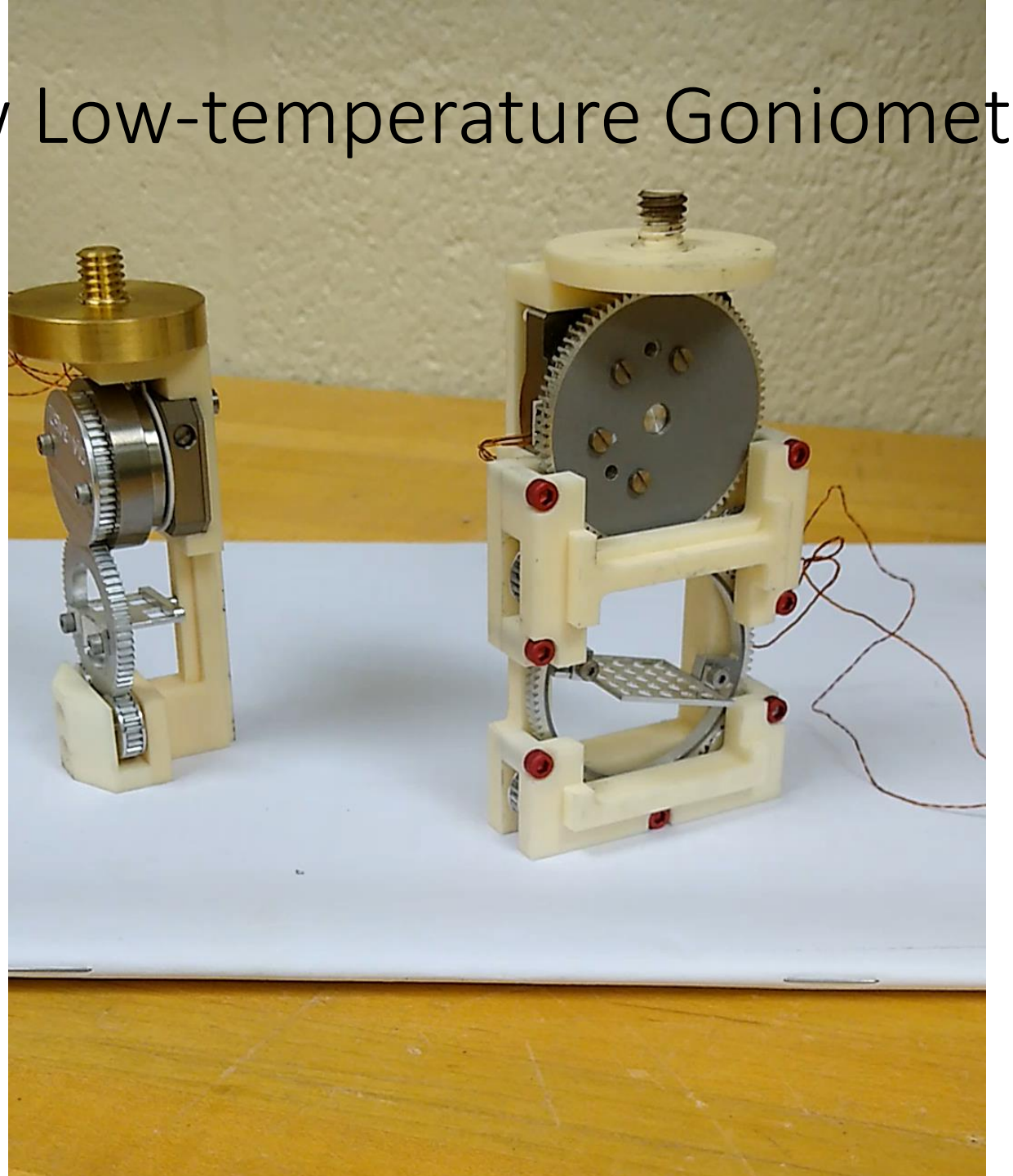
Sample Environment update

Sergiy Gladchenko

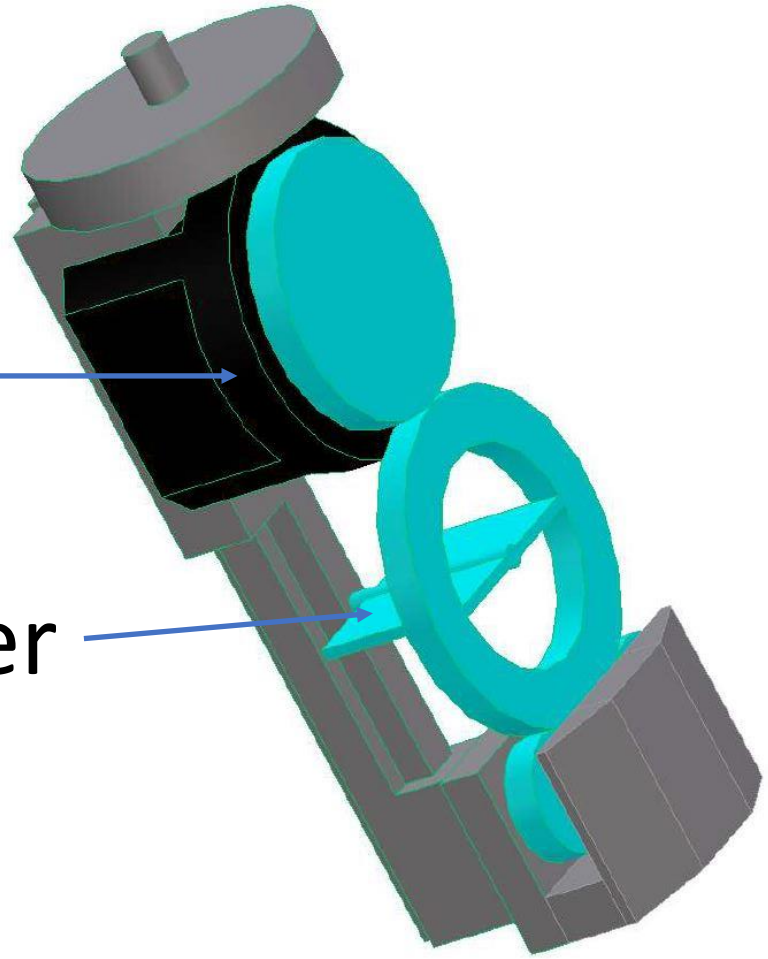
New Low-temperature Goniometer



New Low-temperature Goniometer

Piezo motor

Sample holder

