

The construction of the 1.8K high voltage electrical breakdown measuring system with GM cryocooler

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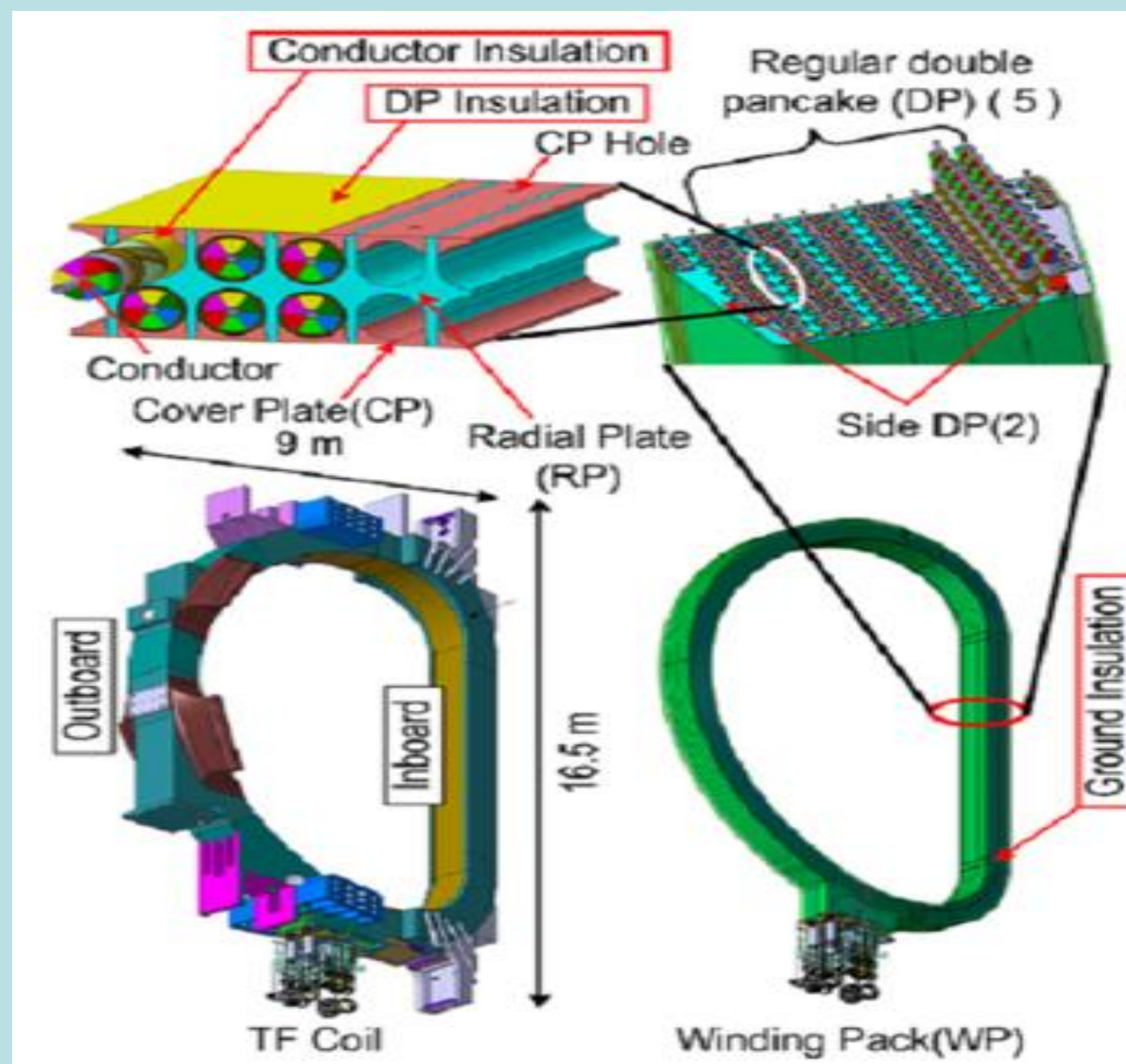
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Background

- The insulation materials for superconducting magnets are required high voltage electrical breakdown strength.
- In order to develop good property insulation materials to satisfy the requirements, high voltage breakdown strength measurement system at low temperature is necessary.
- The result could help the mechanism of electrical breakdown.



Objectives

- Construction of a cryostat which is used for high voltage breakdown test at cryogenic temperature.
- The mearing system is aimed to cool down the film material to helium temperature zone in an vacuum environment(4.2K).
- The maximum voltage is 60 kV.

