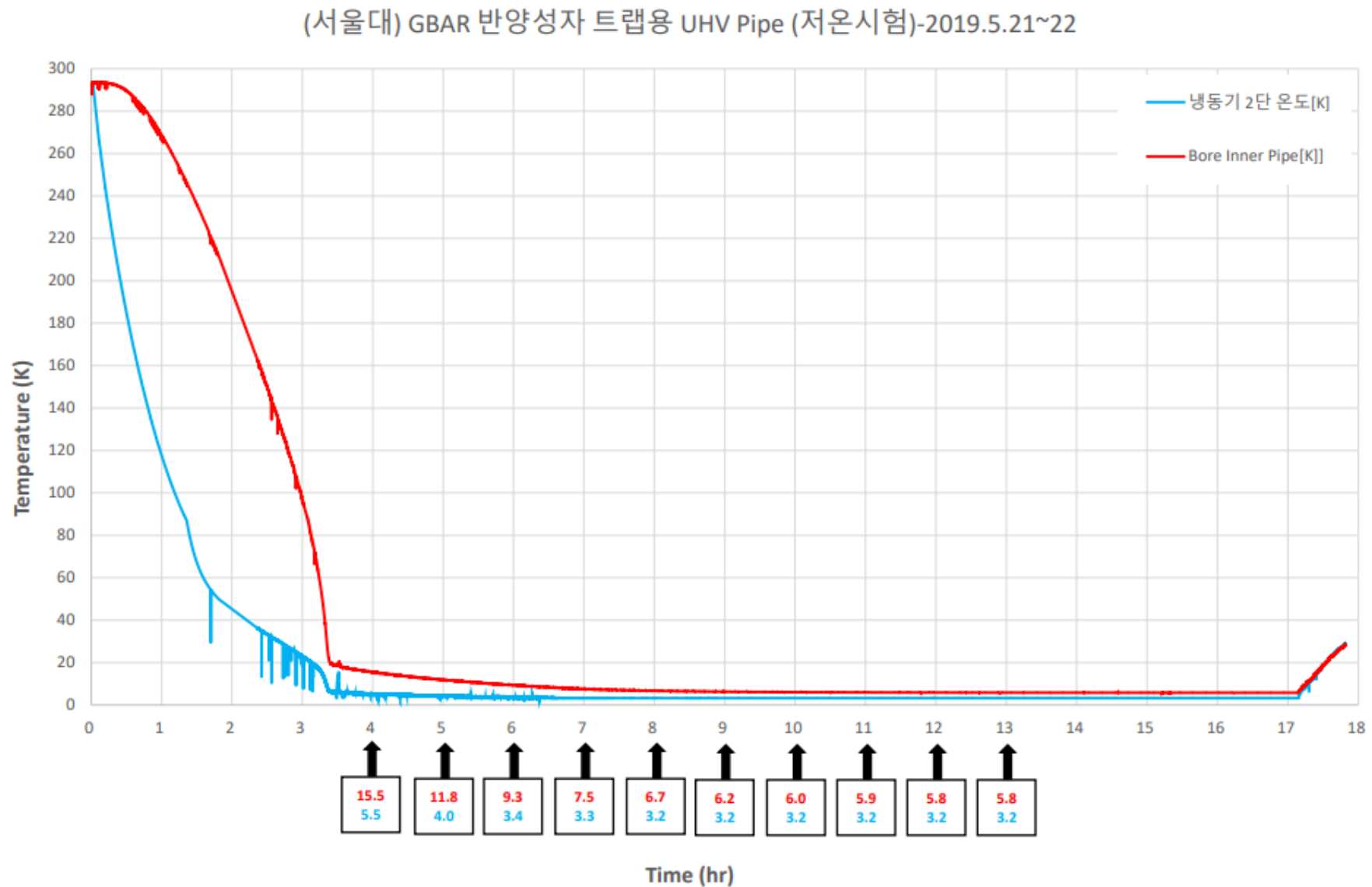
Position of Temperature Sensors

Upstream

Downstream



