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# Crab Cavity
# - Cryogenics -

KEKB Crab Cavity Group
- presented by NAKAI Hirotaka

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# Overview

- Crab cavity cryostat
- Calorimetric measurements
  - Static heat loss of cryostat
  - Unloaded Q-factor of crab cavity
- Cryogenic system monitoring

# Crab Cavity Cryostat

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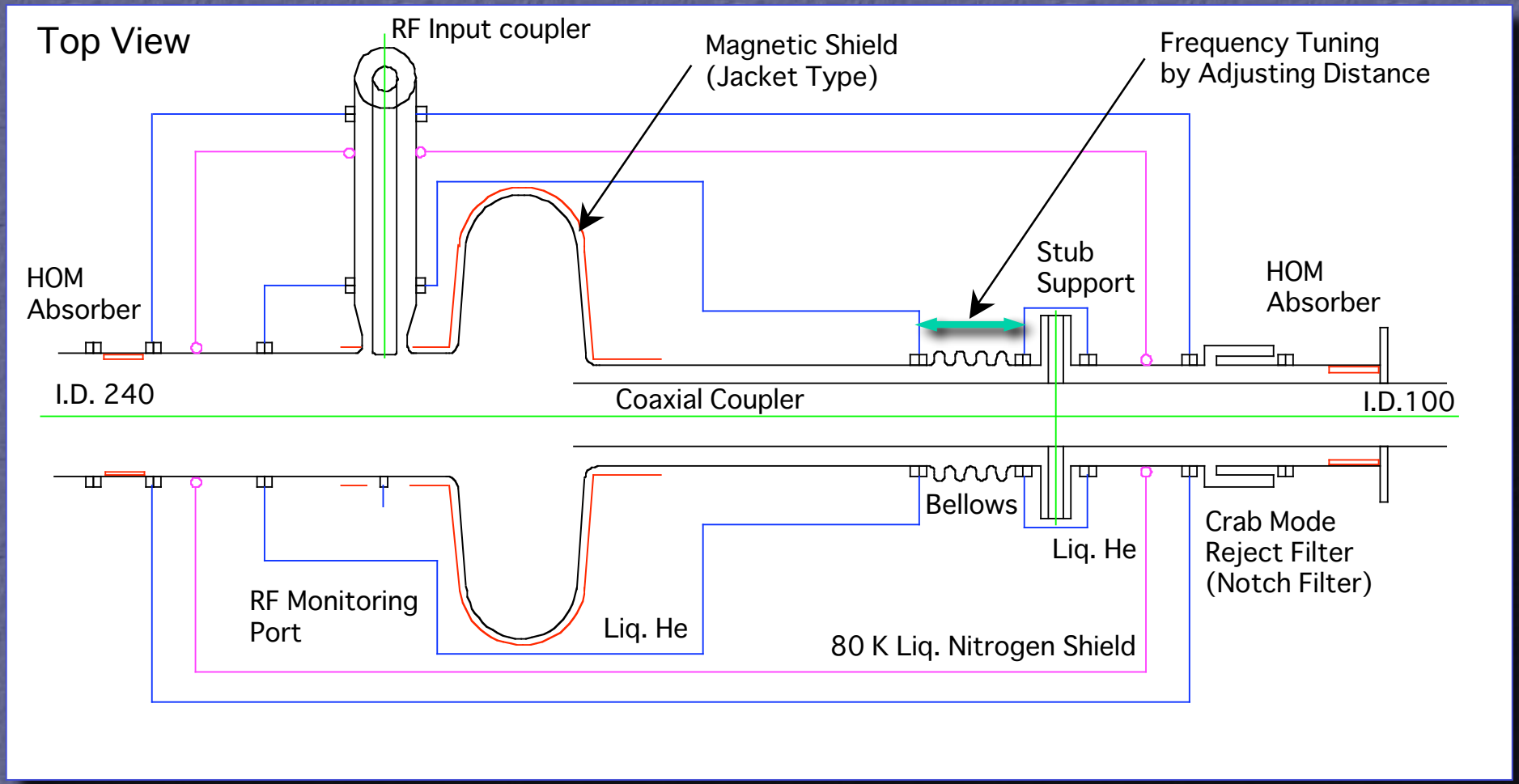
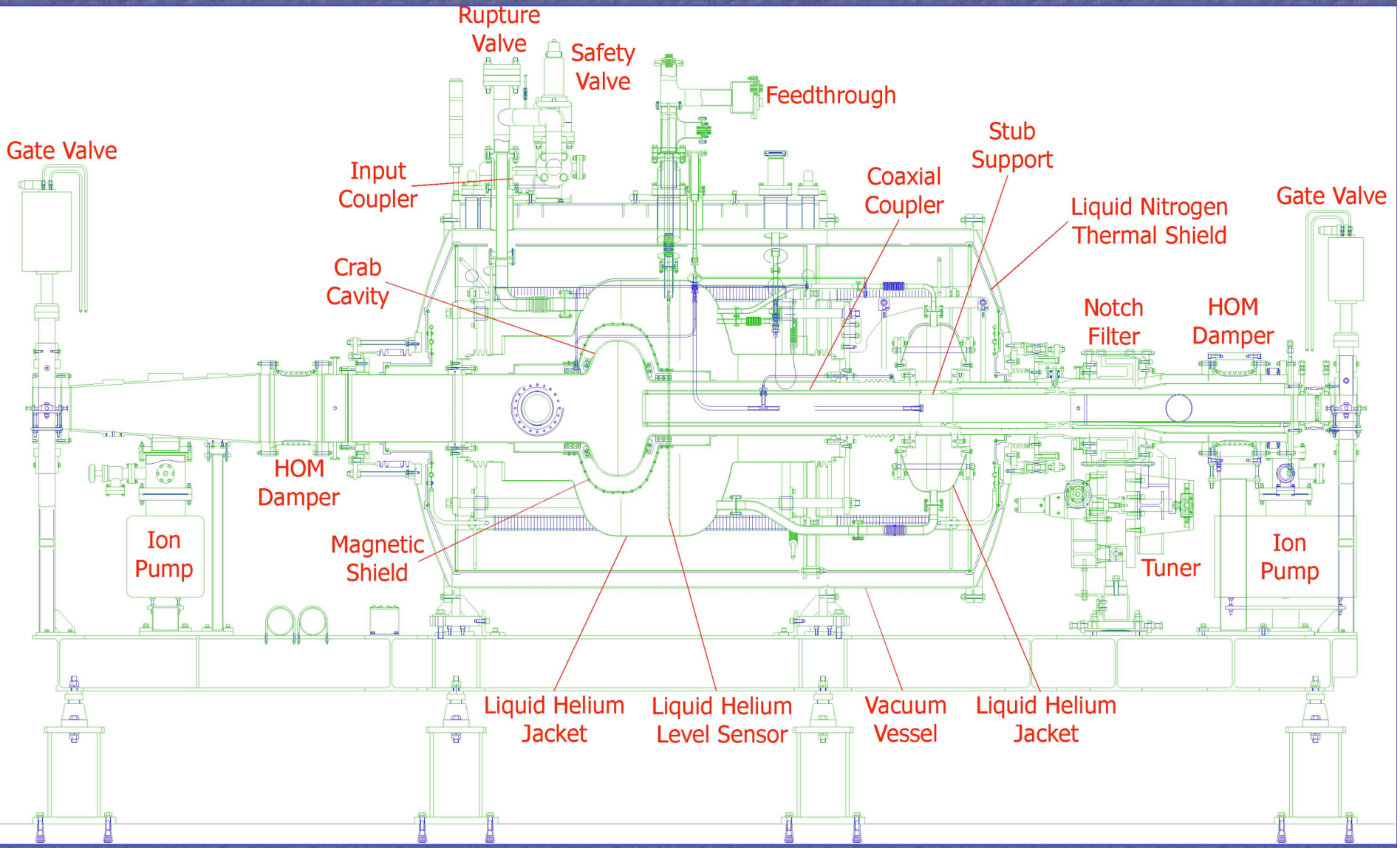
# Cryostat Design Concept

