

STFでの冷凍システム

WG 2

KEK K. Hosoyama

Cryogenic System for STF

Helium Liquefier / Refrigerator for STF

2 K Refrigeration System for STF

Construction Schedule

Collaboration with Industry

Summary

LC加速器開発に関するレビュー
July 28, 2005

Cryogenic System for KEK STF

- Construction of a cryogenic system for KEK STF
 - 1) Helium refrigeration system (TCF 200)
280 L / hr or 600 W at 4.4K
 - 2) 2K refrigeration system for ILC SRF
for Horizontal Test Cryo-module
 - 3) R&D base for 2K cryogenic system
Heat exchanger
High performance distribution system

KEK STF Cryogenic System



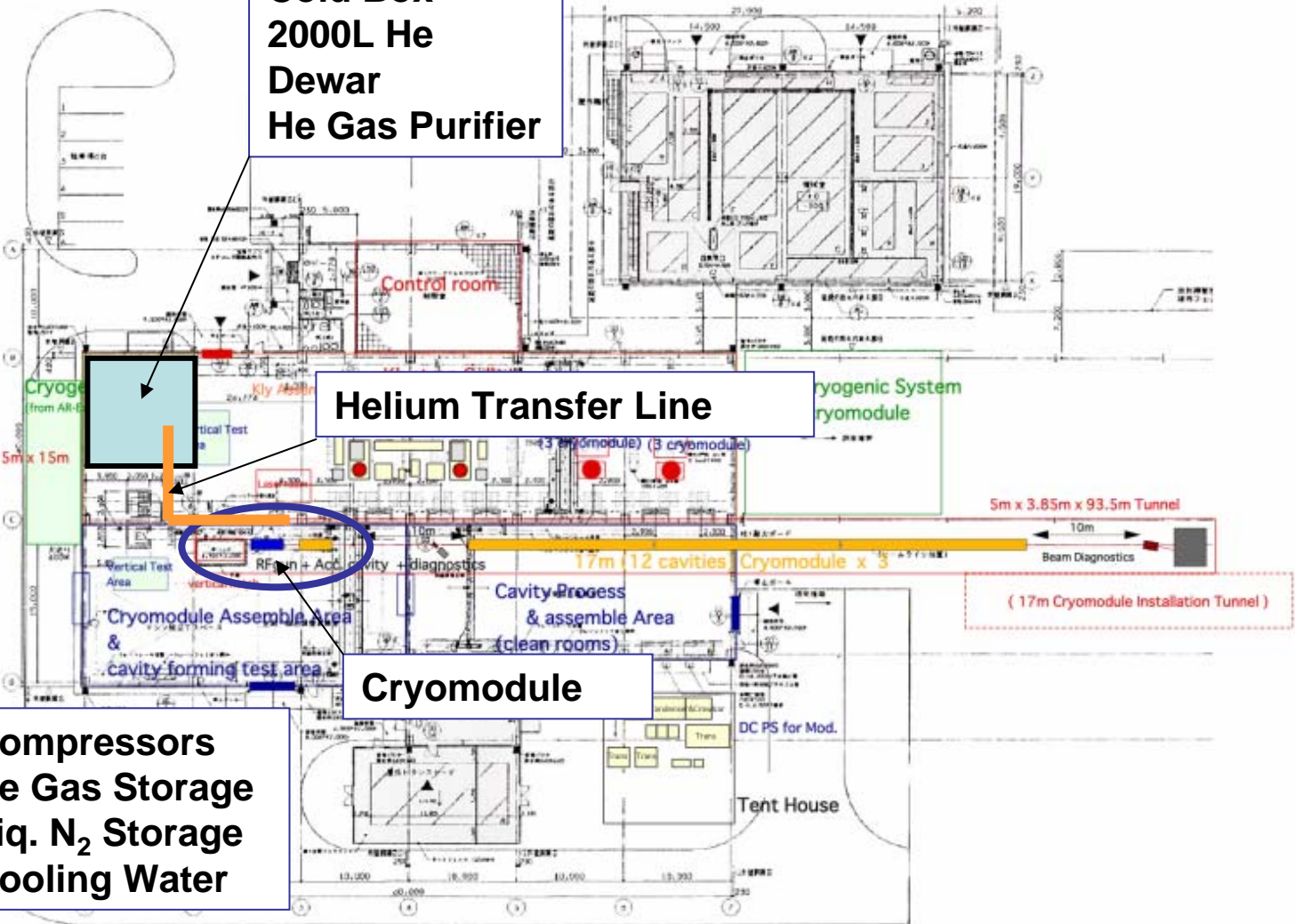
Scale (m)

