IMP novel cavity technology development for industrial application

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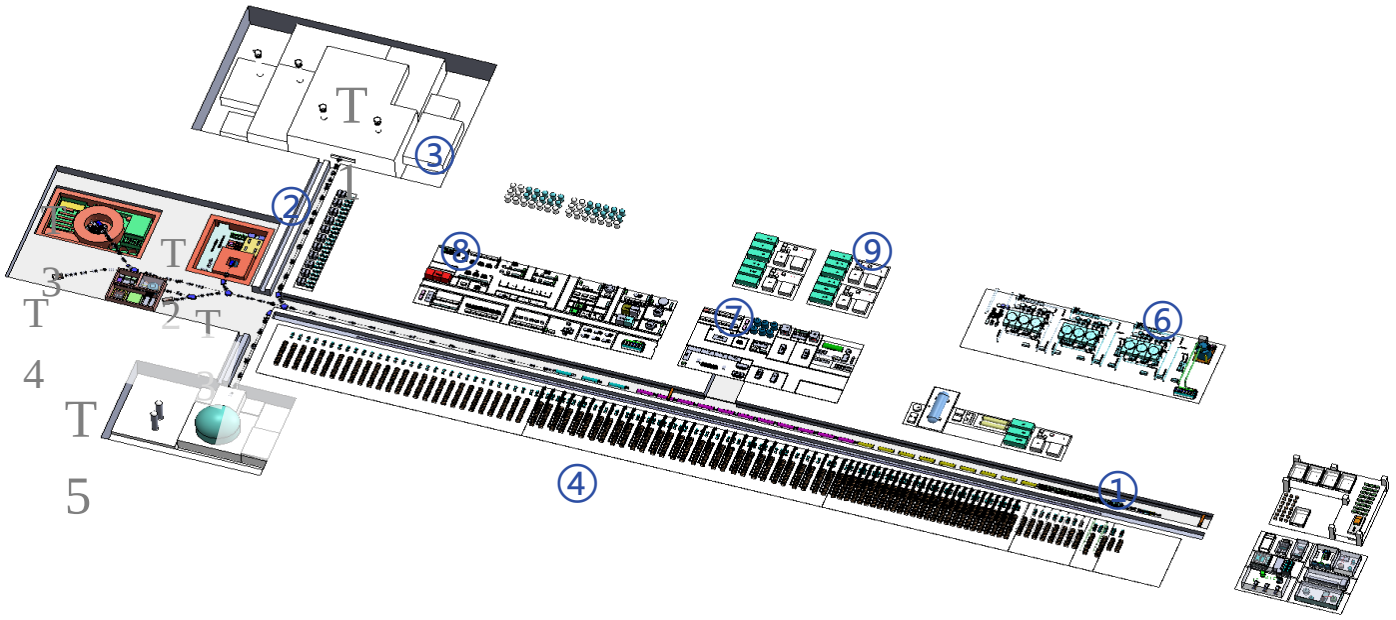
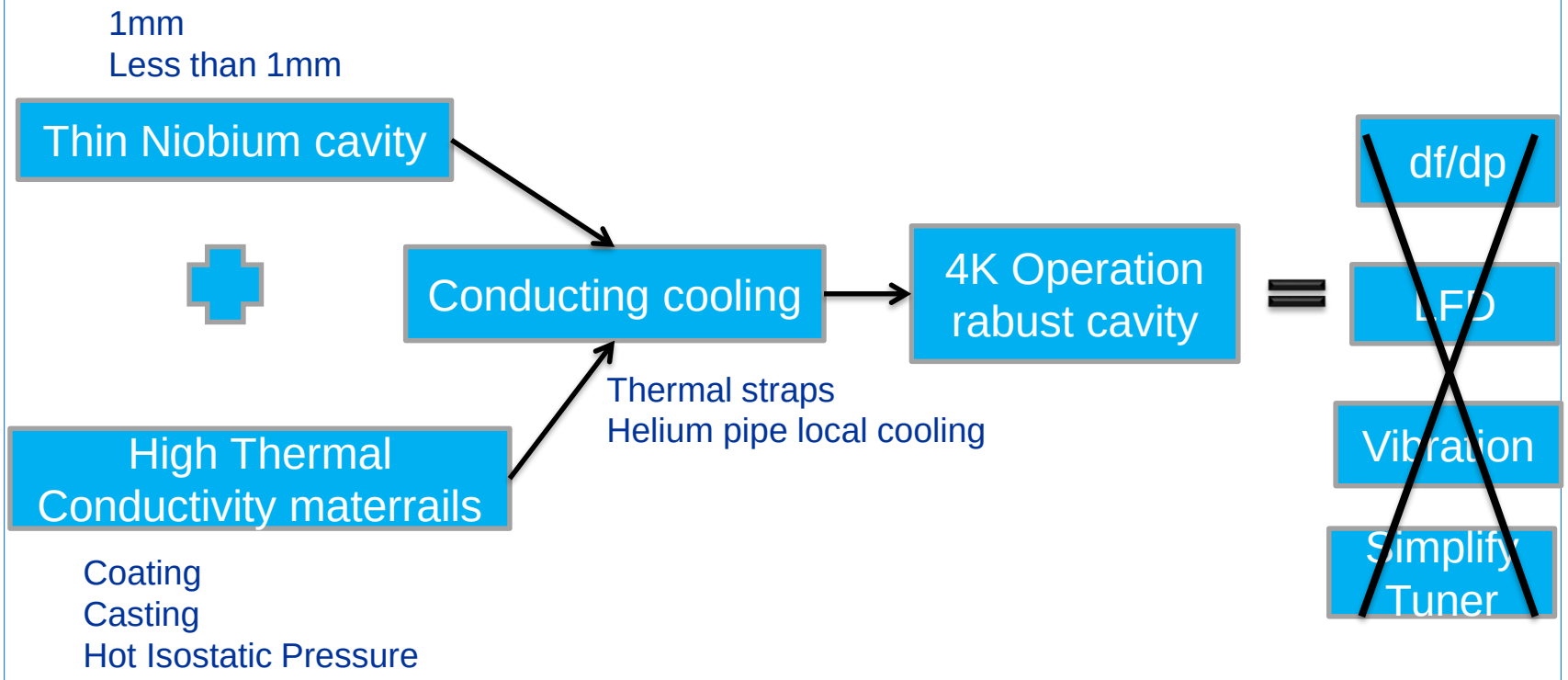
1. Introduction

