# Status of CCT corrector construction and test

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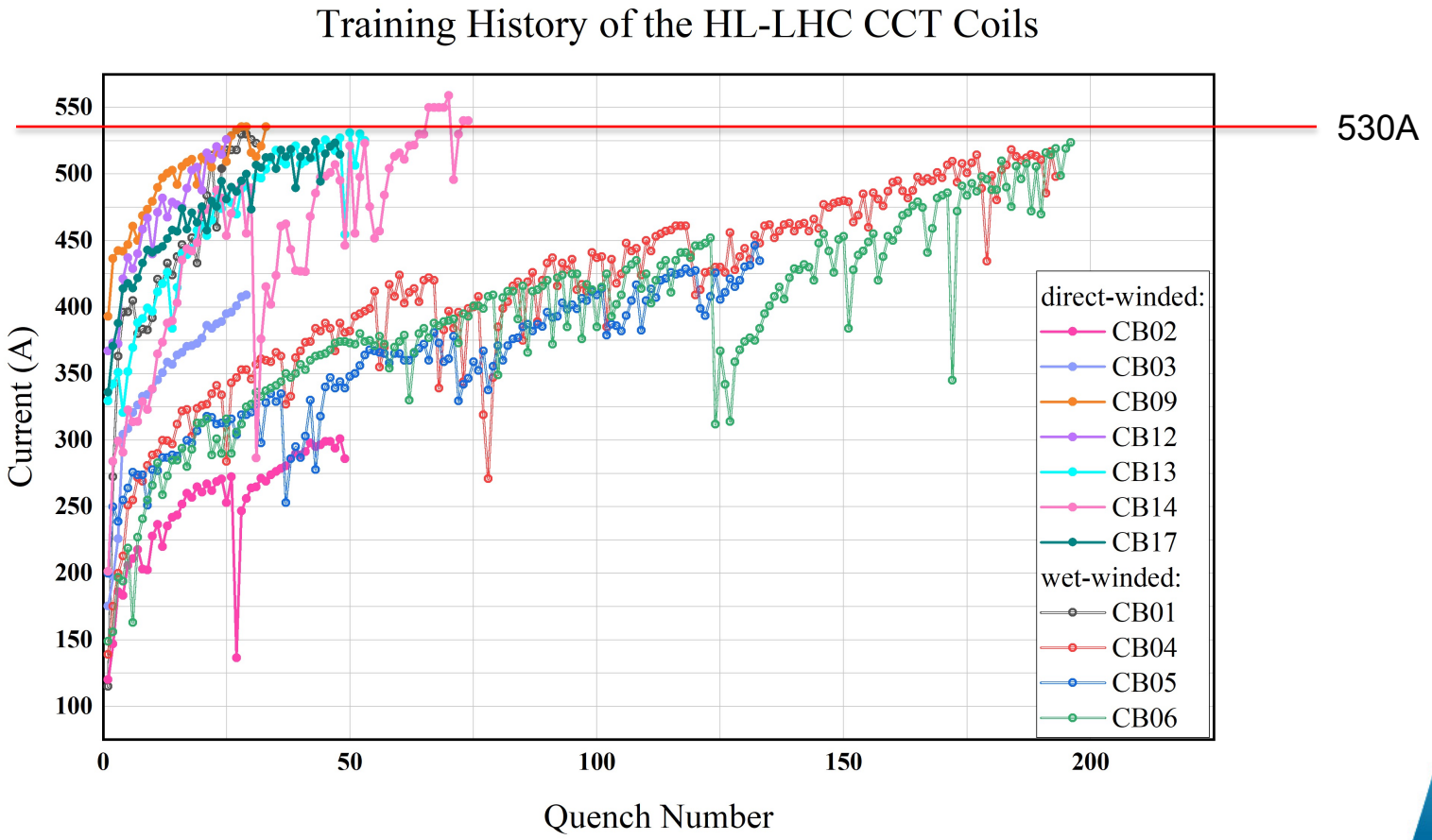
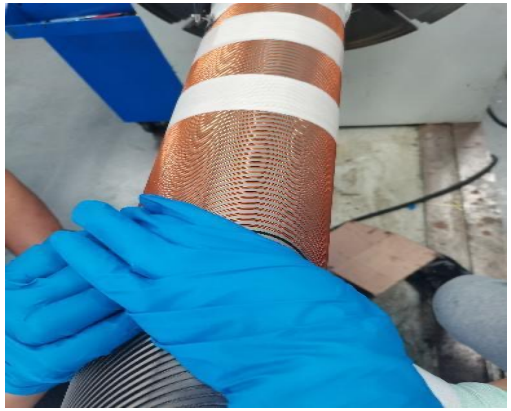
# Progress of series production

| | Coil name | Winding method | Location | Coil stand-alone performance (4.2 K) | Magnet performance at 4.2 K |
|---|---|---|---|---|---|
| MCBRD01 | MCBRD_CB01 | Wet wind | CERN | 530 A | Both apertures reached ultimate current 422 A, and passed 4-hour stability test |
| | MCBRD_CB03 | Direct wind | | 410 A (training stopped due to the availability of the test station) | |
| | MCBRD_CB02 | Direct wind | CERN | Failed to reach the design current | |
| MCBRD02 | MCBRD_CB04 | Wet wind | CERN | 422 A (training stopped due to the availability of the test station) | Both apertures reached ultimate current 422 A, and passed 4*1 hour stability test |
| | MCBRD_CB06 | Wet wind | | 530 A | |
| MCBRD03 | MCBRD_CB09 | Direct wind with new channel size | CERN | 530 A | Both apertures reached ultimate current 422 A, and passed stability test |
| | MCBRD_CB12 | Direct wind with new channel size | | 526 A (25 quenches) | |
| | MCBRD_CB14 | Direct wind with new channel size | BAMA | 530 A (30+34 quenches), put in quarantine | |
| MCBRD04 | MCBRD_CB13 | Direct wind with new channel size | IMP | 530 A (20+33 quenches) | Both apertures reached ultimate current 422 A, and other tests will be implemented in the middle of Oct. |
| | MCBRD_CB17 | Direct wind with new channel size | | 524 A (47 quenches) | |
| *MCBRD05* | MCBRD_CB18 | Direct wind with new channel size | IHEP | *The stand-alone test of CB18 and CB19 will be implemented in the middle of Oct.* | - |
| | MCBRD_CB19 | Direct wind with new channel size | IHEP | | - |
| | MCBRD_CB20 | Direct wind with new channel size | BAMA | *Ready for VPI* | |
| MCBRD_CB10, 11, 15, 16 | | Shipped to CERN for fabrication | | | |