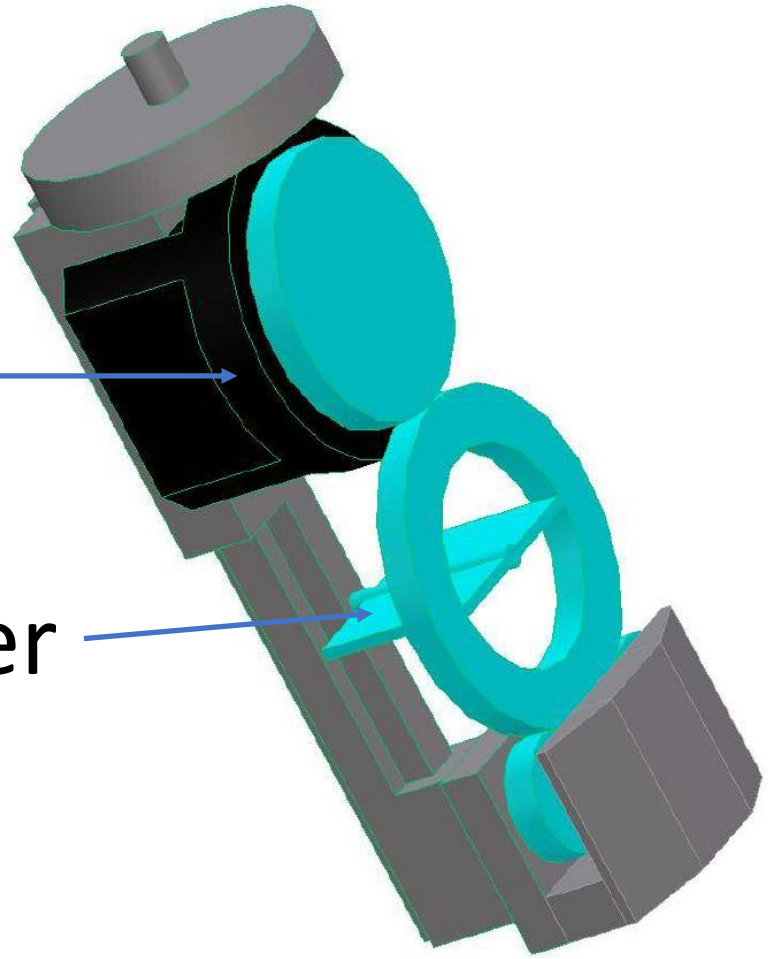


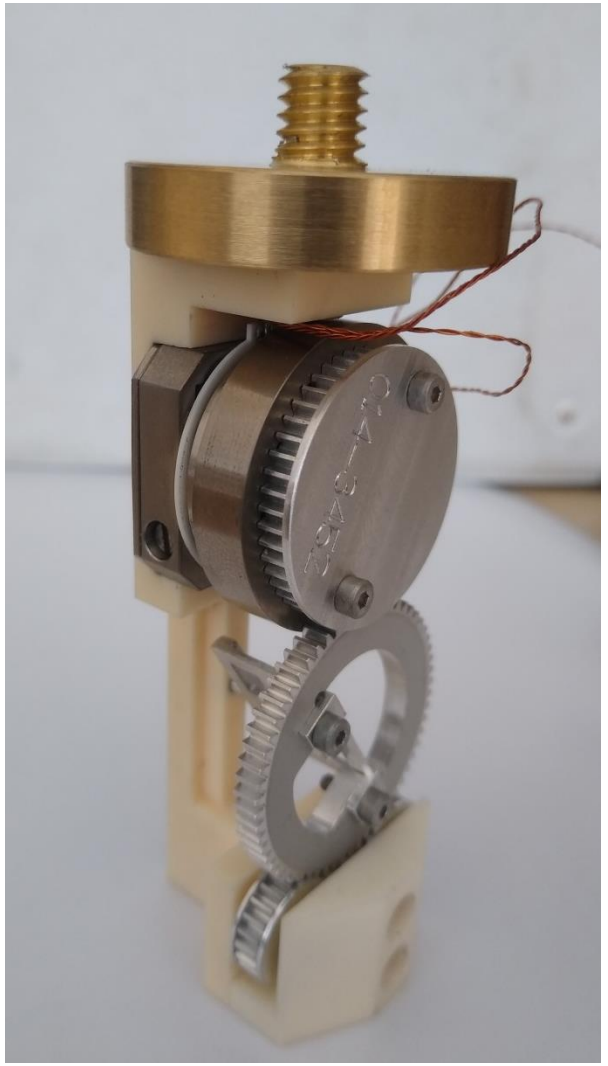
Dimensions: H=115 mm; D=35 mm.
Materials: Frame – alumina;
gears, sample holder – aluminum;
motor – **attocube** piezoelectric motor.

