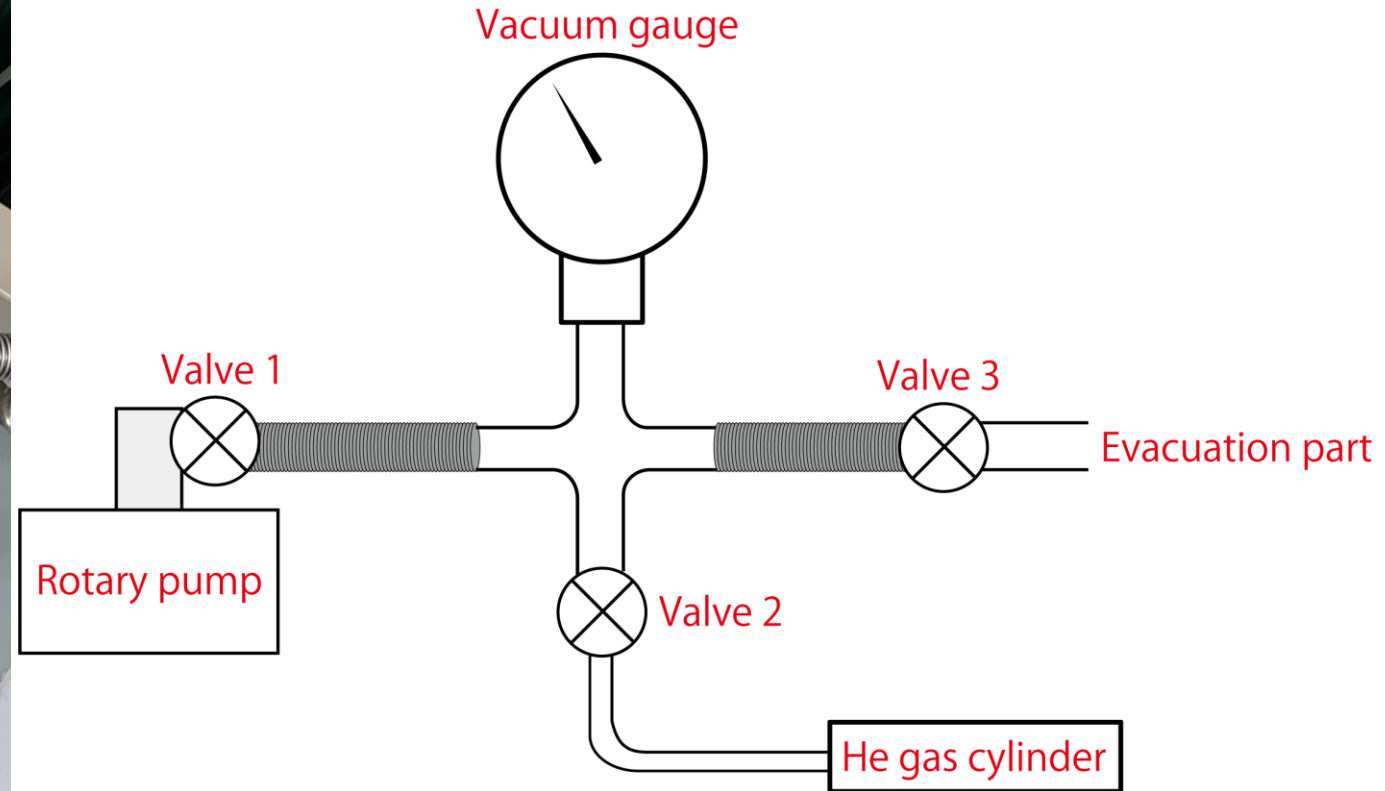
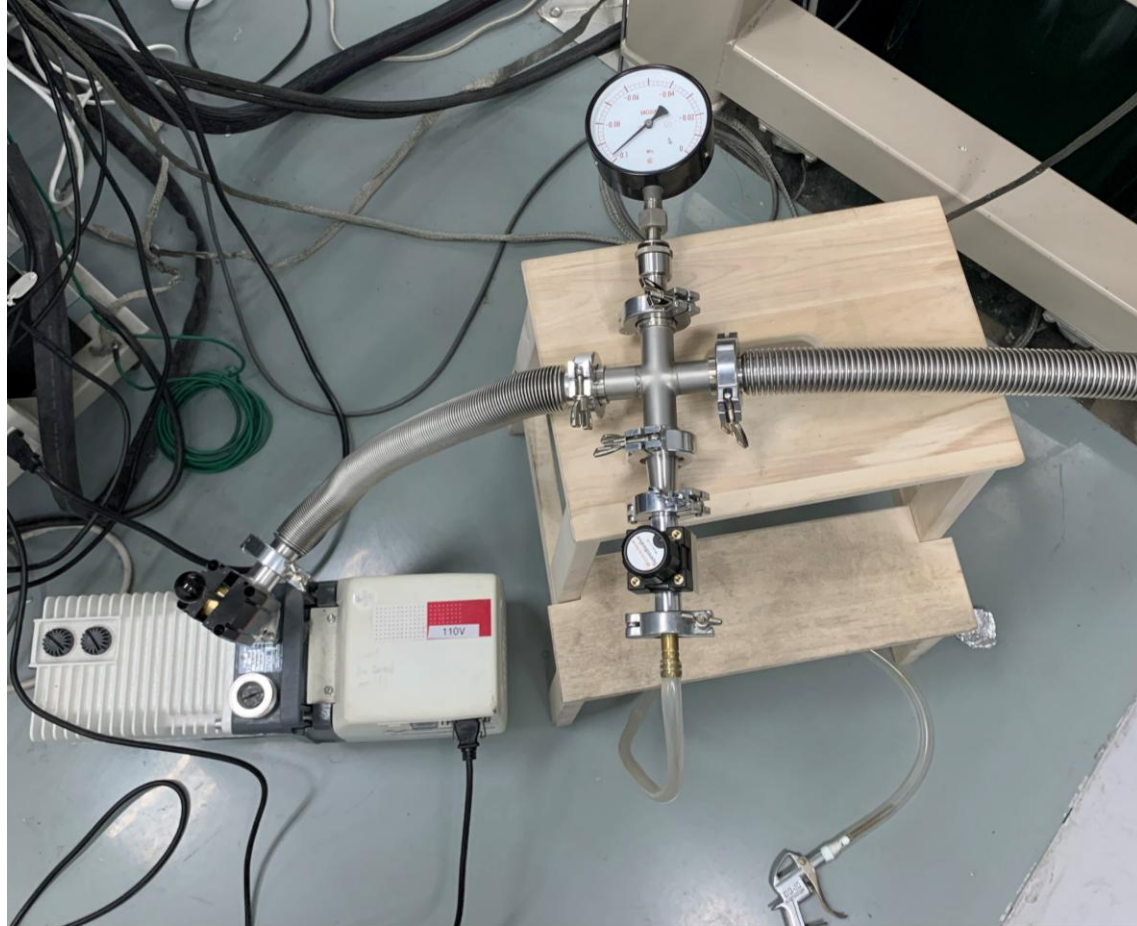


