

# Development and Commissioning of 1KW @ 4.5K Cryogenic System for Superconducting Test Facility of CRAFT

S.S. Li, Q.Y. Zhang, Z.G. Zhu, D.K.Ma, K.P. Wu, X.F. Lu A.Y. Chen

Institute of Plasma Physics, Hefei Institutes of Physical Science, Chinese Academy of Sciences,  
P.O.Box 1126, Shushanhu Road 350, Hefei, Anhui 230031, China, Email: lss@ipp.ac.cn

**ICEC/ICMC**

29th International Cryogenic Engineering Conference  
International Cryogenic Materials Conference 2024  
July 22-26, 2024, Geneva, Switzerland

**ID:#150**

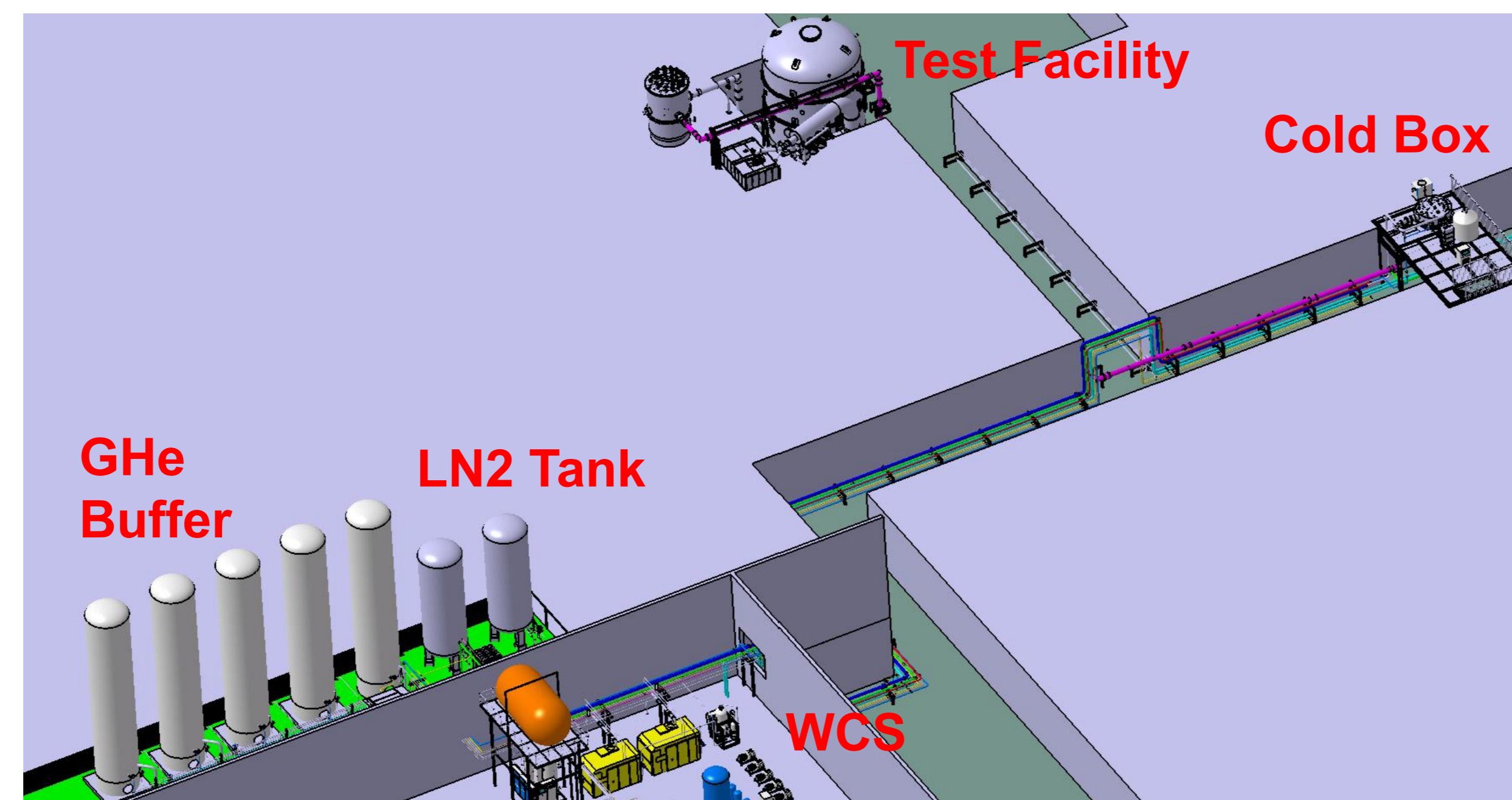


## Introduction

As national major science and technology infrastructure, Comprehensive Research Facility for Fusion Technology (CRAFT) is being built by ASIPP. Cryogenic system is an important part of the research for superconducting magnets. ASIPP designed and developed a 1KW@4.5K helium cryogenic system to meet some cryogenic testing.