New Low-temperature Goniometer

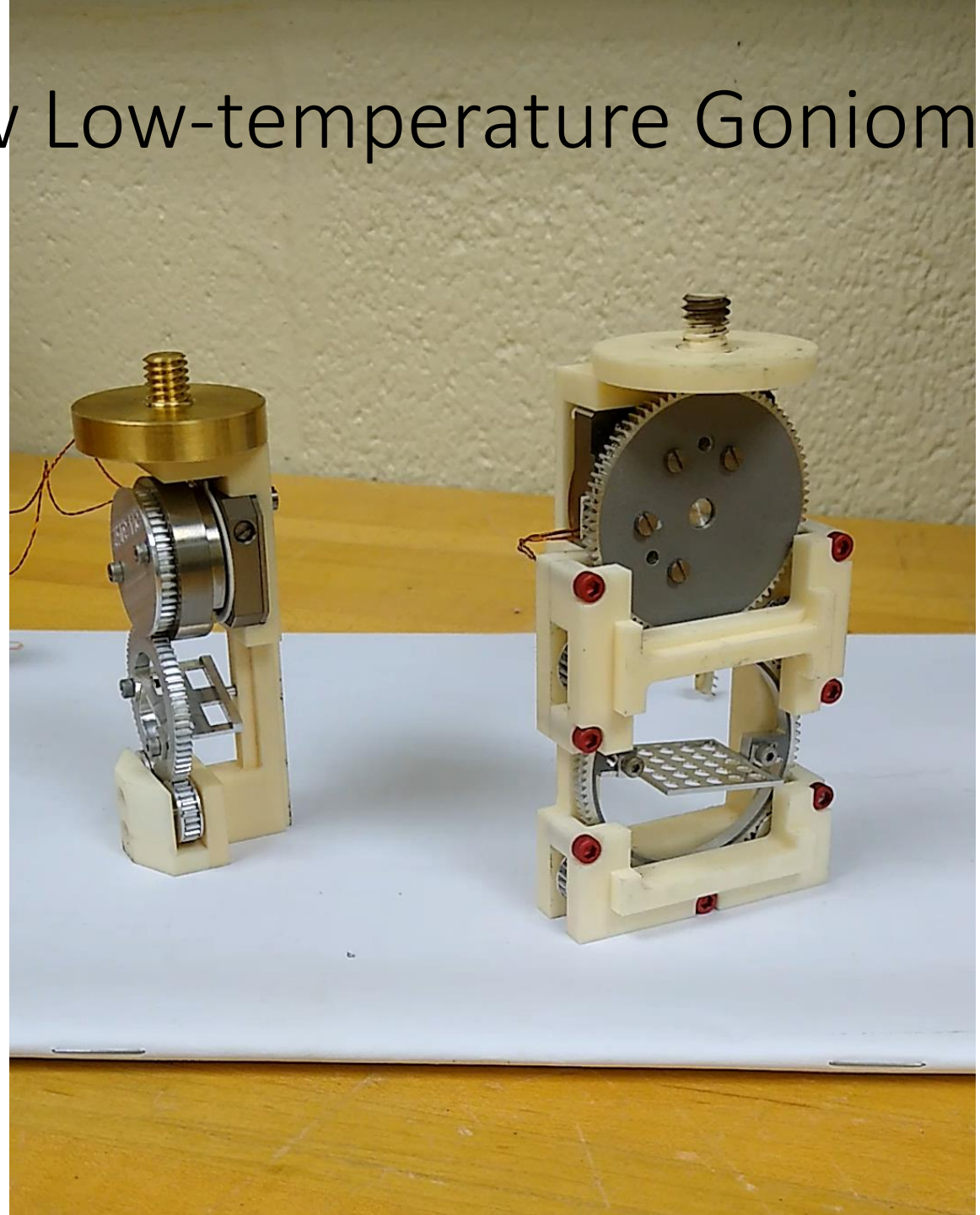
Piezo motor

Sample holder





New Low-temperature Goniometer



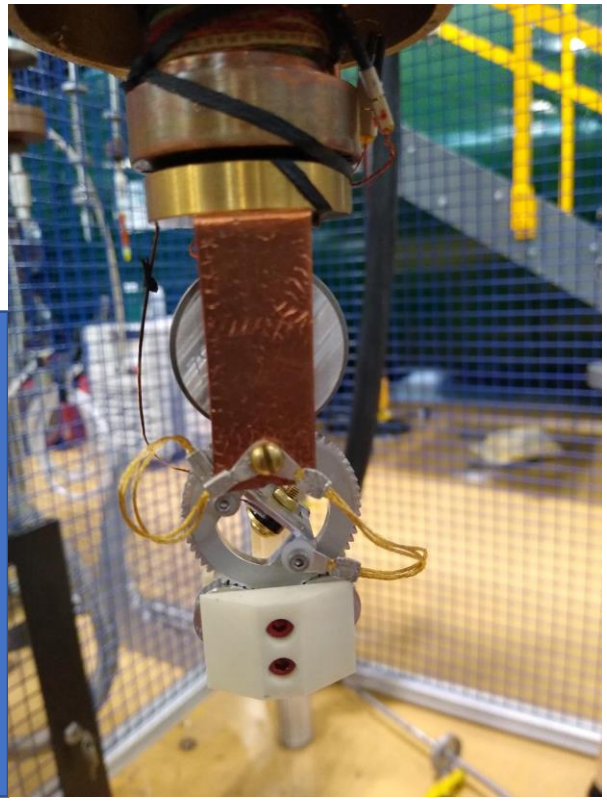
New Low-temperature Goniometer

TLCCR Setup

Pros
- Thermalization through exchange gas, so no mechanical thermal links limiting rotation;

Cons
- Lowest temperature 4K;
- Highest magnetic field 7T.