# He transfer

Revised on 2025/August/25<sup>th</sup>

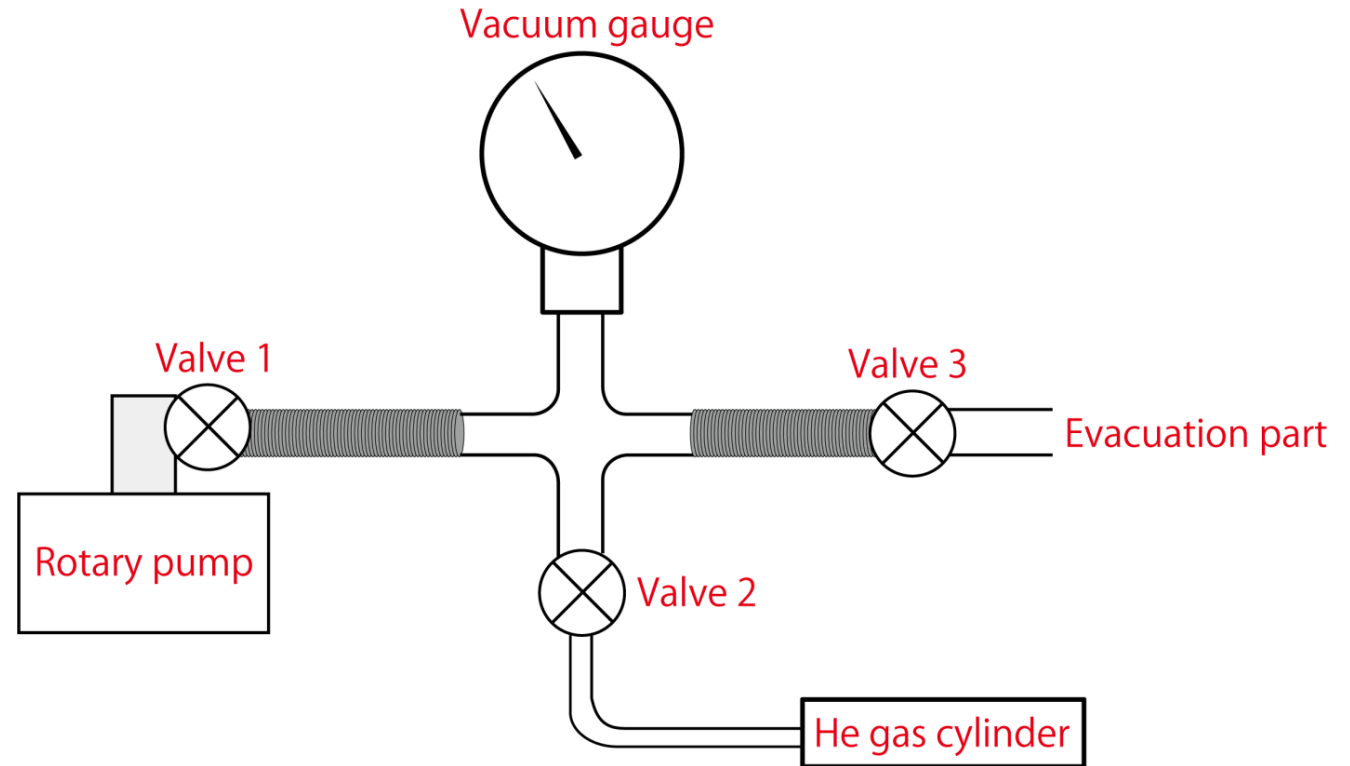
N. Kawakami

# Pre-transfer process : Setting

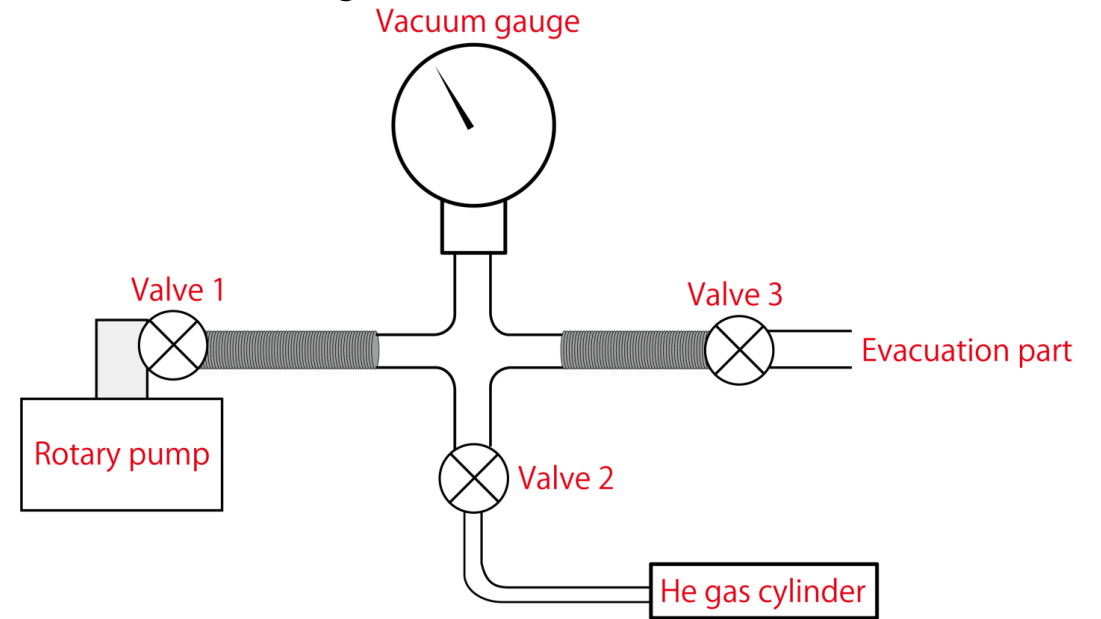


# Pre-transfer process: Tube cleaning

- (1) Turn on rotary pump.
- (2) Open valve 1. The air in tube is evacuated.
- (3) Close valve 1.
- (4) Open valve 2 and fill the tube with He gas.
- (5) Close valve 2 and open valve 1. He gas is evacuated.
