01.25 Meeting

Kyoung-Hun Yoo

Magnet Warm-up

8-2 Removal of Cryogen

Before releasing the vacuum, liquid helium should be removed.

1) In order to empty the helium reservoir the helium transfer siphon must be mated with the siphon entry cone as for an initial fill. The cryostat leg of the siphon should be fitted the straight nozzle. Seal the free outlets from the helium vessel. Pressurize the vessel to about 20 kPa (0.2 bar) with dry helium gas to expel the liquid helium into a storage dewar.

2) The liquid nitrogen in nitrogen vessel can not be emptied in a similar way.

8-3 Releasing the Vacuum

WARNING: You should guard against the possibility of a sudden build-up of pressure in enclosed spaces in the cryostat during this operation, the consequences of which might be serious damage to the system or worse, physical danger.

1) Confirm that the drop-off plate is not fixed by the screws. The drop-off plate can be released after the vacuum space become atmospheric pressure.

2) The vacuum space of the OVC is approximately 260 liters. If dry nitrogen gas of the same volume is not enough for warming up with a short time because almost nitrogen gas is condensed on the surface of helium vessel. Usually in **JASTEC** around 1000 liters (under atmospheric pressure) nitrogen gas is inlet into the vacuum space. The volume is equivalent to pressure reduction around 20 bar of a cylinder of high-pressure nitrogen gas (7m^3).

3) Next day of releasing the vacuum, the vacuum space will become atmospheric pressure. The circulation of helium gas in helium vessel shortens the time for warming up the magnet. The diaphragm pump that has pumping speed around 10 liters/min is available. Proceed as follows.
   - Remove the manifold and insert the blow out tube into the siphon cone.
   - Fit the NW25 blank flange to the top hat of the main side and the nipple flange to the top hat of the shim side port.
   - Connect rubber tubes between the blow out tube and the nipple via a circulation pump. Warm helium gas should be inlet into the bottom of the helium vessel through the blow out tube. During warming up, a build-up of the pressure in the helium vessel will be released by the relief valves.

4) 4 days (*) later after the start of warming up, the magnet temperature will reach to room temperature. Using the shim lead as described in SECTION 5-4-1 monitors the magnet temperature.
   (*) This is a typical value using a circulation pump.

Magnet Cool-down

DATE	OPERATION	Duration (hr)
1st day		
	Introduction	
	carrying and position the magnet in its final location	3.0
	Inspection	
	Examine the Tilt Watch and Shock Watch	0.1
	Assembly	
	Remove the transit fixture	0.3
	Assembly of ancillary components	0.3
	Electrical tests	
	Measurement the resistance of the main and shim circuits	0.3
	Evacuation of the OVC	
	Evacuation of the OVC should be continued over night at least.	19.0
		23.0
2nd day		
	Evacuation of the OVC	
	Leak testing of the OVC	0.4
	Leak testing of the helium vessel	0.3
	Leak testing of the nitrogen vessel	0.3
	Pre−cool the system	
	Pre−cool the helium vessel	7.0
		8.0

3rd day		
	Pre−cool the system	
	Filling the nitrogen vessel	1.5
	Extraction of liquid nitrogen from the helium vessel	1.5
	Pump and flush of the helium vessel	1.0
	Initial filling with liquid helium	
	Filling liquid helium into the helium vessel	2.0
	Preparation of the enegization	
	setting up the power supply	2.0
		8.0
4th day		
	Energizing the magnet	
	Energizing the main coil	2.0
	Energizing the shim coil	0.5
	Measuring the field homogeneity (the filed mapping)	0.5
	Shimming	1.0
		4.0