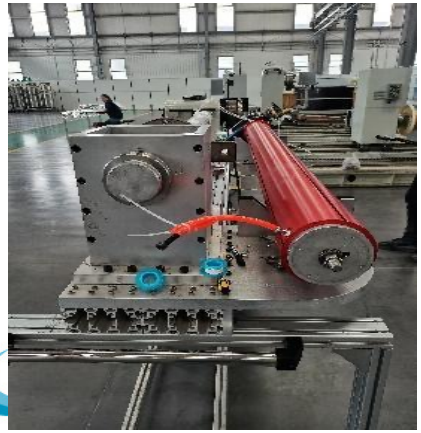
# Stand-alone test results of all Apertures

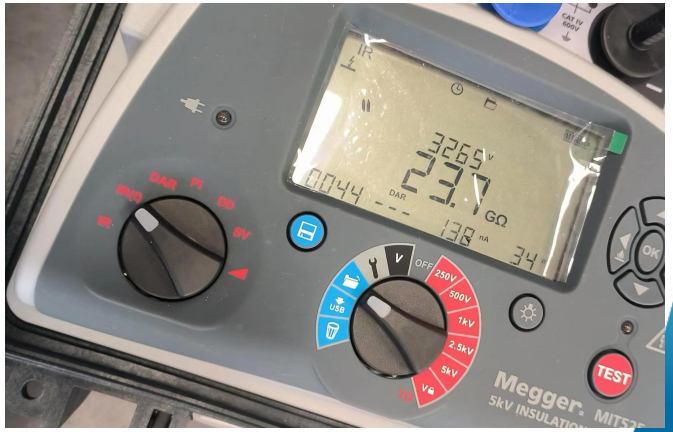


# Manufacture of CB14

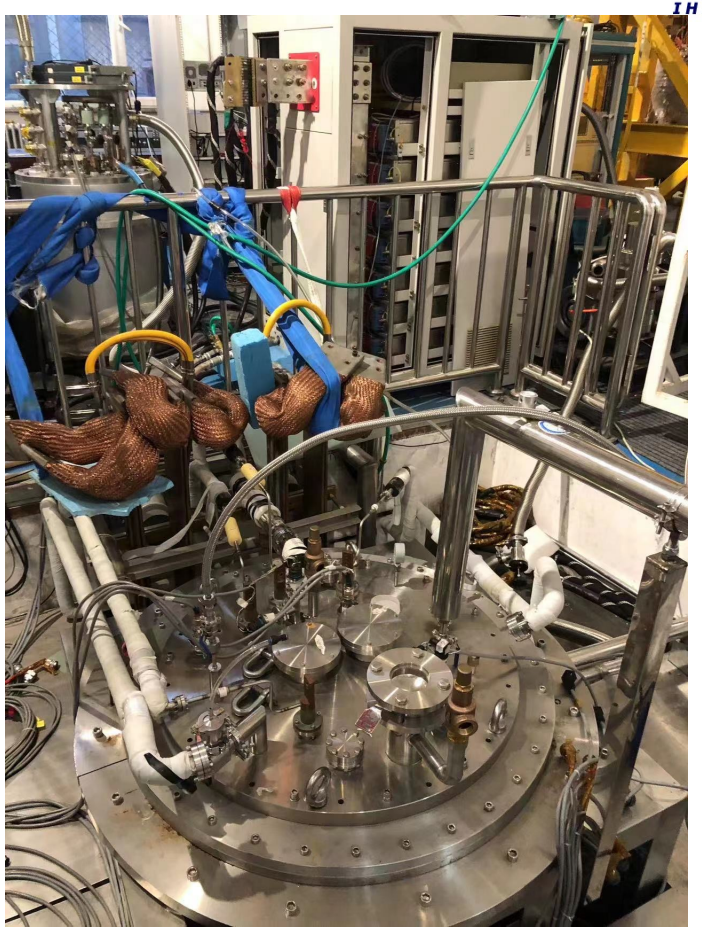


# Manufacture of CB14

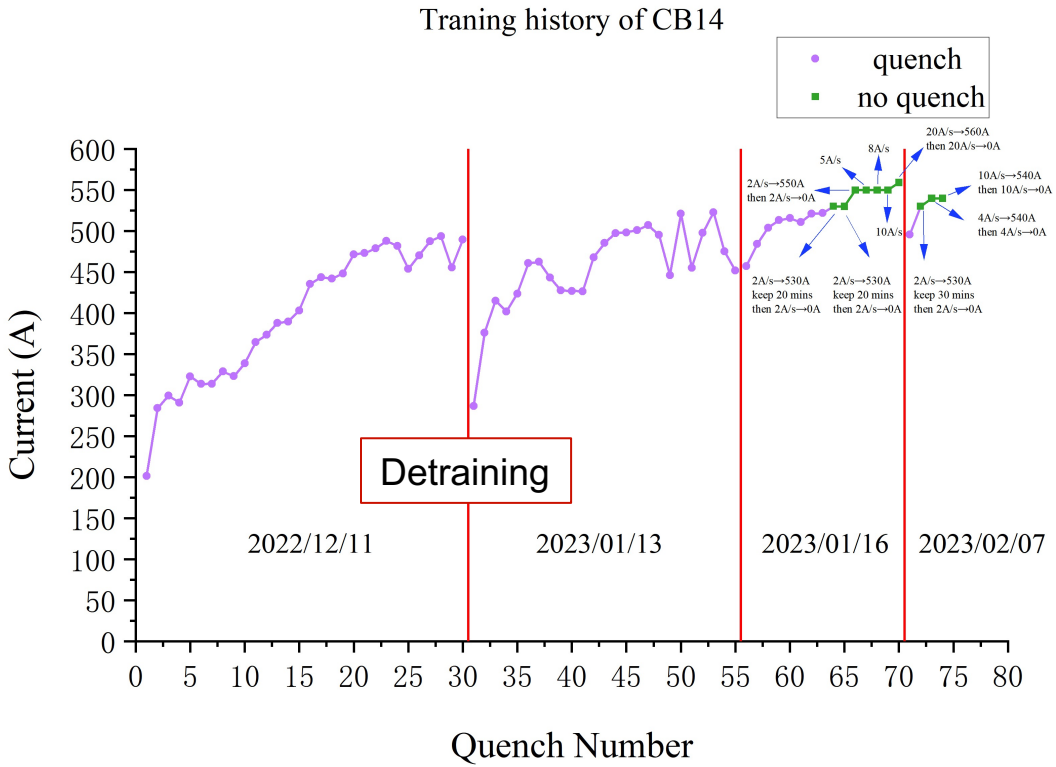





# Stand-alone test of CB14 at IHEP



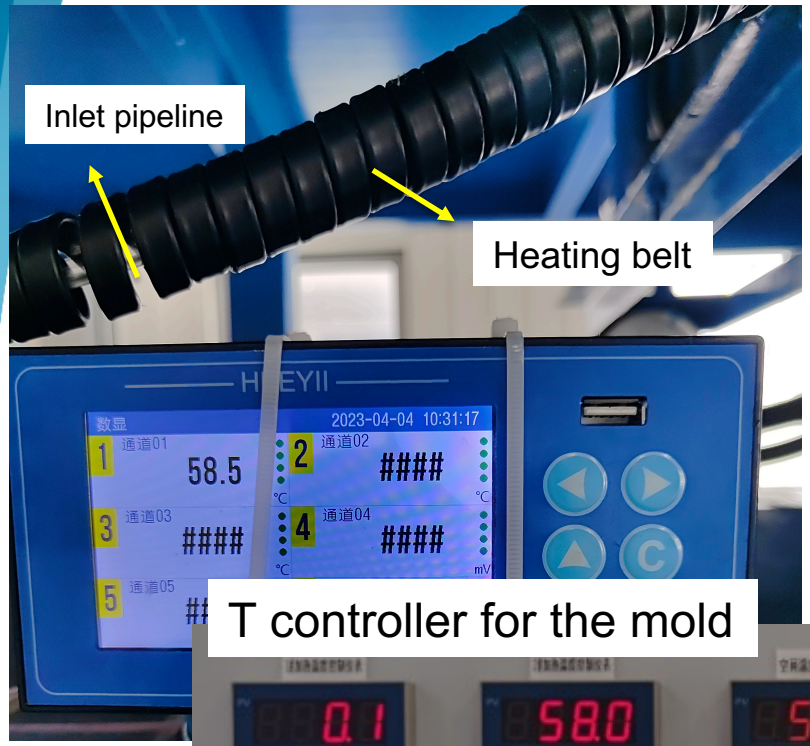
