**MC6D Power Tests Notes 6 Oct 2020**

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These are preliminary notes of the successful power test done on the MC6D dipole string on 6 Oct. 2020 to verify that these dipoles can be safely operated at the 120 GeV currents that will be needed later this year when we expect to deliver beam to Enclosure MC7 at 120 GeV.

To accomplish this test, we started with the currents in the e-log from which operated the MC6D dipoles at the nominal 64 GeV tune. The tests were done with the final current at twice the 64 GeV tune currents to provide some tuning margin above the 120 GeV current. Those doing the tests were G. Koizumi, M. Monningh and J. Lentz.

The basic power test steps were to run at the 64 GeV current and let the temperature of the magnets, cables and power supply stabilize. That was followed by running the MC6D power supply at currents twice, three times and 4 times the power of the 64 GeV power. Given the I squared power relationship, the twice the current of 64 GeV current meant the power would be 4 times the 64 GeV level to test the MC6D supply at twice the 64 GeV current. The appended plots summaries the tests. One deviation from the original plan was that we were not able to reach points during the tests where the supply and return LCW water temperatures leveled off at the test currents. This was due to the heat capacity of the system and the amount of time we had to do the tests. We checked with a heat sensor to make sure that the magnets, cables and the power supply did not excessively heat up to endanger them. One unexpected problem did arise, a new LCW leak on MC6D-2 dipole was found during the check after running the MC6D system at the 64 GeV current. The leak did not seem to spray on any components which aside from the leak itself would cause harm so the tests were continued after the leak. The leak has been reported and will have to be investigated and fixed if possible. This leak on MC6D-2 is faster, few drops per second, than the older known leak on MC6D-4.

The flat top of the ramped supply, even at the twice the 64 GeV current for MC6D, was very flat and reached the desired current level well before the time which we expect the beam to arrive.

The maximum temperatures detected following the running of the MC6D power supply at twice the 64 GeV current for approximately 1 hours, the final step in the step by step increase of the currents, were under 100 degrees F for the power supply, the cables and magnets. The only exception was the cable which went to a filter associated with the MC6D power supply which was found to be just above 100 degrees F. Aside from the leak issues, no problems were encountered in these tests. Hence the tests seemed to indicate we can still run MC6D at the 120 GeV currents assuming the LCW supply temperatures are not too high with other devices on at the same time to place additional heat load to the system. It should be noted that the fans associated with the MS2 LCW system never came on during these tests of 6 Oct. 2020.