Result



The internal structure of the cryostat on one side. The photo shows the electrical part in the cryostat. This part should be well insulated and it is used for test the sample dielectric performance.

Feedthrough

electrodes

The helium inlet

The helium outlet

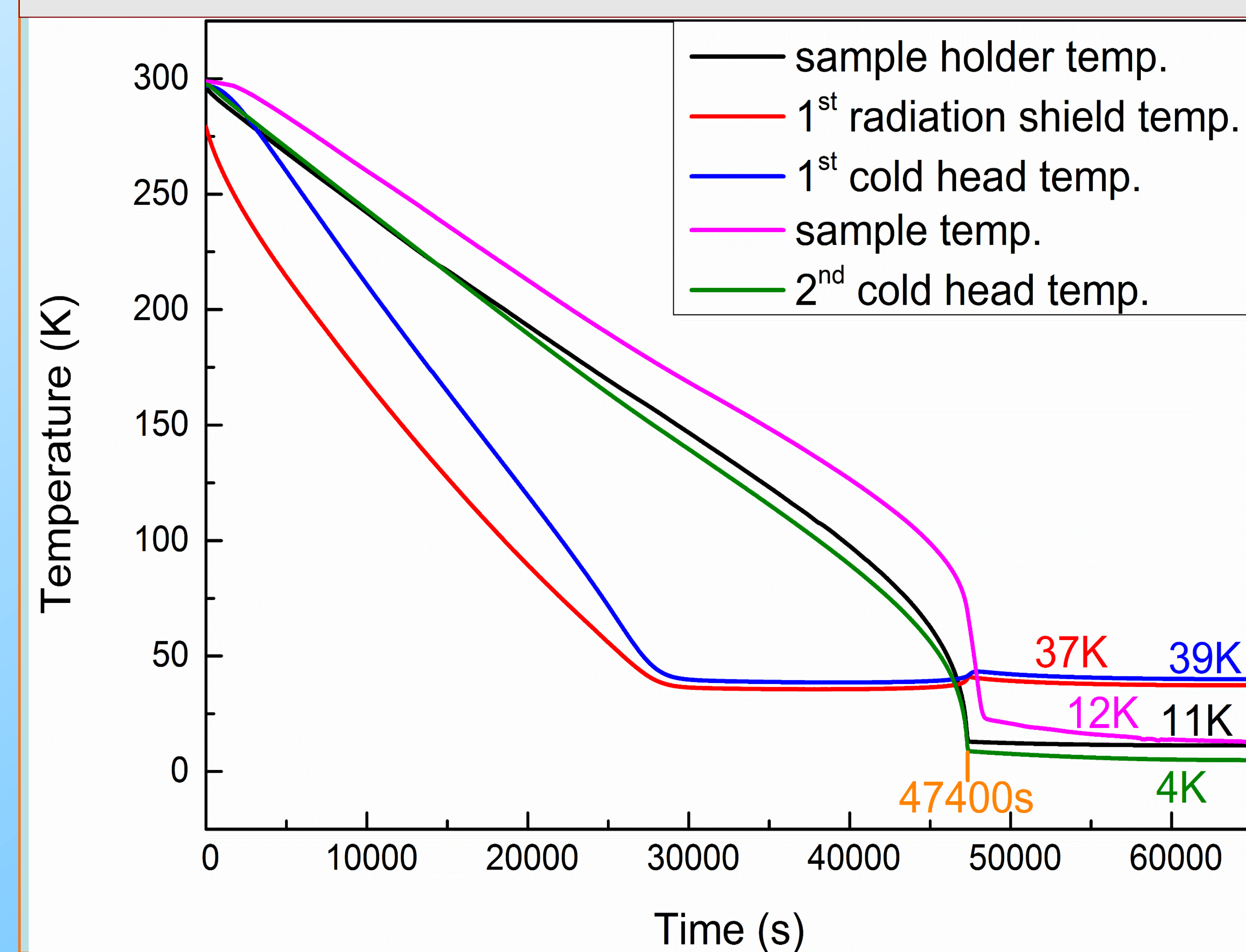
GM cryocooler

Pressure detection

The photo of the internal structure of the cryostat on one side. The photo shows the electrical part in the cryostat. This part should be well insulated and it is used for test the sample dielectric performance.