Dilution refrigerator/He3 Insert Setup



Pros
- Lowest temperature 50 mK;
- Highest magnetic field 10T.

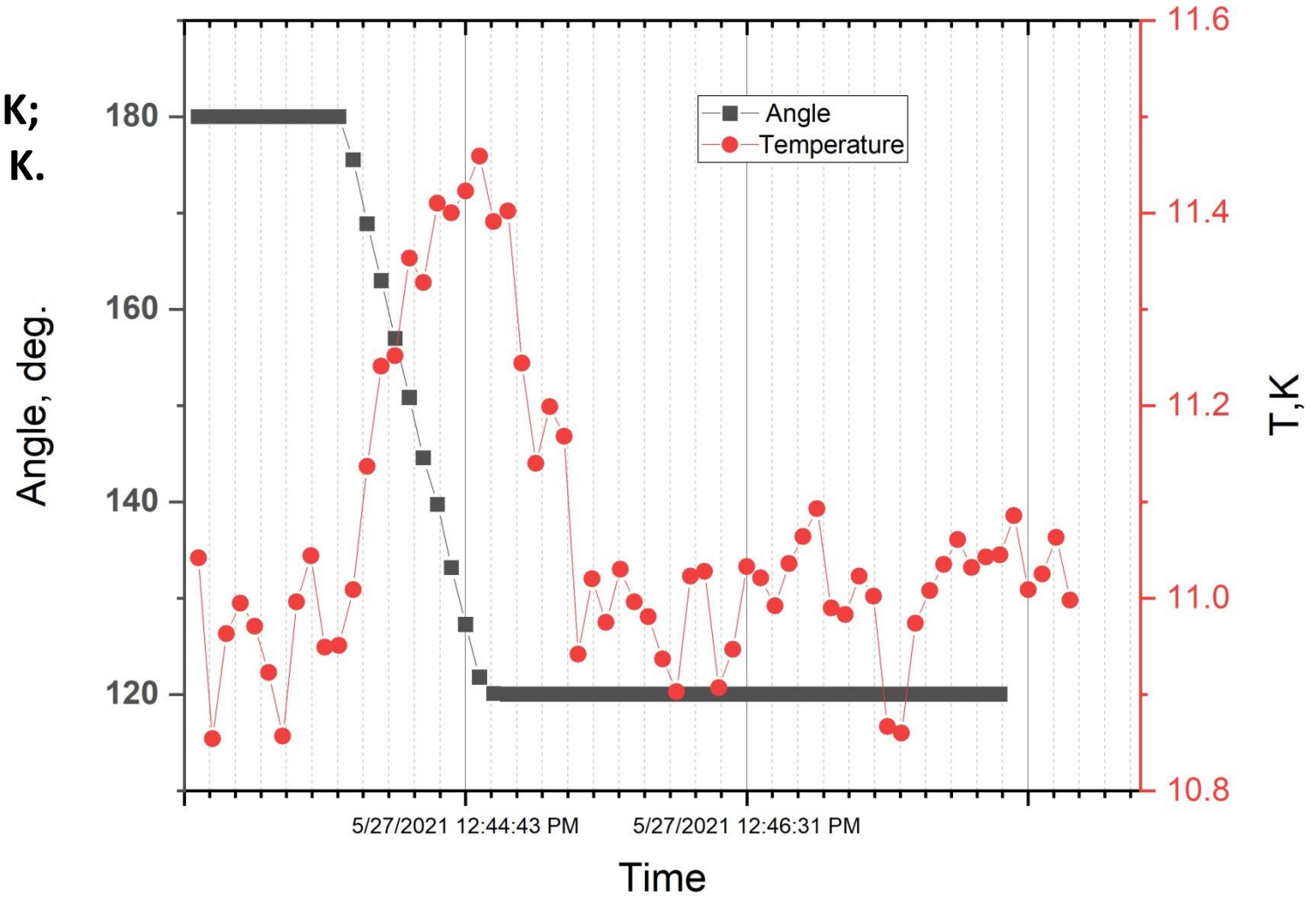
Cons
- Thermalization through mechanical thermal links limiting rotation;
- Mechanical thermal links increase it stiffness at low temperature; can obscure the beam path.

New Low-temperature Goniometer

Current experiment

- **Sample well temperature 10.8 K;**
- **Sample stick temperature 10.9 K.**

TLCCR Setup



New Low-temperature Goniometer

Pros.