- Jacket-type liquid helium vessels
- Coaxial coupler with bellows for frequency tuning
- Stub support for long coaxial coupler for mechanical support and cooling of coaxial coupler tip

# Cryostat Conceptual Design



# Schematic Drawing of Cryostat



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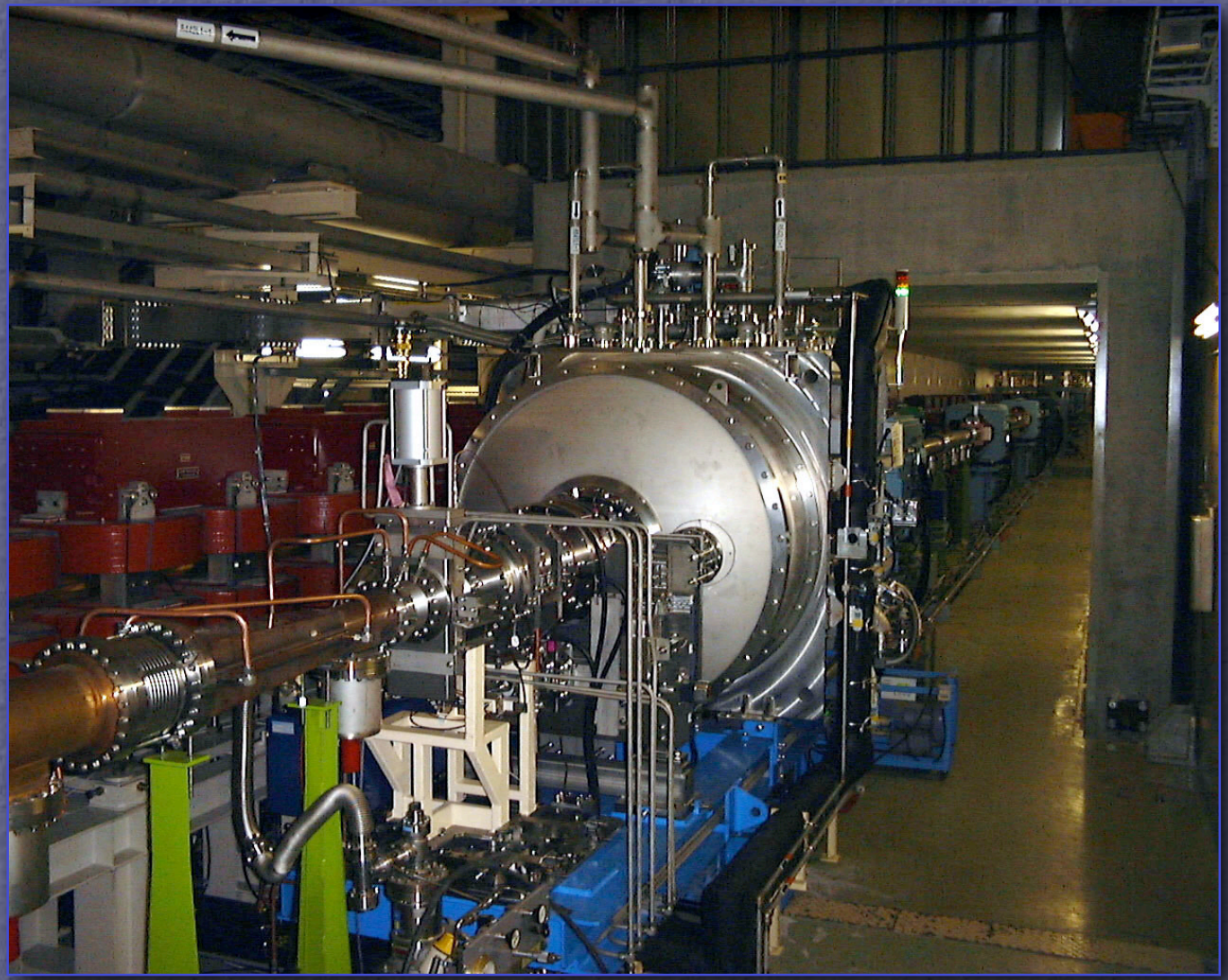
# HER Crab Cavity Cryostat