- (6) Repeat (1)-(5) for several times.



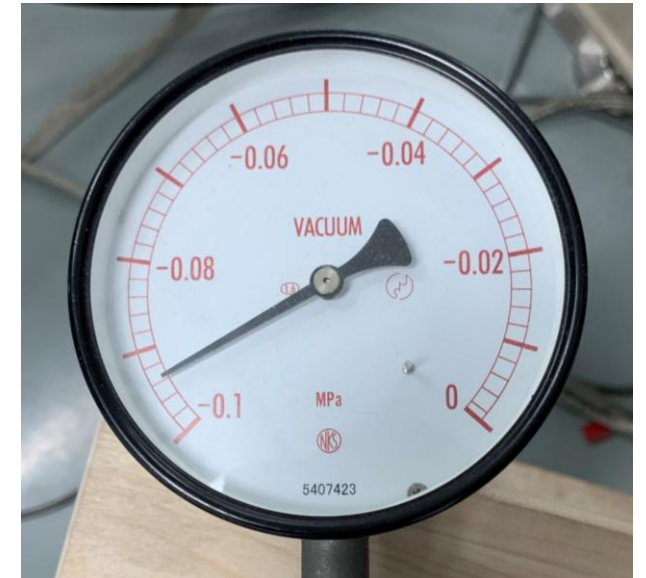
# Pre-transfer process: Inner vacuum layer



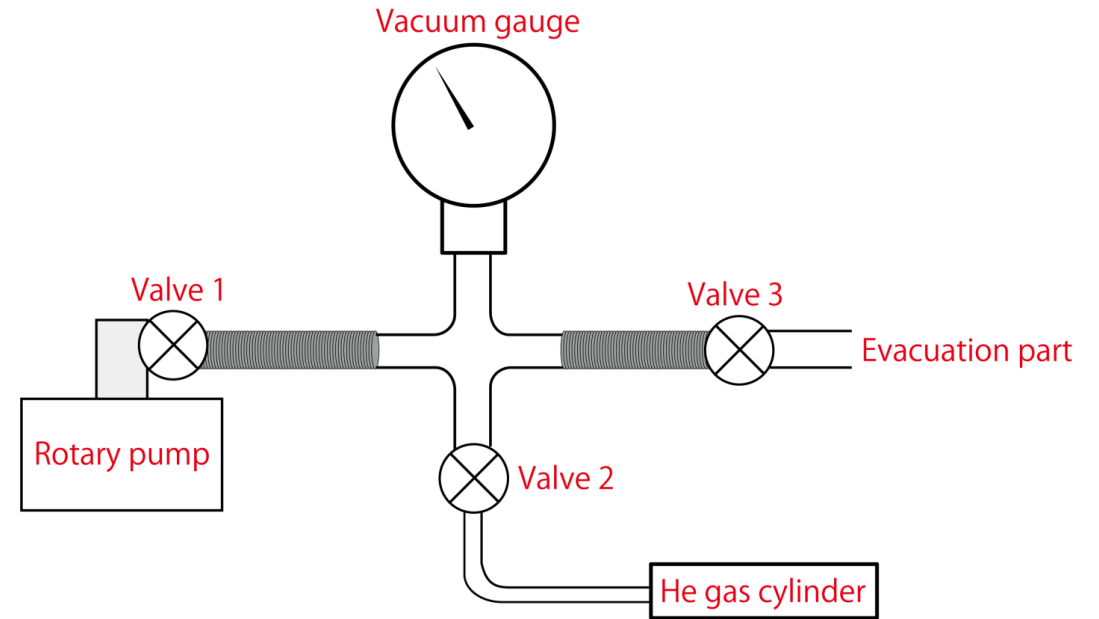
- (1) Perform tube cleaning process.
- (2) Open valve 3. Inner vacuum layer is evacuated
- (3) Close valve 1. Open valve 2 and fill gas He at desired pressure. Now the inner vacuum is filled with He gas at the desired pressure.
- (4) Close valve 3.

