Feather M0

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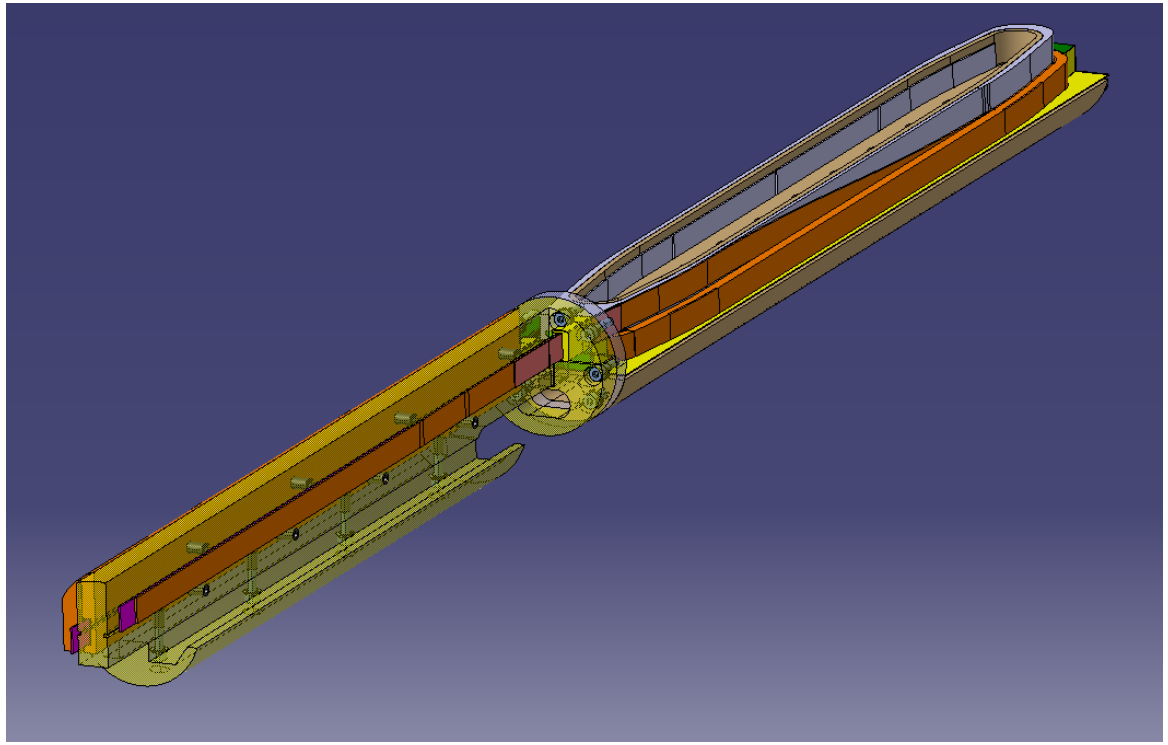