Cold Box
2000L He
Dewar
He Gas Purifier

Helium Transfer Line

Cryomodule

Compressors
He Gas Storage
Liq. N₂ Storage
Cooling Water



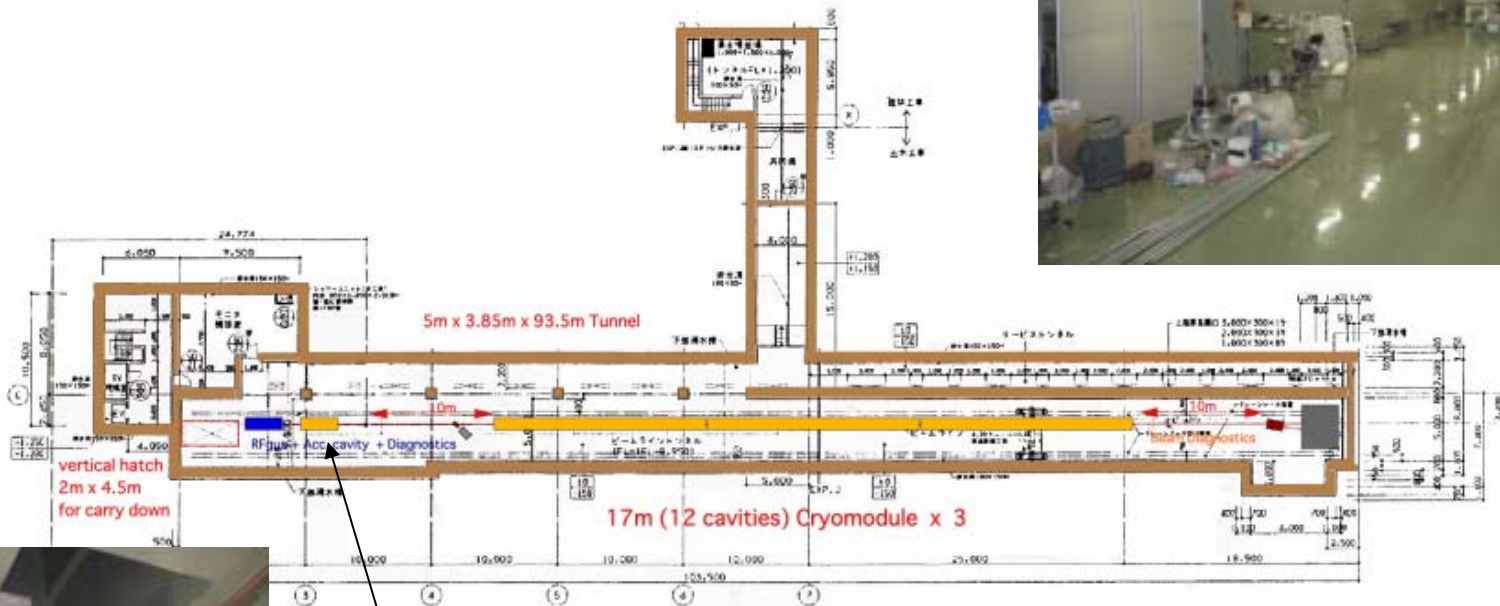
Plan of Superconducting Cavity Test Facility

V2.0 Hitoshi Hayano, 10/06/2004

Cryo-module in STF Tunnel

Plan of Superconducting Cavity Test Facility

Beam Line in the tunnel



Cryomodule
4 x 9-cell cavities

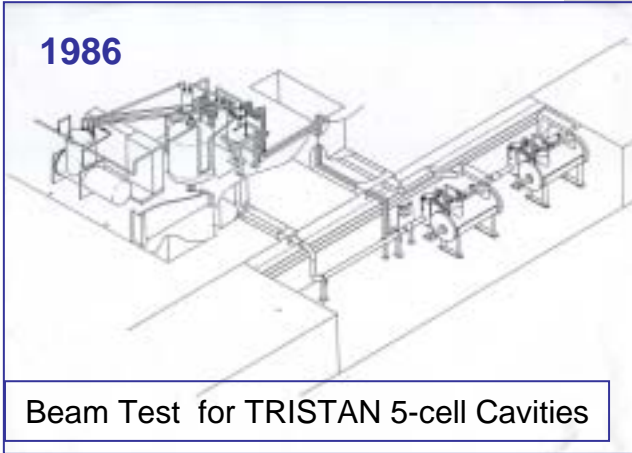


Move Helium ref. system from AR

AR East Building

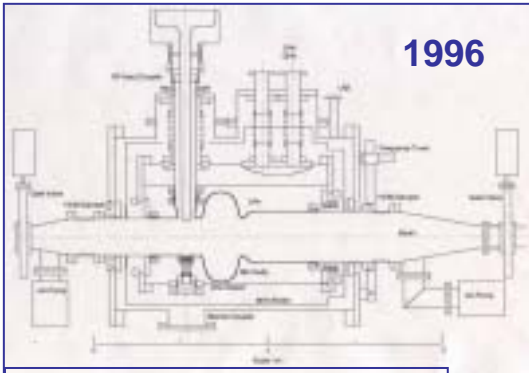
Liquefier / Refrigerator
TCF 200
280 L / hr
600 W at 4.4 K