- **SRF Cavity Requirements for Industrial application**
  - CiADS(153 Cavity)
  - Medical Isotope Production(60 Cavity×2)
  - University researching small facility(a few cavity).....
    - High stability
    - Affording constructing cost
    - High performance



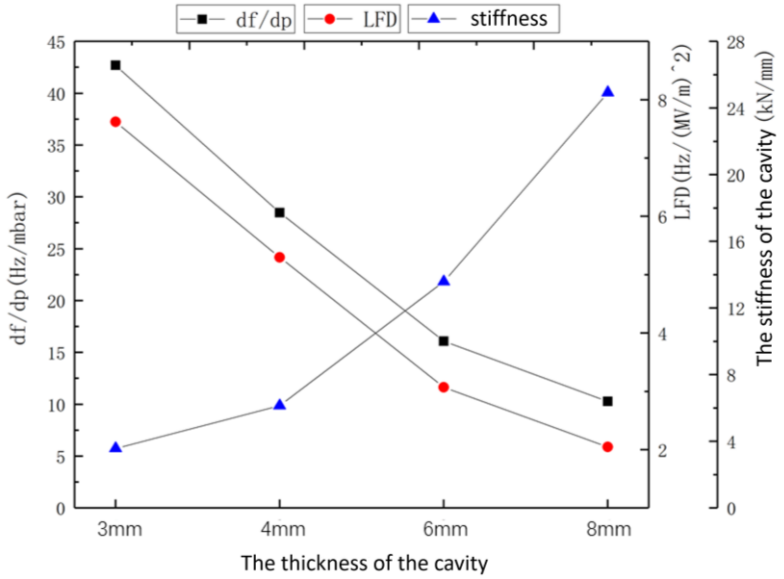
1. Our Pathforward

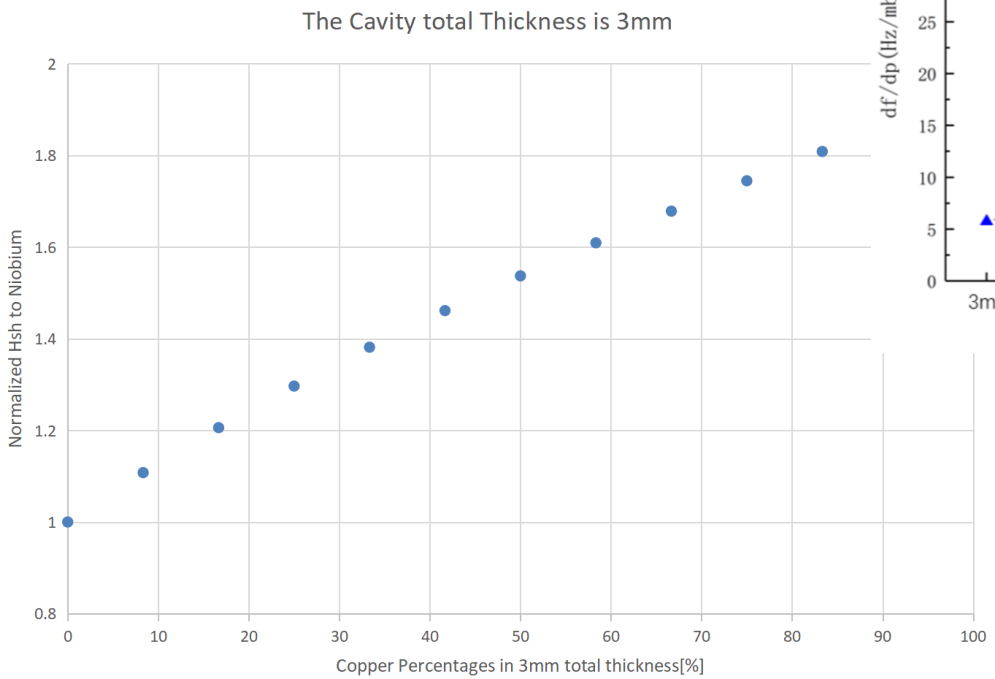
- **A system integration of new technology**
  - Thin niobium cavity fabrication
  - Bonding high thermal conductivity materials to niobium
  - Conducting cooling at 4K