Feather-M0 Introduction

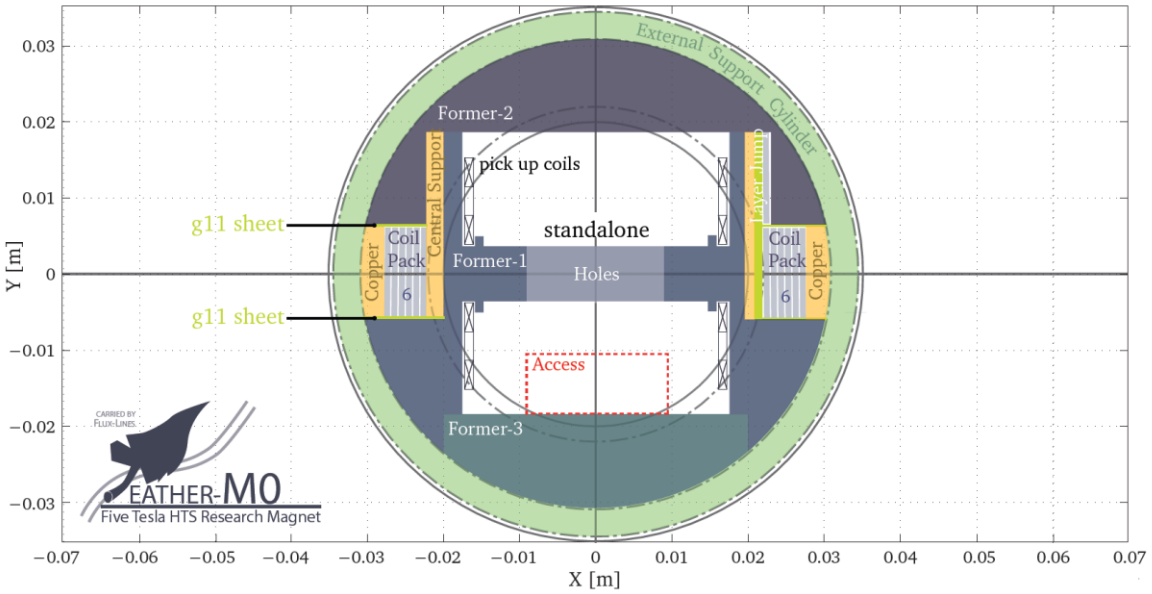


Figure 2.45: *Cross section of the mechanical structure of the Feather-M0 magnets at its straight sections.*

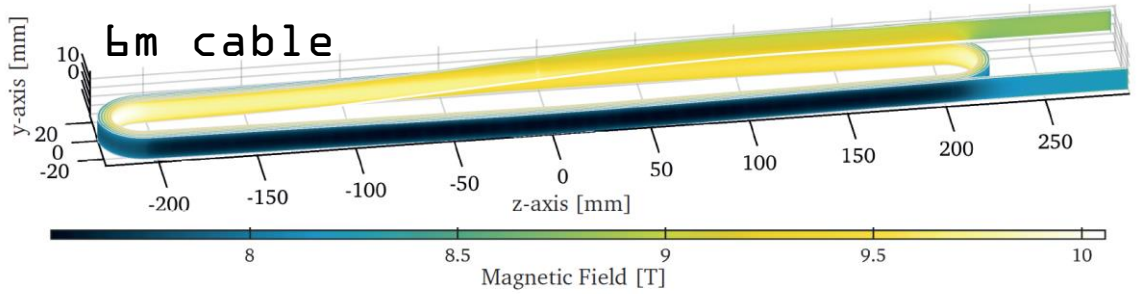


Figure 2.32: *Magnetic field on the surface of the conductor for Feather-M0 when operated at* 6 kA *in a background field of* 8.5 T.