Cooling performance

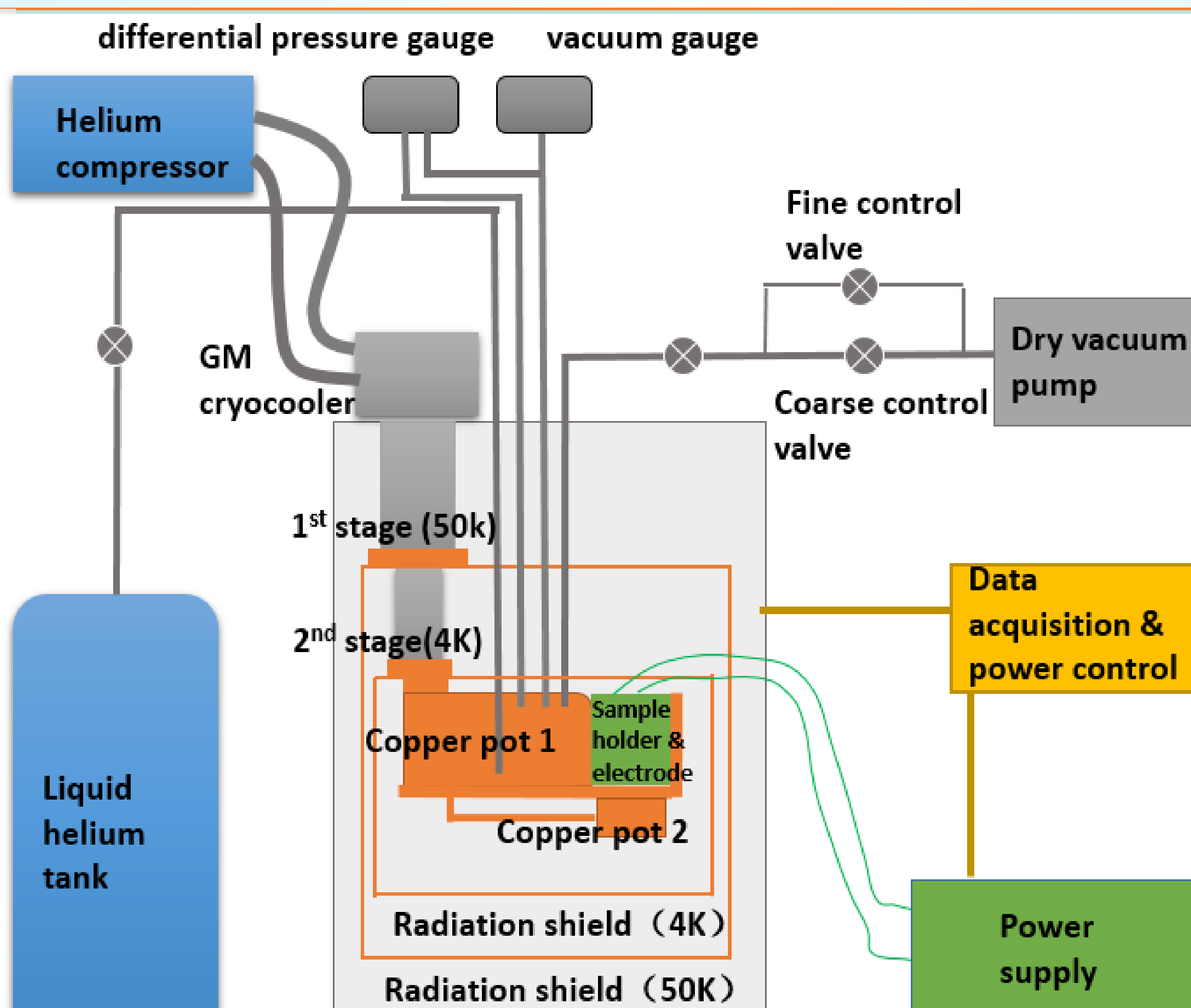


The system cooled by the GM cryocooler. The thermometer is Rh-Fe resistance. The data acquired by Keithley 3706 multimeter. The temperature of the sample is 1K higher the sample holder. The cooling time is 13h due to the size of the cryostat

Conclusion

- A cryostat has been constructed which is used for test the dielectric performance of insulating materials in helium temperature zone and vacuum environment.
- The cooling performance of the cryostat has been tested.
- The electrical breakdown system will be test the accuracy
- In the future, the cryostat will combine the liquid helium. And the temperature of the materials will go to lower temperature

Schematic



The schematic diagram on the left shows the mechanism of the system. It use the GM cryocooler to cool the cryostat in order to reach the helium temperature zone. The liquid helium is used to the sample to the lower temperature, the target temperature is superfluid temperature with the vacuum pump. The power supply system is to get the high voltage. The data acquisition system is used for get and storage the test result.