

ASG SUPERCONDUCTORS

MBRD, VS-06 Testing Activities
31° July 2024

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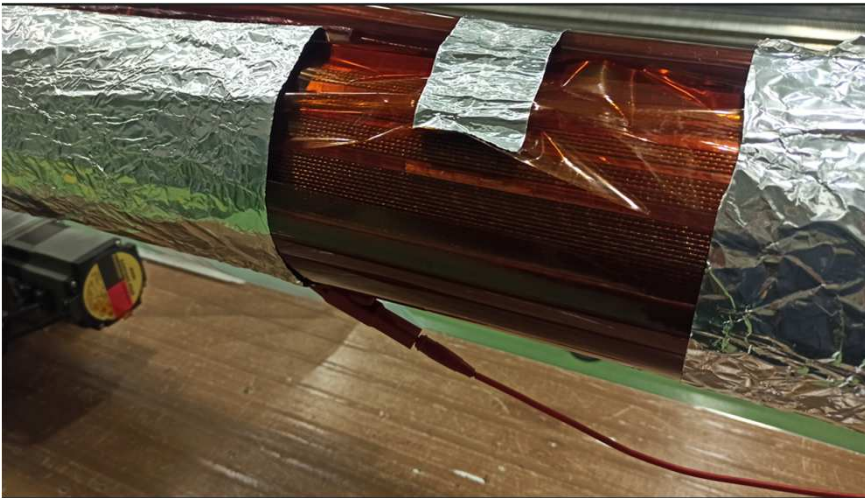


Date	Short Circuit between:	Localization from LC side end	Evidence	Cause	ASG RNC Nr.
10/04/2024	Coil AS-07 - QH dx	4000 mm	Punching/Burning	Foreign Debris	RNC240411A
12/04/2024	Coil BS-08 - Ground	500 mm	Ground Insulation damaging	PTFE Coated Sheets overlapped cut the ground insulation	RNC240422A
28/05/2024	Coil BS-08 - QH sx	4500 mm	Punching/Burning	Foreign Debris	RNC240529A
01/07/2024	Wedge - QH sx (*)	6400 mm	LF insulation breakage	See detail here below	RNC240705A



Focus on RNC240705A: QH breakdown VS coil during the fourth collaring attempt

Disease:
coil BS-08 discharge VS QH left when 3,1kV
testing voltage is applied.

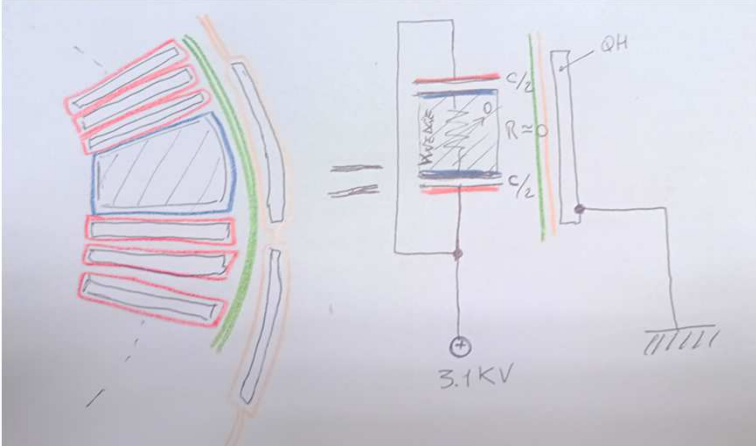


Preliminary investigation localized the electrical
issue on QH in correspondency of a wedge. The coil
seems stranger at the problem.