2. Niobium Copper Cavity

- **Higher thermal stability**
  - Nb thermal conductivity 0.25RRR=75 W/(m.k)
  - Cu thermal conductivity 400 W/(m.k) even more
- **Low cost of niobium(3mm to 1mm)**
- **High Mechinical stability**



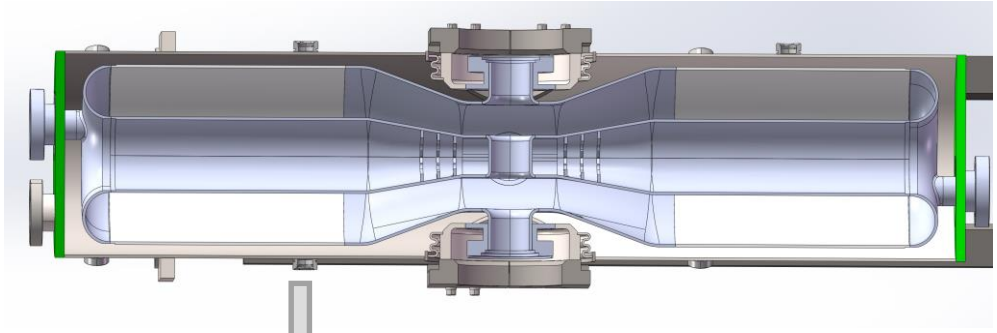


2.1 Thin cavity development

- 1mm thickness 1.3 GHz cavity are develeoped
- Three cavity fabrication vendors are involved
- Completed Two single cell cavities

2.2 Nb-Cu HWR Cavity Design

- **Aimed to improve the stability of low beta cavity**
  - Local area helium cooling
  - Rest area use conducting cooling