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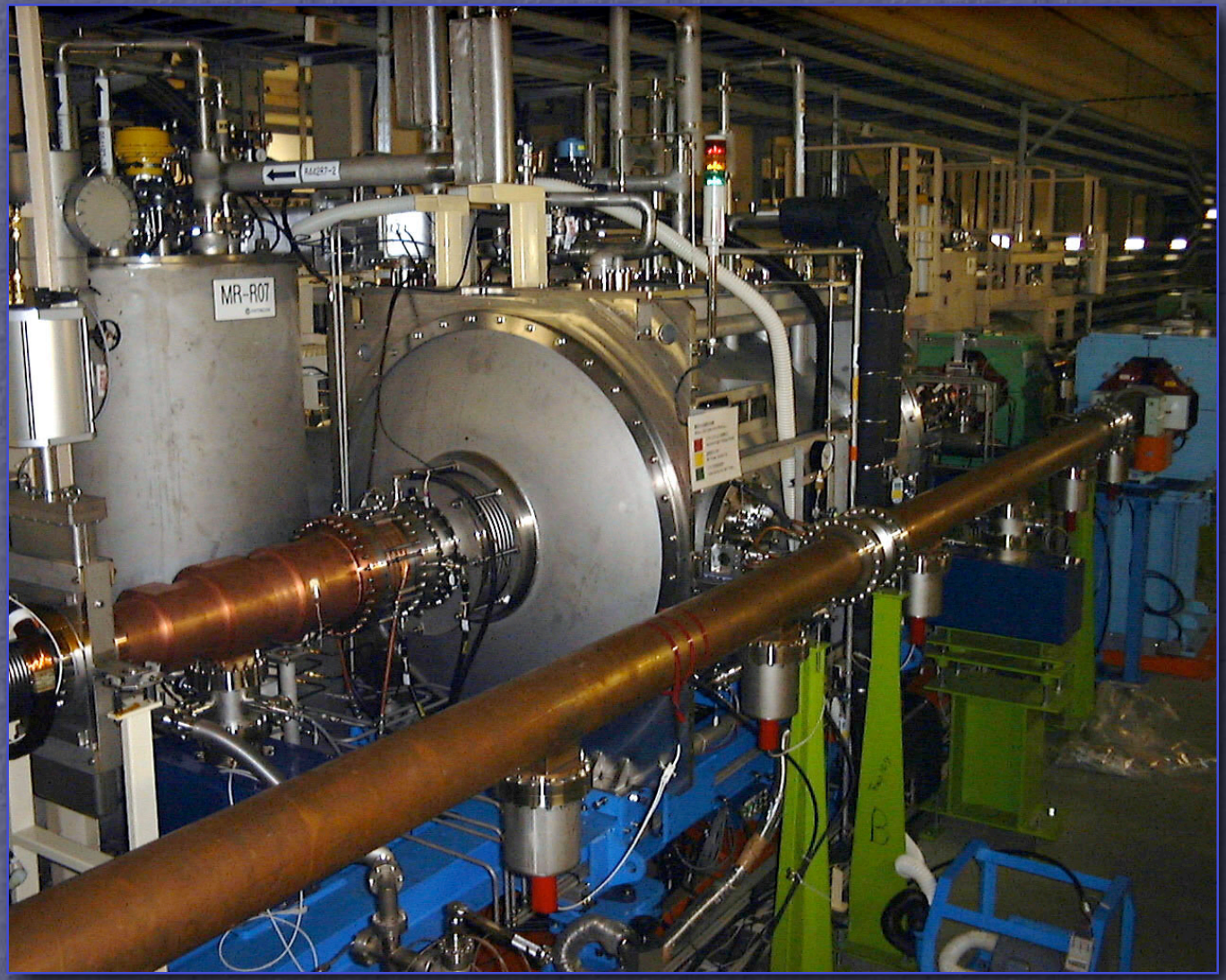
# LER Crab Cavity Cryostat