1986

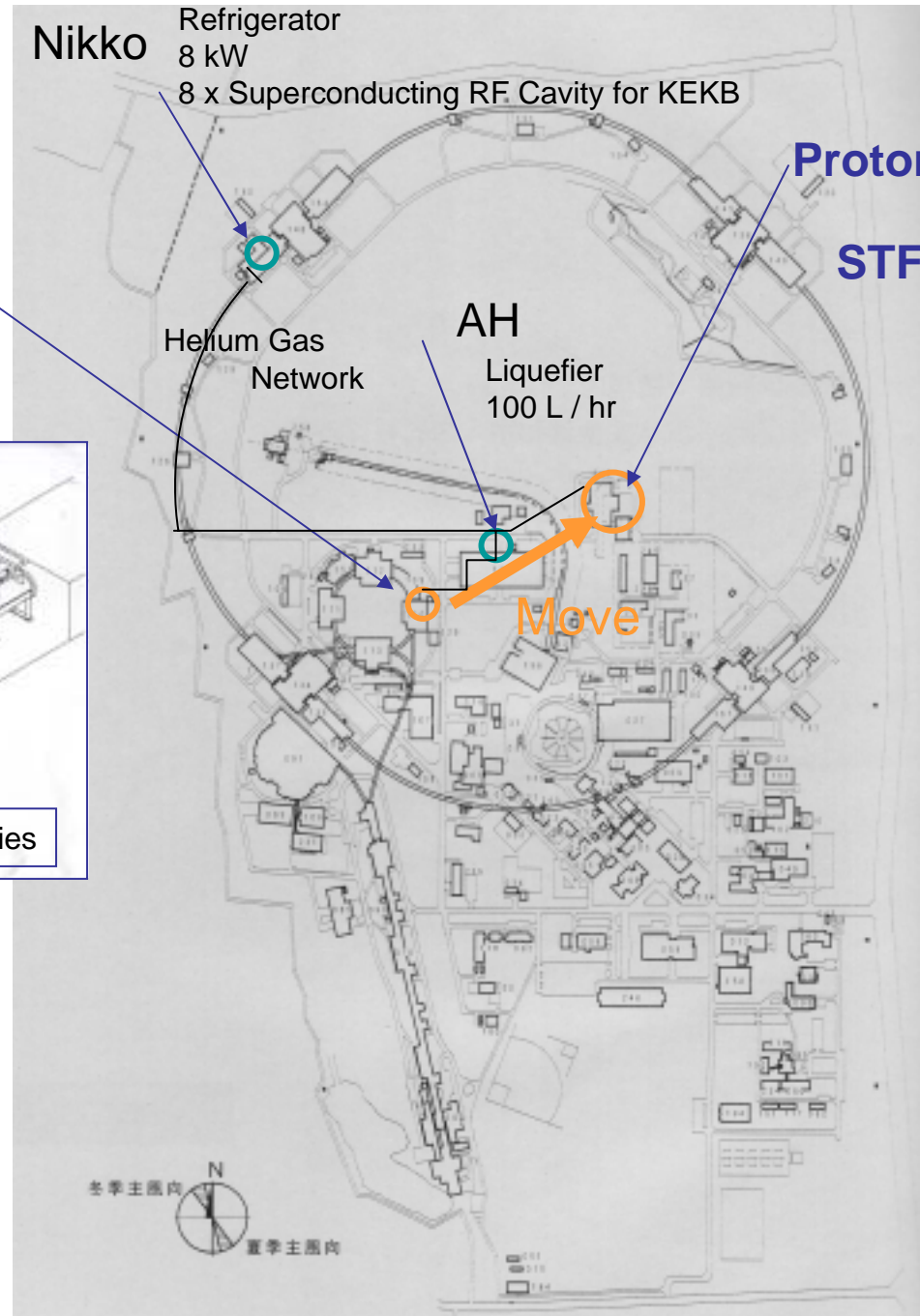


Beam Test for TRISTAN 5-cell Cavities

1996



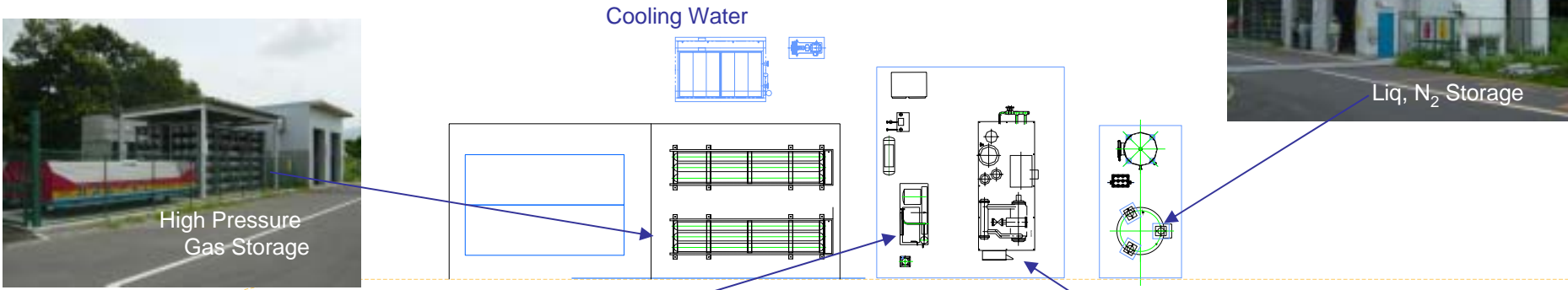
Beam Test for KEKB Cavity



May 2005

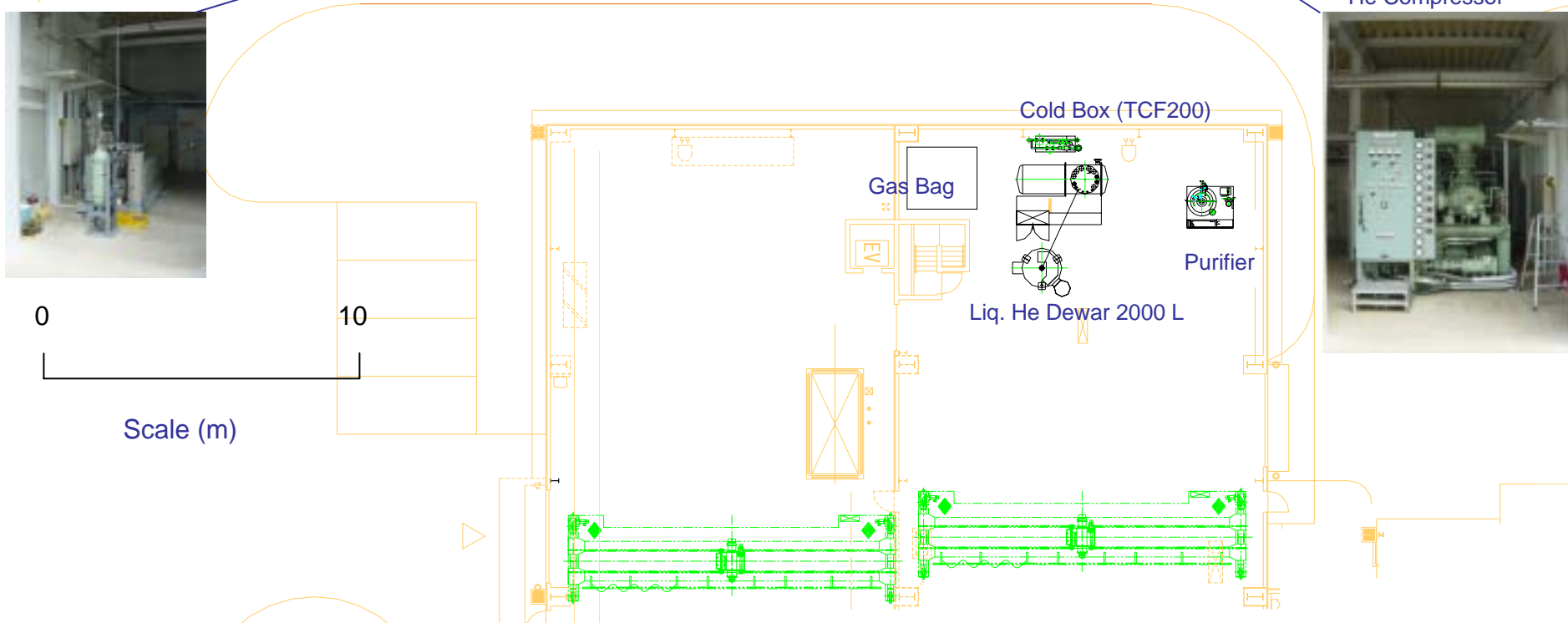
September 2005
Operation

Layout of the Cryogenic System 1