※ On March/2023, the pressure is set to be -0.094 MPa at 80 K (STM temperature).

※ For L-N<sub>2</sub> experiment, you can fill to atmospheric pressure (0 in the right picture). In my experience, it makes the temperature stabler.



# Pre-transfer process: VTI



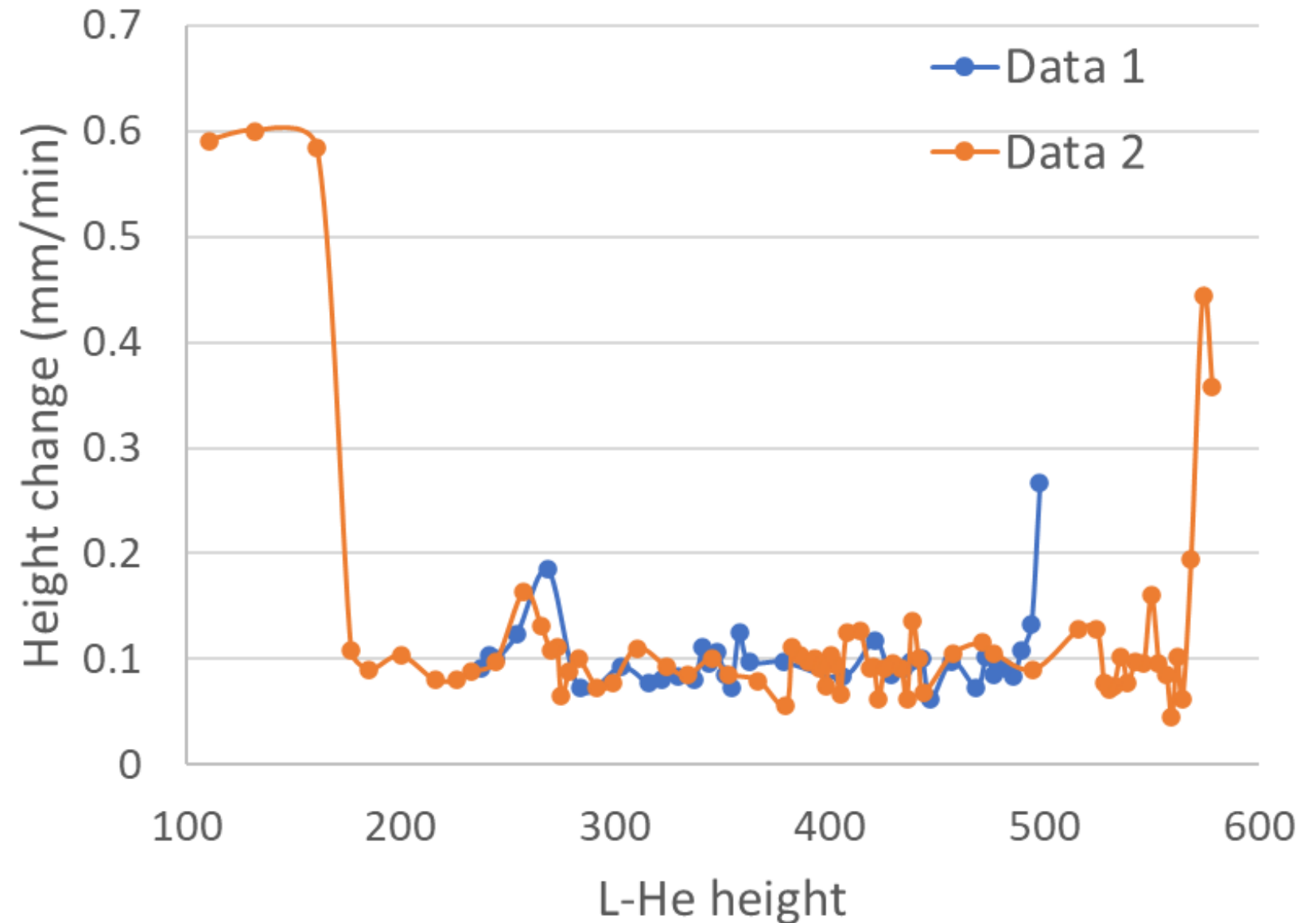
- (1) Perform tube cleaning process.
- (2) Open valve 3. VTI is evacuated.
- (3) Close valve 1. Open valve 2 and fill gas He. Now VTI is filled with He. Close valve 2.
- (4) Open valve 1. The He gas in VTI is evacuated.
- (5) Repeat (3) and (4) for several times.
- (6) Close valve 1 and open valve 2. Fill VTI with He gas at desired pressure.
- (7) Close valve 3.

