

ASG SUPERCONDUCTORS

MBRD1 REPAIR ACTIVITY AT ASG PREMISES

July 31, 2024

www.asgsuperconductors.com

VS-01 Aperture (Coils AS-01 + BS-01)

Coils vs. ground

Coil **AS-01** insulation vs. ground @3,1kV -> **45,9** GΩ

Coil **BS-01** insulation vs. ground @3,1kV -> **44,8** GΩ

Quench Heaters vs. ground

QH AS-01 dx insulation vs. ground @3,1 KV -> **48,6** GΩ

QH AS-01 sx insulation vs. ground @3,1 KV -> **31,8** GΩ

QH BS-01 dx insulation vs. ground @3,1 KV -> **31,1** GΩ

QH BS-01 sx insulation vs. ground @3,1 KV -> **24,8** GΩ

VS-02 Aperture (Coils AS-02 + BS-02)

Coils vs. ground

Coil **AS-02** insulation vs. ground @3,1kV -> **61,1** GΩ

Coil **BS-02** insulation vs. ground @3,1kV -> **49,6** GΩ

Quench Heaters vs. ground

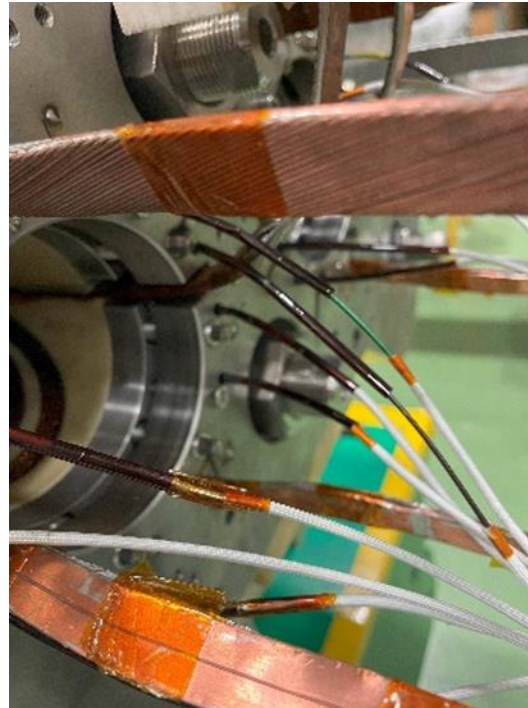
QH AS-02 dx insulation vs. ground @3,1 KV -> **32,2** GΩ

QH AS-02 sx insulation vs. ground @3,1 KV -> **18,2** GΩ

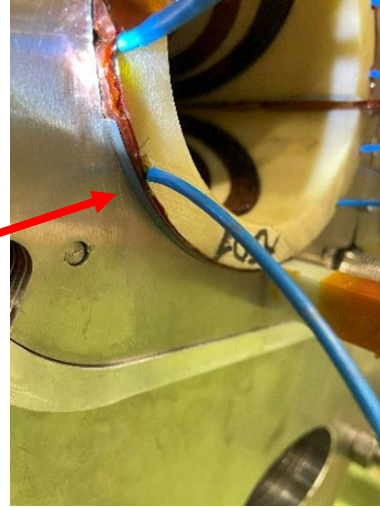
QH BS-02 dx insulation vs. ground @3,1 KV -> **31,1** GΩ

QH BS-02 sx insulation vs. ground @3,1 KV -> **23,7** GΩ

In the photos is shown the status on the MBRD1 at the arrival at ASG on July 2024