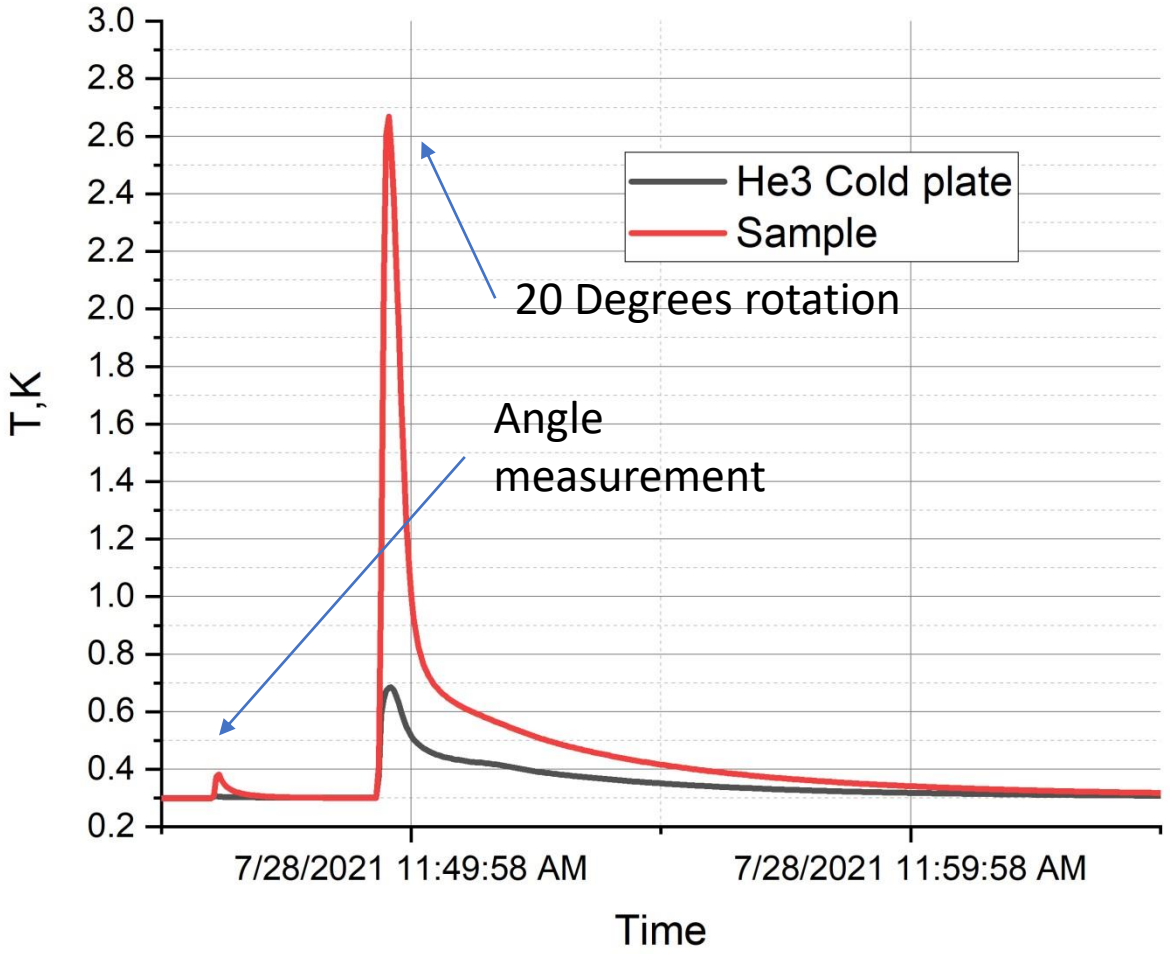
- Sample and Cold plate base temperatures are equal (T=0.3K).
- Heating up the sample during rotation and angle measurement are reasonable, doesn't require recondensation.
- Cooling back down to base temperature within minutes, not hours.(Reason: sample Holder thermally disconnected from motor)

Cons.

- Angle of rotation limited and depend on temperature:

  300K: Interval 120 deg-220 deg
  85K: Interval 125 deg -190 deg
  10K: Interval 143 deg – 165 deg

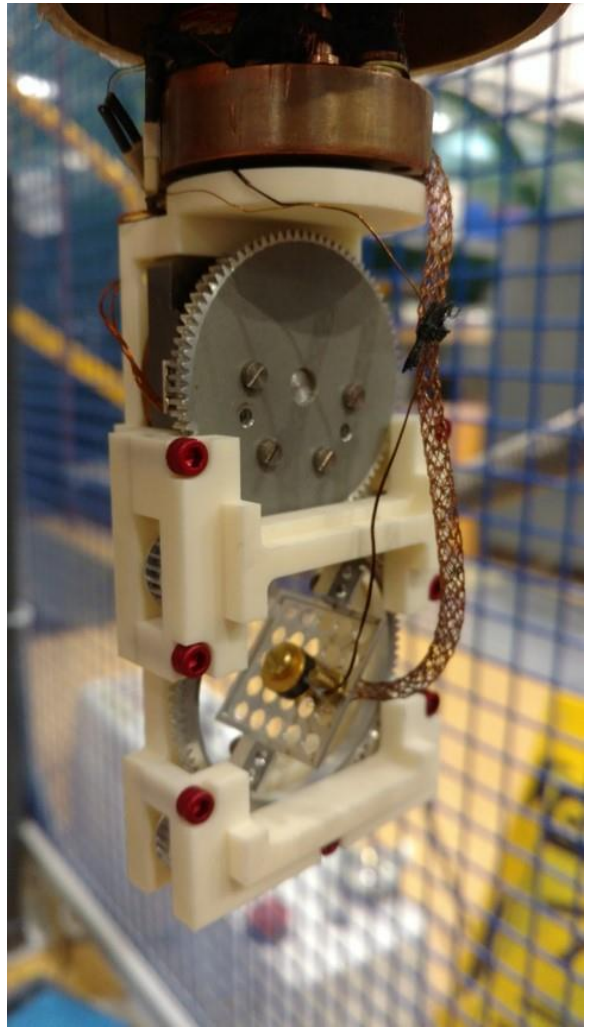
He3 Insert Setup



New Low-temperature Goniometer

Possible approaches to thermalize Goniometer sample holder at He3 insert/Dilution refrigerator