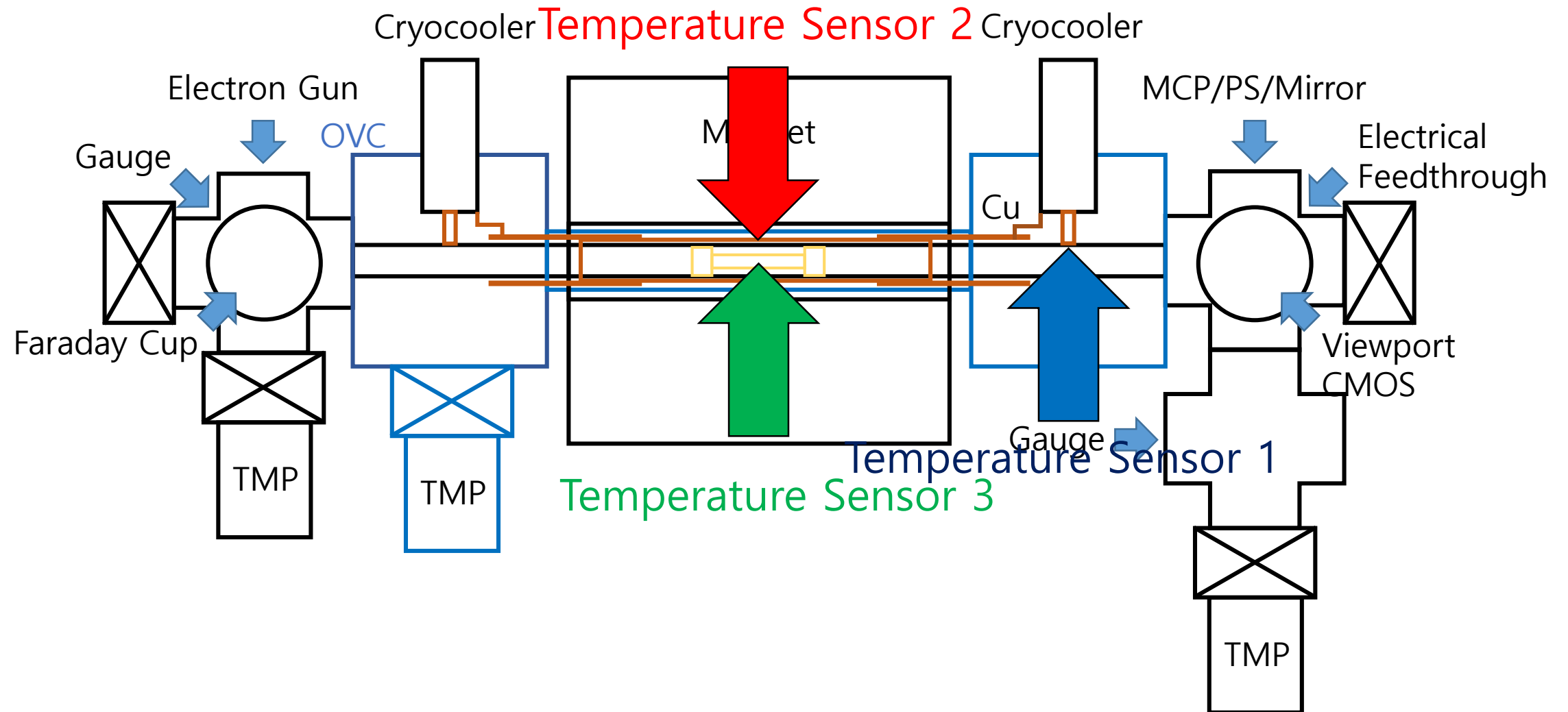
Cooling Test of CUHV Pipe without MRE in CVE