※ On March/2023, the pressure is set to be atmospheric pressure at 80 K (STM temperature).

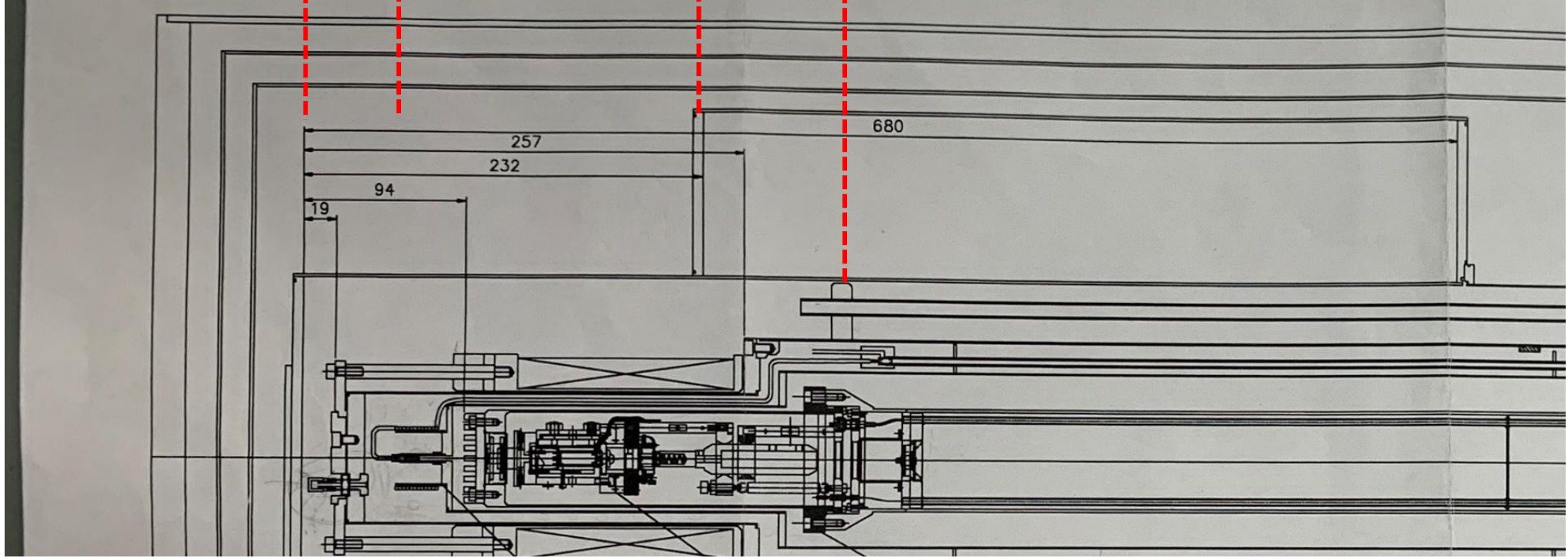
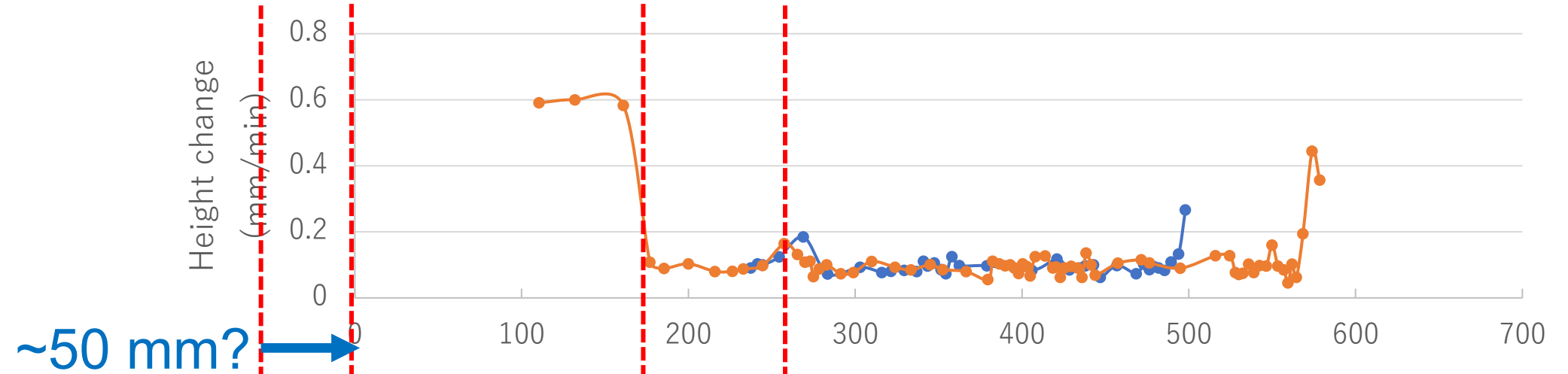