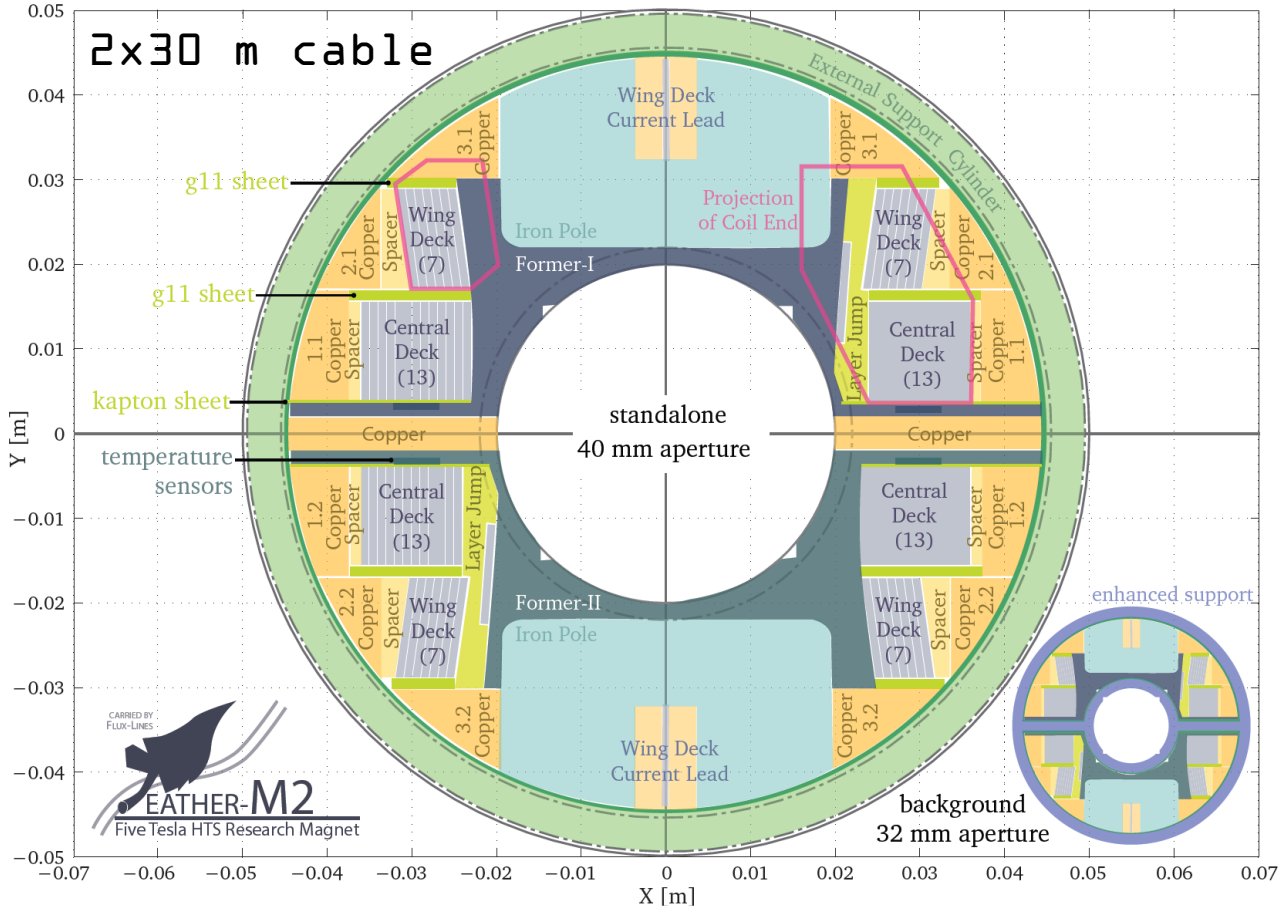


Figure 2.46: *Cross section of the mechanical structure of the Feather-M2 magnets at its straight sections.*

- Feather-M0 is a subscale version of Feather-M2 which contains many of the features.

Feather M0