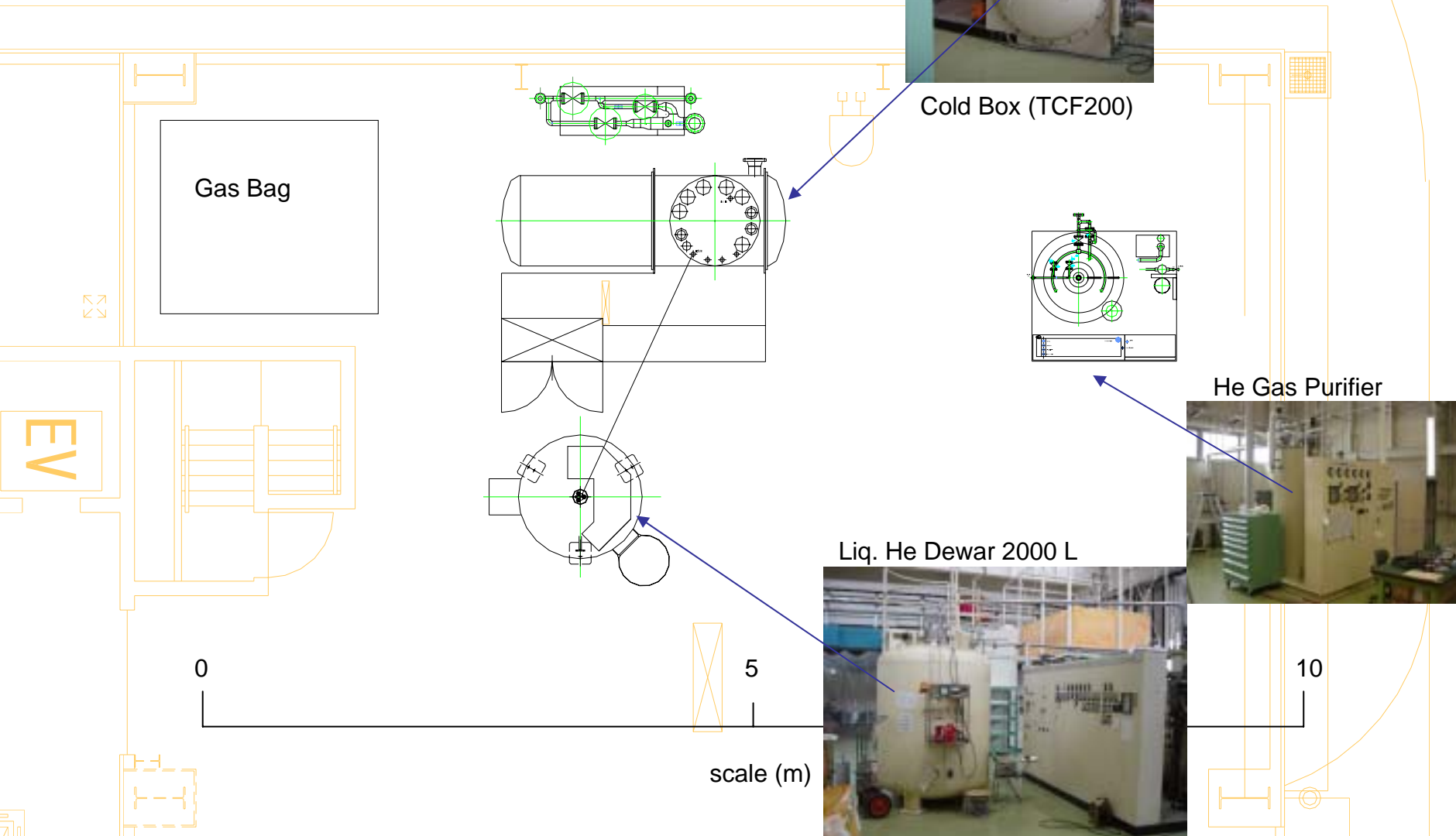


Recovery Compressor

He Compressor



Layout of Cryogenic System 2



2K refrigeration system

1) Small size 2K system ~ 20 W Step 1

Test Bench

Build up a 2K cooling system as quick as possible!
High Performance Helium Transfer Line