# Stand-alone test of CB14



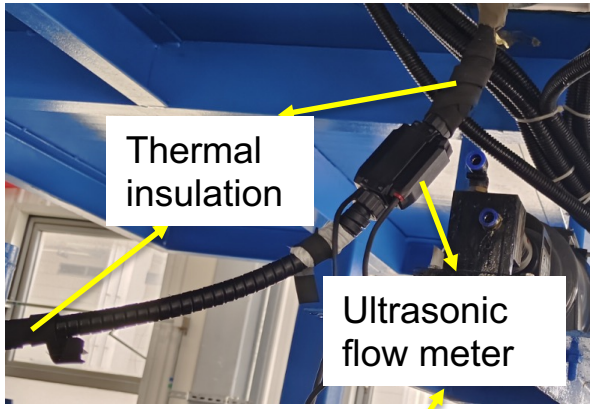

Changes:

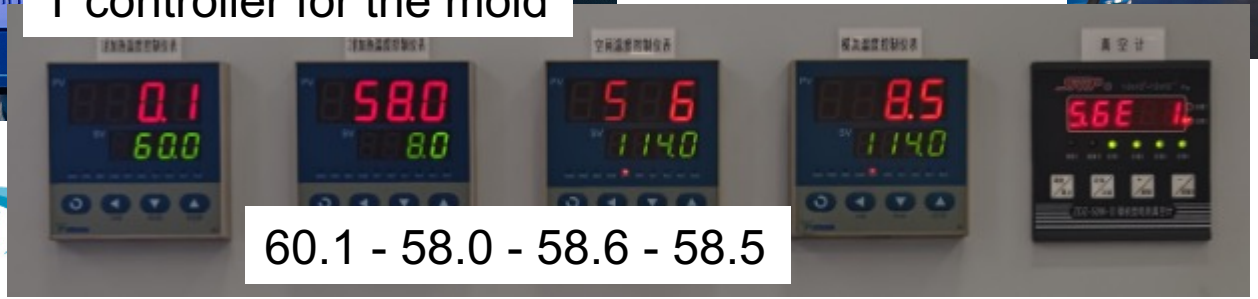
- Changes of the operators.
- **The inlet pipeline between mix tank and impregnation furnace (exposed in the air ~10℃) didn't use any thermal insulation.**
- It takes a longer time (6~7h) of injection compared with CB09 ~ CB13 (3~4h).