- Racetrack HTS test magnet
- Gathering quench data
  - Verify model predictions
- Test of impregnation winding method
- Run magnet safely to very high current densities (15 kA, 1200 A/mm^2)

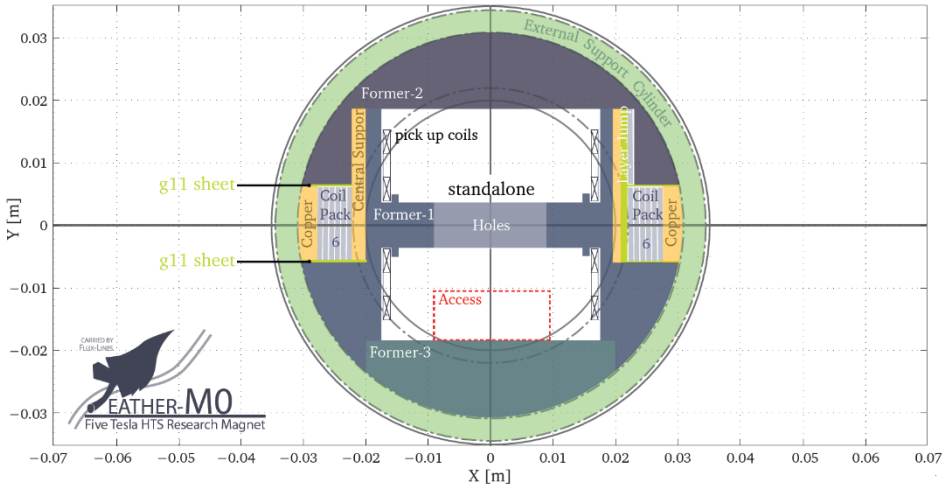
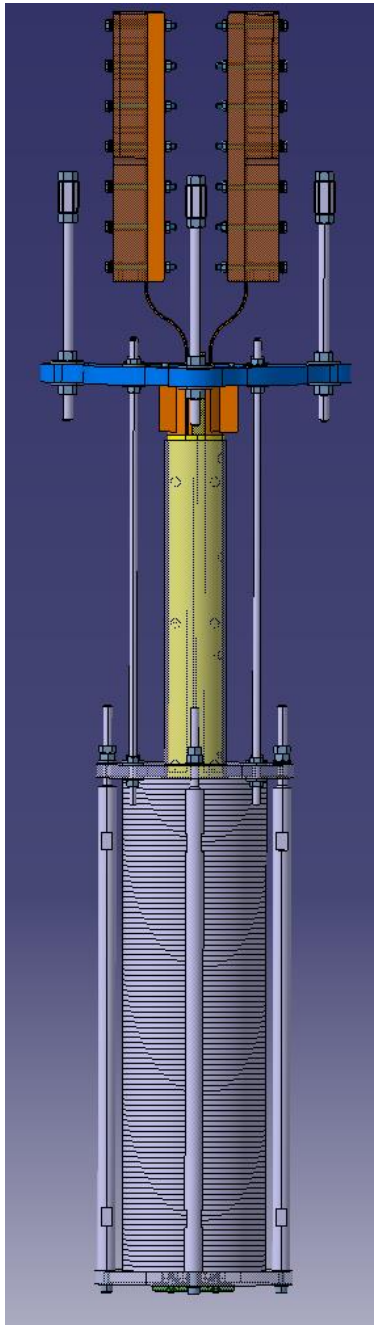