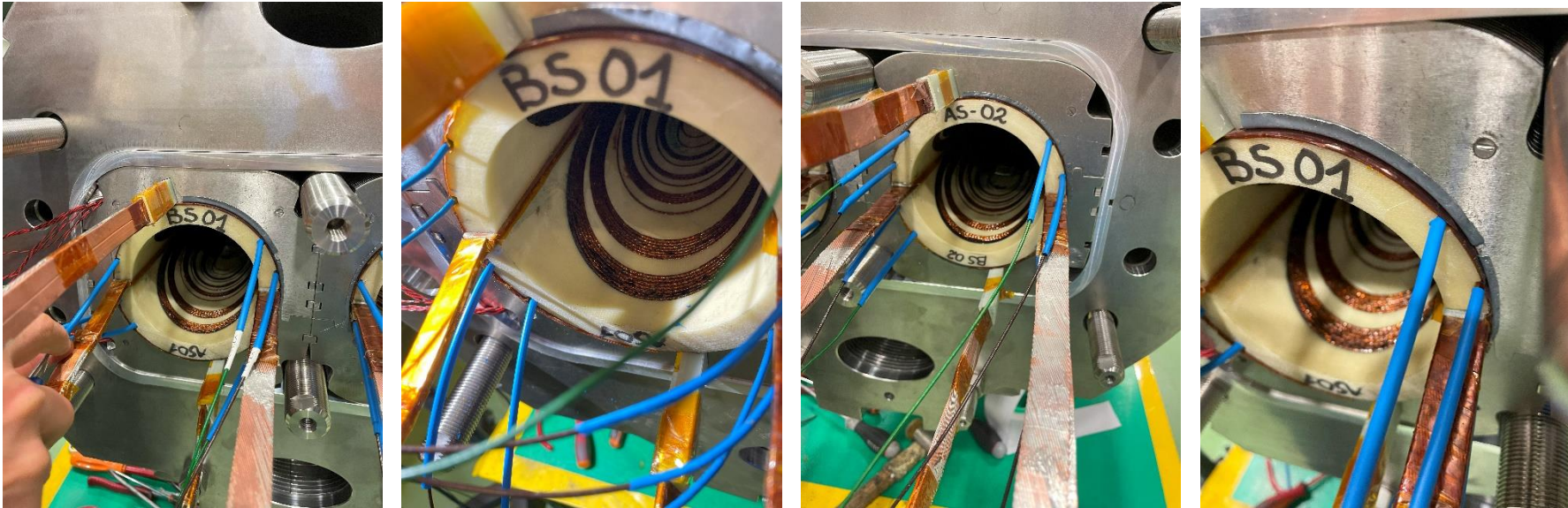


In these photos is shown the status on the MBRD1 Dipole. It is shown the detail of the YT112+ QH wire.

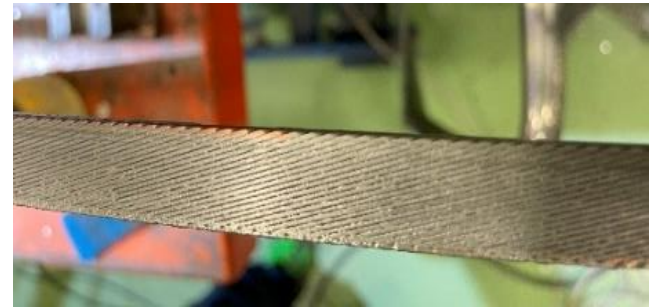


Coil by coil (on LC end) it is shown the coil protection foil edges bent against the adjacent collar





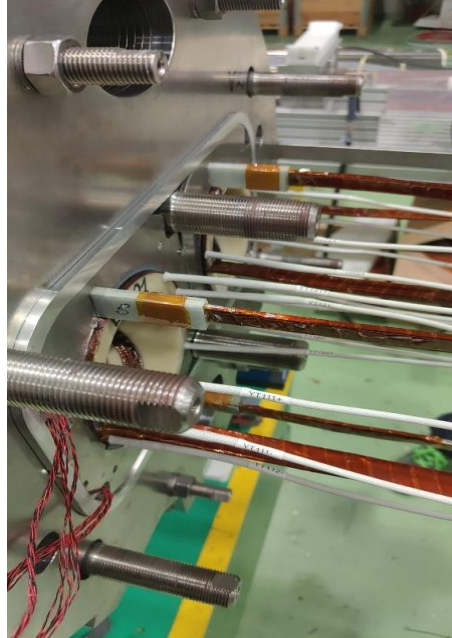
In this slide is shown the application of the (blue pipe) above the insulation of the QH wires.



