MBHSP109
Update Cool down 7
Results on magnet performance

Salvador Ferradás Troitiño (TE-MSC-TF)
Gerard Willering (TE-MSC-TF)
Franco Mangiarotti (TE-MSC-TF)
Jerome Feuvrier (TE-MSC-TF)
Jean Luc Guyon (TE-MSC-TF)

05 February 2020 - 11T Dipole Technical Meeting #23

Contents

SP109 history

Winter 2018-2019:

Long magnets test station. ΔT of 150K

- Cool down 1
  Powering to Ultimate current ✓
- Cool down 2
  Verification. Change in the VI curve at (both1.9 K and 4.5 K). Quench current 100 A lower @ 4.5 K
- Cool down 3
  Further reduction in coil performance (at both 1.9 K and 4.5 K). Quench current ~ 50 A lower @ 4.5 K

Spring 2019:

Long magnets test station. ΔT 50 K

- Cool down 4
  VI showed degradation even after a reduced gradient cooldown
  High quench integral studies reaching up to 16.5 MA^2s
  VI showed degradation after high-QI quenches

July-August 2019:

HFM test station. ΔT 50 K

- Cool down 5 and 6
  No powering. HV tests, focusing on QH-Coil.

More information included in 11T Technical meeting #6
Prepared by G. Willering, M. Duda et al

Contents

Goals of cool down 7 & 8

- Cool down 7 (Jan 2020)

  Phase 0 - 4.5 K

  Training quench and VI at 4.5 K.

  Phase 1 - 1.9 K

  Ramp to target current and HV tests.

  Phase 2 – 200 K

  HV tests @ 3 bars

- Cool down 8 (not possible due to schedule)

  Verification of test station and cooling rate dependency, at 4.5 K

Contents

Cooling procedure of Long Magnets vs HFM cryostats

Long Magnets test station

- Cooling to 4.5 K
- Injection of LHe

- Warm – up

  Vaporization using heaters installed between yoke and shell

HFM test station

- Cooling to 4.5 K,

  2 steps

  1. RT - 80 K
     - Gas injection at desired temp
  2. 80 K – 4.5 K
     - LHe injection

- Warm – up

  1. 80 K – RT
     - Gas injection at desired temp
  2. 4.5 K – 80 K
     - Vaporization using heaters at the bottom of the cryostat