Figure 2.45: *Cross section of the mechanical structure of the Feather-M0 magnets at its straight sections.*

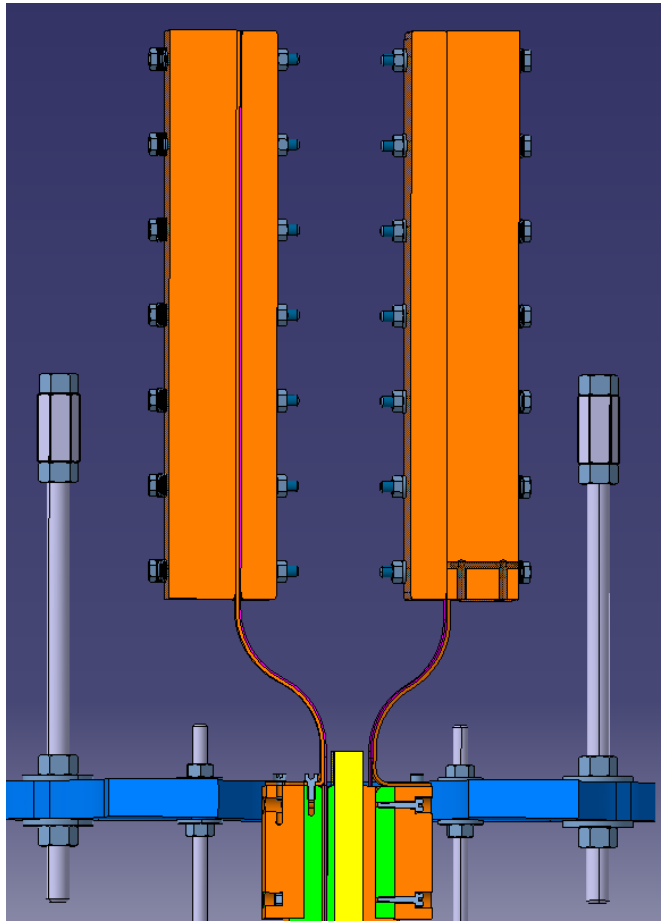
Suspension in Diode cryostat

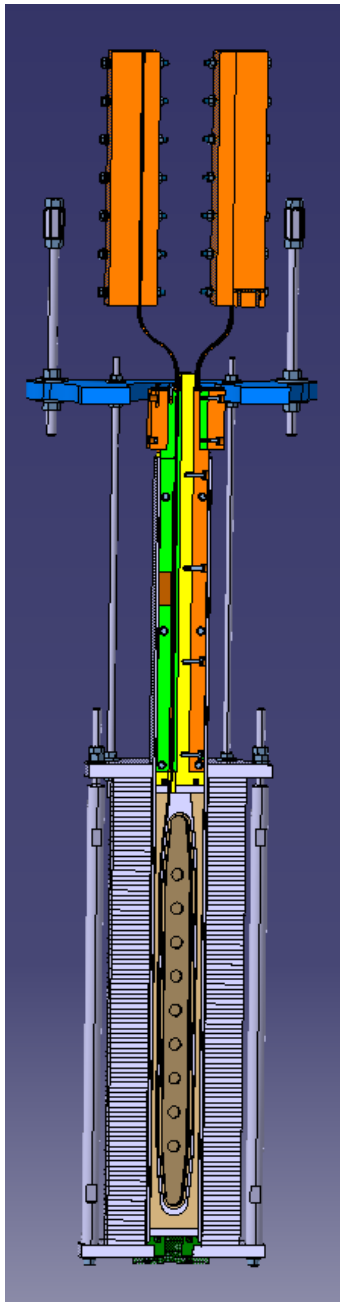
- Yoke
- Copper lead stabilization
  - Mechanical clamp protection
- Connection plate



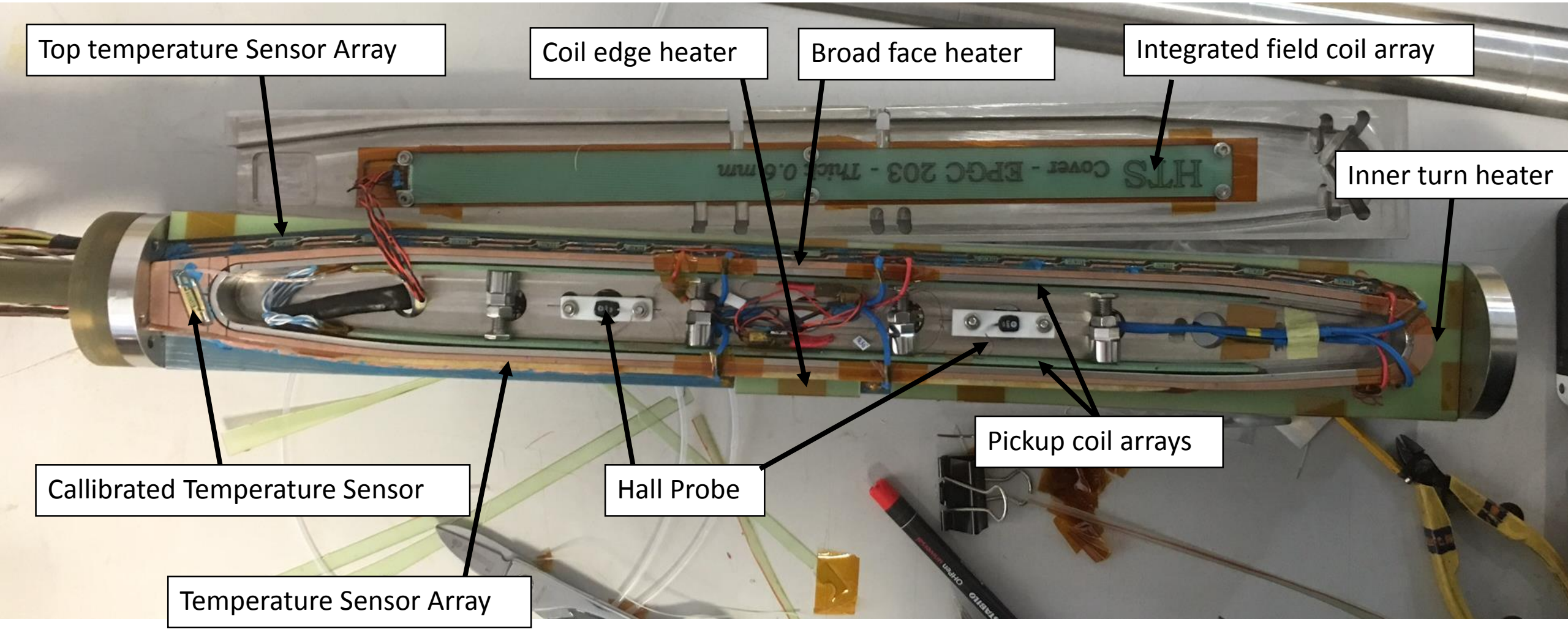
Connection to the cryostat

- Clamped indium joint
  - Pre-tinned leads
- Shunt copper strip
- Soldered clamped splice
  - Pre-tinned leads