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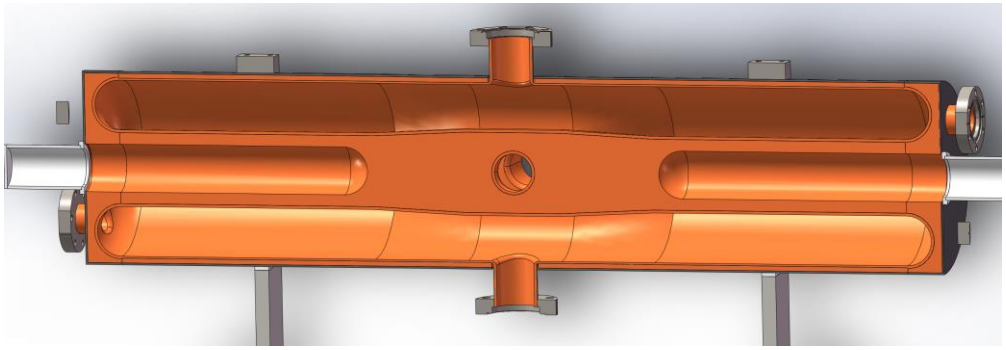
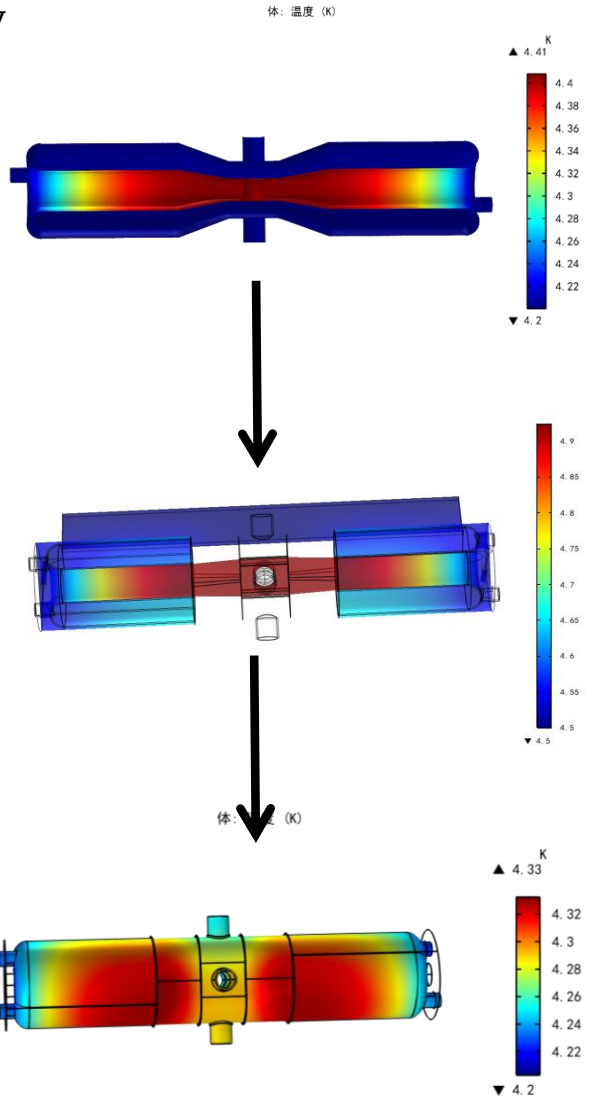
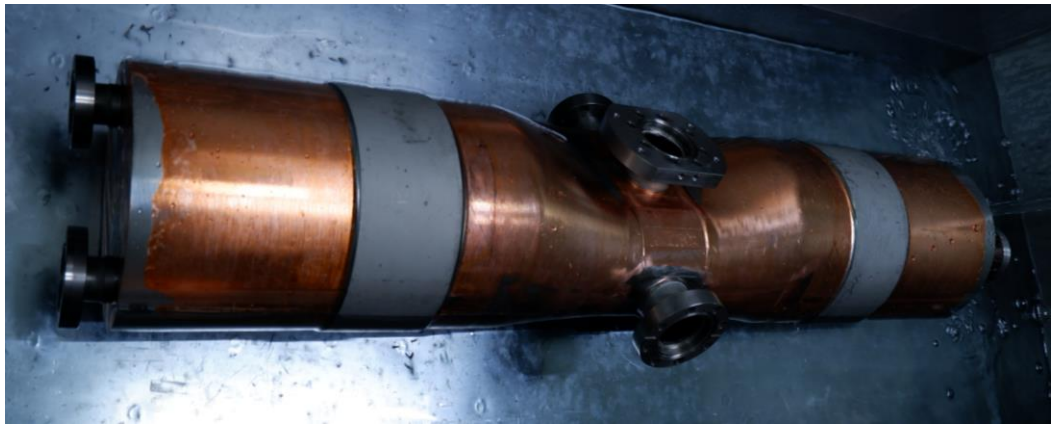
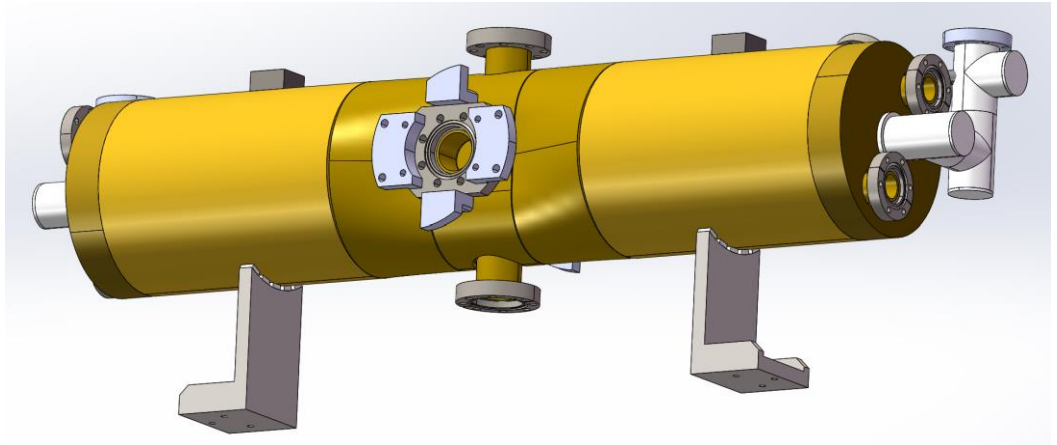


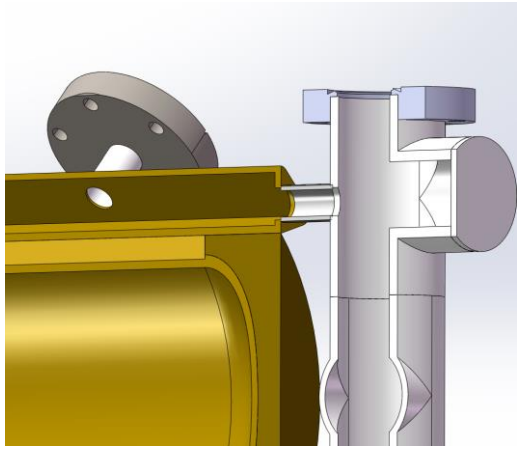


2.2 Cavity Fabrication

- 2mm Niobium Cavity+4~5mm Casting Copper
- 200μm BCP +600 0C 10 hours + light BCP +HPR

