**MQXFS1b Test Plan**

**Rev. 1, 3/29/2017**

**OUTLINE**

**Test Cycle I**

* Verify that all configuration files are uploaded to the production area and DAQ computers are rebooted
* **Room Temperature preparation**
  + Electrical checkouts and Hi-pot
  + Check the quench and slow scan data logging
  + Verify that the VMTF Overview Display is up and running
  + Initial RRR measurements: check CVT, FVT and Lead signals
  + Verify that all warm checkouts are completed in the Test Readiness Verification Procedure document (TID-N-769)
  + Magnetic measurements (z-scan) at room temperature
* **Cool down**
  + Restricted cool down: temperature difference between the magnet top and bottom should not exceed 100 K
  + Periodically check the SG data logging
  + Perform preliminary measurements of coil/segment RRR down to 70 K (see Quench Protection Test plan)
* **System checks at 4.5 K with 120 mΩ dump resistor:** 
  + Cold Electrical Checkout and Hi-pot, Quench Detection Checkout
  + Verify that all cold verification steps are completed in the Test Readiness Verification Procedure (TID-N-769)
  + Connect the CPS3 power leads and proceed with the AQD/DQD balancing
  + Ramp to 1000 A, adjust Cu-I AQD balance and perform manual trip
  + Heater induced quenches at 20% and 30% of **INOM=16480 A**
  + Splice resistance measurement to 6 kA
  + Magnetic measurements before training, Imax=6 kA at 4.5 K or 1.9 K
* **At 1.9 K operation with 30 mΩ dump resistor:**
  + Install the quench antenna and acquire quench antenna signals
  + Acquire voltage spike data for each ramp
  + Quench Training at 20 A/s in first few ramps, then continue with mixed ramp rates: start at 50 A/s and then continue at 20 A/s
  + Ramp rate dependence study
    - Ramp up at dI/dt = 10 A/s, 50 A/s, 100 A/s, 150 A/s, 200 A/s, 300 A/s, 350 A/s
    - Ramp down at dI/dt = 300-10 A/s starting from INOM (16.48 kA or 95% of Imax achieved during the training)
  + Magnetic measurements to maximum stable current (see Magnetic measurements plan)
  + Splice resistance measurements (could be at 4.5 K)
  + Inductance measurements
  + Quench Temperature Dependence Study at 1.9-4.5 K
* **Quench Protection study at 1.9 K**
  + See detailed **Quench Protection Test Plan**
  + Protection heater study
  + Quench Integral and Fast extraction studies
  + Energy loss measurements (could be at 4.5 K)
* **Warm up to 300 K**
  + Cold RRR Measurements. Additional RRR measurements at different temperatures from 20 K to 300 K
  + Magnetic measurements during warm up
  + Periodically check the SG data logging
* **At 300 K after the test**
  + Repeat RRR measurements at room temperature
  + Magnetic measurements

**Test Cycle II**

* Only if the ultimate quench current (17.9 kA) was reached in Test Cycle I
  + Confirm key findings and investigate open questions from the previous cycle