2) Cooling of a Cryo-module ~ 20 W Step 2

Temporary Operation (4 x 9-cell cavities)
Construction of TRT

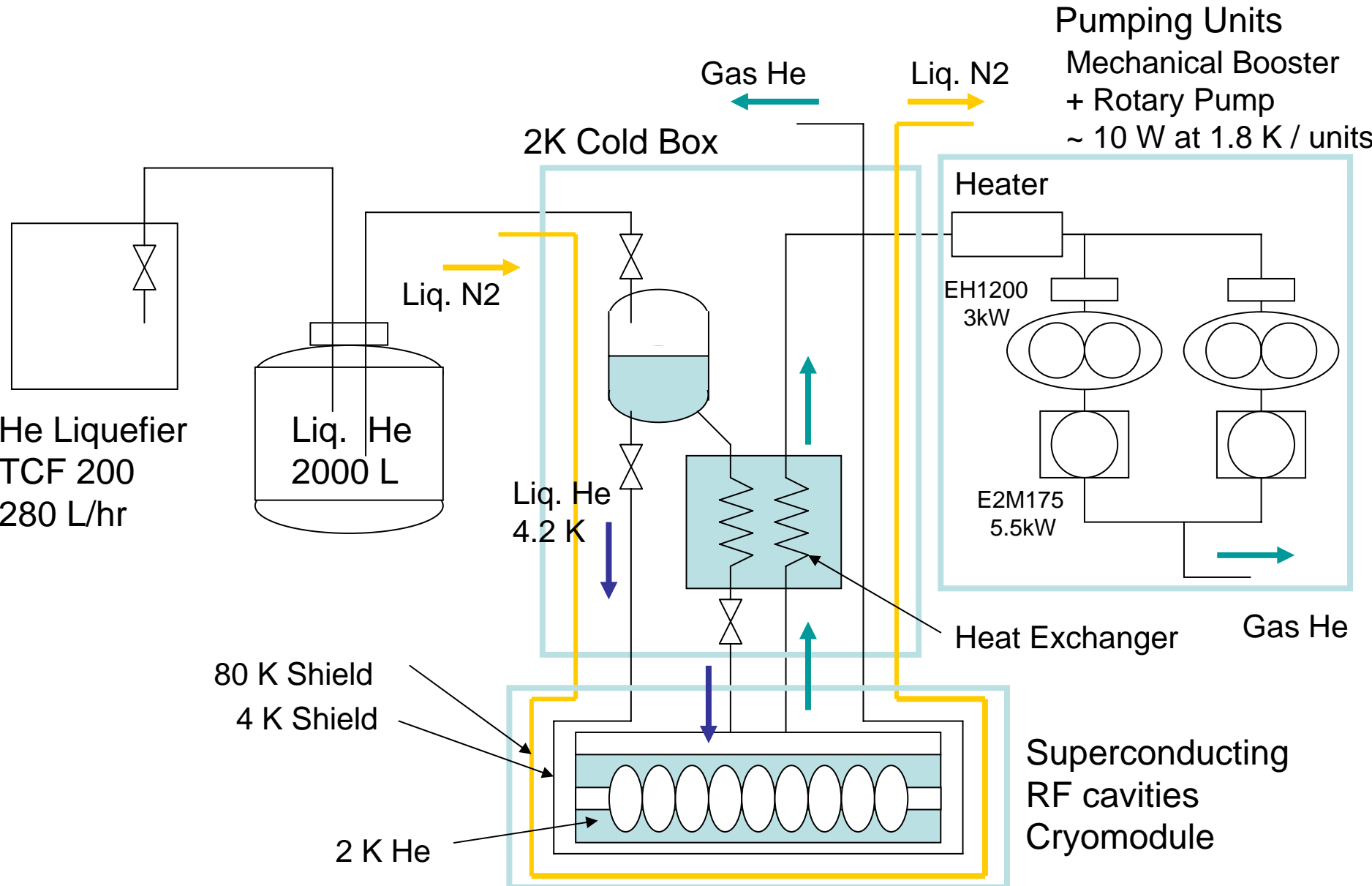
3) Medium size 2K system ~ 40 W Step 3

Long term operation

He Refrigerator / Liquefier Refrigeration mode
Construction of TRT

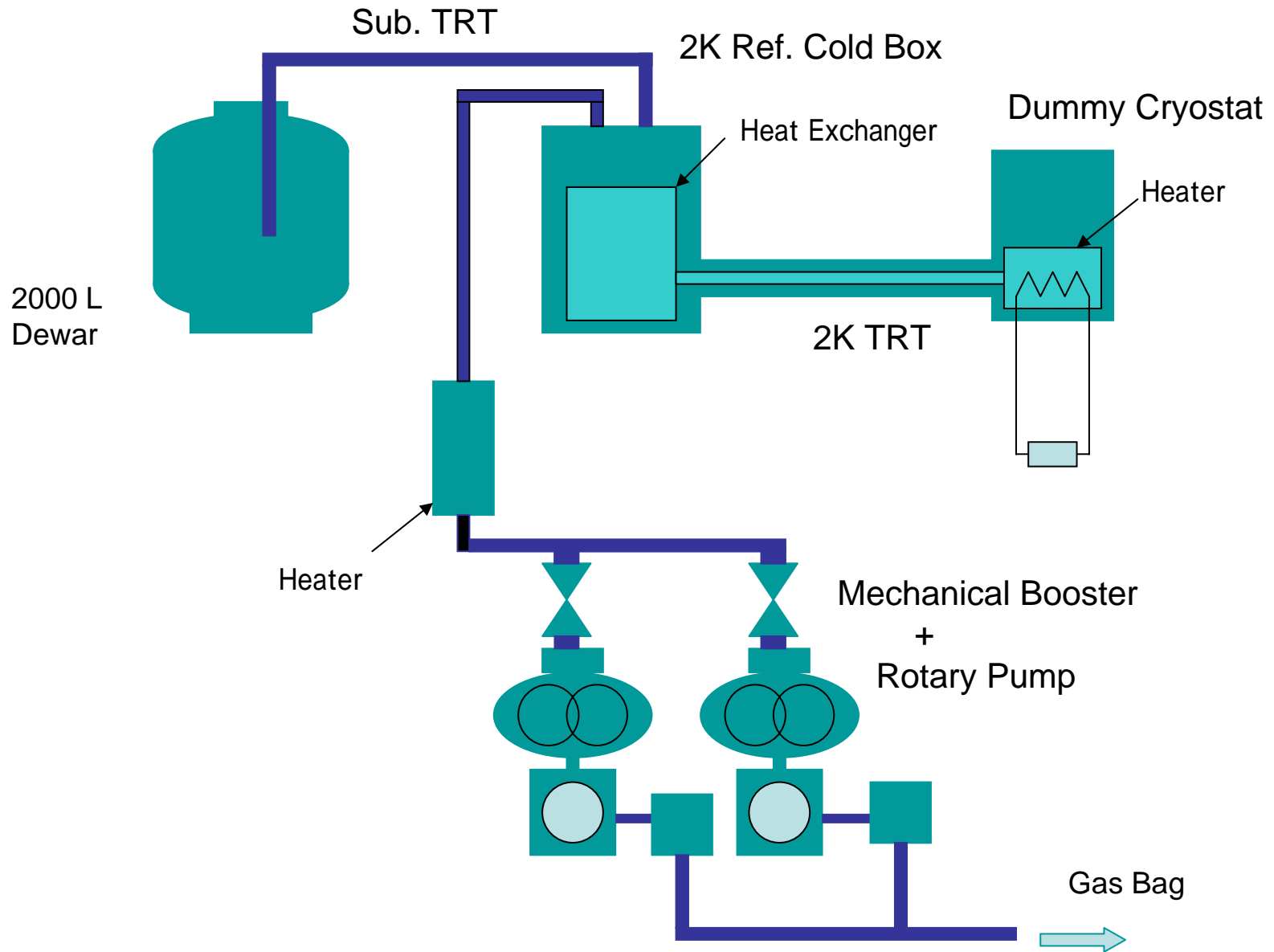
Concept of 2K Cooling System for Superconducting RF Cavities