# L-He decreasing rate

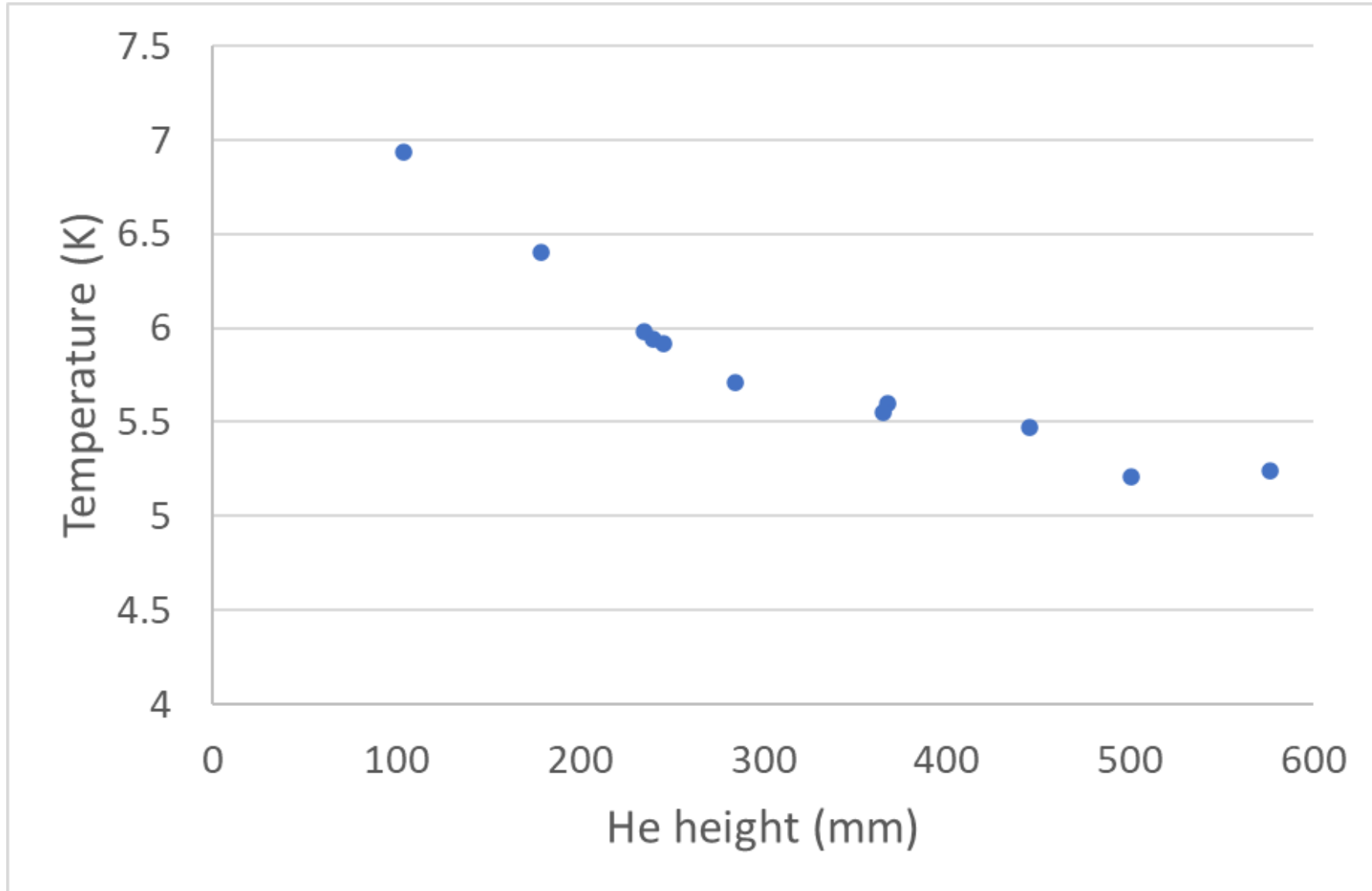
- (i) After finish transfer, the He level decrease fast.
- (ii) The decrease rate does not depend on the He height.
- (iii) Below 170 mm, the He level decrease fast because of the small volume of the tank.