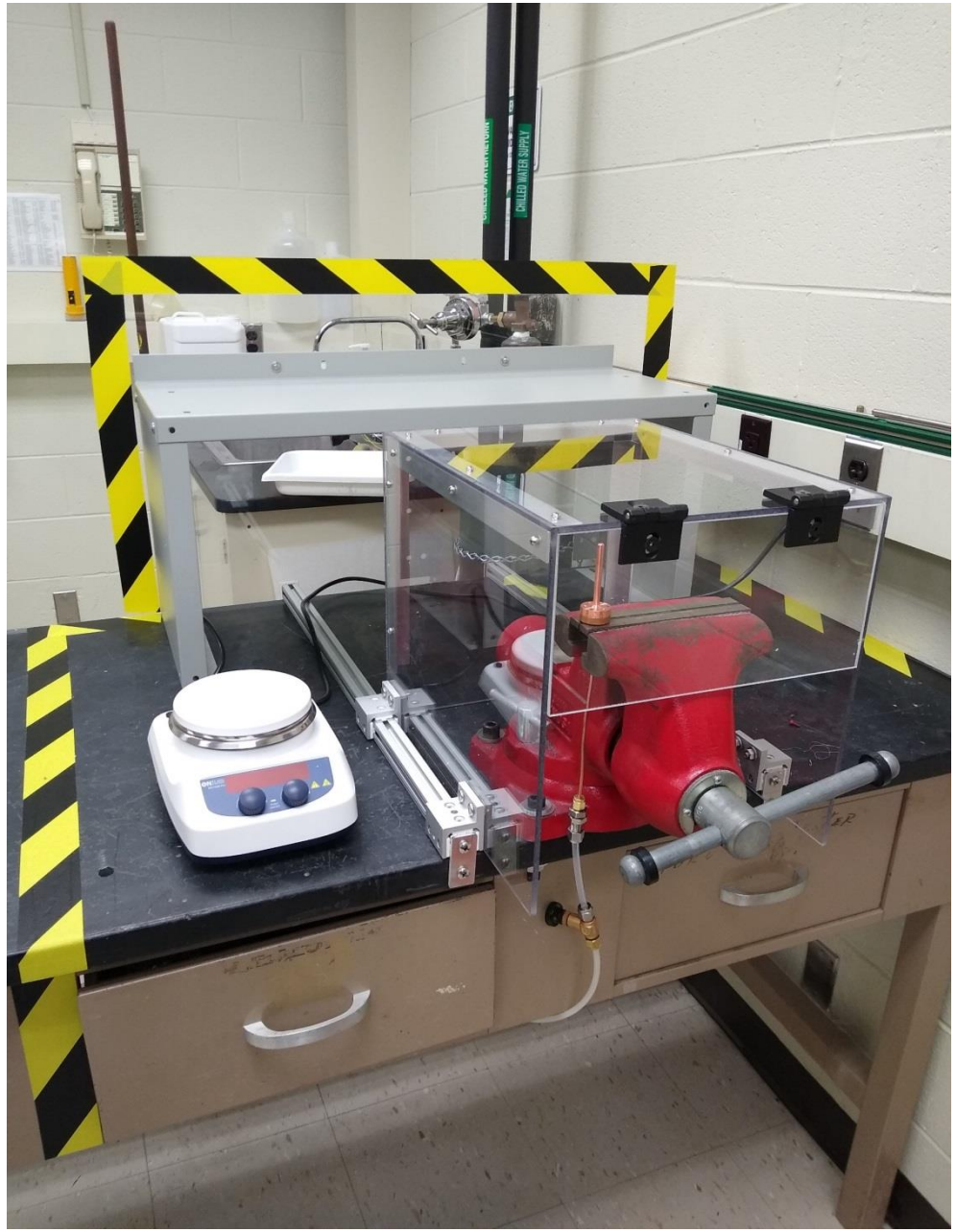
1.



2.