# Corrective action of the VPI station

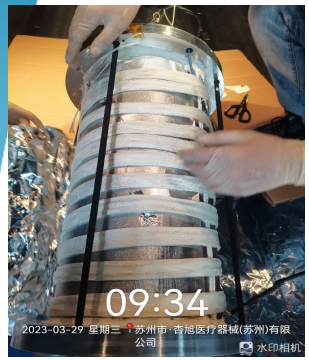


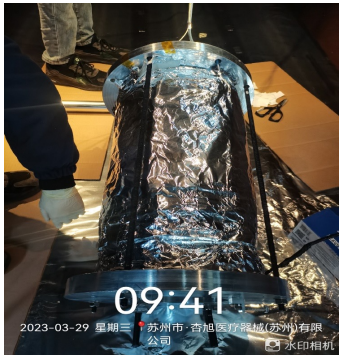


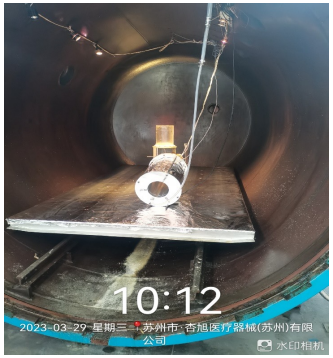


# Qualification of the VPI system



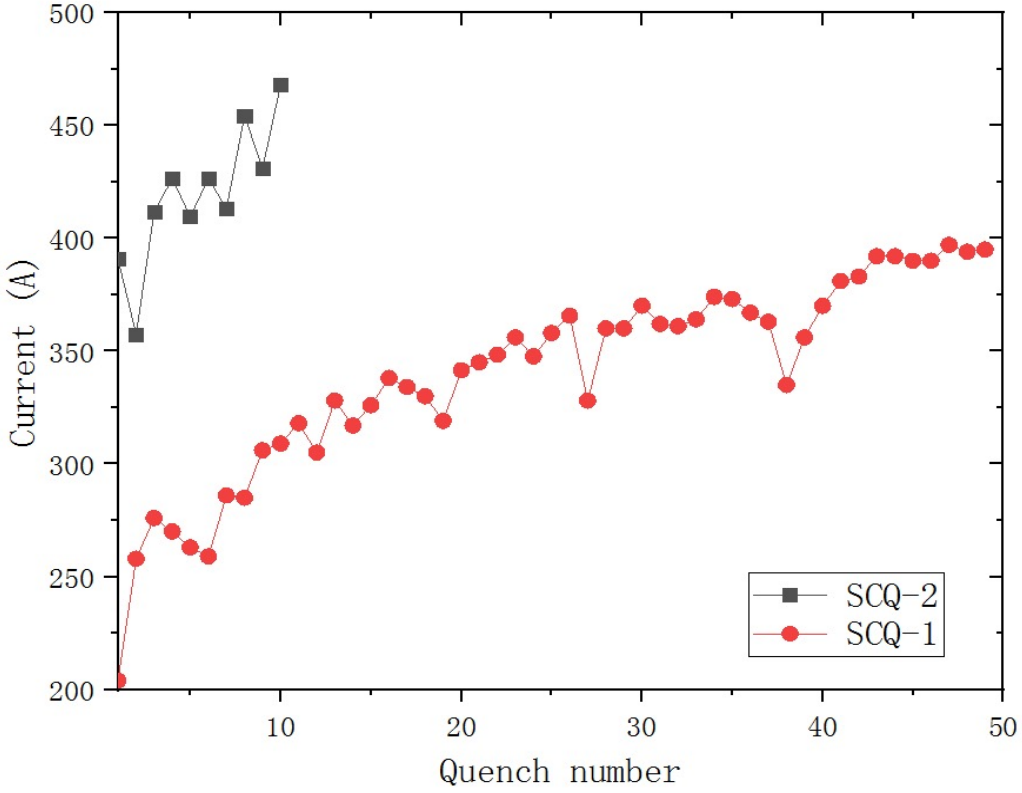


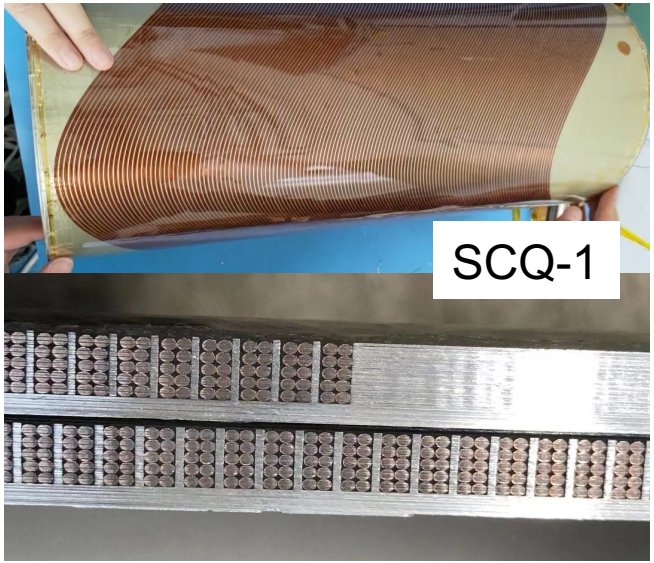

Set the curing procedure.
设定固化程序。

60℃ —30min→ 80℃ —1440min→ 80℃ —60min→ 135℃ —180min→ 135℃ —→ 20℃

- We use a 0.5m quadrupole CCT magnet as a qualification of the VPI system after applying the corrective actions.
- This magnet will be tested this week.

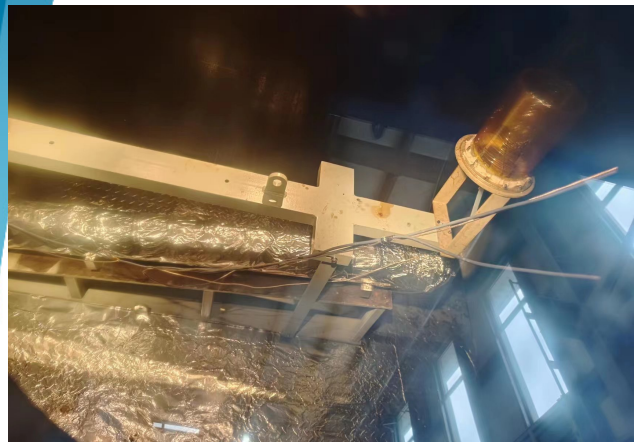
# Performance of SCQ-CCT coils

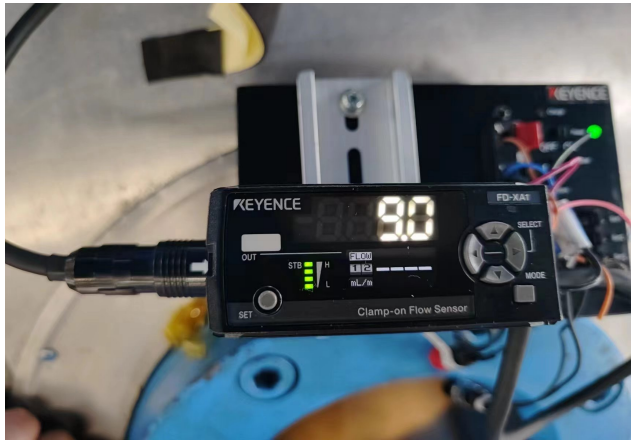



- Well impregnated magnet SCQ-1 experienced long training
- With the modified channel size, the training performance of SCQ-2 significantly improved.