# Estimated Correspondence between He level and cryostat

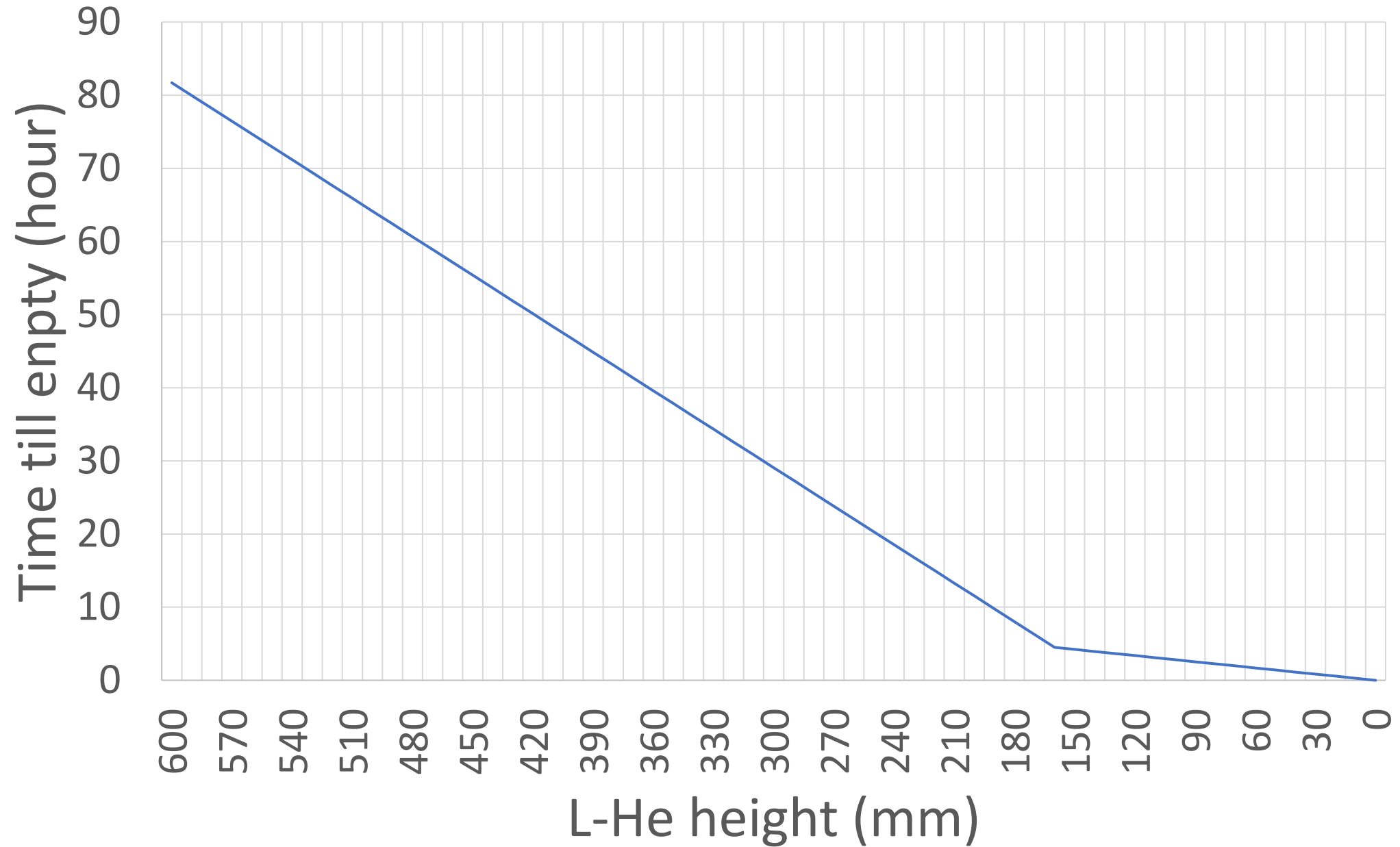


# Temperature and He level



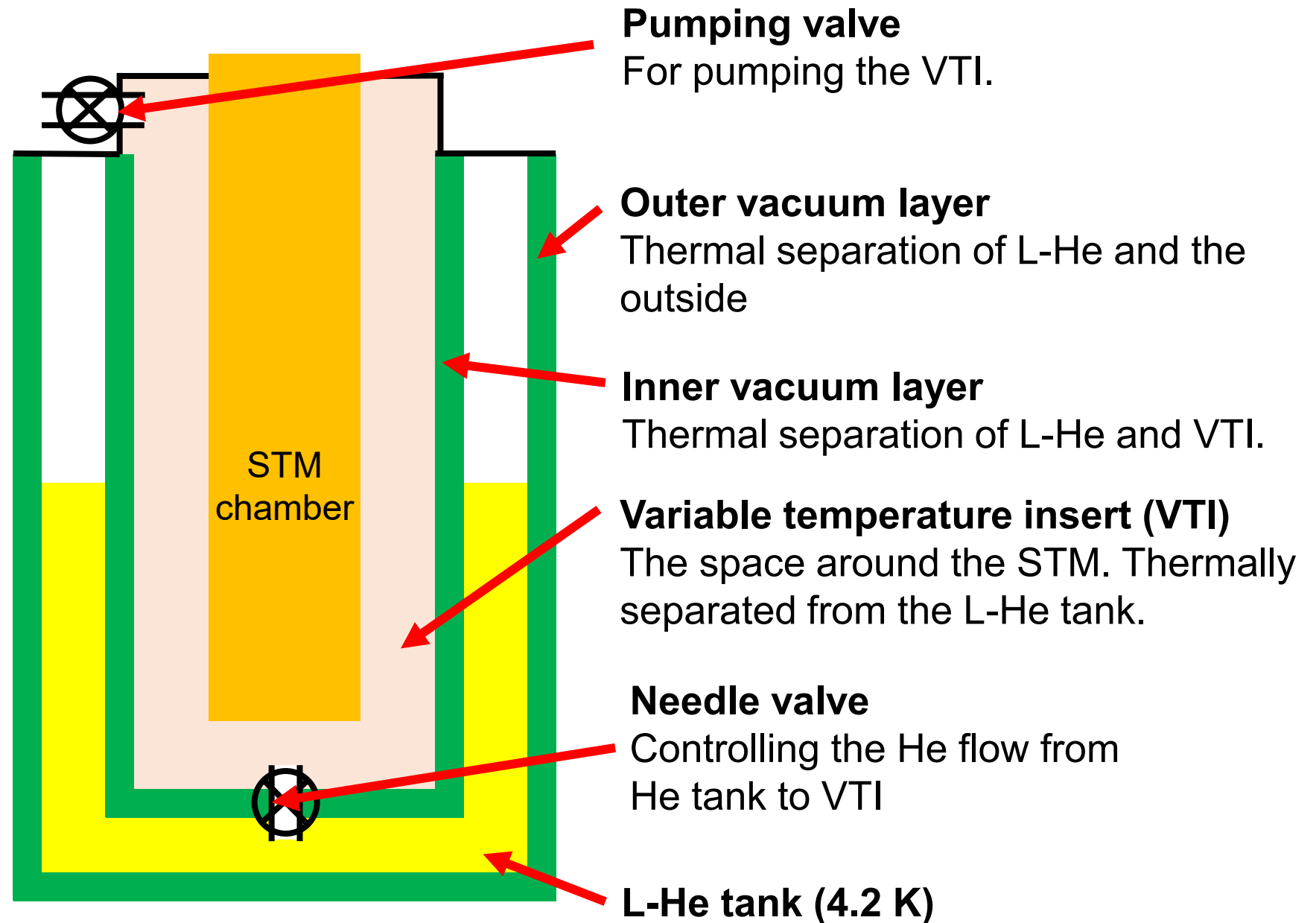


# Keeping time of L-He



VTI operation to reach  
~1.6 K

# Simplified schematic of the system



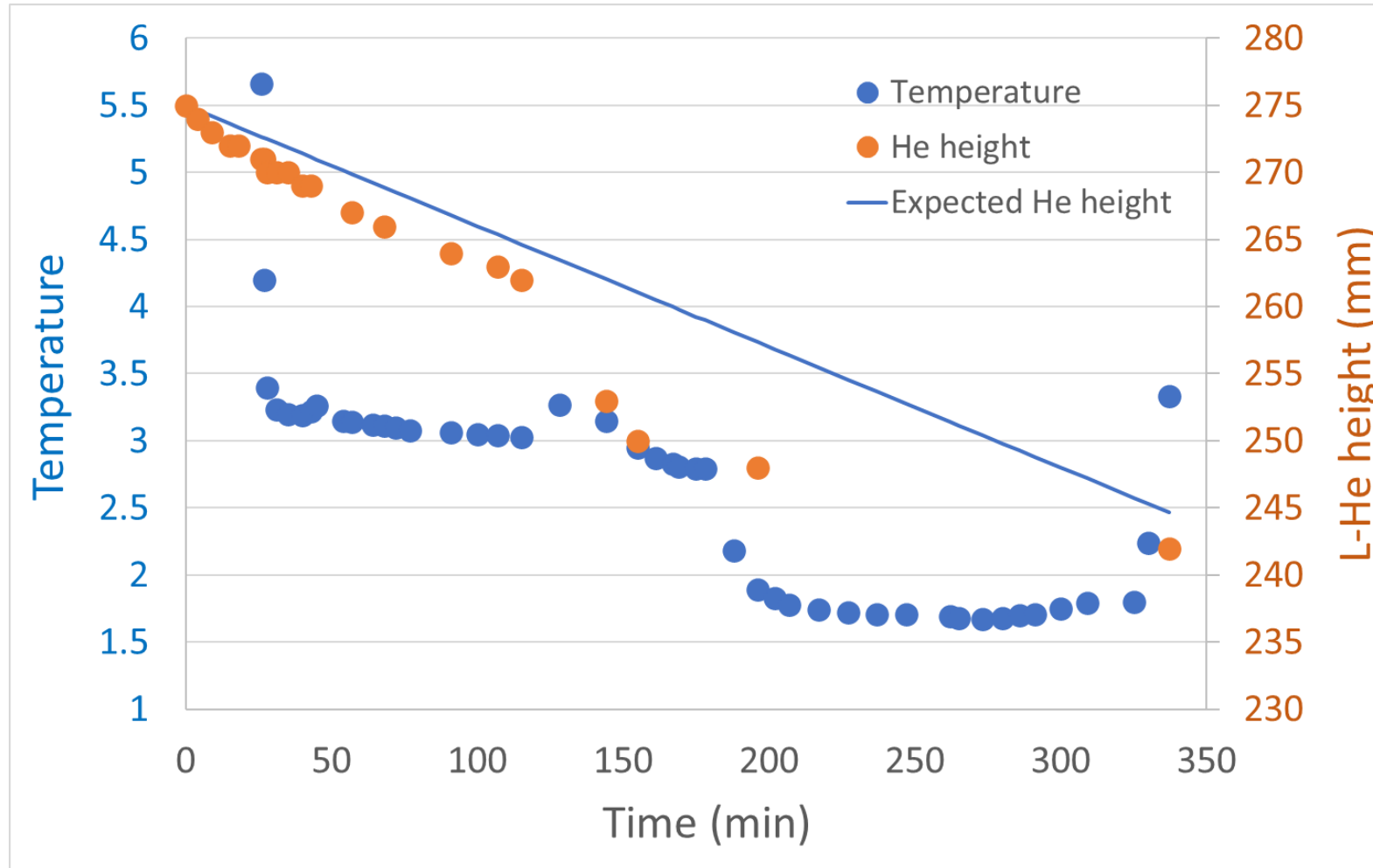
# Operation

- ① Retract the tip and sample for several steps for safety.
- ② Measure the VTI temperature.
- ③ Pump the Inner vacuum layer by turbo for at least 1 hour. The STM temperature may increase.
- ④ Make sure that the needle valve is closed.
- ⑤ Pump VTI by rotary pump through the “pumping valve”.
- ⑥ Open the needle valve for several tens of seconds. Then, almost close it.
- ⑦ If the temperature of the STM and VTI starts to increase or stack for over 3 min, repeat ⑥.
- ⑧ If it succeeds, the VTI temp. would reach  $\sim 1.2$  K and STM temp.  $\sim 1.7$  K.

✂ The operation method is not fully established yet.

✂ In March 2025, there was a huge leak in the STM chamber when cooling down to 1.6 K.

# Temperature and He height change



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During the cool down, the He consumption is much more than normal consumption.

Once it finished cooled down (reached at ~1.7 K), the He consumption is less than normal.