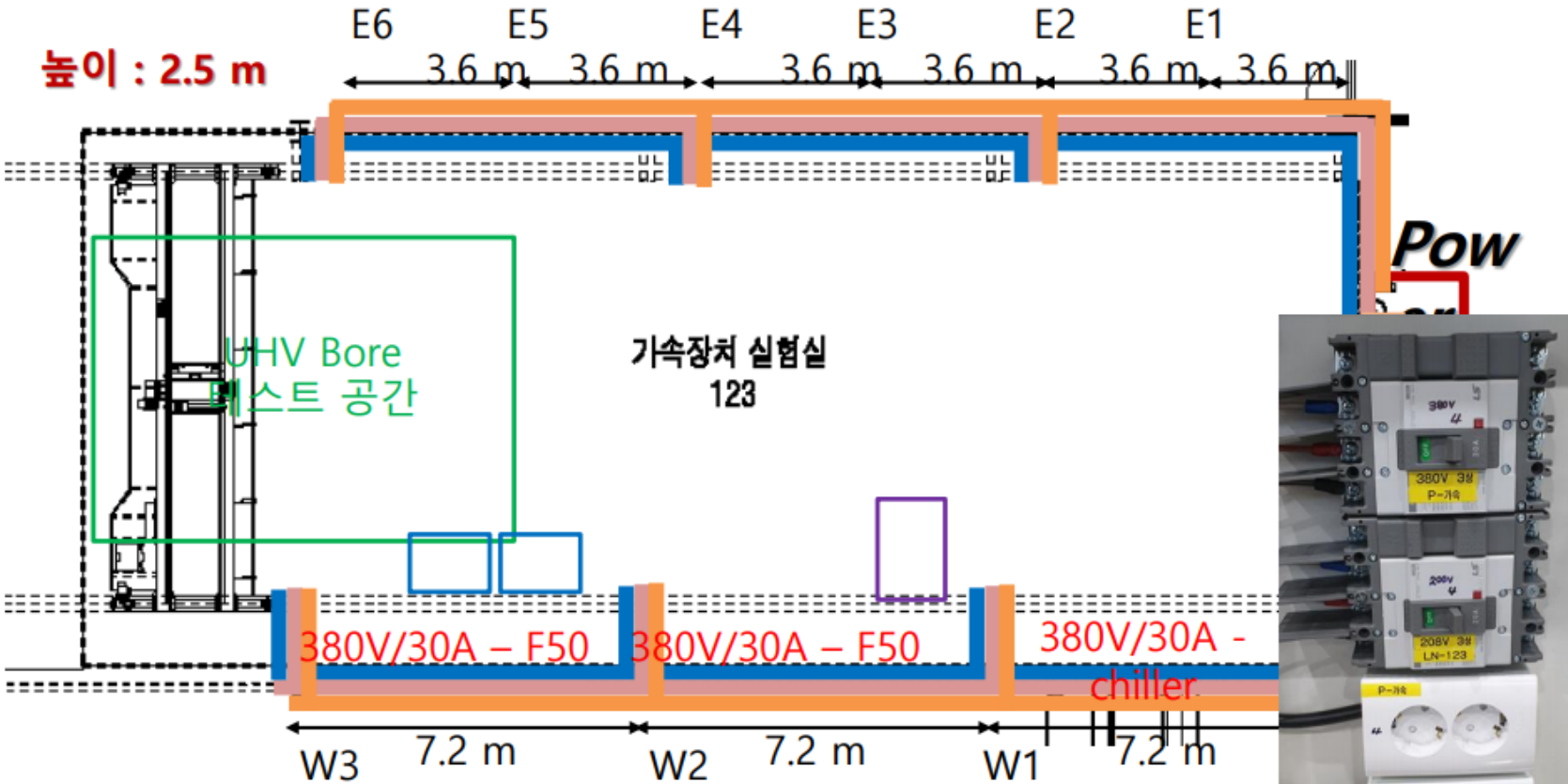
Cooling Test of CUHV Pipe with MRE in Korea Univ.

Upstream

Downstream



Space for CUHV in Korea Univ.