# VPI for CB17

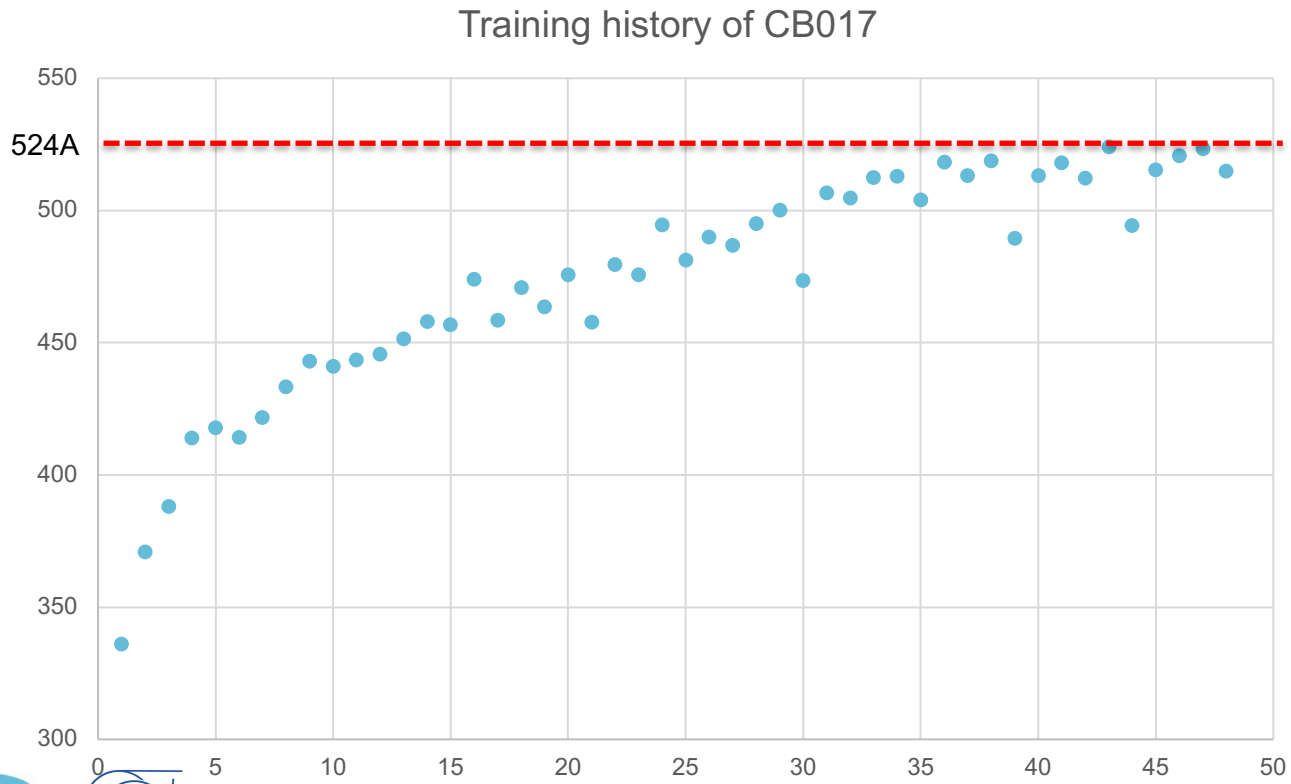




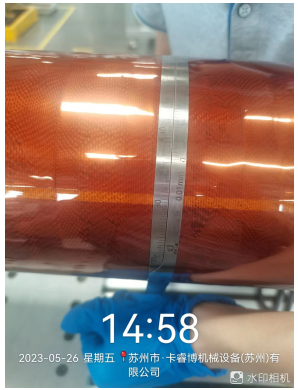


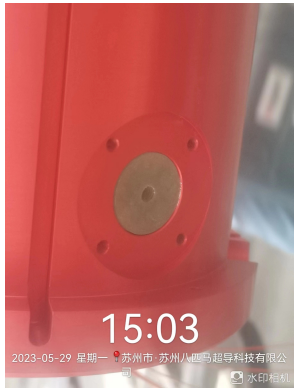
| Equipment | Object | Function | Voltage/ Current | Test Time | Resistance |
|---|---|---|---|---|---|
| Megger MIT 525 | Coil to ext. tube | IR | 512V/5.82nA | 30 s | 88.0 GΩ |
| | Coil to ext. tube | IR | 1026V/10.4nA | 30 s | 98.4 GΩ |
| | Coil to ext. tube | IR | 1544V/16.5nA | 30 s | 93.8 GΩ |
| | Coil to ext. tube | IR | 2052V/22.3nA | 30 s | 92.2 GΩ |
| | Coil to ext. tube | IR | 2557V/20.8nA | 30 s | 123.2 GΩ |
| | Coil to ext. tube | IR | 3267V/32.1nA | 30 s | 101.9 GΩ |