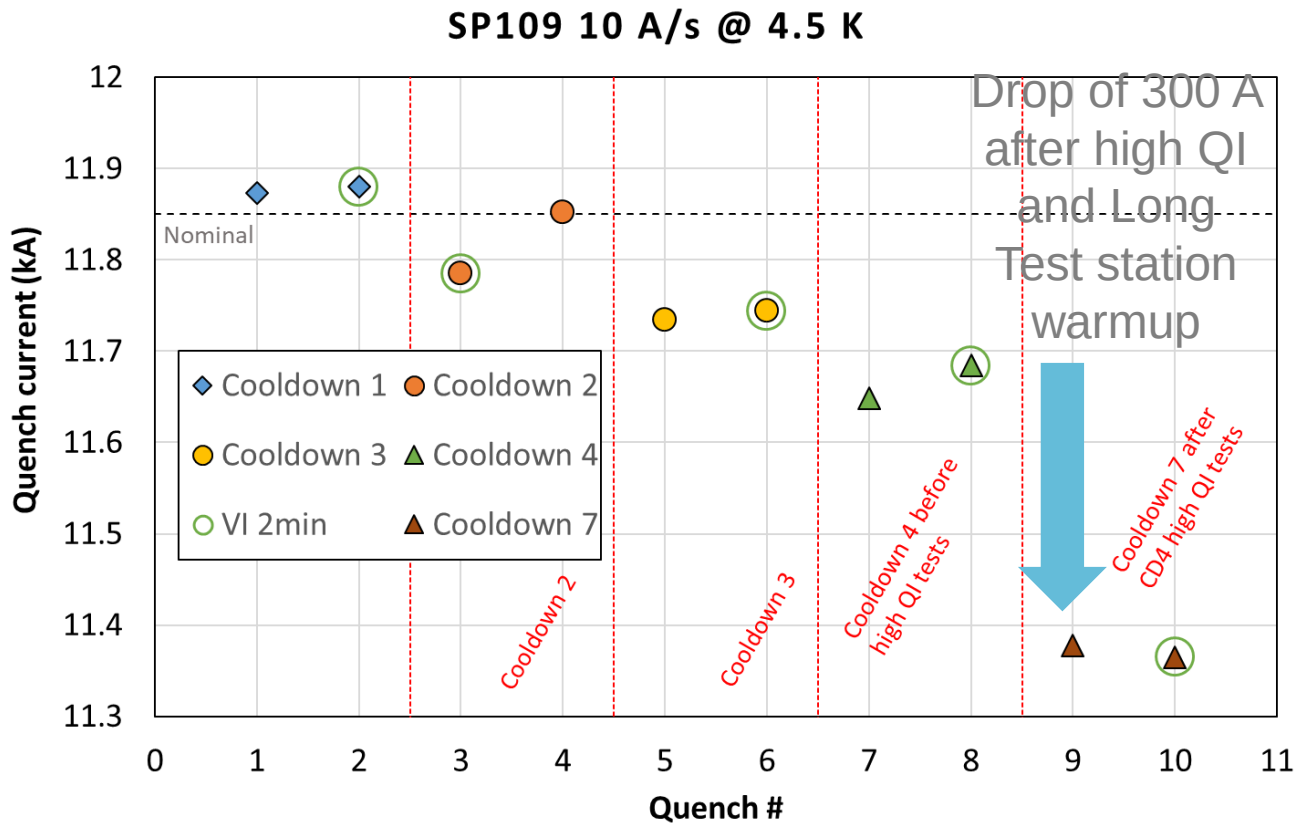
Contents

Cooldown # 7: Coil limit @ 4.5 K

Phase 0 - 4.5K

- **It was concluded previously, that thermal cycling affected the performance of the magnet.**
- The quench current of the magnet decreased after the high QI studies during CD 4.

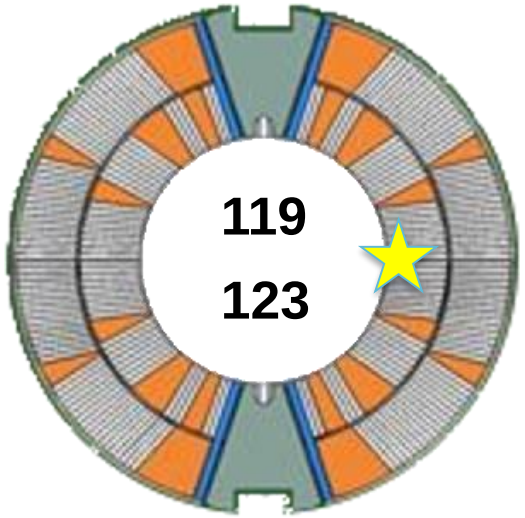
  This was observed also at 1.9K



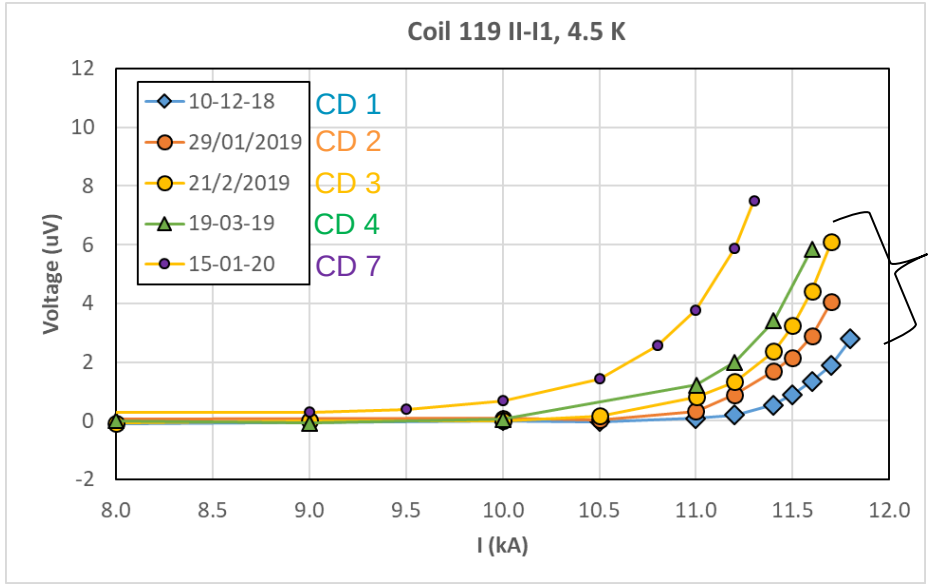
More information included in 11T Technical meeting #6
Prepared by G. Willering, M. Duda et al