- Calorimetric Measurements

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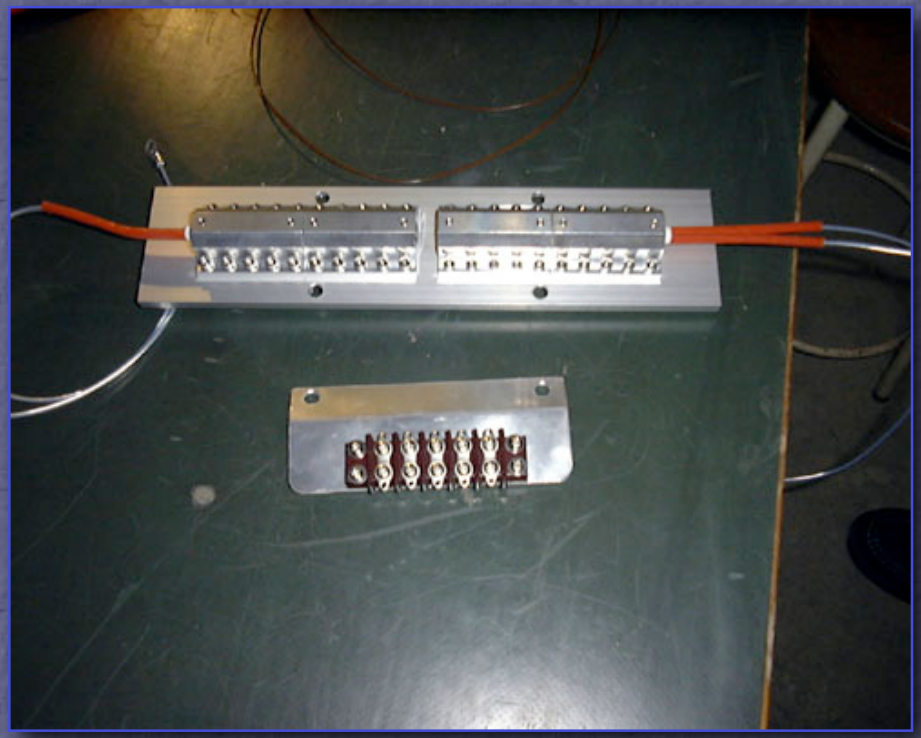
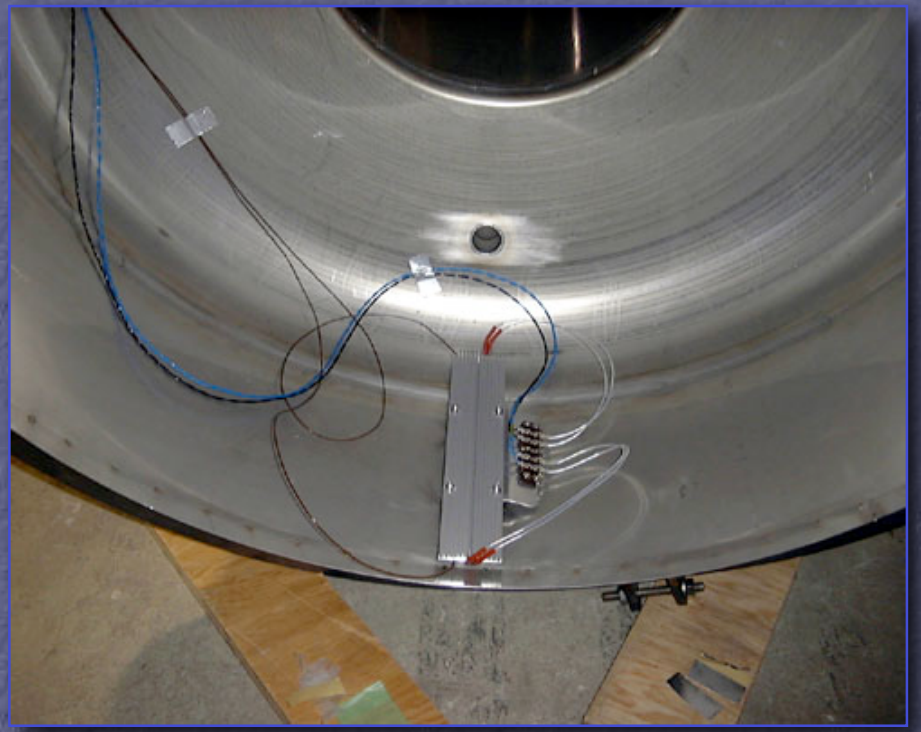
# Heater in Helium Jacket





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# Static Loss of Cryostat

HER 20061117

| Heater [W] | Duration [min.] | Coupler [L/min.] | Coax. [L/min.] | Bellows [L/min.] | Total [L/min.] | Q-flow [W] | Total Loss [W] | Static Loss [W] |
|---|---|---|---|---|---|---|---|---|
| 0 | 28 | 3 | 139.5 | 157.5 | 300 | 18.67 | | |
| 20 | 20 | 3 | 137.5 | 157.5 | 298 | 18.54 | 50.00 | 31.46 |
| 40 | 15 | 3 | 139.0 | 158.0 | 300 | 18.67 | 46.15 | 27.48 |
| 0 | 27 | 3 | 137.0 | 156.0 | 296 | 18.42 | | |
| 20 | 20 | 3 | 137.0 | 157.0 | 297 | 18.48 | 57.14 | 38.66 |
| 40 | 15 | 3 | 138.5 | 158.5 | 300 | 18.67 | 50.00 | 31.33 |
| Average | | | | | | 18.57 | 50.82 | 32.25 |

LER 20061223

| Heater [W] | Duration [min.] | Coupler [L/min.] | Coax. [L/min.] | Bellows [L/min.] | Total [L/min.] | Q-flow [W] | Total Loss [W] | Static Loss [W] |
|---|---|---|---|---|---|---|---|---|
| 0 | 32 | 4 | 98.7 | 137.9 | 240.6 | 14.97 | | |
| 20 | 21 | 4 | 99.5 | 142.0 | 245.5 | 15.28 | 38.18 | 22.90 |
| 40 | 16 | 4 | 101.2 | 117.2 | 222.4 | 13.84 | 40.00 | 26.16 |
| 0 | 32 | 4 | 99.3 | 142.0 | 245.3 | 15.26 | | |
| 20 | 22 | 4 | 95.8 | 149.4 | 249.2 | 15.51 | 44.00 | 28.49 |
| 40 | 16 | 4 | 96.5 | 125.0 | 225.5 | 14.03 | 40.00 | 25.97 |
| Average | | | | | | 14.82 | 40.55 | 25.73 |