In this picture is shown the restoring and the soft soldering of the Rutherford cable to the “reinforcement” bar.

For a further protection of the QH wires a glass braid is the applied.

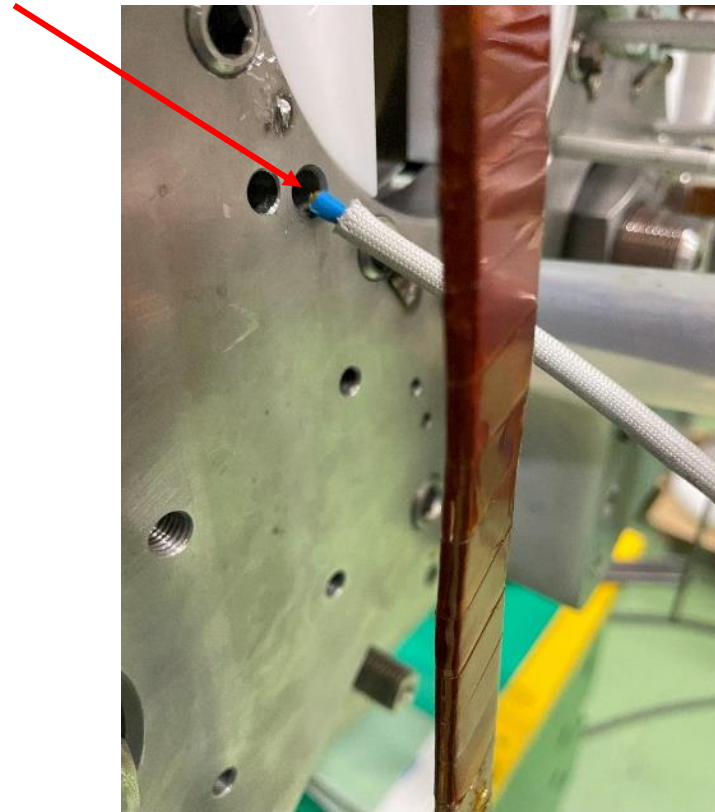
The glass braid length is about 400 mm measured from the LC plate outer surface.



NOTE - The Y112+ wire (the one affected to short vs. ground during the test campaign after its arrival at CERN.

As shown in the pictures, the rupture appears to be due to fatigue stress.

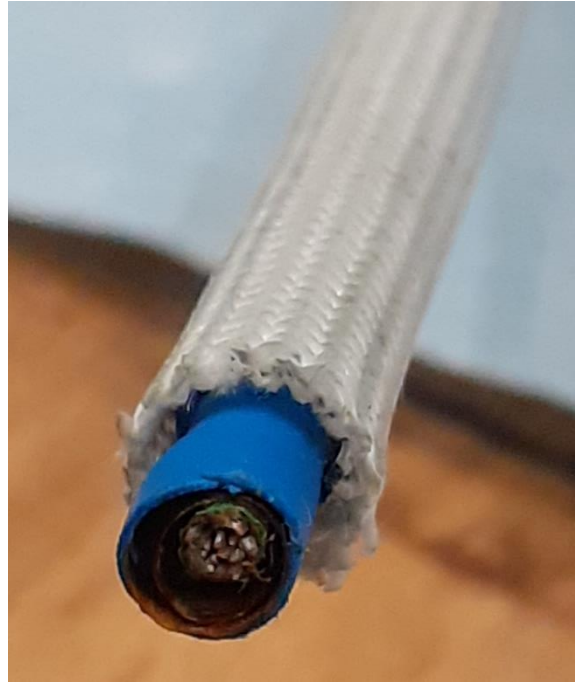
NOTE - Despite being an unfortunate event, it favorably occurred at ASG before completing the assembly of the end plate, allowing to intervene with minimal time and economic impact.