Cooldown # 7: Coil limit @ 4.5 K

Phase 0 - 4.5K

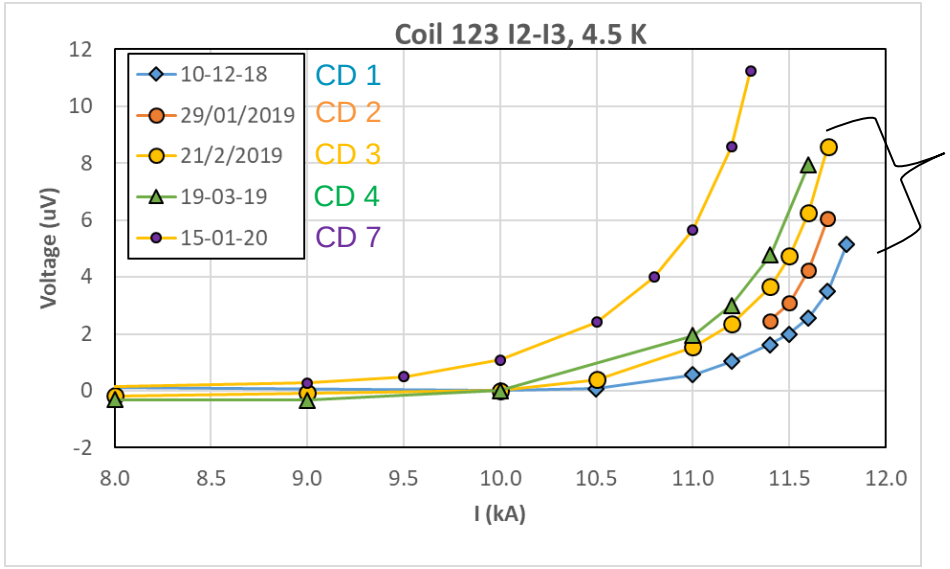


A full TC in HFM would be helpful to study the station-dependency.