고려대학교 준비

- Chiller-F50 피팅 및 작업 Table, 일부 공구

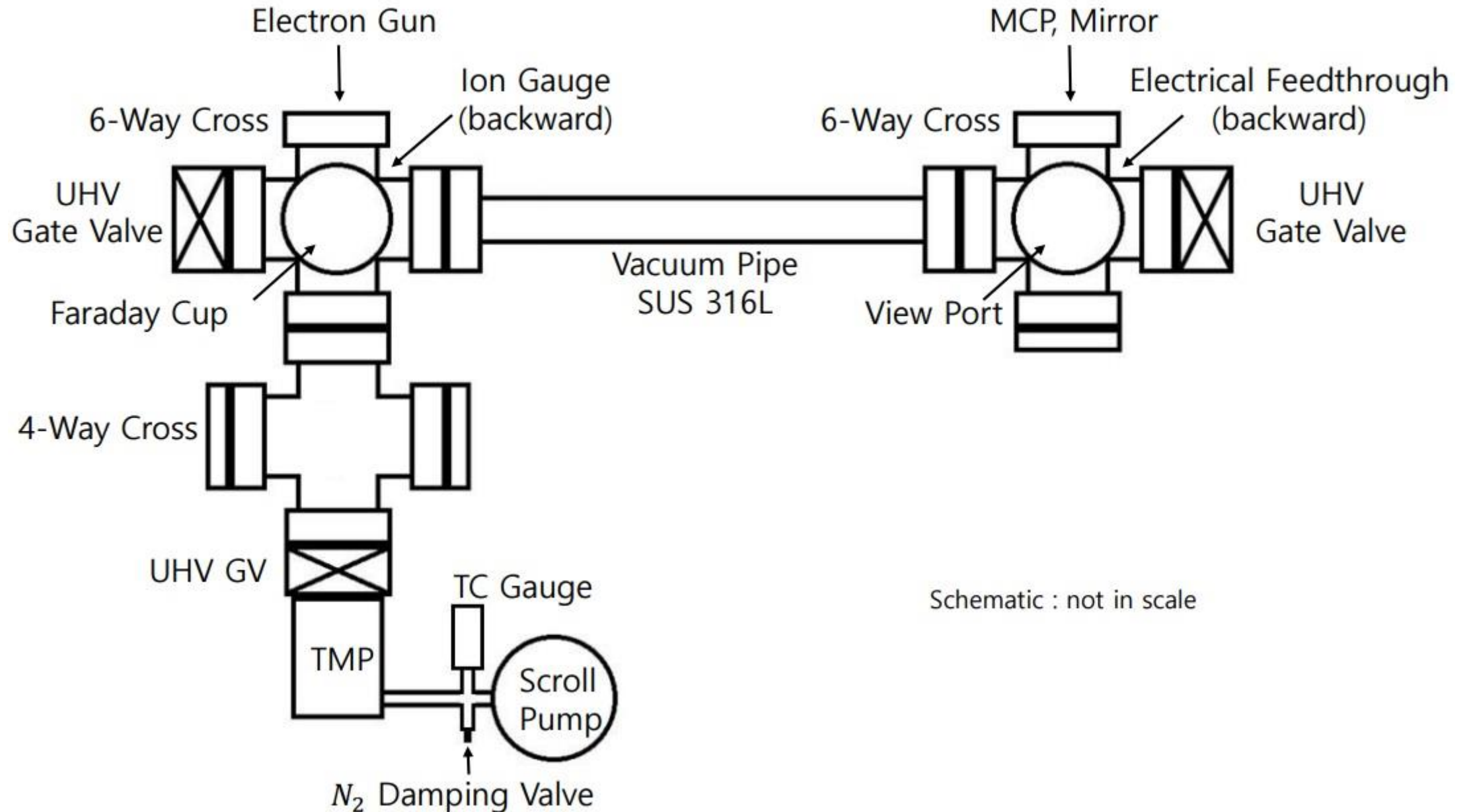


Cooling Test of CUHV Pipe with MRE in Korea Univ.



