CW AB KL SP PHM MT MC VK HW MP JC JP JB

Agenda

Focus Coil
Currently cooling, 35K, will have baselined by Monday
Visited Tesla - drawing shows slight asymmetry in magnet.
Closer to upstream end - possibility of touch, gap between shield and OVC is 2.4? c/f 6mm at downstream end
long term fix is open up and increase clearances - no hydrogen absorber experiment.
short term, adjust tensioner straps: move by 1 or 2 mm. Tesla to consider connections.

Measurements in FC1 in R100 show movement of 0.5mm with/without vac in OVC.
Correlates with difference between R9 and hall.
Force due to atmospheric pressure would be 10-12 tonnes
Plan to experiment Monday, with pressures in 3 volumes. Hydrogen isolating, upstream and downstream.
Volumes up and down are limited by windows to 0.4bar in compression, 3 bar in tension. Helium windows in spectrometer solenoids should also be considered.
JB in e-mail contact with Tesla.
Depending on results from Monday, next question is moving cold mass?

DL require cold coils for commissioning tests early next week. - note comments re powering magnets below, SS magnets must be off.

Calculations show FC is short of cooling power by 0.5 W - could achieve this with drip addition of He liquid at few cc /min He with ‘special’ stinger.
SH has contact with AS scientific, have two drawings of possible design choices.
MC notes AS Scientific have a poor record on delivery.
KL recommends buying now.
AB notes these may be available as catalog items, but catalog items may be too short.

JC need to examine this in detail considering heat flow. Even with He full we will have less thermal margin.
JB Shields are at 95K compared with 70-75K before. Shield at 95K was at 91K previously in hall.

Adjustments have been made to cryo-cooler pressures - small change. Cryo-cooler pressure is now correct.
Cooldown is same as previous cooldown in hall 10% longer than cooldown in R9.
AB think this is not a cooler issue.
Order stinger next week. £5k? <£10k

Spectrometer Solenoids

Summary AB
Conjecture: failure was due to M2 not being powered.
Quench requires thermal propagation down mandrel. With M2 not powered, no power is deposited in mandrel at M2 and therefore M1 takes longer to go NC
Normal quench is protected, all contractors open.
E1/2 went normal, M1 voltage built up, did not turn over because coil did not go NC as quickly as before, current flowed in qps and heated resistors or links, diodes also heated
At 20s circuit opened up (something melted) but coil was still not NC and was able to supply current which lead to high voltage and breakdown.
Need simulations to show that current can flow for 20s in such conditions, which seems long.

MP Quench back was designed to protect central coil. Quench back does accelerate bringing coils down but should not be key to magnet protection.

Current through 20ohm external resistor could result in damage to leads, possibly blow lead connection to diode pack.

MP: think of coils as independent magnets, each diode pack should be able to take full load. We have a weak link in the connections.
This same situation could arise if any power supply fails and magnet stays cold. We could lose a magnet. Should review superconducting magnets and power system before applying any power to any magnet.

MP we need a documented set of possibilities all of which we should model, prepare this list for Monday. On Tues agree test schedule. AB we may need to be quicker?

MC we will lose He as soon as 1 coil quenches which implies no more cooling and LTS burns out. Cold mass temps do not relate to temperatures of LTS leads at feedthrough and in vac envelope.
Lead from resistor to diode pack was copper? Was OK before because in other quenches coil had gone NC and power was going into coil.
MC, SP LTS wires may be vaporised, usually wires are rated for only 10s of current pre-damage.
MC need to get power out in time of quench in 10s, with no heaters, we require an external circuit to pull out power- this will not be possible, can't engineer it to be low enough resistance.
KL if we could power focus coil, does this risks SS. Can prove FC Monday if SS are off.

Protect each coil from quench independently.
If coil is SC, external circuit is OK
If coil goes NC internal protection is OK.

problem arises when coil is SC and qps is triggered.
Common heatsink for resistors may cause cross-talk between coils, but there is probably significant thermal impedance due to the g10 cloth.
MC could be ok but helium could be gone.
MC more chance of success if contractors are independent. But loss of helium may still result in LTS failure.

SP force quench by driving current in to coil.
CERN QPS using eddy current. Possibly use eddy current to quench cold coil, need to apply high voltage.
Need to calculate voltage required.
VB this system forces quench by applying voltage but this will also be applied to diodes and open protection circuit, which will prevent desired effect.

Do not run SSU until we have solution. MC support no run position.

What should we do M2?
AB need to verify LTS lead protection will work.
Use M1 as pick up coil for M2; drive small current into M2 and look at signals in M1 qps.
Voltage taps are OK which indicates failure should be close to diodes or resistor.

Soak test. Diode trays earth leakage was OK still see power supply instability, but there is a change.

next meeting Monday