Magnet Cool-down

1. Mechanical Equipment

1	A crane capable of lifting 700 kg
2	Shackles
3	Wire ropes
4	A main pumping system (Refer to Figure 5-4)
4.1	A turbo-molecular pump (Typical pumping speed 350 liters/sec)
4.2	A rotary pump (Typical pumping speed 16m3/h)
4.3	A Pirani gauge
4.4	A Penning gauge
4.5	Various vacuum valves
4.6	Flexible stainless steel lines (Inner diameter≧25mm)
4.7	Vacuum fittings
5	A He gas leak detector
6	A sub pumping system (Refer to Figure 5-4)
6.1	A rotary pump (Typical pumping speed 10m3/h)
6.2	A pressure gauge (−0.1〜+0.1MPa)
6.3	Vacuum valves
6.4	Flexible stainless steel lines
6.5	Vacuum fittings
7	A He gas pressure regulator with a hose
8	Hand tools
9	Silicon rubber hoses
10	A field mapping jig

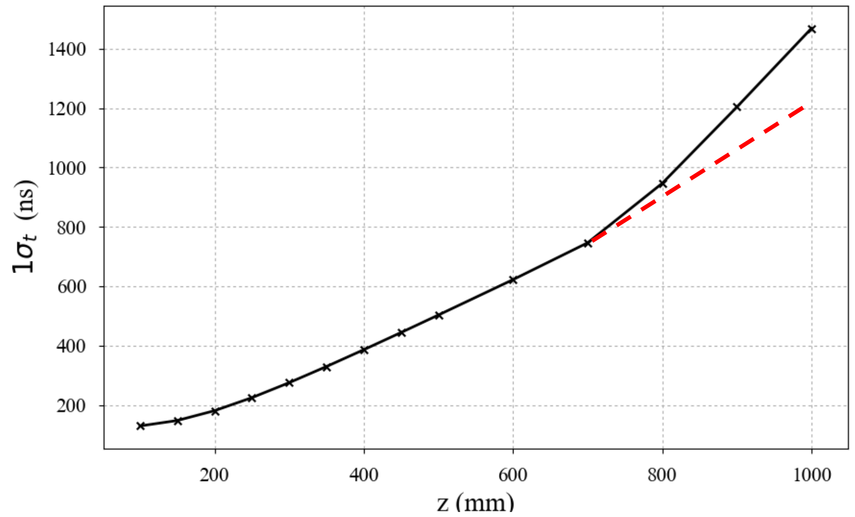
2. Electrical Equipment

1	A tester
2	A main coil power supply combined with a switch heater power supply
	Imax≧90(A)、Vmax≧±4(V)
3	Main current cables
4	A shim coils power supply
	Imax=±20(A)、Vmax=±4(V)
	combined with 10 channels switch heater power supplies
5	Shim current cables
6	A NMR TESLAMETER manufactured by METROLAB
	A #8 probe and a pre-amp for a TESLAMETER
7	A oscilloscope
8	A digital voltage meter
9	A hot air blower

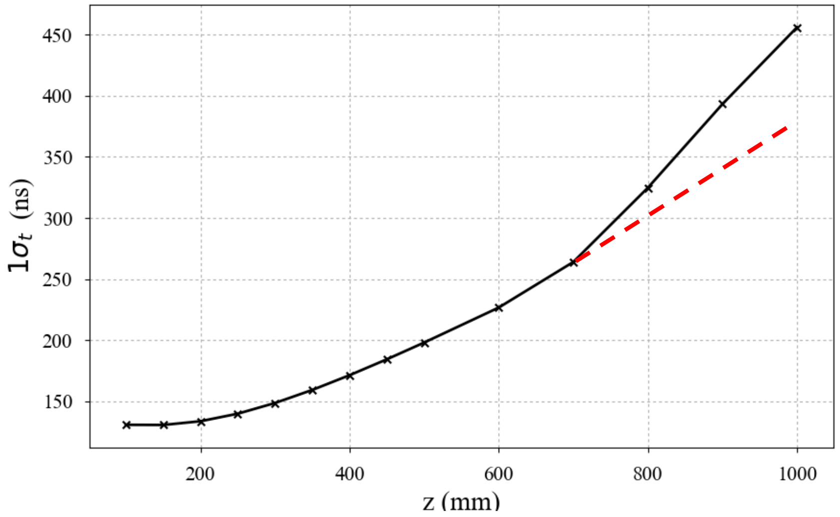
3. Materials

1	A minimum 500 liters of LN2
2	A minimum 400 liters of LHe
3	A cylinder of high pressure He gas (7m3×1)
4	Vacuum greases
5	Cleaning agent and solvent
6	Paper tissues
7	Goggles
8	Protective gloves