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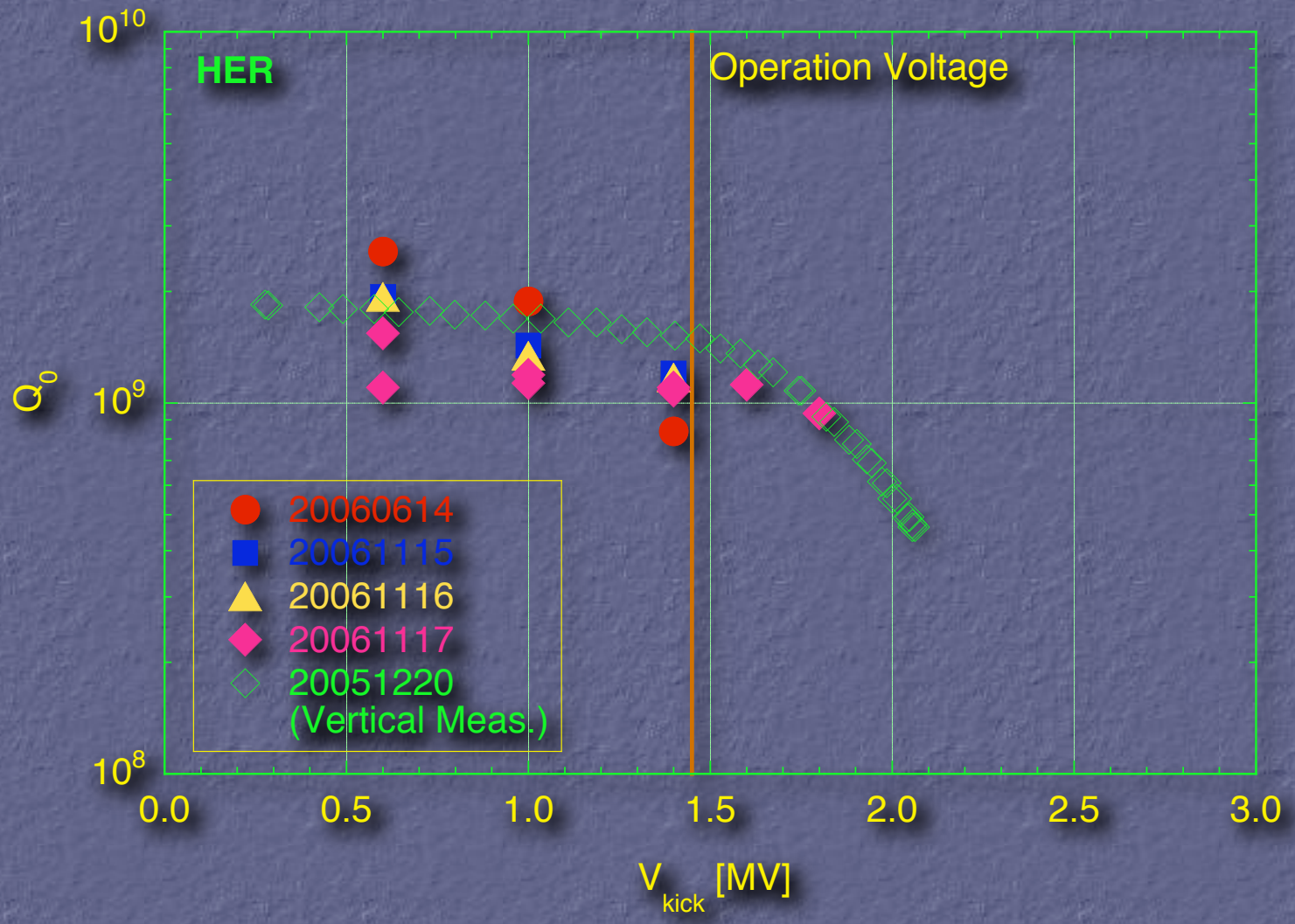
# Unloaded Q-Factors of HER



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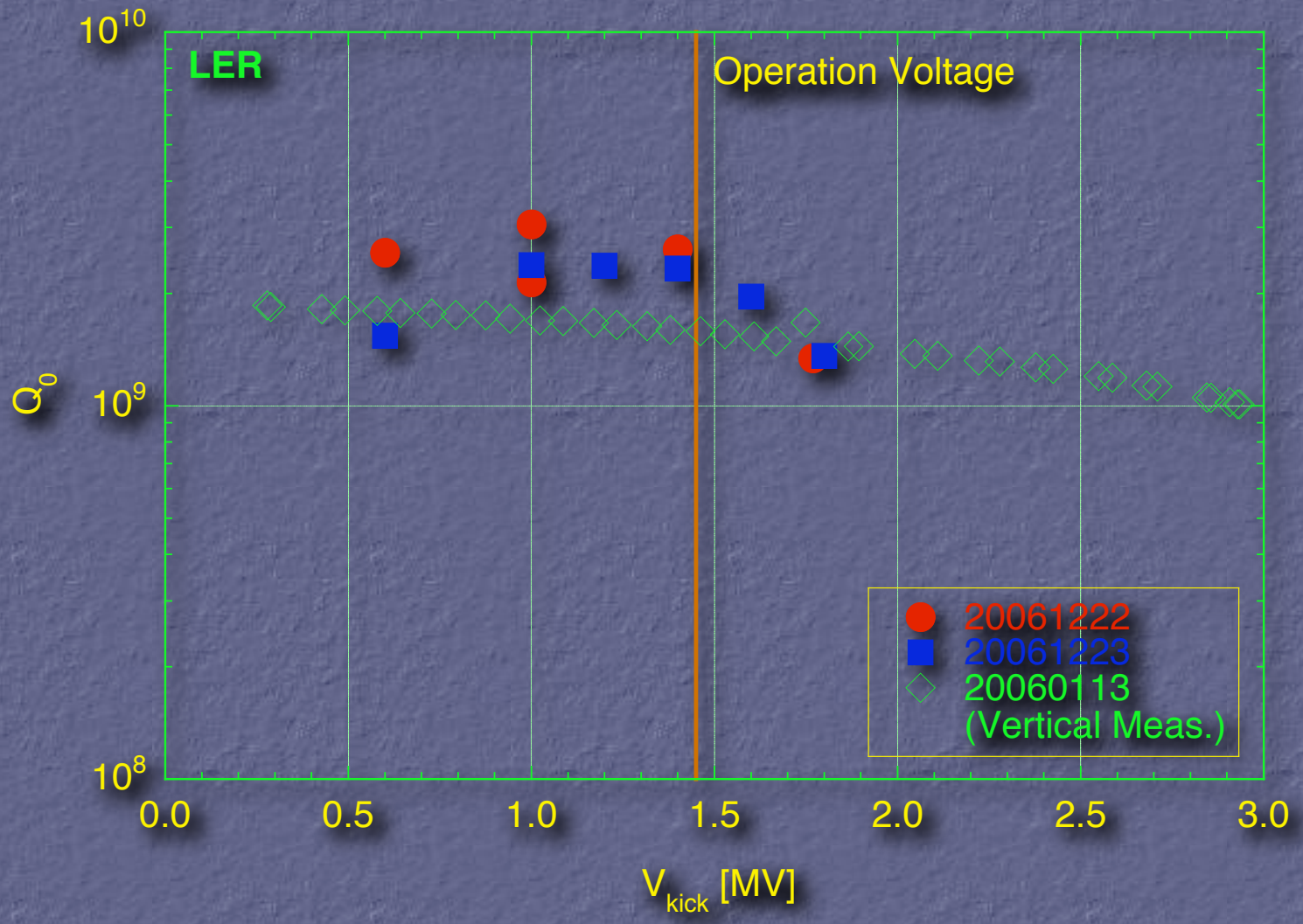
# Unloaded Q-Factors of LER