# Stand-alone training of CB17



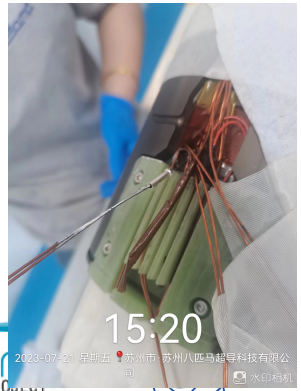
# Manufacture of CB18

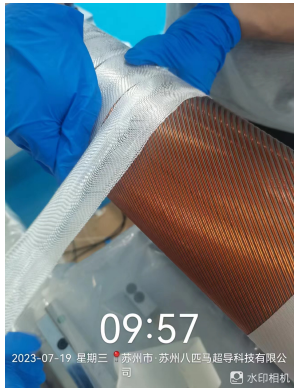





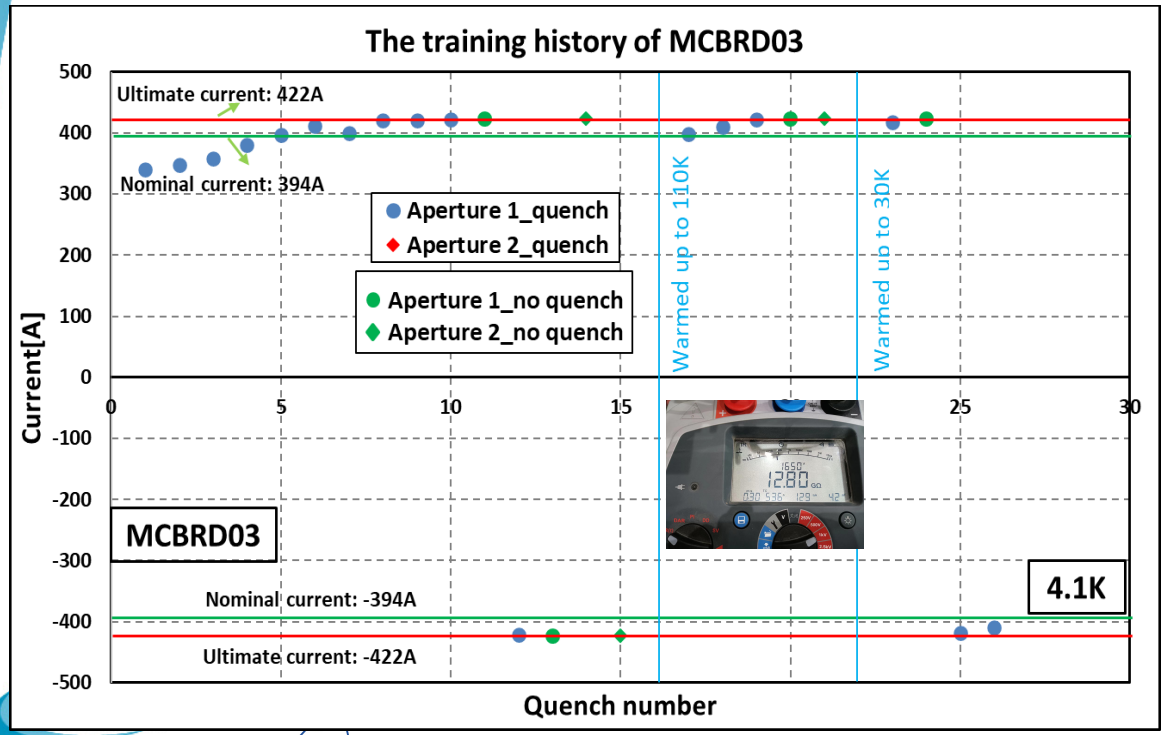
# Manufacture of CB19

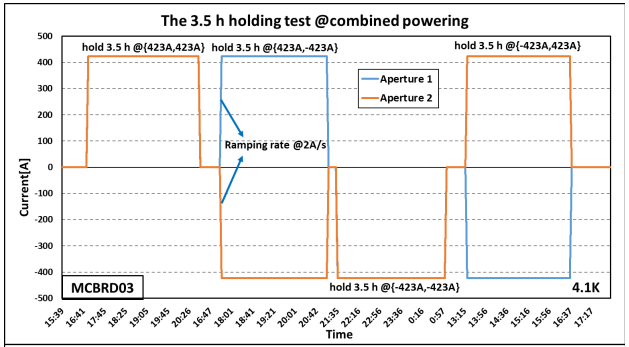


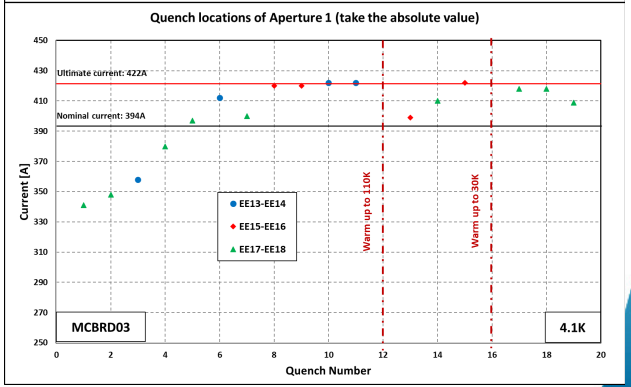




# Training history of MCBRD03 (1st test)

- AP1(CB12，25 quenches 526A) reached ±422A after 11 quenches.
- AP2(CB09, 33 quenches 530A; after thermal cycle ＞500A) reached ±422A without any quenches.

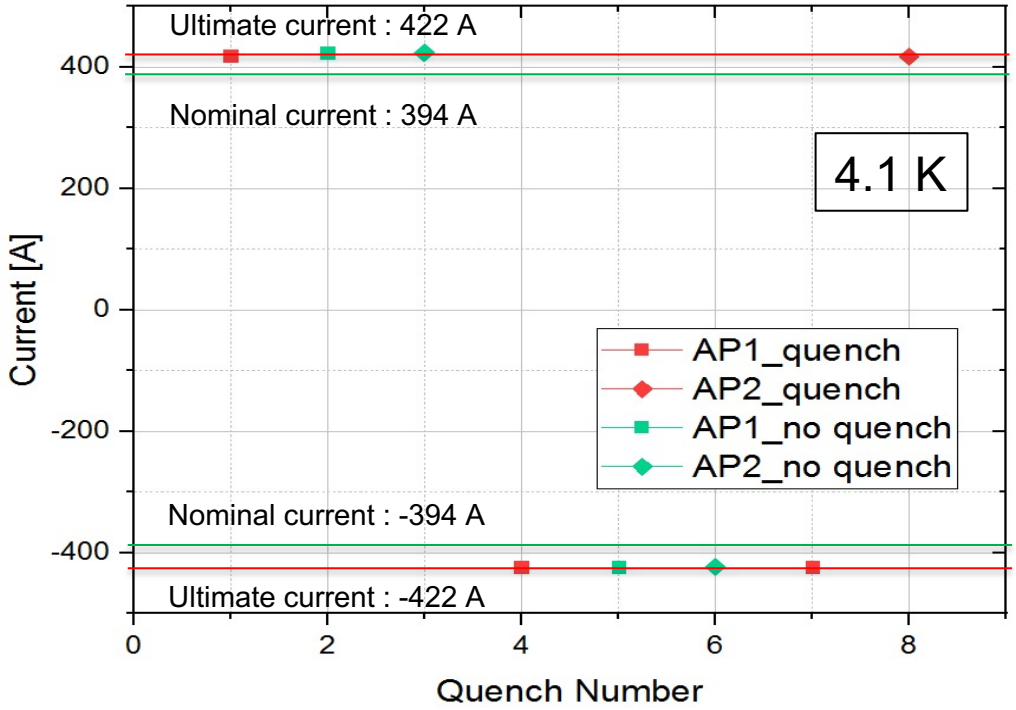


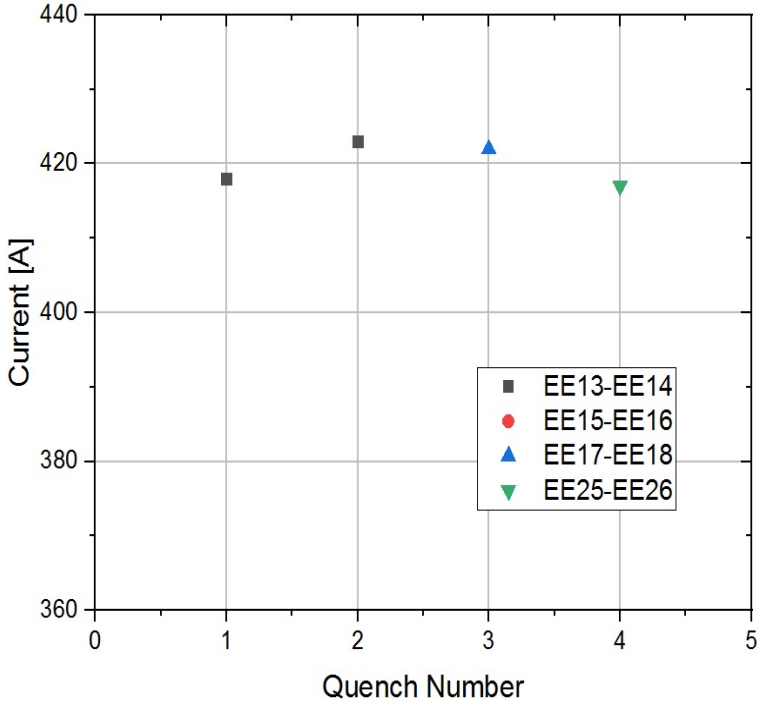



# Training history of MCBRD03 (2nd test)

- Both Apertures reached the nominal current without any quenches after thermal cycle.