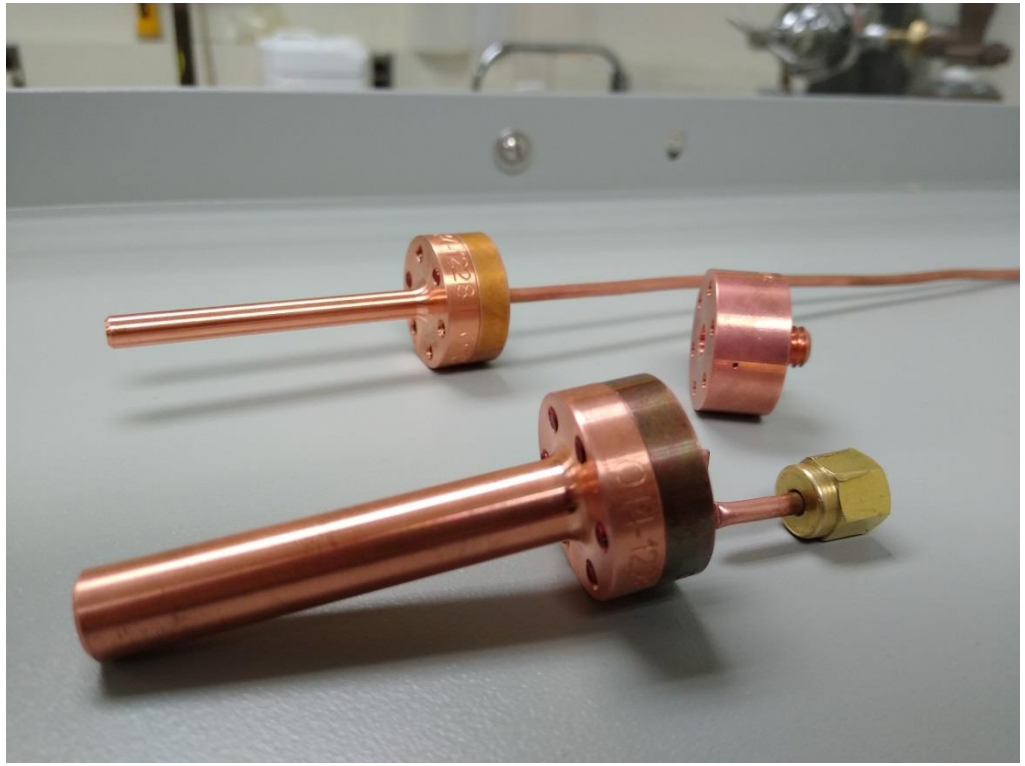
New Gas pressurizing station

- Make the whole sample pressurization process at the same location;
- Safety first! Hazard review submitted;
- Updated and modified equipment best fit to sample pressurization;
- Step by step pressurization manual prepared.



Gas pressurizing cells modification

Reliability!



140 pieces of new modified cells has been ordered and received.

Thanks to RFO team, and Colin Wrenn and Douglas Johnson especially!

11T Magnet update

- New main temperature controller (*better temperature control, 4 heater loops fit to our experimental needs)*;
- New circulation pump
- Adjusted He3-He4 mixture
- Baffle modification

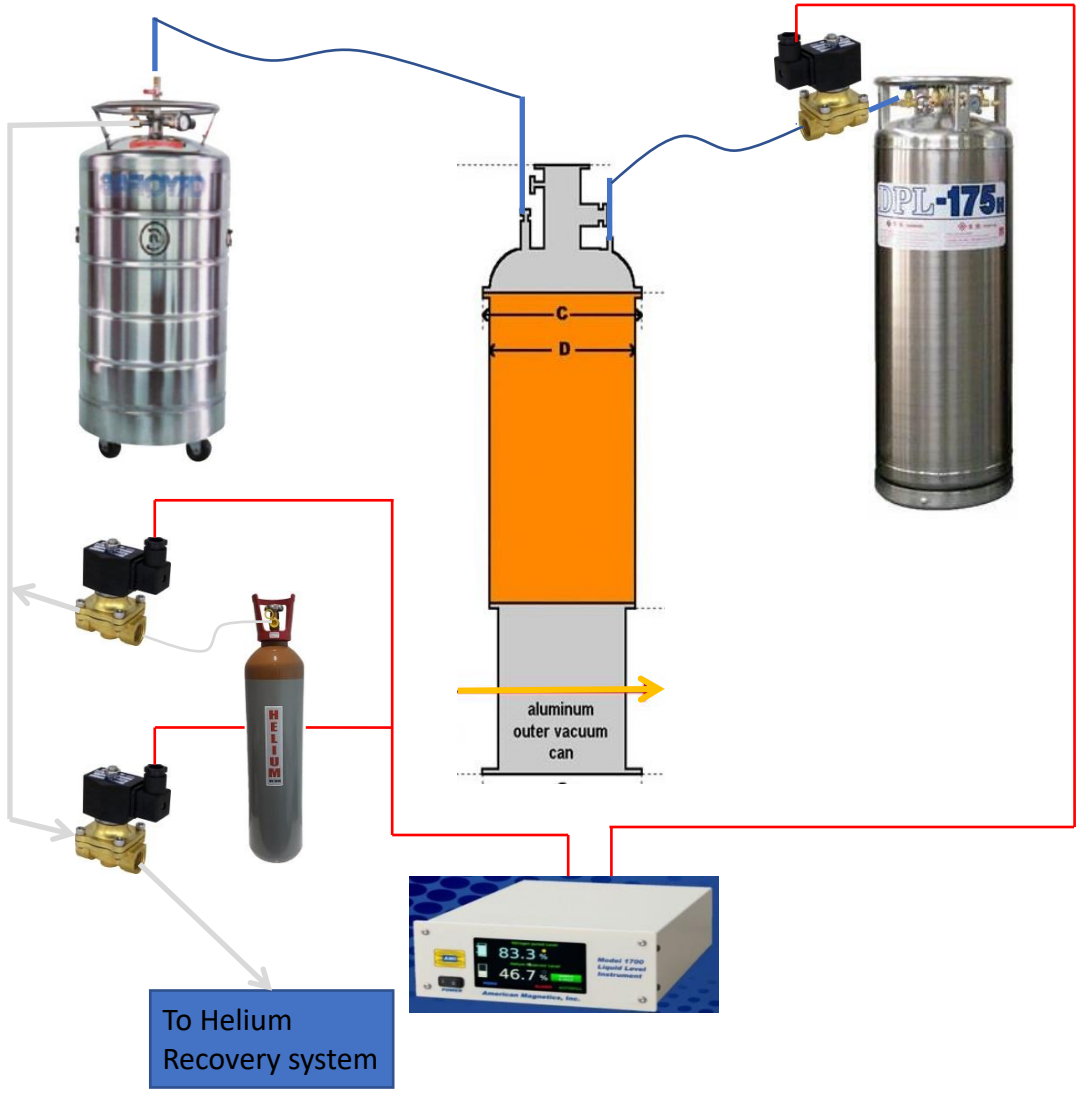
Mix. Chamber T = 47 mK; Sample T = 65 mK

Auto-refill of LHe and LN system (prototype)

- LN and LHe transfer controlled by Level Meter monitor Model 1700 (standard equipment for SE Wet Cryostats);
- System of solenoid valves and relays start and stop the transfer of cryogenic liquids into the Cryostat;
- To reduce evaporation of Liquid Helium during and between the transfers modified transfer line has been designed;
- Automatic and semi-automatic regime of transfer will be available.