# Monitoring Devices in Cryogenic System

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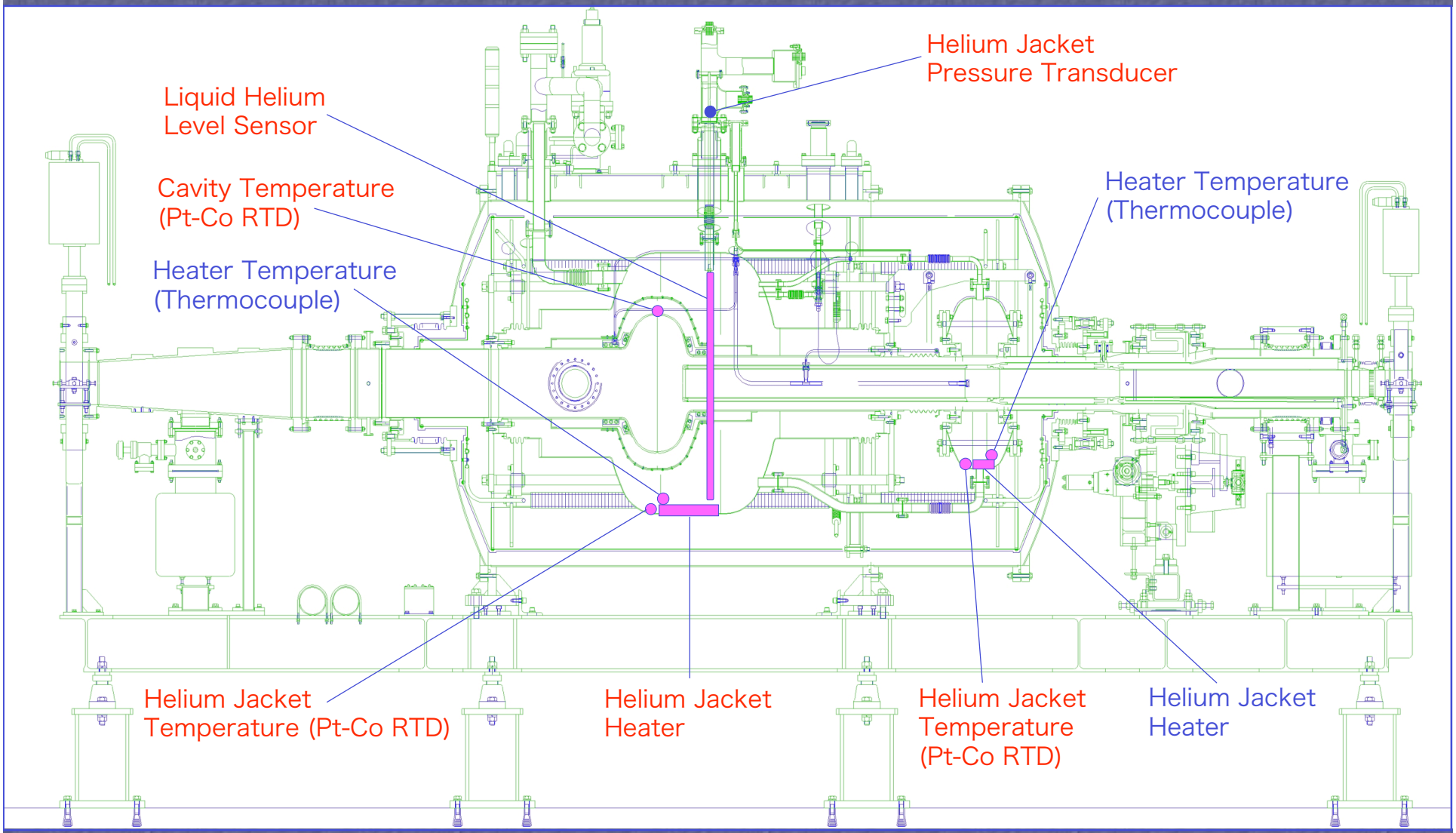
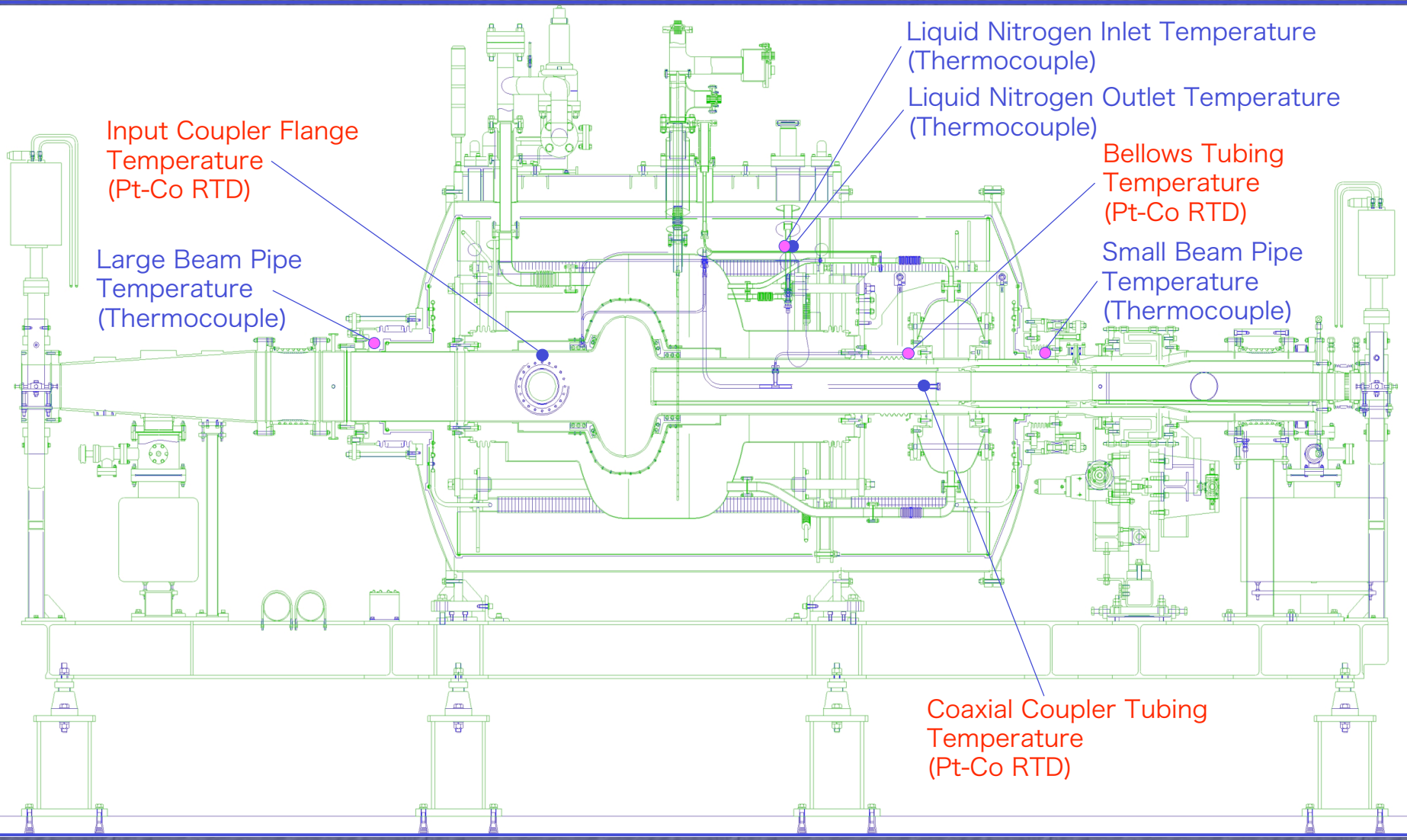
# Monitoring Devices