Small Size 2K System



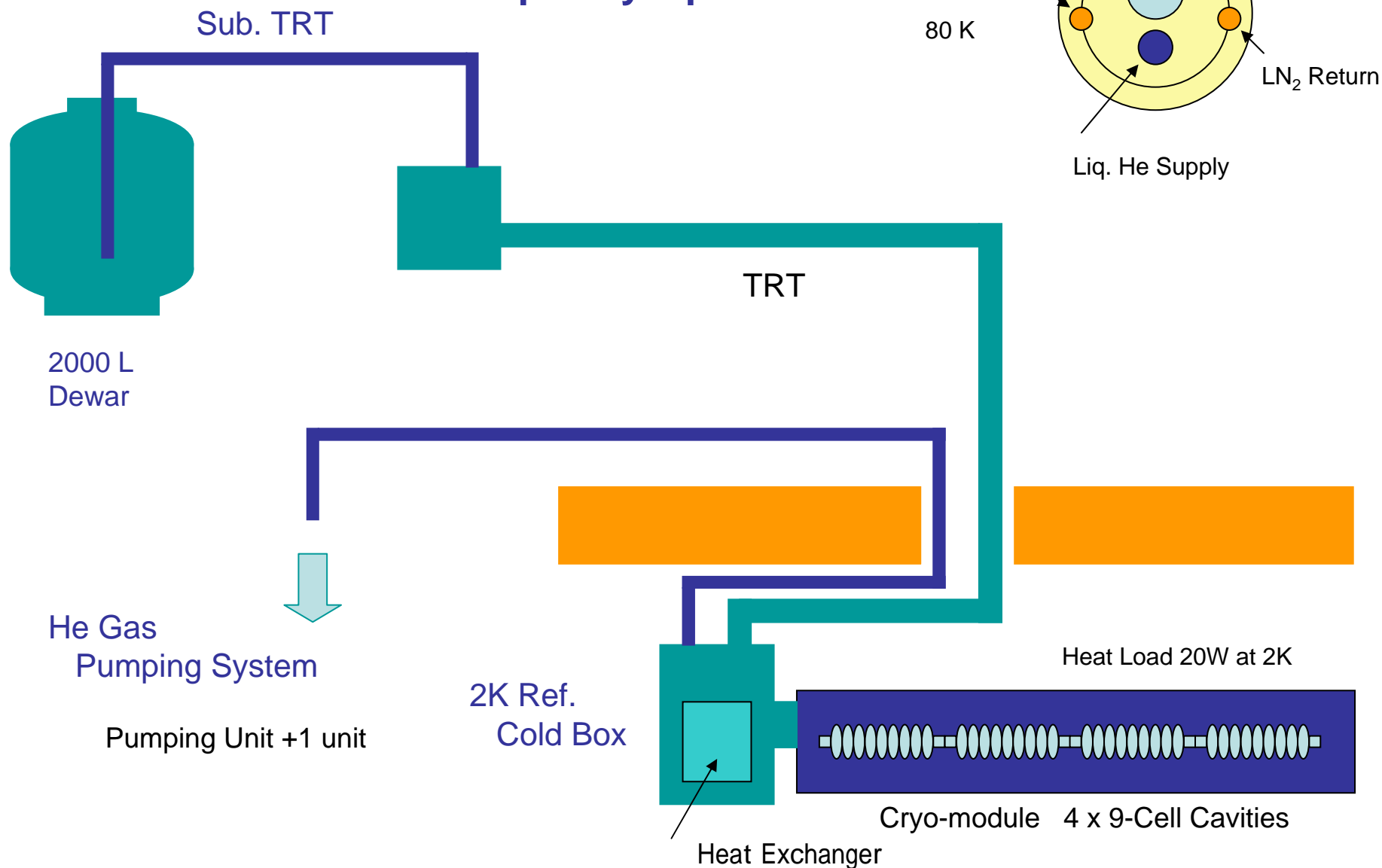
2K Cooling System Step 1

Test Bench for R&D



2K Cooling System Step 2

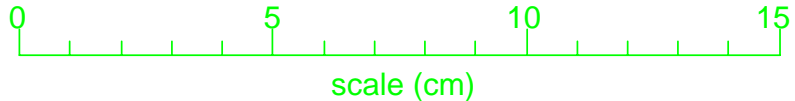
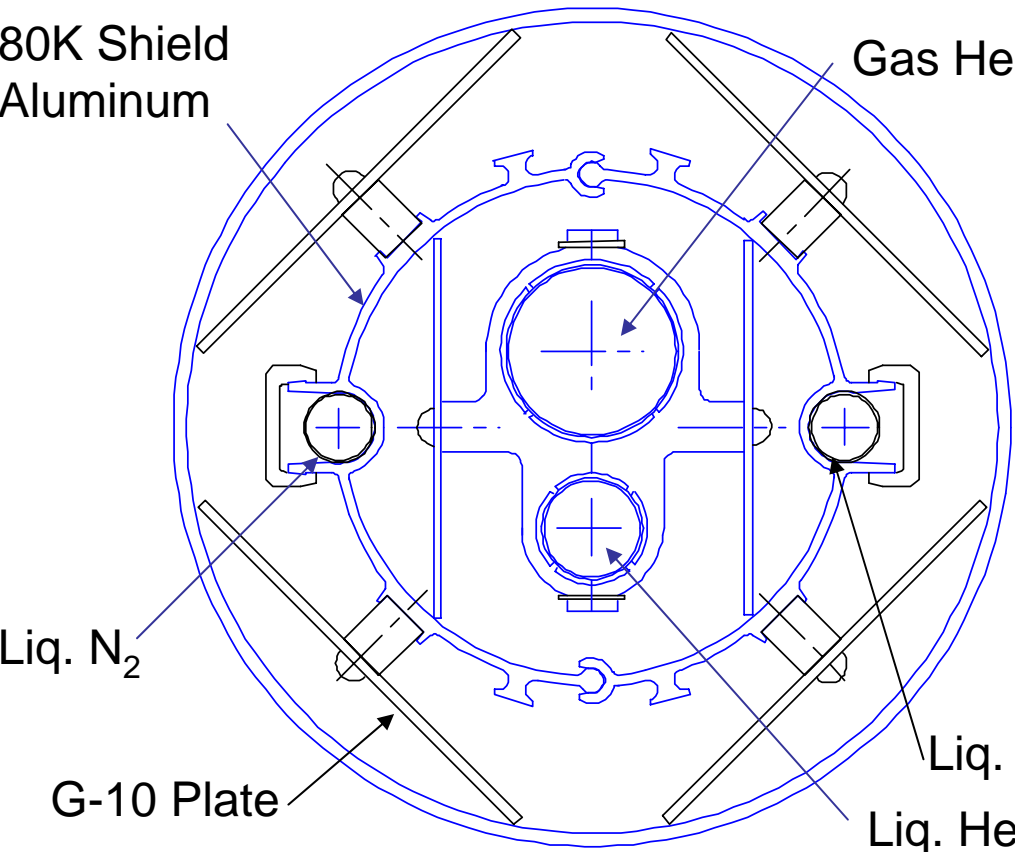
Temporary Operation