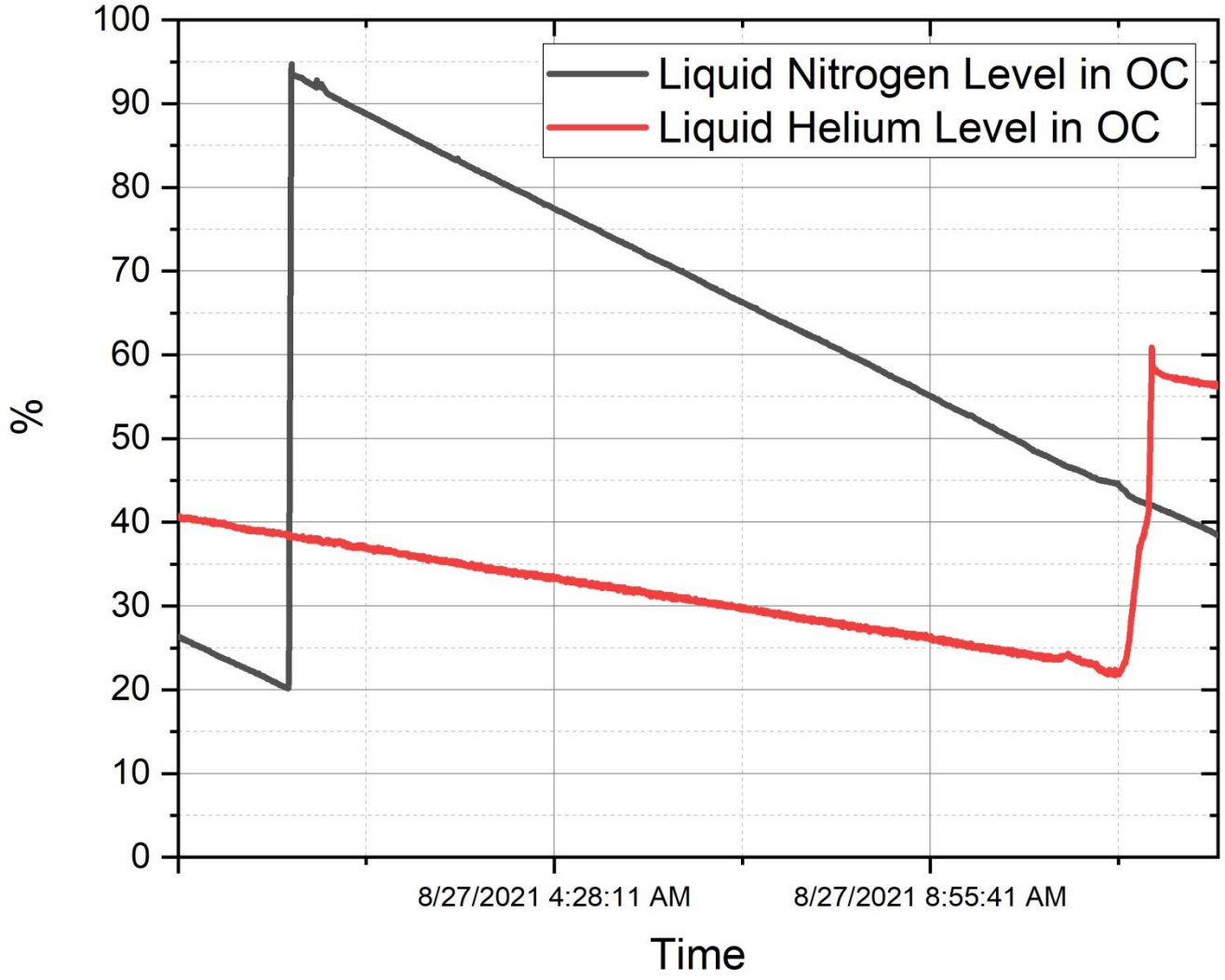
Auto-refill of LHe and LN system (prototype)

- LN and LHe transfer controlled by Level Meter monitor Model 1700 (standard equipment for SE Wet Cryostats);
- System of solenoid valves and relays start and stop the transfer of cryogenic liquids into the Cryostat;
- To reduce evaporation of Liquid Helium during and between the transfers modified transfer line has been designed;
- Automatic and semi-automatic regime of transfer will be available.



Thanks to Jeff Ziegler for help with design of electronic part of system!

Auto-refill of LHe and LN system (prototype)



Summary

- Preparation of user and technical manuals for SE equipment, including superconducting magnets, inserts, low temperature cryostats;
- Designing of lifting procedure for cryogenic equipment, carts, and their combination;
- Maintenance of cryogenic equipment, updating controlling hardware and software;
- Participation in procurement process for new equipment and systems;
- Active communication with facilities worldwide to find and implement new ideas to create and operate of Sample environment equipment for Neutron research.

Future projects

- Goniometer project: - Test different setups for low and ultralow temperature experiments;
  - Modify new and existing SE equipment for availability of use of Goniometer;
  - Discuss availability of additional data line for Neutron Instruments to communicate with LT Goniometer in experiment;
  - Continue working on Patent application;
- Auto – refill of LHe and LN project: - Continue working on safe and reliable usage of Auto-refill system;
  - Design operational protocol, detailed manual, prepare hazard review;
  -Discuss requirements from each Instrument for safe and un-problematic implementation of Auto-refill system.
- Test the communication between Neutron Instruments and SE equipment.