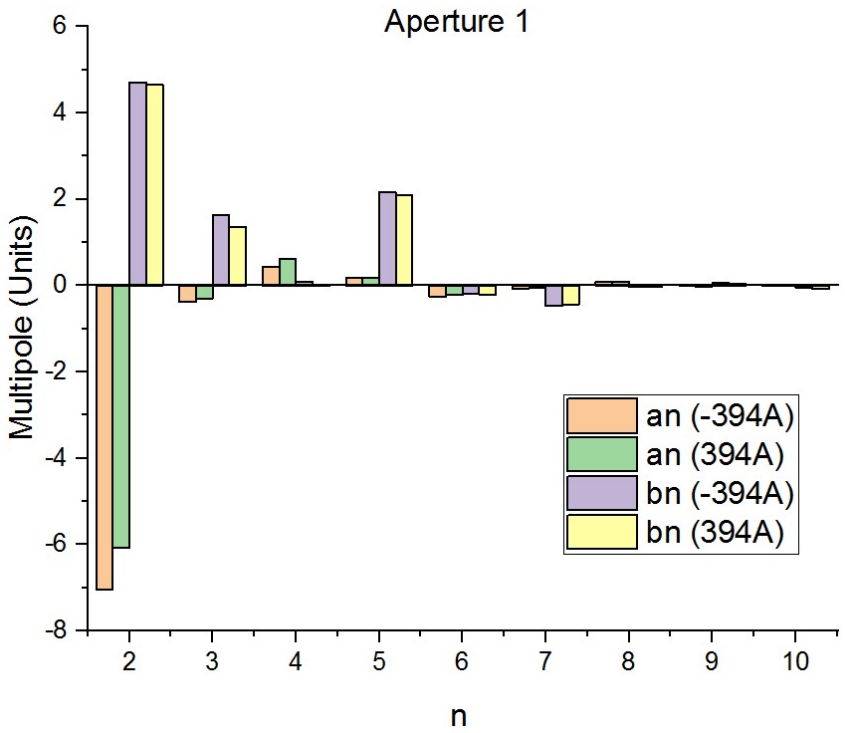


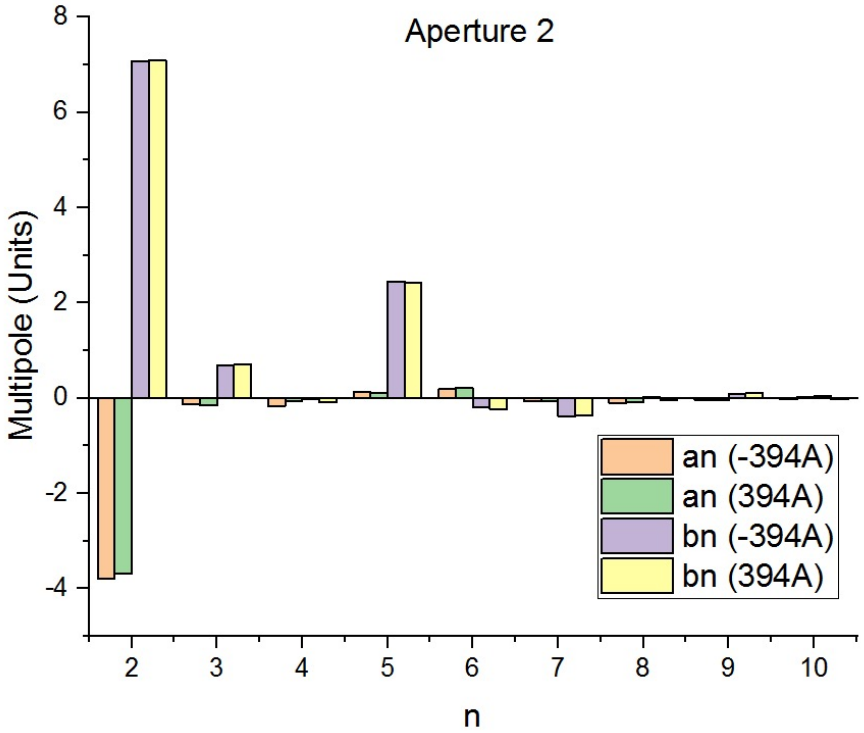




Training history and quench location of the 2nd test

# Field Quality of MCBRD03

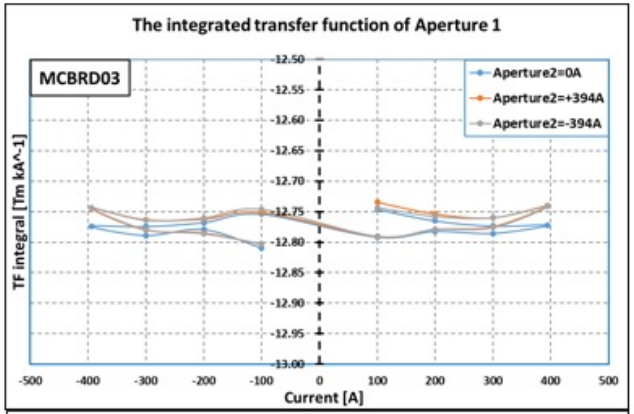
***Multipoles (individual powering)***

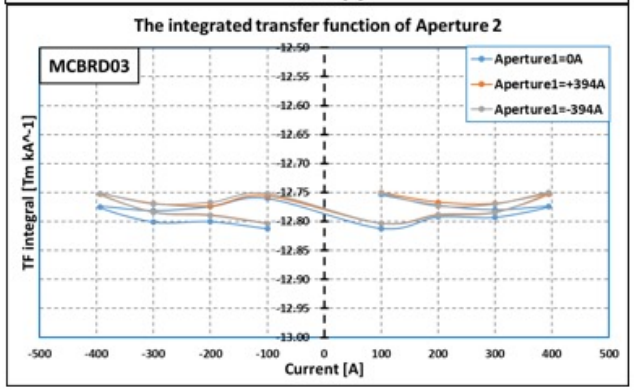


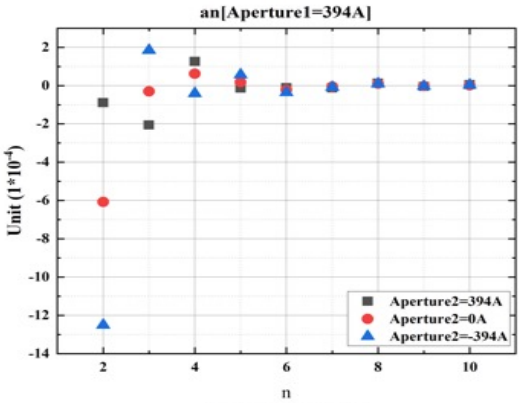
# Field Quality of MCBRD03

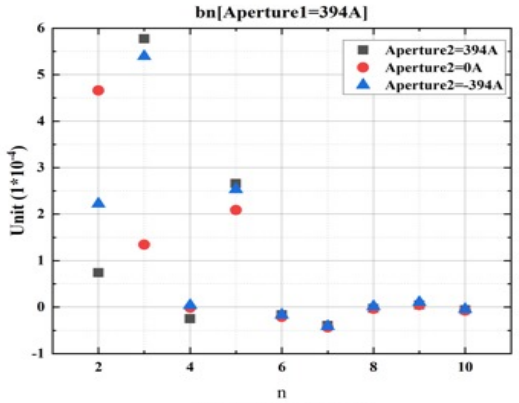
***Crosstalk-transfer function (combined powering)***