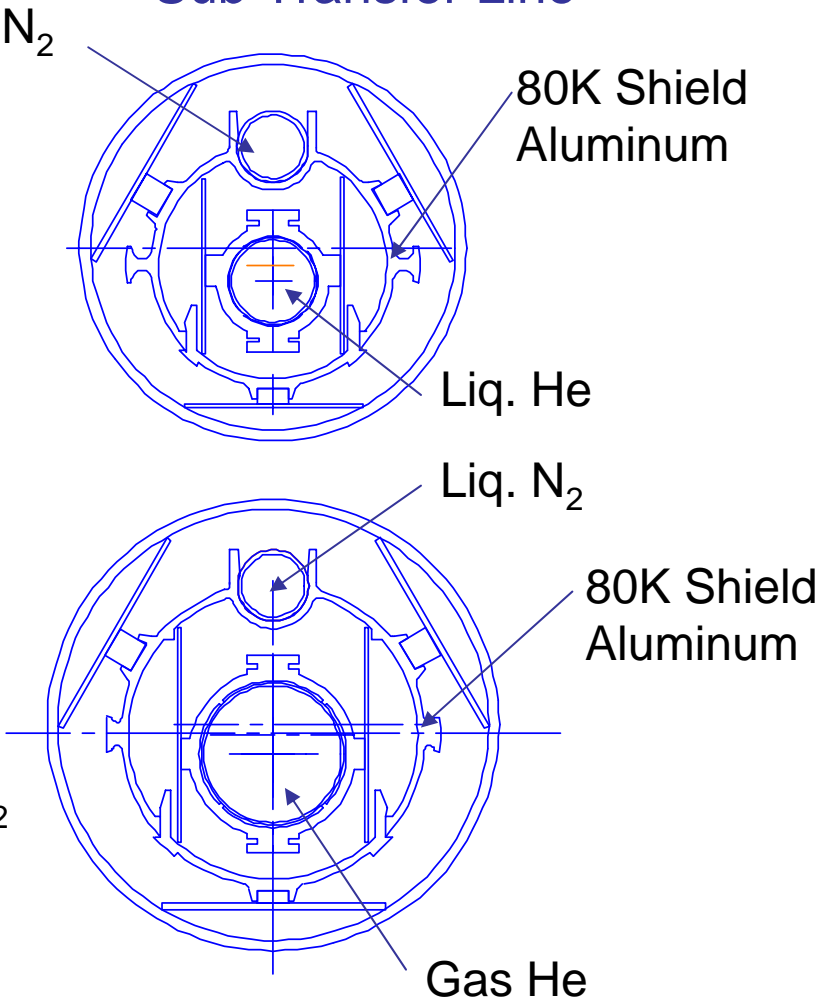
High Performance Transfer Line

Developed at KEK

Main Transfer Line

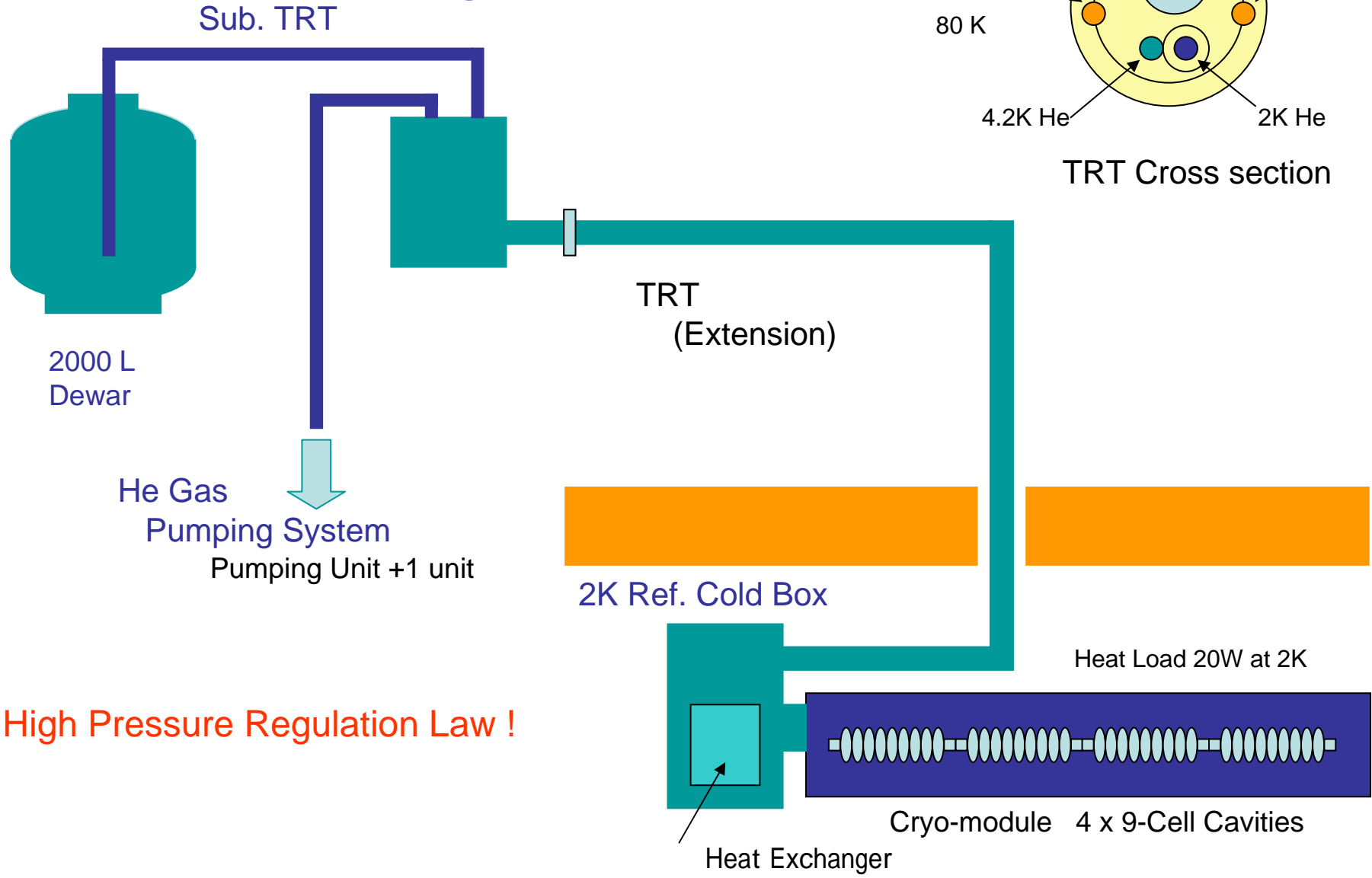


Sub Transfer Line



2K Cooling System Step 3

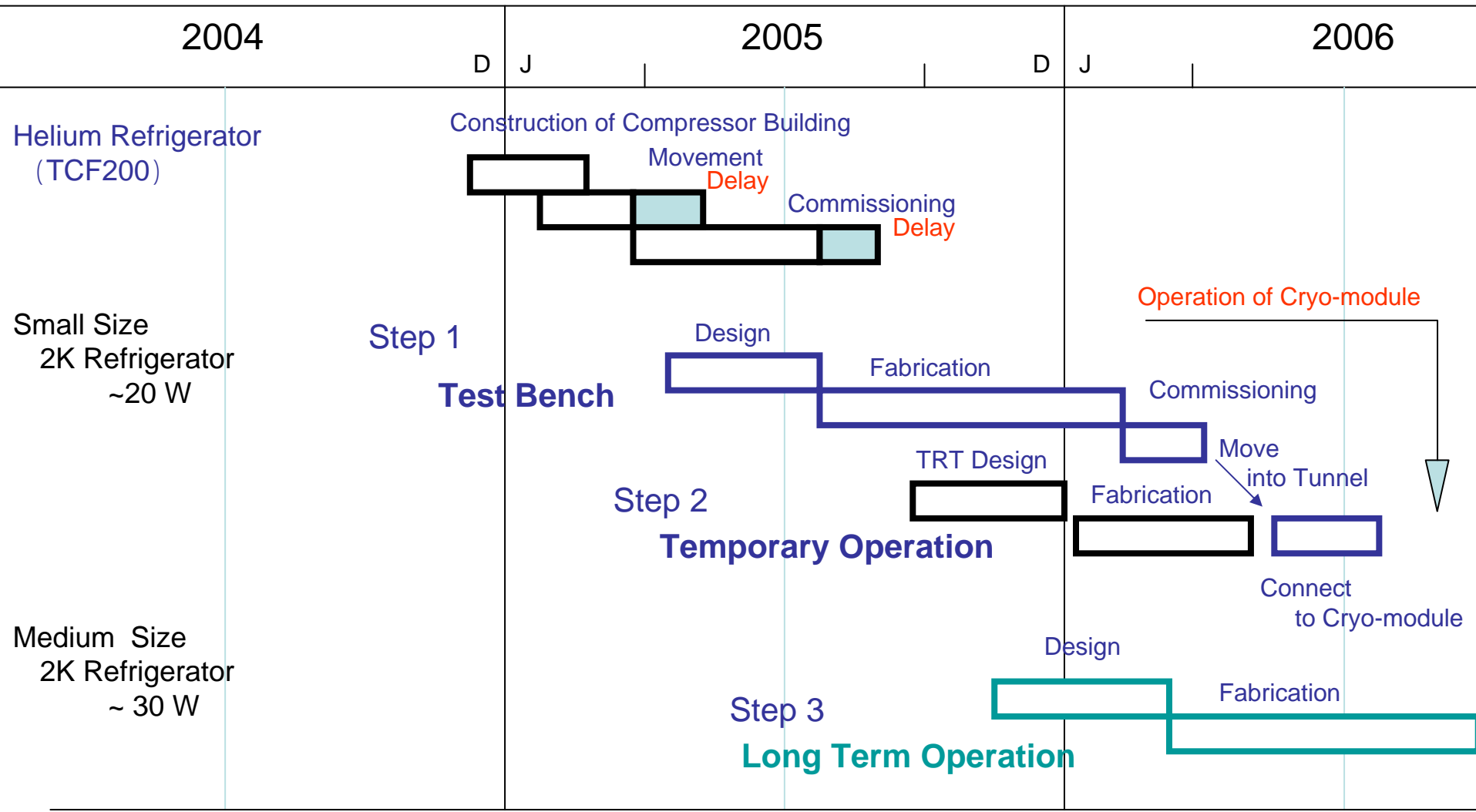
Long Term Operation



High Pressure Regulation Law !

Schedule of STF Cryogenic System

K. Hosoyama



Collaboration with Industry

- STF (Cryogenics) 検討会

(株)大陽日酸、(株)日立製作所、(株)日立酸素、
(株)前川製作所、(株)小池酸素

- 2K 冷凍機 (STF, ILC)

設計・検討

- 要素開発

Heat Exchanger

TRT

Valve

Joint

Summary

- Helium ref. system (280 L /hr or 600) was moved to KEK STF site by end of May 2005, and commissioning of the system will start soon.
- A small 2K system with cooling power ~ 20 W will be completed by the end of March 2006.
- Cryo-module (4 x 9-cell cavities in the tunnel) will be cool on Sep. 2006.
- The cryogenic facility will be used for R&D center of cryogenic components.