Before high QI @ CD4

CD 1 – CD 4
Voltage increase due to thermal cycling



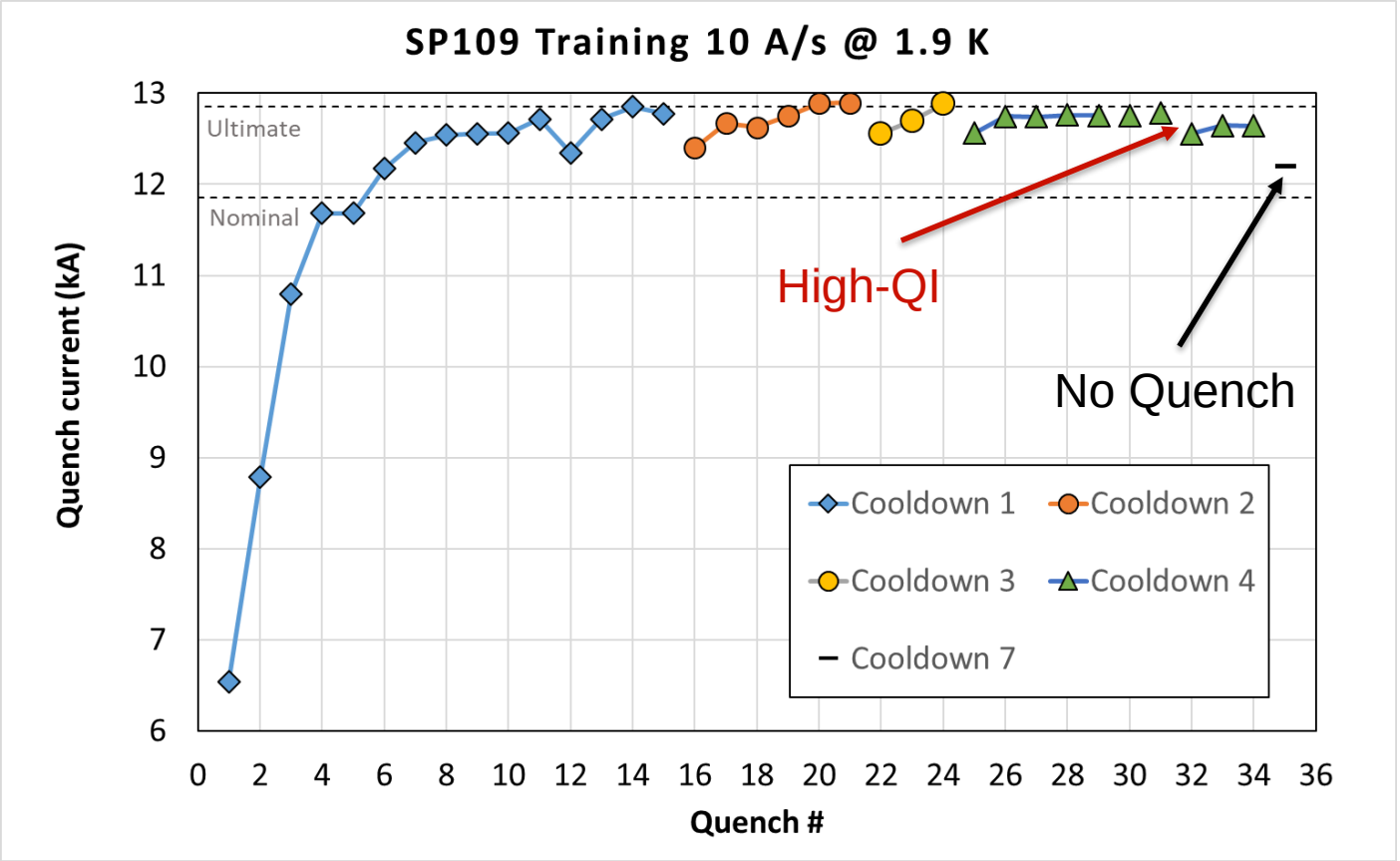
Before high QI @ CD4

Contents

Cooldown # 7: Performance @ 1.9 K

Phase 1 - 1.9K

- **Ramp to target current of 12.2 kA without quench.**
  - Showing good memory



Contents

Conclusions and next steps

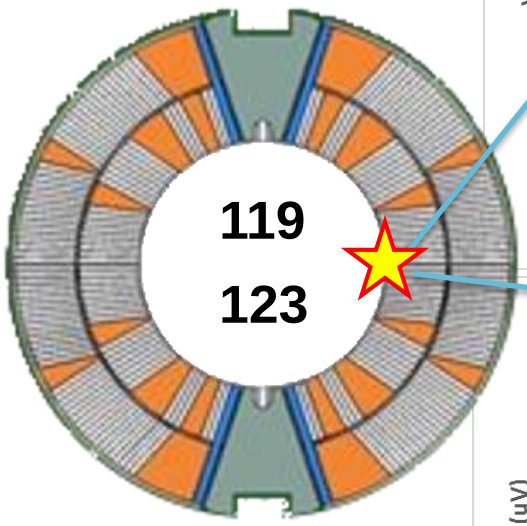
- The magnet reached 12.2 kA @ 1.9 K showing good memory
- There is degradation at 4.5 K as it was seen at 1.9 K after high-QI studies in CD 4

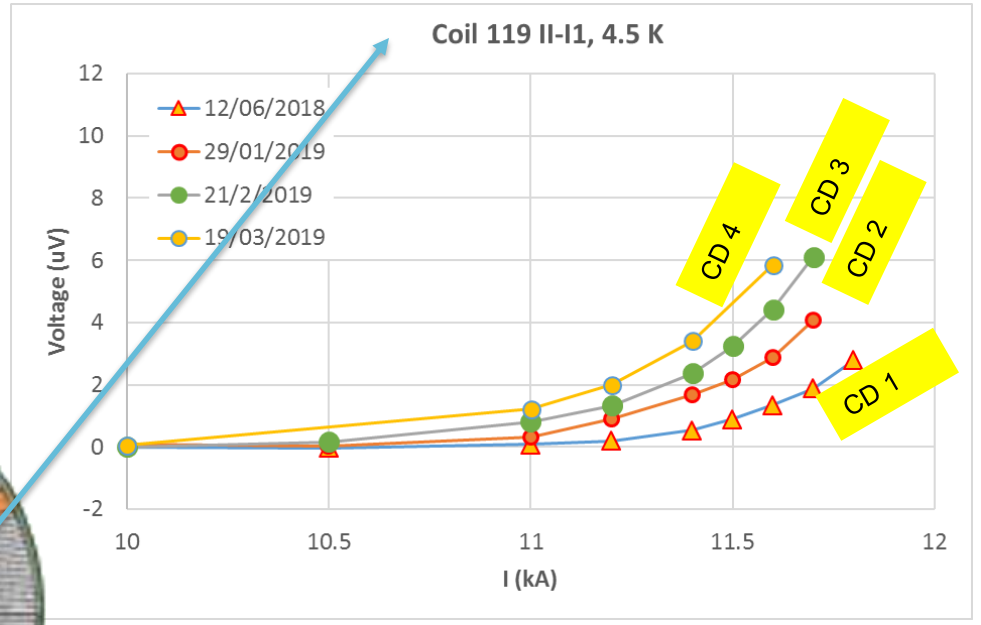
- Cooldown 8 if possible to compare test station dependency