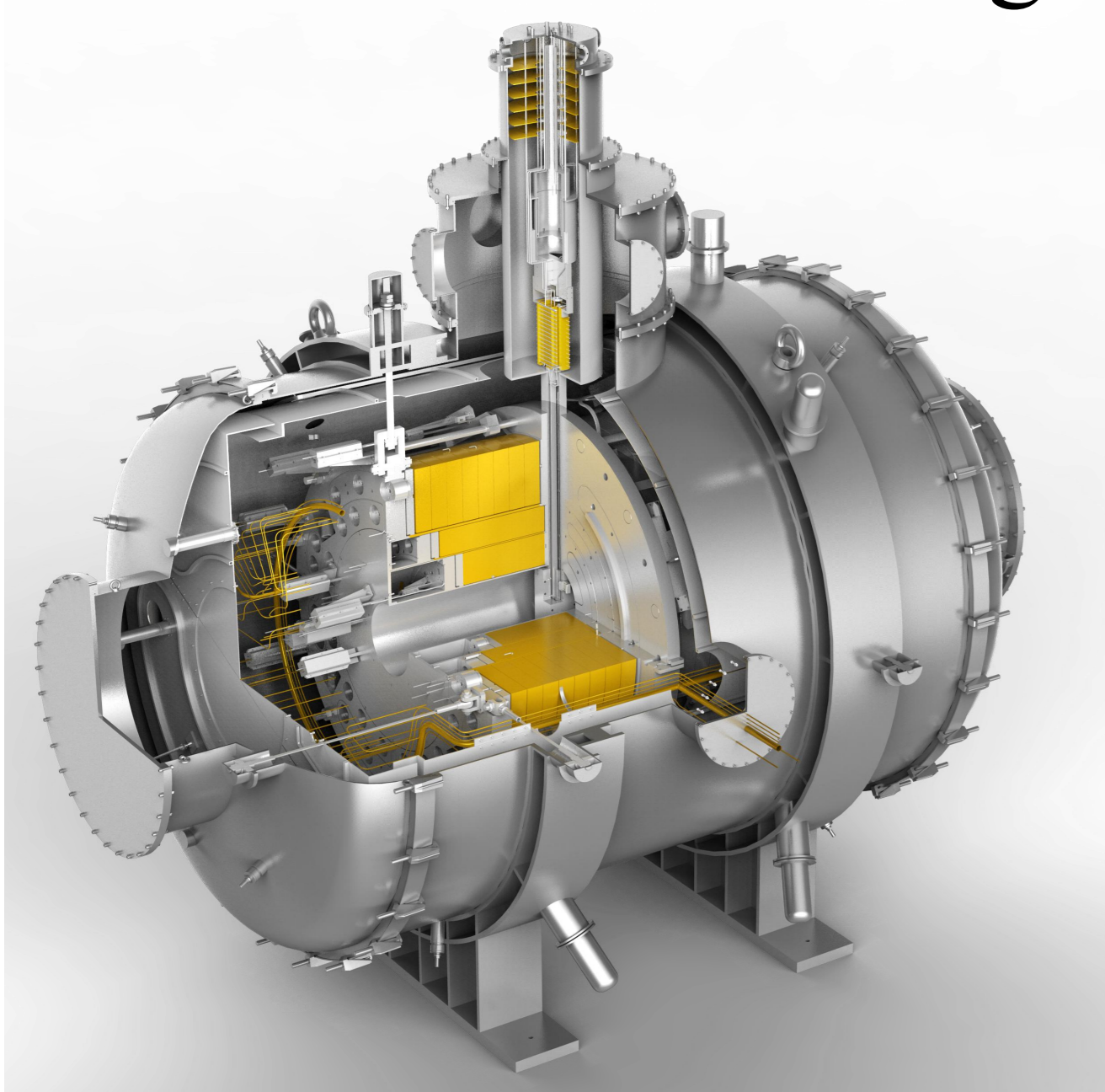
CRAFT in Hefei, Anhui



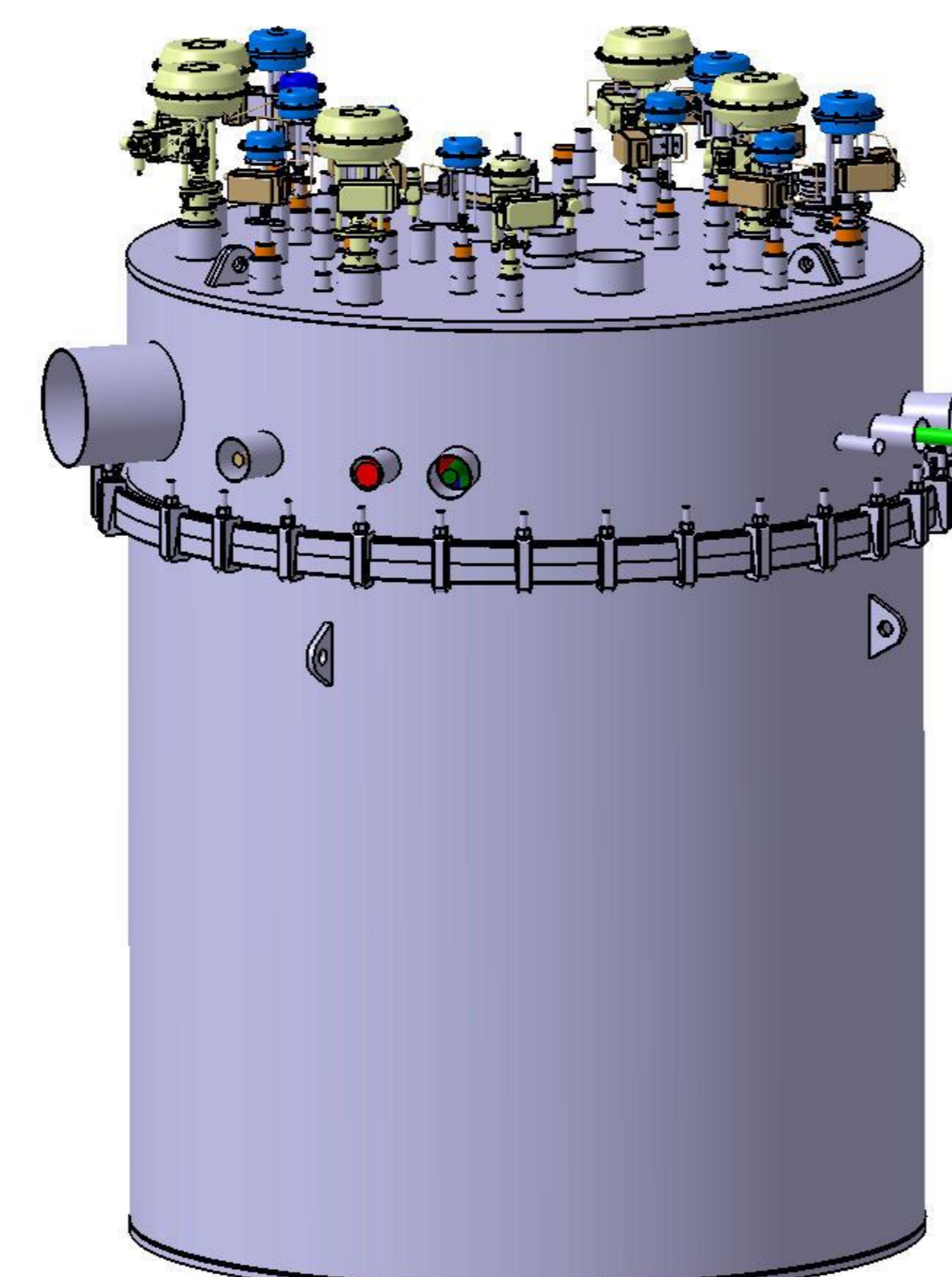
Layout of 1KW Cryogenic System

## Cryogenic System Requirements

The helium cryogenic system with a capacity of 1000 W is used for all the operational modes of CSMC and SC. Each facility has a corresponding distribution system and does not operate at the same time. The helium system can provide a cooling capacity more than 1KW, and reserve 3.8K cooling mode.