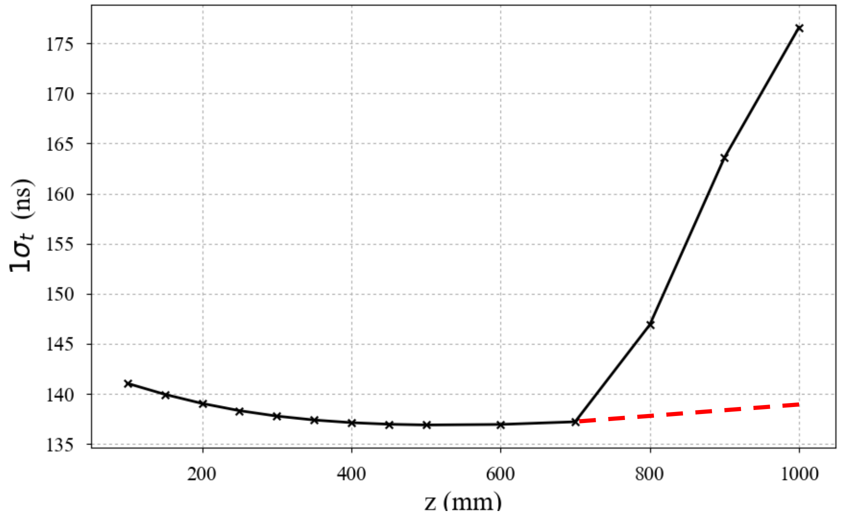
Extraction Simulation



Energy : 50 eV



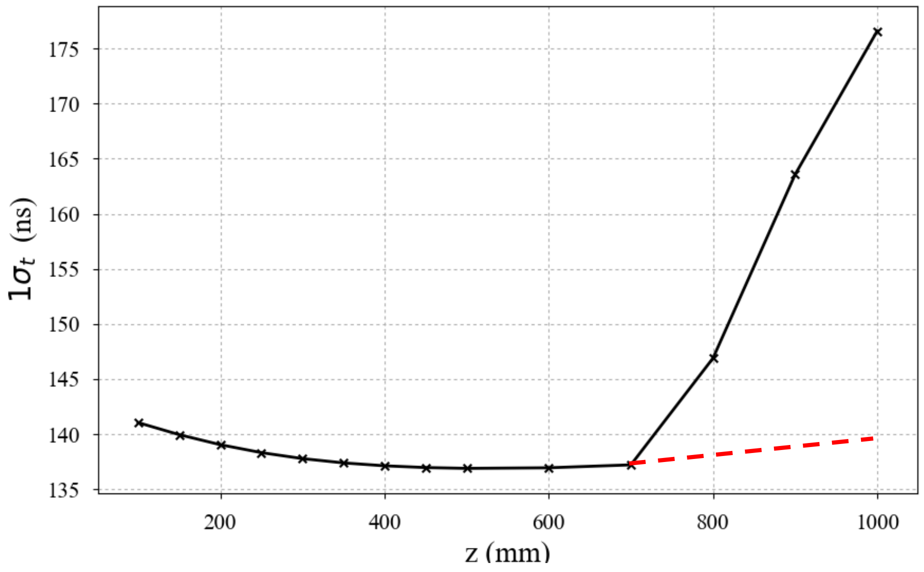
Energy : 100 eV



Energy : 300 eV

Extraction Simulation

Energy : 300 eV



Extraction voltage slope x 2