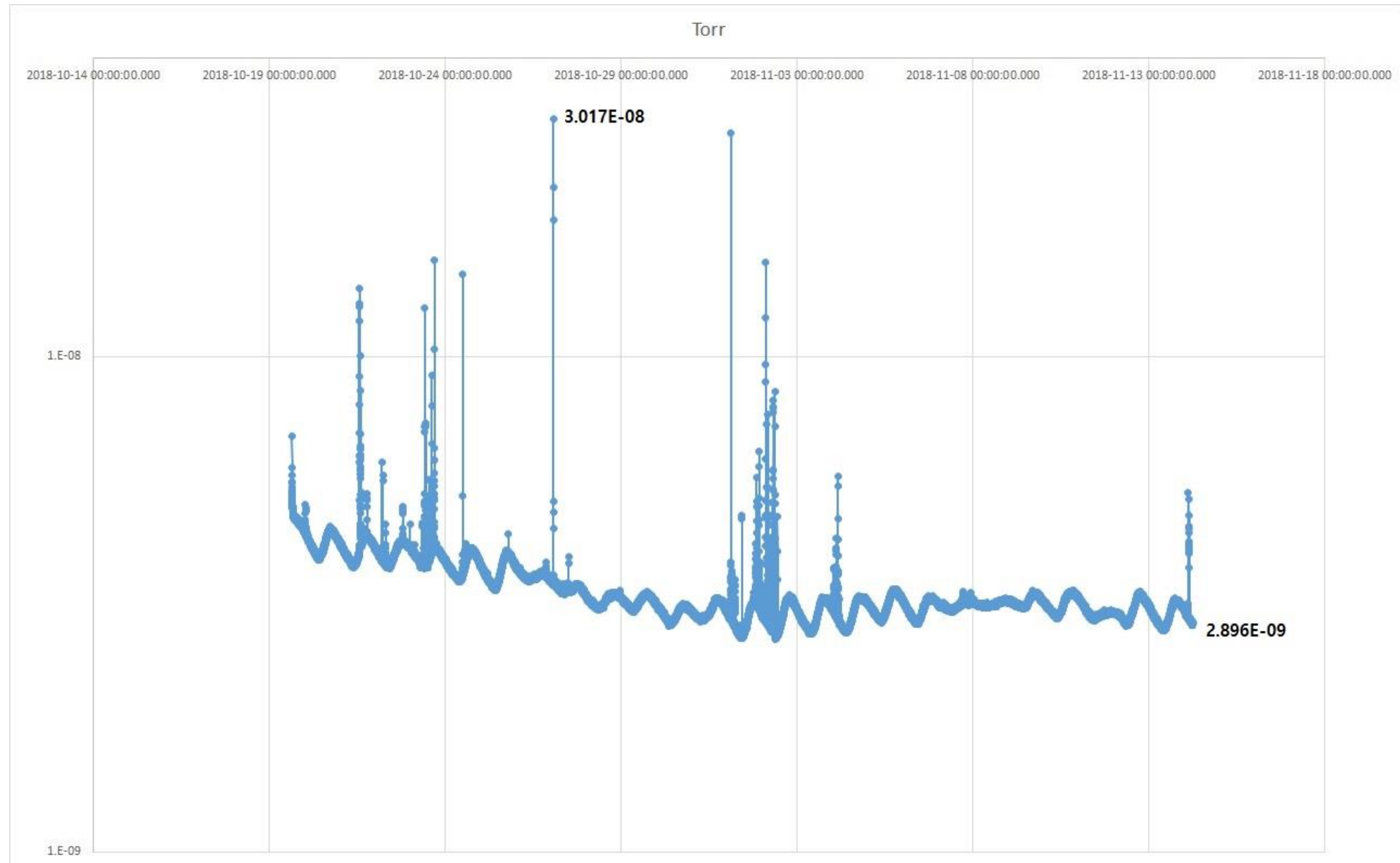
Electron Test in Room Temperature

Vacuum Test in Room Temperature



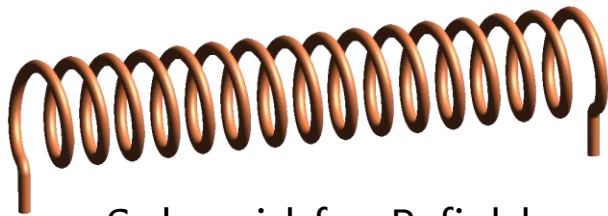


Vacuum Test in Room Temperature



[illegible]

MRE & Wire



Control System

- MRE & Electric Wire Connection
- HV, HV Switch
- Amplifier

- E-Gun & Faraday Cup
- MCP, PS, Mirror, CMOS
- Solenoid for B-field

- Control System

- Vacuum System

Thank You!