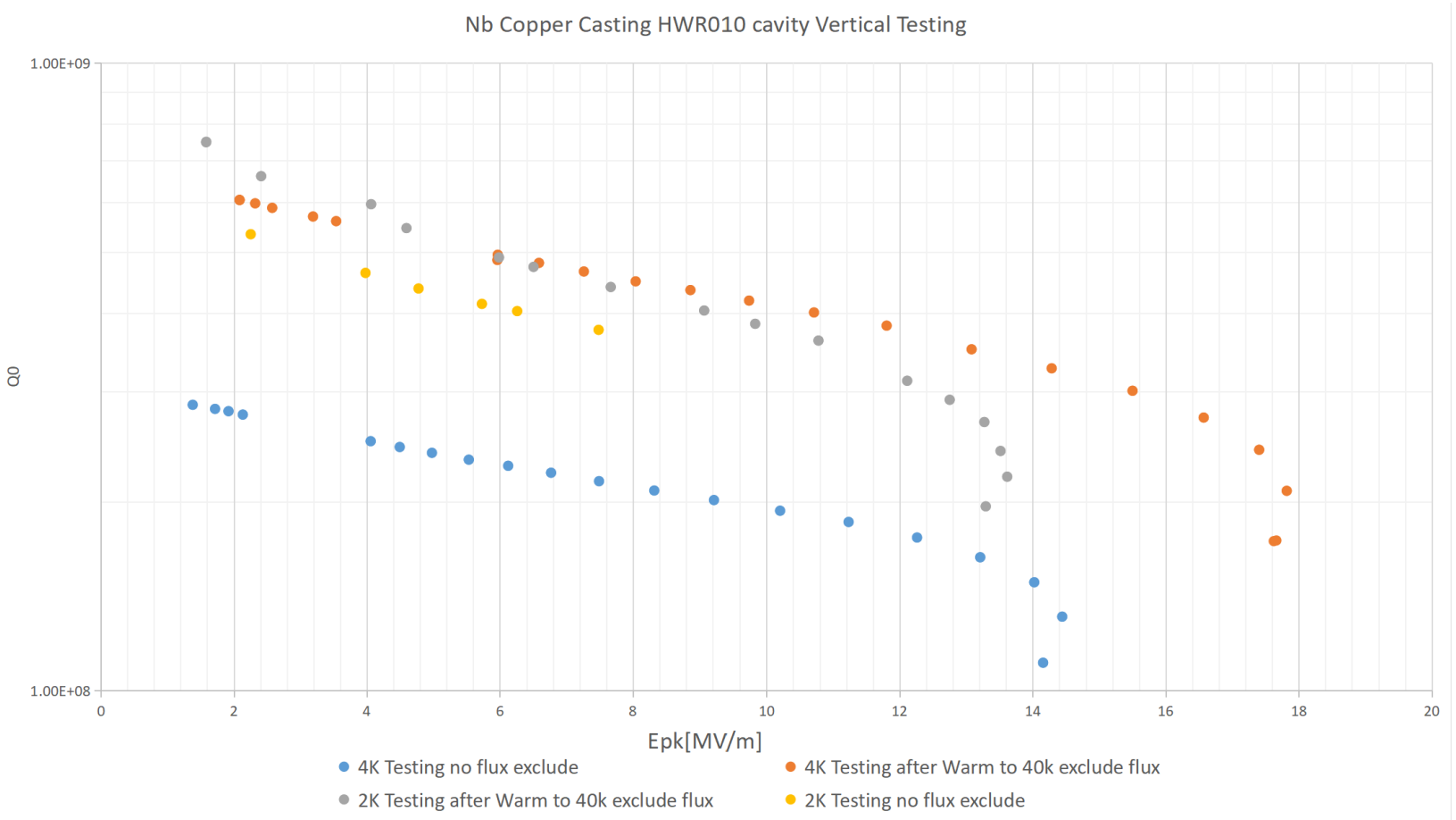






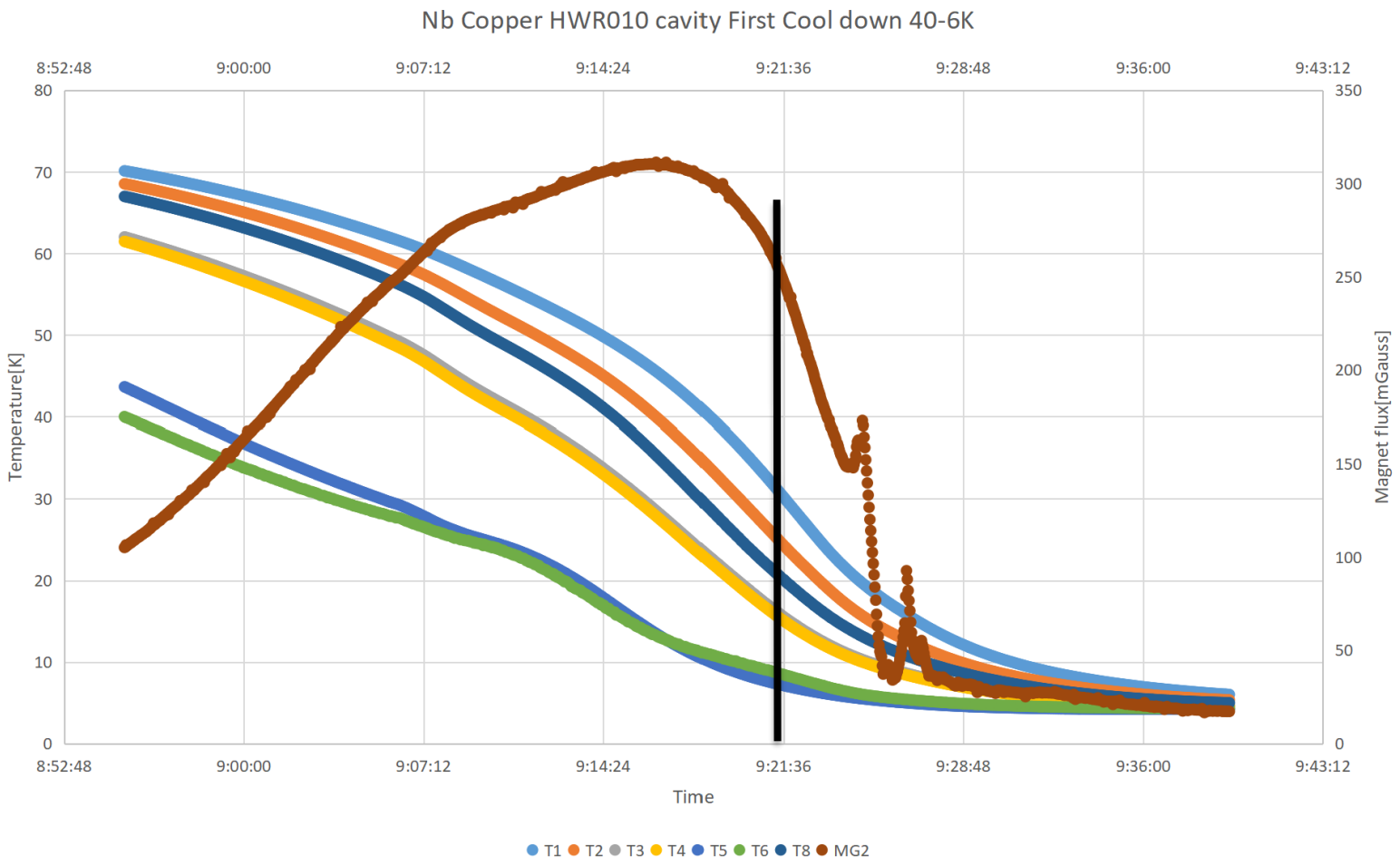
2.3 Vertical Testing Results

- **Firt vertical testing shows the cavity performance limited by the trapping flux and hydrogen Q disease**



