Hello,

Sorry for the late reply - I am following up on the header feedthrough specs from last Thursday's meeting. This is just a first draft, let's iterate on this to make sure it works for everyone.

 At this point, it looks like the following will need to get fed through the header:

- Coax cables for acoustics

- Cables for heaters

- Ribbon cable for Hall arrays

(other instrumentation - not discussed here - sample voltages, main field dipole, ...)

**Coax cables:**

I think at this point, Maxim just needs two coax cables and the system will resemble what has previously been used at BNL for the CFS tests.

**Heater cables:**

It would be great to have up to three heaters. Ideally these heaters would be measured with a four point method, however if this is too cumbersome we could probably downselect to two heaters and skip the four point measurement.

A fair amount of power may need to be generated to drive a quench (>=10W). The heater design / resistance may change, however the preliminary scoping looks to be a ~ 80 ohm film heater, so we would need to drive a minimum of 28 V at 0.36 A (for a short duration, 0.1-5 seconds). If we can't induce a quench at the maximum 10 kA power supply current with the 10 W pulse, it would be nice to have some flexibility to go up a bit in heater power.

**Hall array:**

The plan is to build and send a 14 sensor array (I think I may have incorrectly stated 12 sensor in the past meeting). We may not power or monitor all of the sensors (we may downselect to ~ 8, depending on the cable design / number of tapes per layer). Each sensor is powered in parallel, these high sensitivity sensors have high power consumption which is hard to drive in series. At 4.2 K I am expecting each sensor resistance to be on the order of 1.2 kOhm. At 77 K we power these at 6-8V, and at 4.2 K I have powered these at both 1 and 2 V. If we powered the 14 sensor array with 2 V, it could consume approximately 25-30 milliamps. We may run at a lower voltage than 1-2 V, however if the test "fails" and the Hall sensor array does not measure current redistribution, I would like the possibility of driving higher voltage into the sensors, potentially up to 4-6 V or on the order of 75 mA.

We are usually working with larger arrays where wiring the many signals is cumbersome, so we have typically just used ribbon cable. The current plan would be to have a 30 wire ribbon cable measuring the 14 differential pairs, which would get split and manually soldered to the feedthrough that Anis sent a photo of. There would then be two additional wires to power the Hall array. We can change any of this if needed. We haven't done a 4.2 K Hall array test with CORC yet (we would have a higher cable currents and lower sensor powering / sensitivity than 77 K), however the solenoidal Hall array tests at 77 K can have signals varying on the order of +- 10 mV and we are trying to measure features on the order of  50-100 microvolts. Depending on the ramp rate, I would think 1 KHz measurement frequency is plenty.

I said I would send some Hall sensors, but we are running somewhat low and have three boards to build. The sensors we like are the "HG-302C" and the "HG-106A" - please just don't buy all of their stock so we can't buy more when needed :) The link to order is below and they are very cheap.

<https://gmw.com/product-category/hall-magnetic-and-current-sensors/>

This is just a starting point but let's iterate on this as needed. Any feedback / modifications / suggestions are welcome!!

Best,

Reed