After having removed the LC head plate, it was found that the YT112+ wire is interrupted at approx. 5mm inwards measured from the outer surface from the G10 end-spacer.

It was agreed a repair solution that involves the milling of the end spacer with enough dimensions to allow a new QH wire soldering.

Before carrying out this intervention on the MBRD1 magnet, the operation was qualified onto the third opening of the D2-prototype.



The repair qualification was successfully carried out the following sequence:

- Dig a cavity into the G10 end spacers using a portable milling tool at the point where the QH exits, making the wire end accessible for soft soldering.
- Remove the wire insulation from the wire end.
- Weld a new wire to the first one.
- Carry out the electrical test at 3.1 kV to finally assess the repair procedure.
- Once the test is positive, fill the cavity with charged epoxy resin.



What was detected



End spacer digging



Digging completed

NOTE - the new QH wire has been directly soldered onto the QH end).





Resin blend

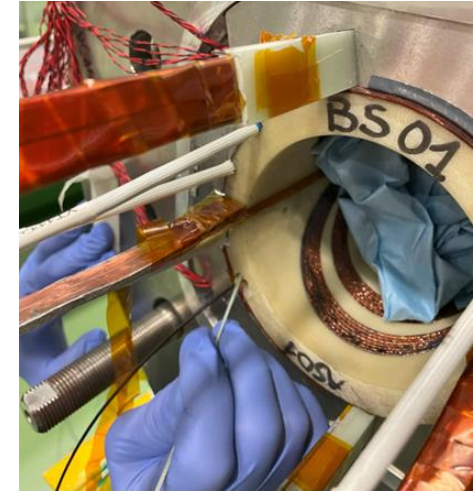
Resin blend made of
ARALDITE
DBF/ARADUR HY
956 EN produced by
HUNTSMAN



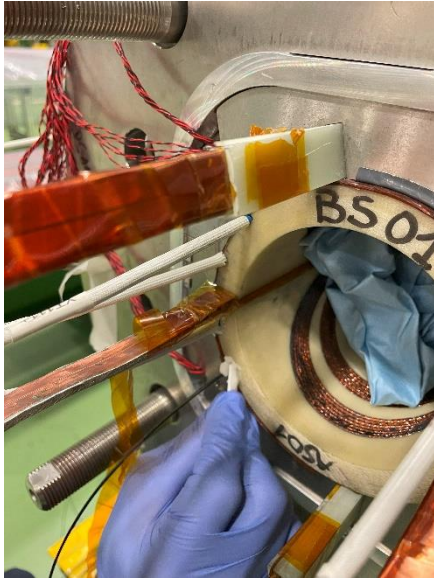
Resin blend charged
with glass powder



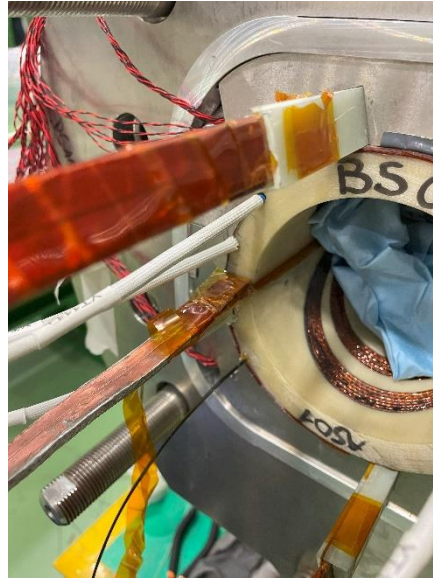
Glass powder



Cavity filling having payed attention not to leave air
bubbles trapped inside.



Completion of the filling



Resin excess removal



At the completion of
the operation