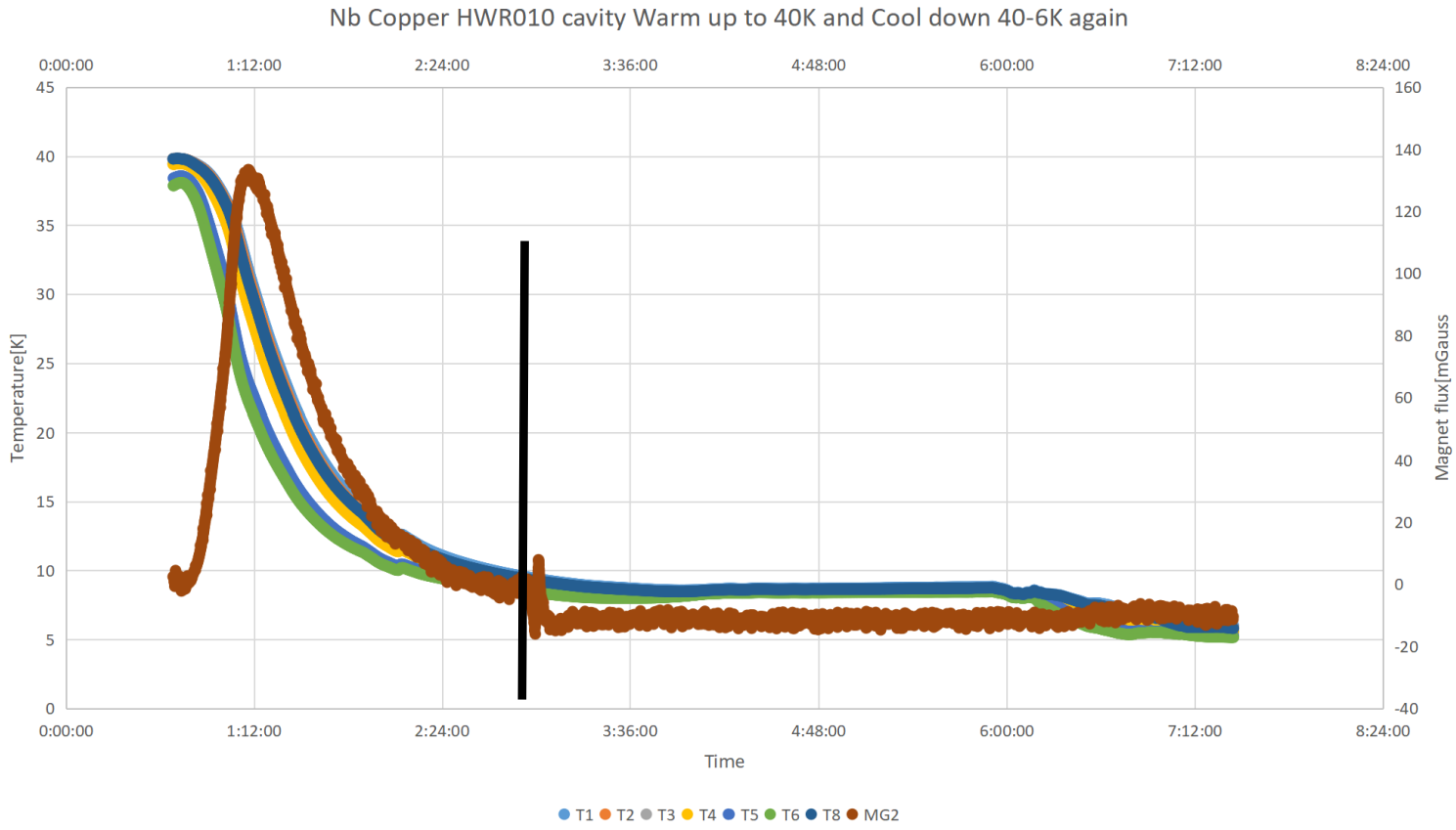
2.3 Thermo-electromotive flux trapping

- Corfirmed part of resitance come from trapping flux
- First round cool down absorbed 250 mGauss Flux