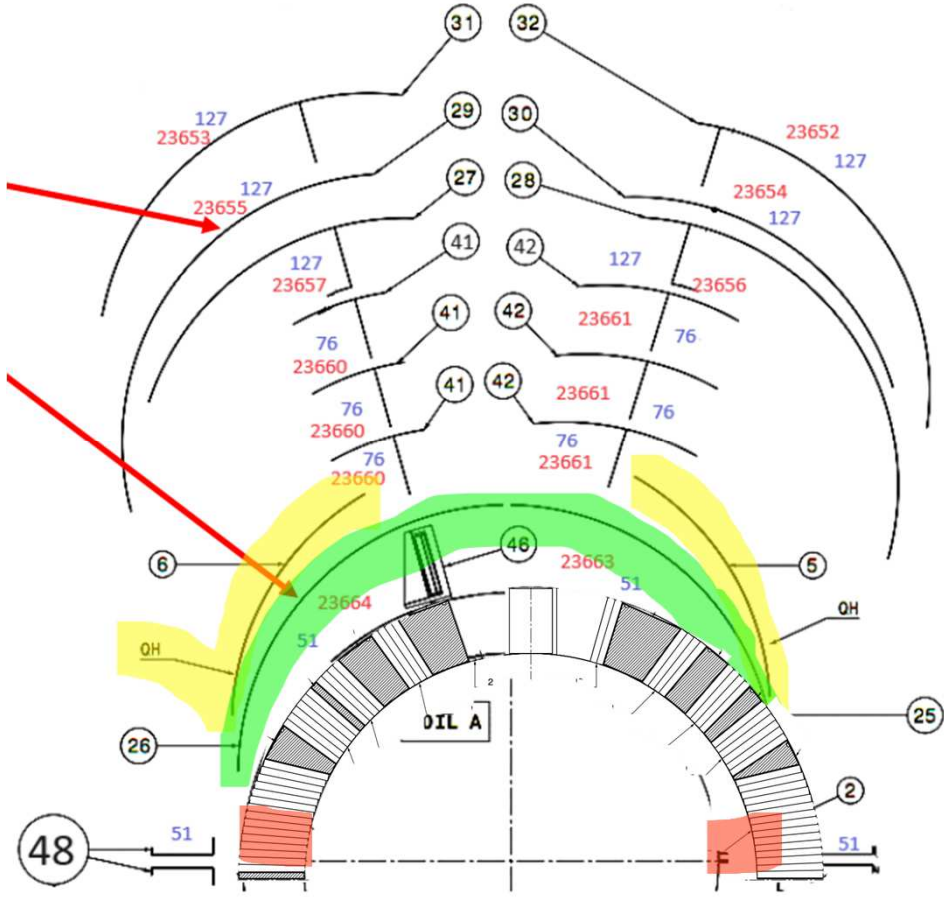
How this is possible?



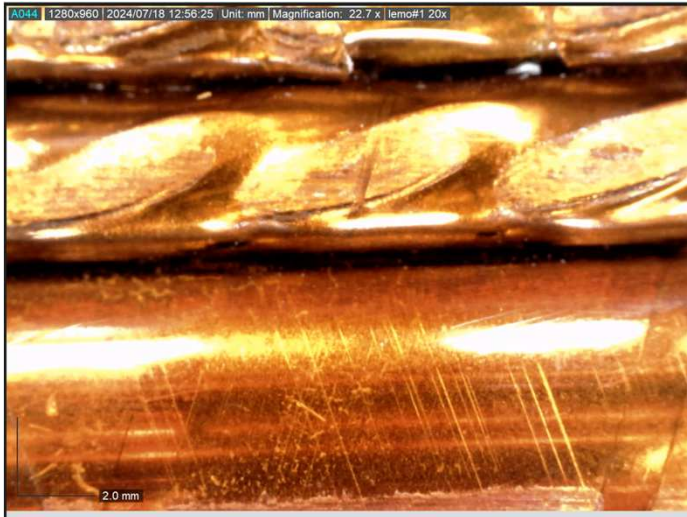
in order to understand how and if, is possible that the QH - floating from the electrical point of view - should discharge VS the QH, that is grounded, we need analyze the electrical configuration of the insulation system of D2 coils and try to deduce a electric equivalent scheme



effectively, the QH offers respect the coil the capacitance of a a long capacitor having 2x 2000x15mm surface that means, modelling 0.2mm of kapton per side (kapton permeattoivity=3.5 about) a capacitance of about 5.5nF. The measured capacitance is 5nF that confim calculation