- Thermometers
  - Platinum-Cobalt alloy resistance thermometer (Pt-Co RTD) for liquid helium temperature
  - Copper-Constantan thermocouple for liquid nitrogen temperature
- Superconducting liquid helium level sensor
- Pressure transducer
- Heater for heat load compensation
- Vacuum gauges
  - Cold cathode gauge (CCG)
  - Pirani gauge

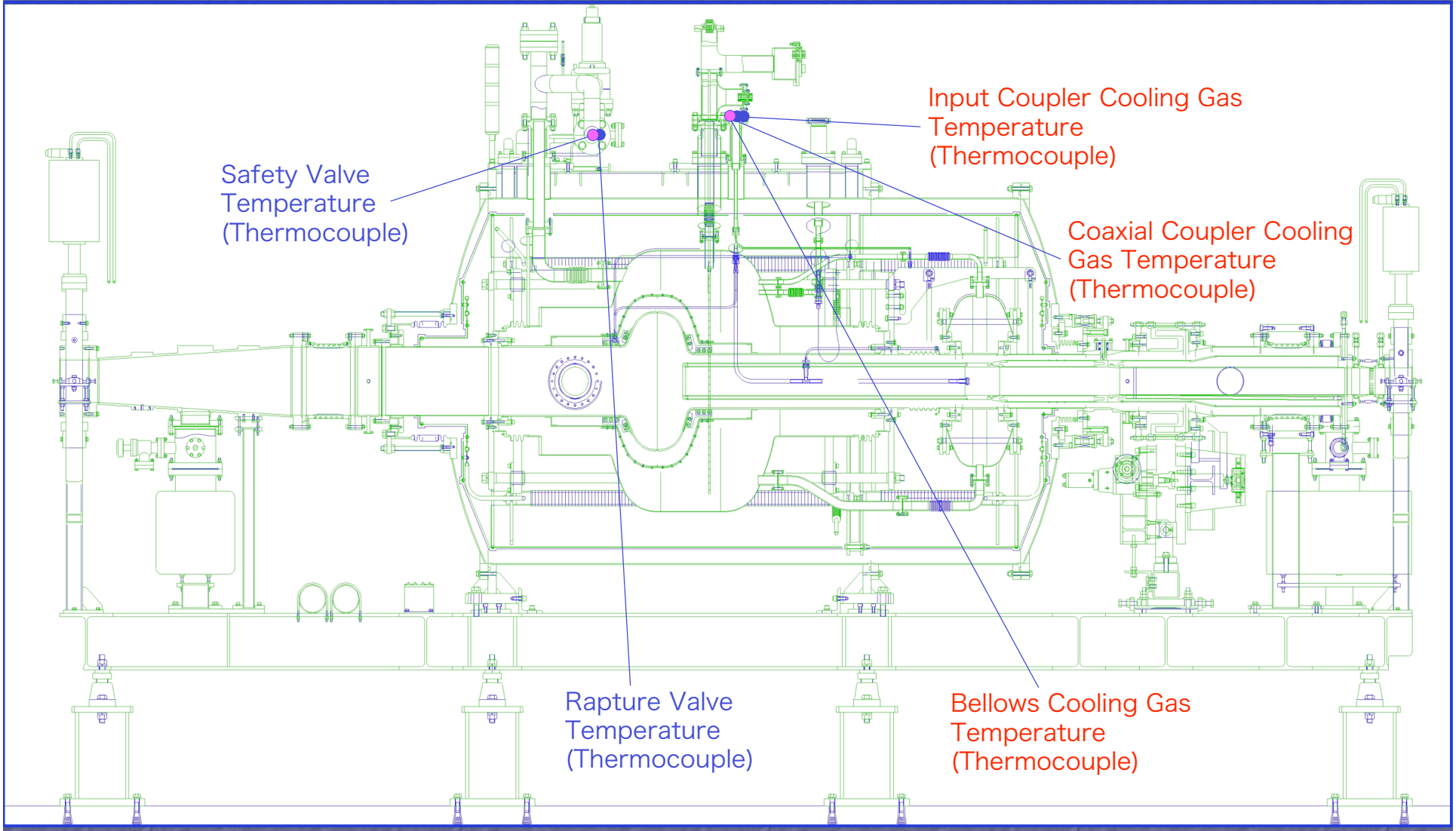
# Devices in Helium Jackets



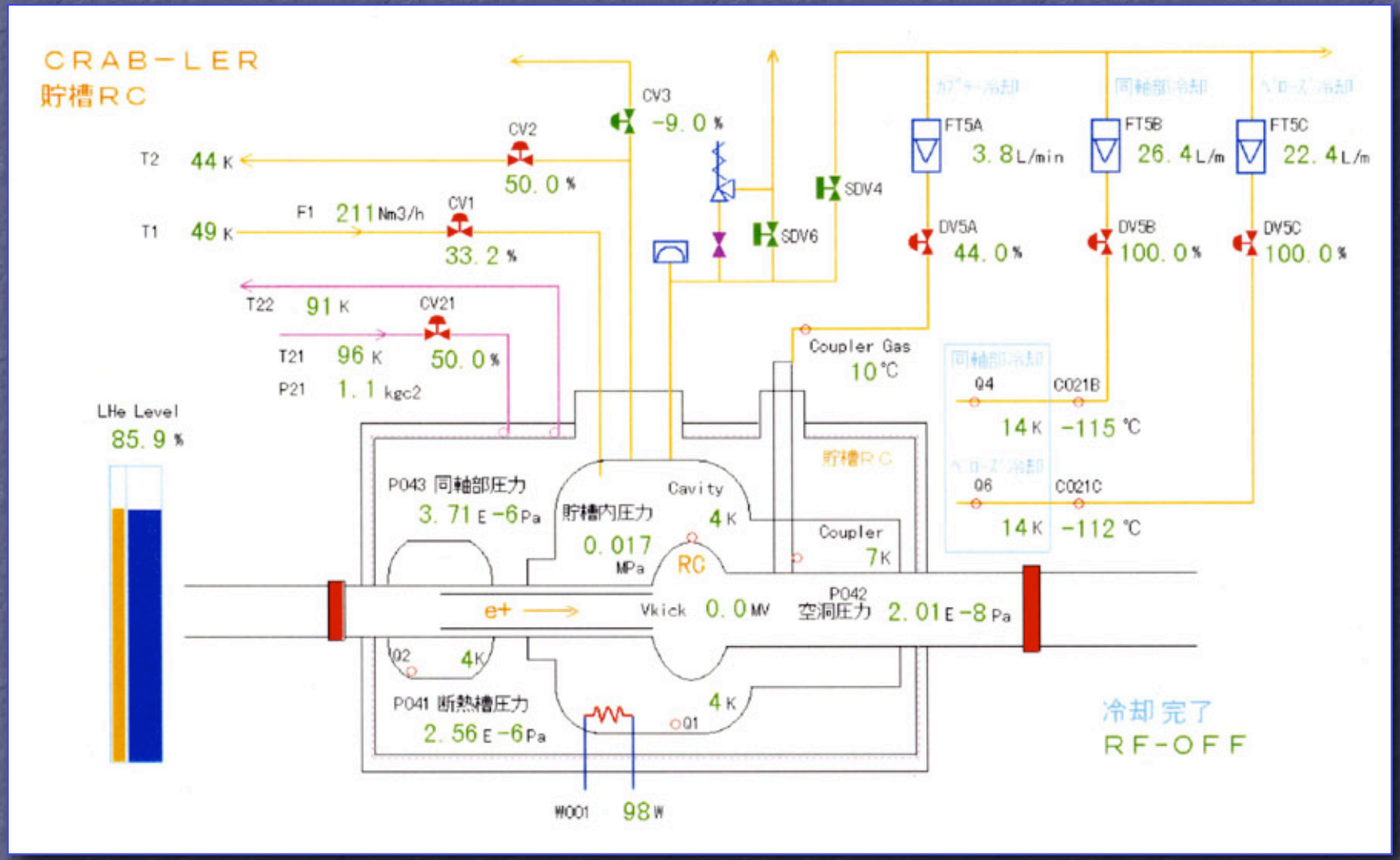
# Devices in Vacuum Vessel



# Devices at External Tubing



# Display of Control System



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# Summary

- Crab cavity cryostats manufactured successfully and connected to the refrigeration system
- Calorimetric measurements carried out
  - Moderate heat load to cryostats
  - Cavity performance not so degraded during installation to the cryostat
- Monitoring devices equipped and work properly