CRAFT SC  
Superconductor Performance Testing Facility

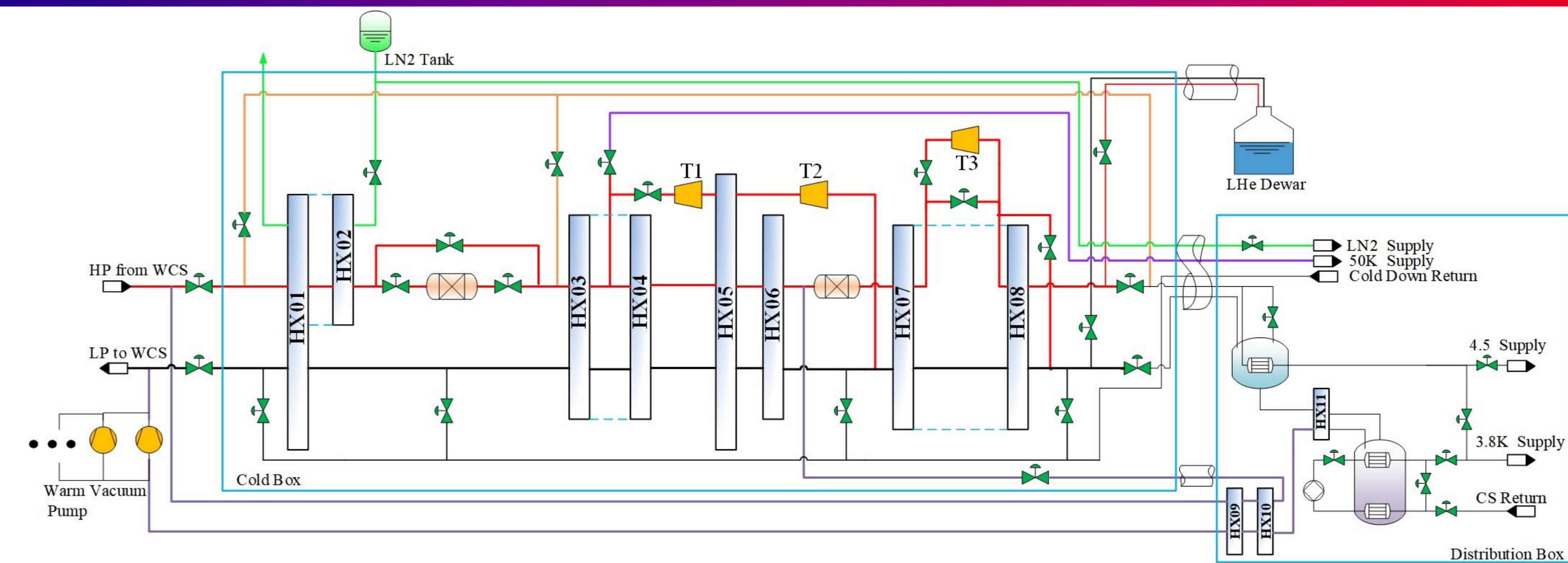


Cold Box  
Design and Development by ASIPP



CSMC  
Central Solenoid Model Coil Testing Facility

## Process Flow of Refrigerator



- LN2 is consumed for pre-cooling;
- 3 turbines to produce refrigeration power at 4.5K
- Providing test condition of 3.8K subcooler by warm vacuum pumps ;

## Cryoplant Integration

Gas He Storage



LN2 Storage

Compressor



Helium Purifier

- Helium gas storage: 2000Nm<sup>3</sup>\*4
- LN2 storage: V=50m<sup>3</sup>\*2
- Dewar: 2000L
- Purifier: 200Nm<sup>3</sup>/h

ASIPP has completed the integration of all equipments. The auxiliary system can also be used for other cryogenic systems.

Cold Box 4.5K



Dewar

## Commissioning

The cryoplant was successfully commissioned for the first time. Acceptance testing of the 1KW @ 4.5K cryogenic system was completed in May, 2023.