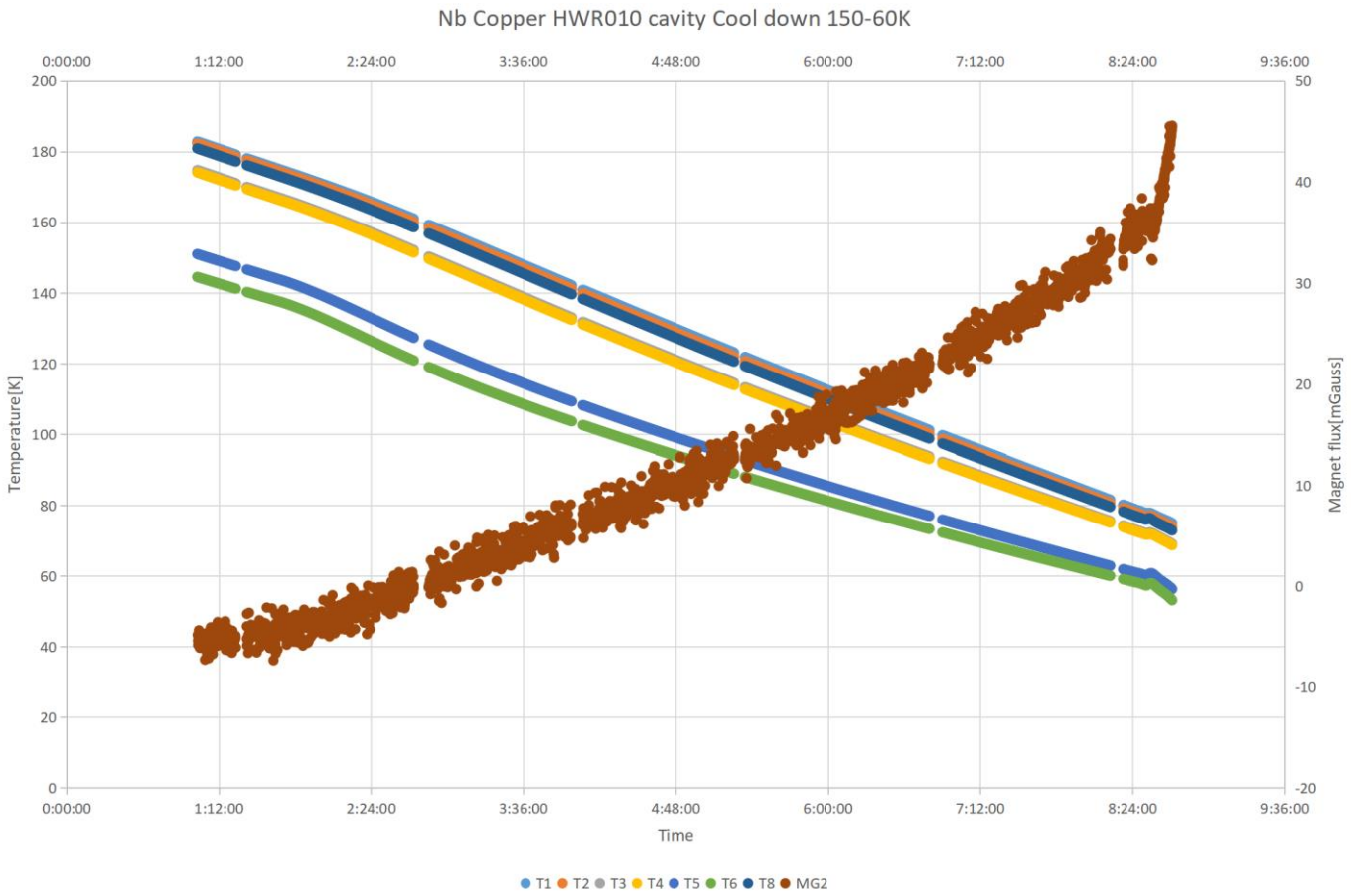
2.3 Thermo-electromotive flux trapping

- **Warm up to 40K and re cool down absorbed 14mGauss Flux**
- **Low beta cavity sensitivity is 1.1nΩ/10mGauss**
- **Additional resistance is 28nΩ in first cool down, consisting with the Q0 testing, which shows 42nΩ difference.**



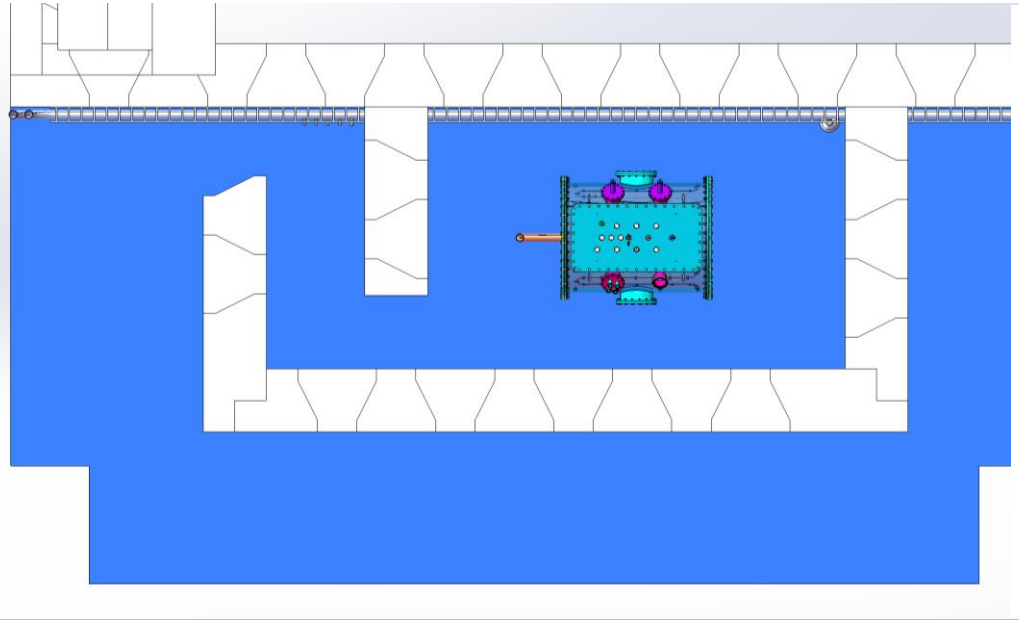
2.3 Hydrogen Q disease?

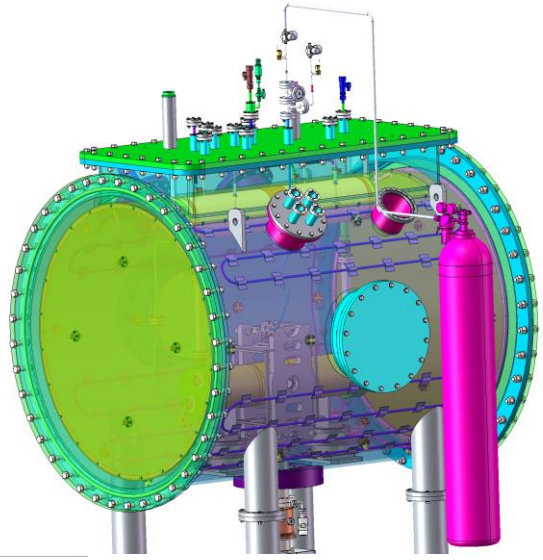
- 150K-75K slowing cool down possible low down Q0
- 1K/min cool down are not achieved, stay 8hours in the dange area
- Another round testing is prepareed



2.4 Horizontal Testing Prepare

- Validating the conducting cooling method
- Validating the integration perforemance, cavity, tuner and coupler





3. Conclusions and Future plans

- The technolegy of producting thin cavity (near 1mm) have been ready
- Bonding high thermal conductivity copper to niobium cavity have been developed
- The surface preparation for casting copper to niobium cavity will be investigated
- 1mm thick 1.3GHz cavity will be tested soon
- The horizontal testing facility will be ready soon

Thanks for your attentions!