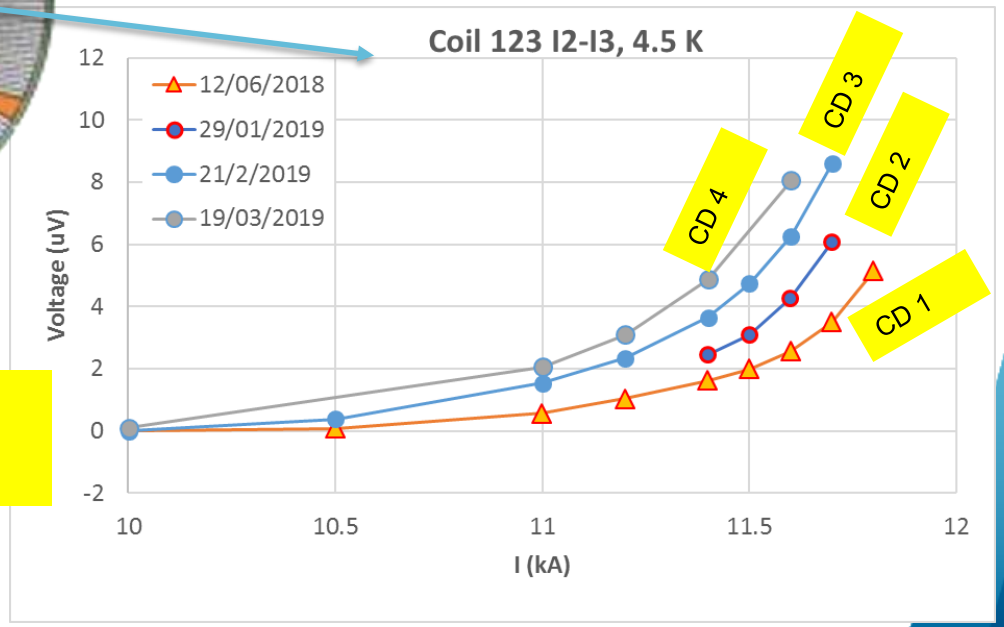
Additional slides

V-I measurements in SP109 at 4.5 K

Back





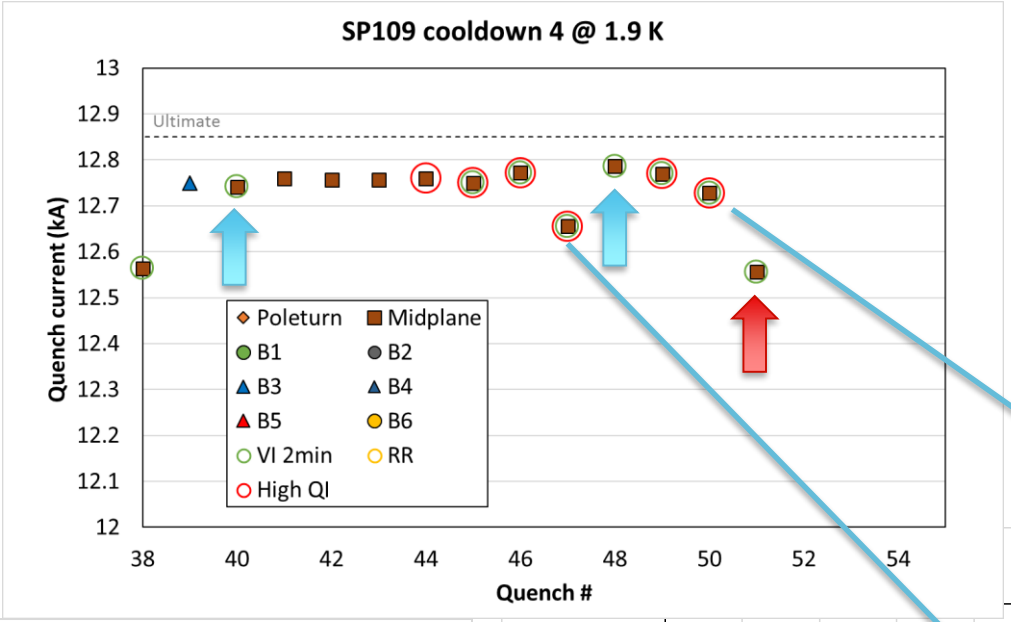


Quenches in the midplane at the coil limit all occur in the right half of the magnet.

High QI

Back

- VI curve shifts after last QI quench (hotspot temperature > 300 K)
- Quench current drops after last QI quench
- During quench almost full length of the segment is not superconducting: almost full length sees high temperature
- Consistent with thermal cycle observation



More tests to follow and verify tomorrow