Upgrading the Hall B Magnet FastDAQ system

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With the repairs and upgrades to the Hall B Solenoid Magnet Power Supply (MPS) nearing completion, some components were replaced with similar but not identical components, with the main driver being parts availability. One of these components is the flexible links between the bus bars in the power supply between the MPS and the external leads. In the original MPS these were laminated copper sheets, Fig. 1, and the new ones are a braided copper cable, Fig. 2.

In order to ensure that there are no changes in performance due to these new components, two new voltage taps (VT) were added across the flexible links to measure the voltage drop, if any.

Changes to both software and hardware were required to implement these additional VTs. Hardware required the physical wiring of the taps from the MPS to the instrumentation racks, the installation of additional isolation amplifiers, and finally, wiring to the ADC modules of the cRIO. Software changes were needed in the LabVIEW code as well as on the EPICS softIOC to display the new values to end users.

The LabVIEW code on the cRIO is split into two main sections, the FPGA code that acquires data from the ADC modules and the virtual instruments (VIs) that process the data and send it to EPICS and the PLC. Fortunately, the FPGA code was done so that all channels on all ADC modules are sampled, and as such didn't need to be modified in any way with the addition of the new VTs. The VIs that process the data from the FPGA required removal of the new channels from the block of code that removes any unused channels from being processed and adding the correct scale factor. The new signals (VT, average, min, max) also needed to be added to the EPICS IOC that runs on the cRIO, as well as the softIOC that passes it to mya for archiving.

The PLC code simply needed to shift offsets (as the new VTs were added between existing used channels) and add new tags for the new signals. Lastly, the VTs were added to the EPICS CSS screens, Fig, 3.

- **Hardware and software upgraded to read out and display two additional voltage taps on the new MPS flexible links**

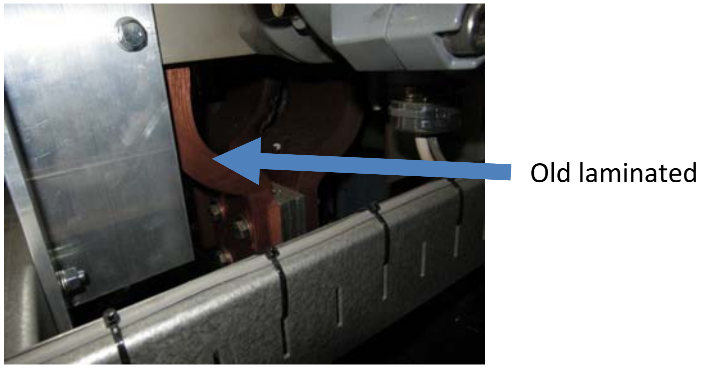

FIG. 1. Old laminated link

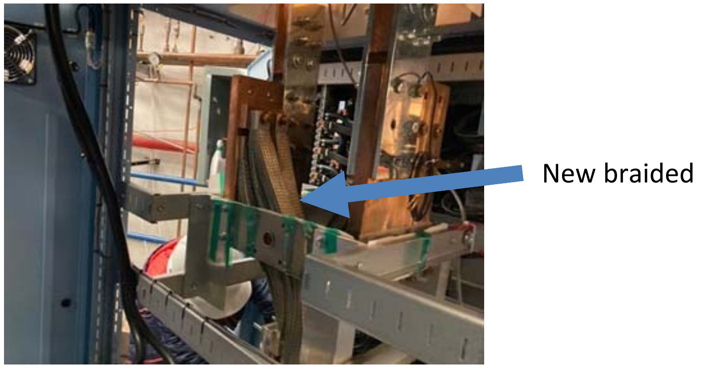

FIG. 2. New braided link

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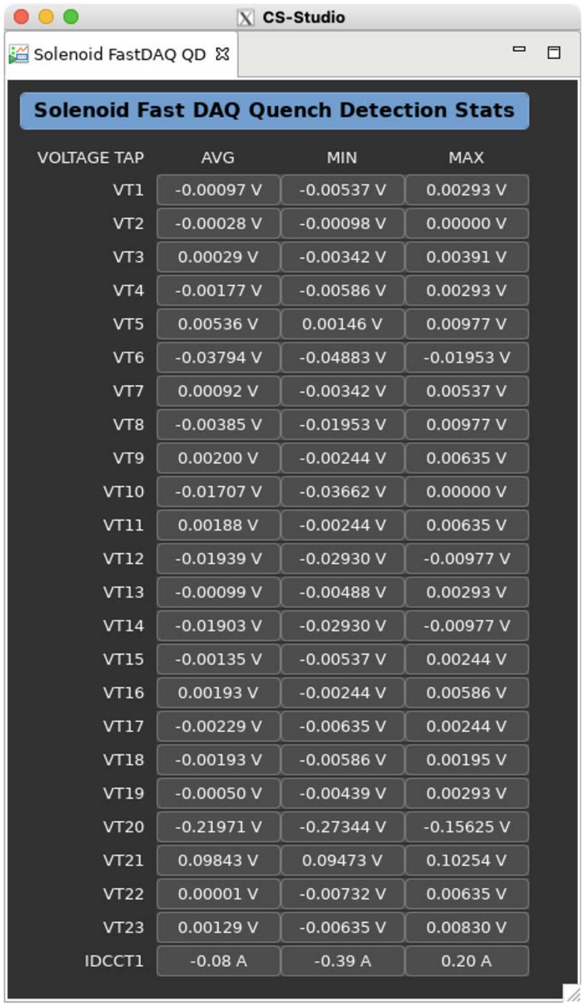

CS-Studio

Solenoid FastDAQ QD

Solenoid Fast DAQ Quench Detection Stats

VOLTAGE TAP	AVG	MIN	MAX
VT1	-0.00097 V	-0.00537 V	0.00293 V
VT2	-0.00028 V	-0.00098 V	0.00000 V
VT3	0.00029 V	-0.00342 V	0.00391 V
VT4	-0.00177 V	-0.00586 V	0.00293 V
VT5	0.00536 V	0.00146 V	0.00977 V
VT6	-0.03794 V	-0.04883 V	-0.01953 V
VT7	0.00092 V	-0.00342 V	0.00537 V
VT8	-0.00385 V	-0.01953 V	0.00977 V
VT9	0.00200 V	-0.00244 V	0.00635 V
VT10	-0.01707 V	-0.03662 V	0.00000 V
VT11	0.00188 V	-0.00244 V	0.00635 V
VT12	-0.01939 V	-0.02930 V	-0.00977 V
VT13	-0.00099 V	-0.00488 V	0.00293 V
VT14	-0.01903 V	-0.02930 V	-0.00977 V
VT15	-0.00135 V	-0.00537 V	0.00244 V
VT16	0.00193 V	-0.00244 V	0.00586 V
VT17	-0.00229 V	-0.00635 V	0.00244 V
VT18	-0.00193 V	-0.00586 V	0.00195 V
VT19	-0.00050 V	-0.00439 V	0.00293 V
VT20	-0.21971 V	-0.27344 V	-0.15625 V
VT21	0.09843 V	0.09473 V	0.10254 V
VT22	0.00001 V	-0.00732 V	0.00635 V
VT23	0.00129 V	-0.00635 V	0.00830 V
IDCCT1	-0.08 A	-0.39 A	0.20 A

FIG.3. VT22 and 23 added to CSS screen

All that remains to be done with the newly added VTs is some hardware documentation (additional labeling) and a final verification with a voltage source to ensure all measurements are as expected.