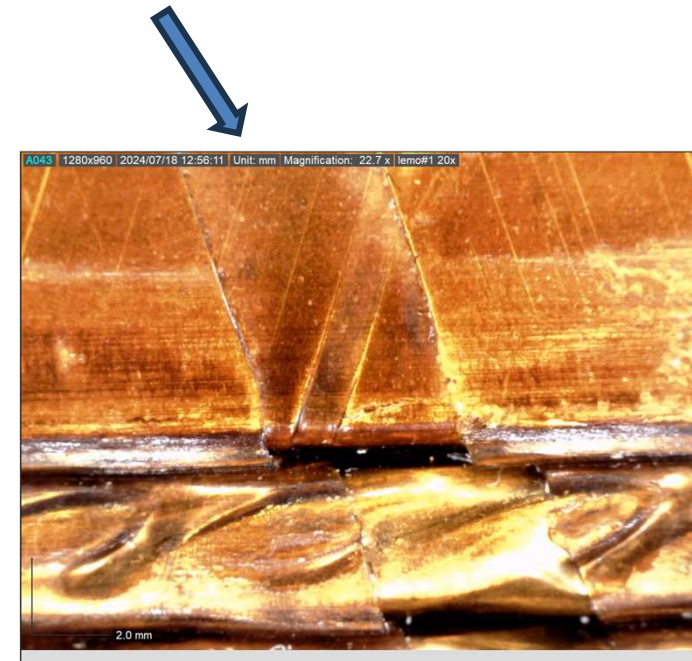
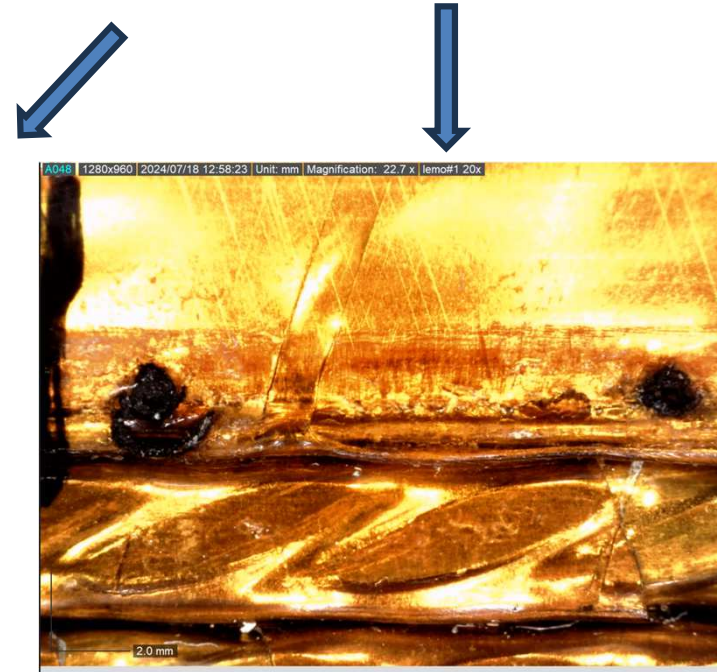
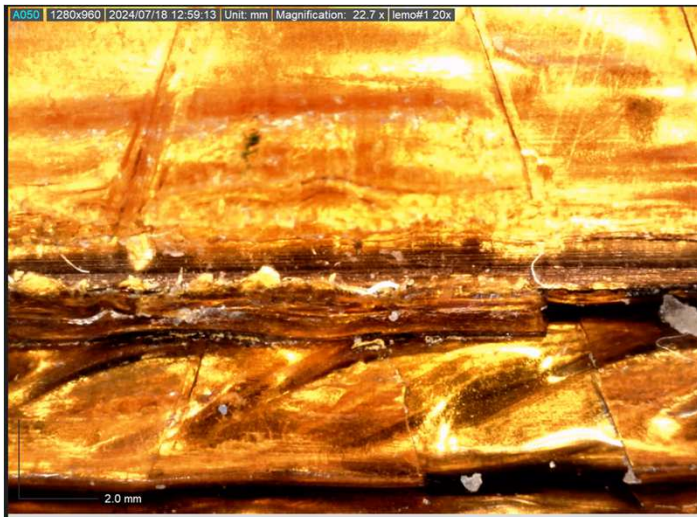