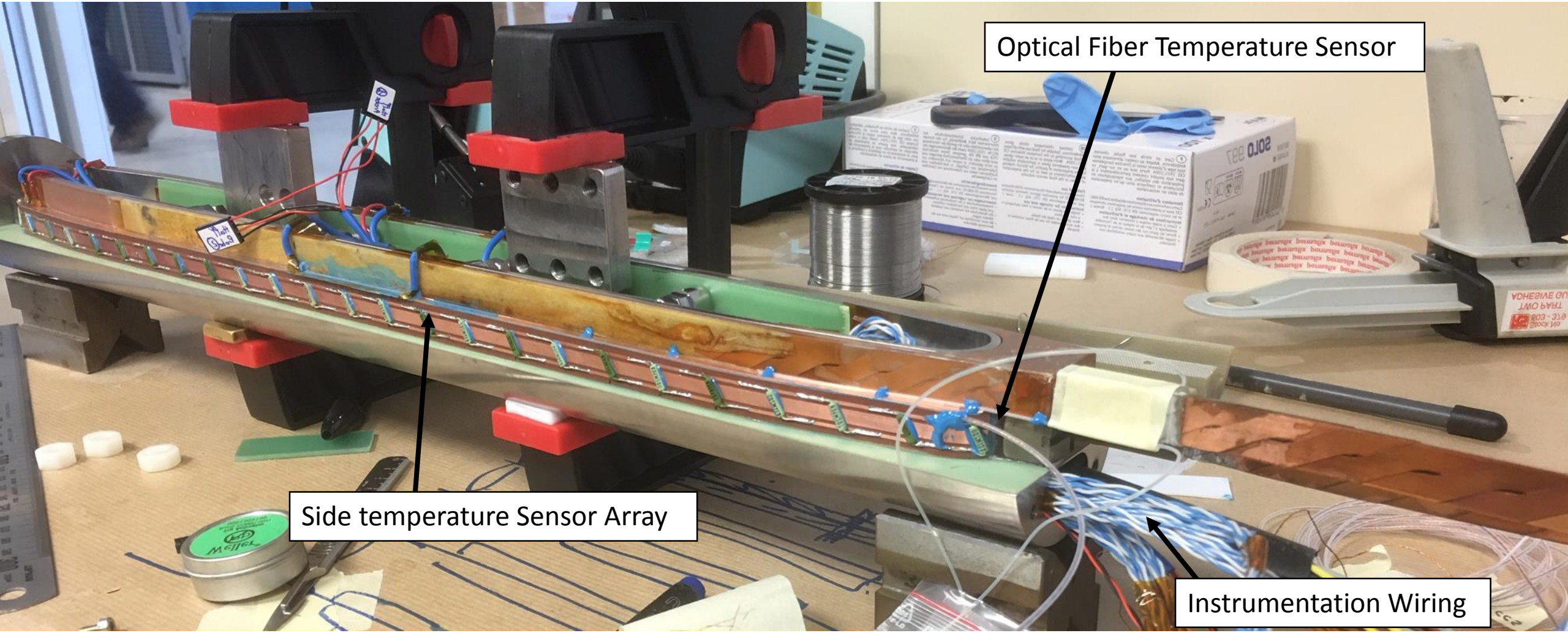




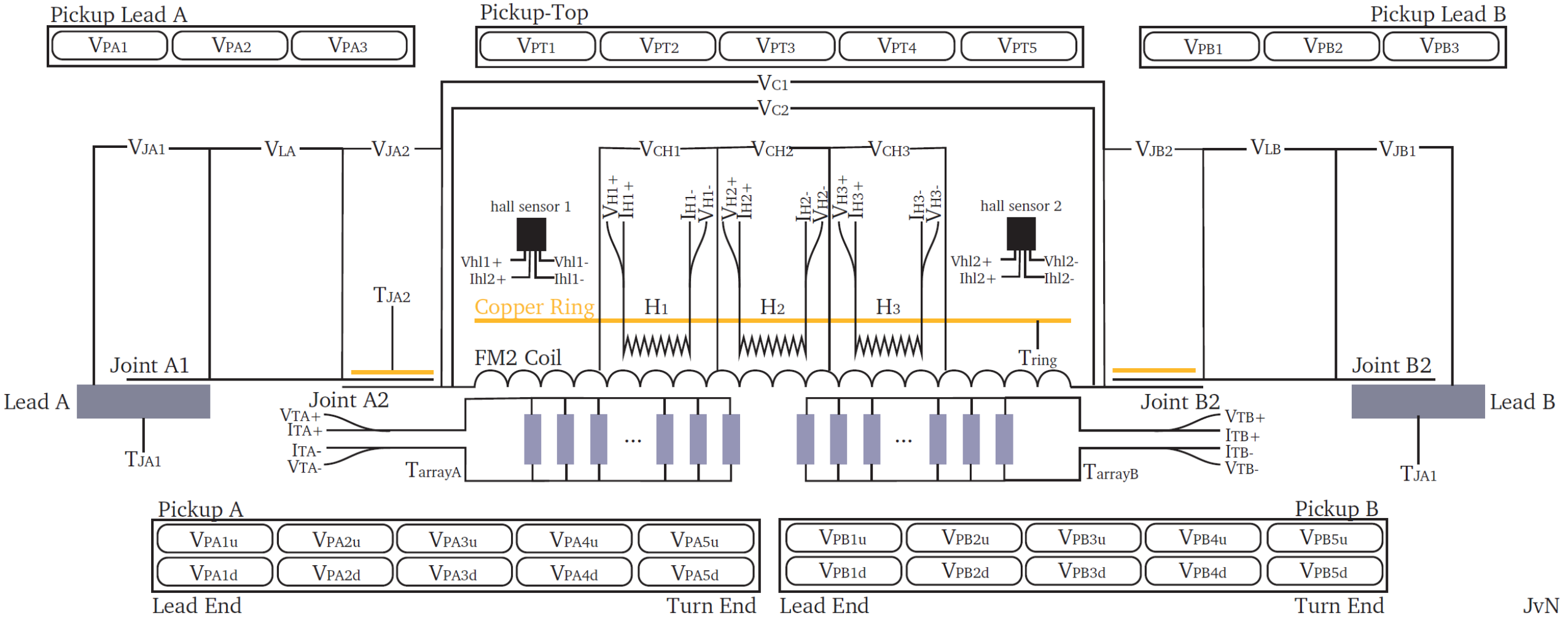
Feather M0


Top temperature Sensor Array
Coil edge heater
Broad face heater
Integrated field coil array
Inner turn heater
Pickup coil arrays
Callibrated Temperature Sensor
Hall Probe
Temperature Sensor Array

Feather M0


Optical Fiber Temperature Sensor
Side temperature Sensor Array
Instrumentation Wiring

Feather-M0 Instrumentation Diagram



Quench Detection and Protection

SM-18 Diode cryostat

PotAIM

Voltage quench protection
- Threshold 100 mV
- Window 5-10 ms

DAQ

Safety Matrix

Sync Trigger

Protection Trigger

Ni cRIO

RT Processor

Time synchronisation
- NTP

DAQ

Fire heaters
- Quench protection trigger with pre-set delay

Voltage over magnet
Cryostat sensors

Remaining sensors

Signals

Quench Detection Signals

Sensor	Frequency [Hz]	No. Pairs	Planned Quench Detection
Voltage	1000	7	Threshold + HPF
Temp. array	100	2	Drift threshold
CCS	100	2	Drift threshold
Pickup coils magnet	10 000	20	FFT, threshold w/ BPF
Pick up coils leads	10 000	4/6	FFT, threshold w/ BPF
Hall sensors	1000	2	?

Other Signals

Sensor	Frequency [Hz]	No. Pairs	Description
Voltage heater leads	(trigger) 10000	3	Heater power input
Voltage over cable at heater	(trigger) 10000	2	Normal zone resistance
Current heater	100	3	Heater power input
Pick up coils	10 000	5	Field calibration Fresca

Test plan

Cryostat ready may 16th

- HTS lead test
  - Test clamp connection + parallel DAQ
- Warm magnet test
  - Test sensors + protection
- Cold magnet test at low J_e
  - Check superconductivity
- Start at high Temperature
  - Low quench energy > Minimize consequences
- Gradually higher current + lower temperature
- Heater pulse with protection delay (Determine MQE)