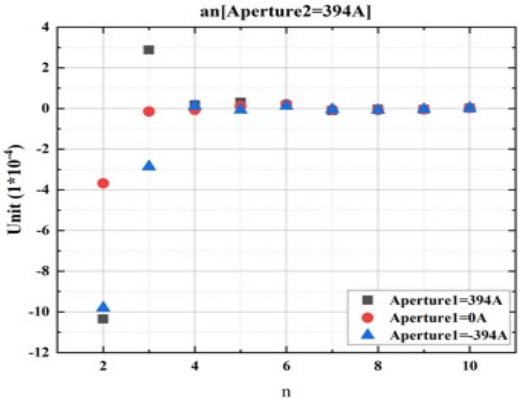


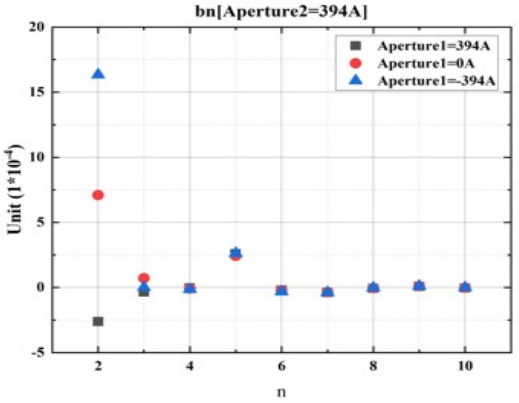




***Crosstalk- Multipoles (combined powering)***

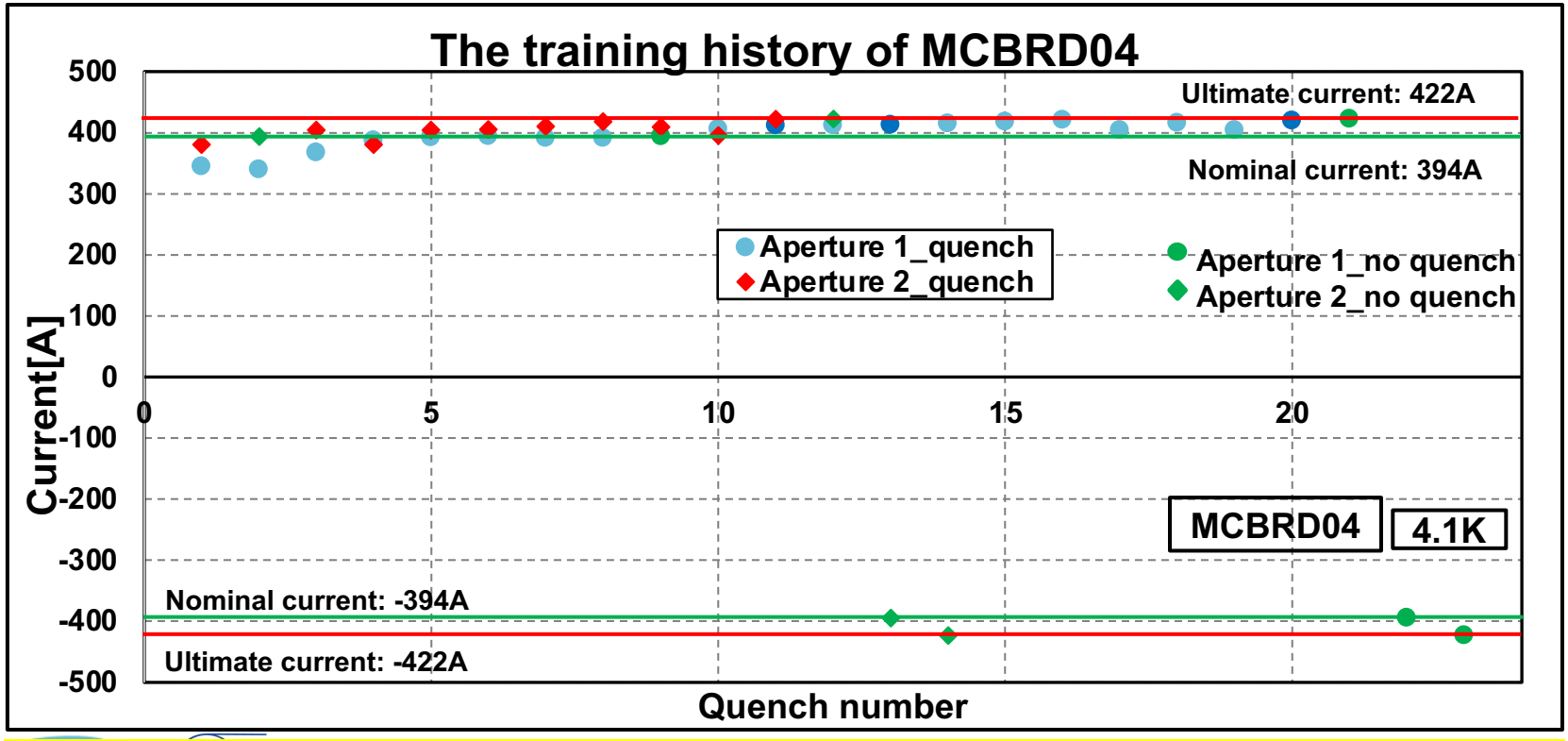


# Training history of MCBRD04 (1st test)




- AP1(CB17, 47 quenches 524A) reached ±422A after 15 quenches.
- AP2(CB13, 53 quenches 530A) reached ±422A with 10 quenches.

# Summary

- 4 series CCT magnets have been fabricated. All of them reached the ultimate current and passed the field quality test. The 5th magnet is under fabrication.
- The 4th magnet to be delivered in late Oct or early Nov. The 5th magnet to be assembled in Nov, tested and delivered in late Dec 2023 or early Jan 2024
- Production rate for the rest of series magnets: every 3 month per magnet
- Components for 2 CCT magnets have been shipped to CERN from IHEP, to verify the performance with components from China and CERN fabrication process.


***Thanks for your attention***