The wedge, due the capacitive partition, reaches a certain level of voltage V_w during the HV test. This capacitor is like an small ideal current generator

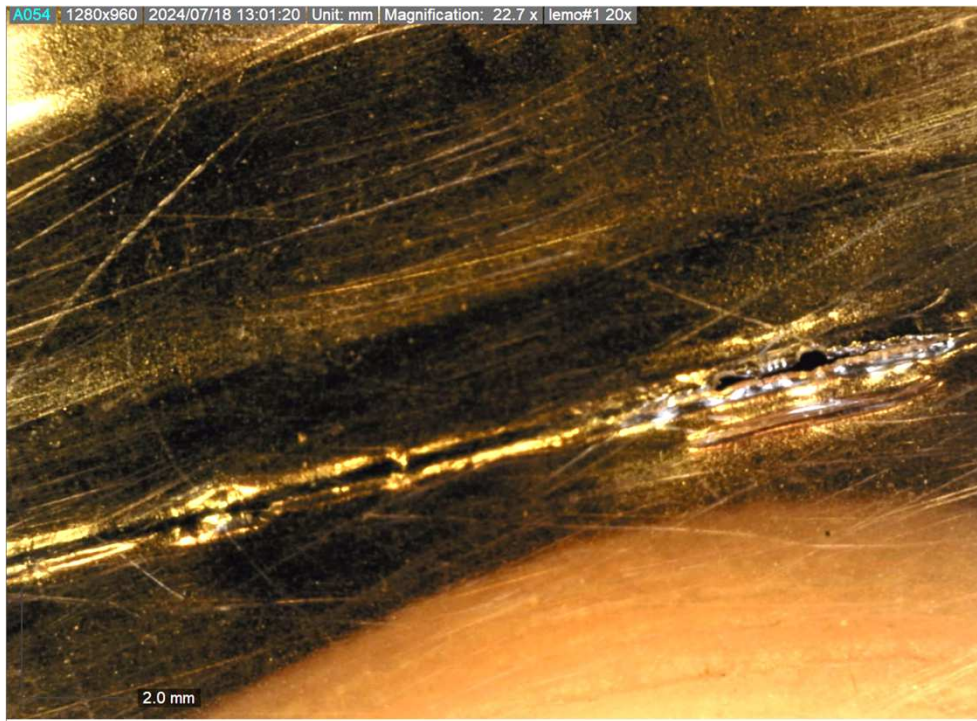


Normally, the presence and the integrity of the insulation system allows an enough electrical rigidity to resist to V_w

however, in the present case, close to the damaged zone, we observed a damage on the QH insulation due to a mechanical event (sliding?). The carbonaceous residuals are on the wedge.



corresponding of the wedge position there is a long-shaped cutting (on item 26 in the drawing a p.4)



...and here below the magnification of the damage directly on the wedge surface



CONCLUSIONS:

1. The electrical model of the coil-wedge-grounded QH demonstrates that the wedge can reach a certain voltage level V_w during tests
2. V_w cannot damage the insulation if the insulation is integer
3. V_w can generate a problem if the insulation VS QH is mechanically damaged: in this case the current generated by the 5nF capacitance of wedge can lightly burn the kapton fringes around the mechanical damage.
4. the coil seems not involved in this electrical damage.