Solenoid Coil Temperature Monitoring During Cooldown

Date: May 30, 2017
Time: 15:00 – 15:30

Attendees: Pablo Campero, Probir Ghoshal, Tyler Lemon, Wesley Moore

1. For cooldown, temperature of Coils must be monitored.
    - 1.1. Existing temperature sensors are placed on thermal strips rather than directly on Coil.
        - 1.1.1. There can be a difference of a few K in temperature between the thermal strip and coil so better indicator of coil temperature is needed.
    - 1.2. Coil temperature estimate to be calculated using voltage tap reading, current reading, and interpolation formula.
    - 1.3. Current used in calculation will be provided by either MPS or external power supply.
        - 1.3.1. Current will be a constant 1 [A] or 10 [A].
            - 1.3.1.1. Exact current value yet to be determined.
    - 1.4. Coil specific details in table below.
    - 1.5. Interpolation formula coefficients determined by Probir Ghoshal.
        - 1.5.1. Coefficients for each coil in table below.
    - 1.6. Temperature estimates will only be used during cooldown of Solenoid.

2. Course of action to add Coil temperature estimates:
    - 2.1. Pablo Campero will add calculations to Solenoid PLC.
    - 2.2. Wesley Moore will add indicators to EPICS Cooldown Parameters screen to display temperature estimate.
    - 2.3. Probir Ghoshal will add all information on calculations to Cooldown spreadsheet.

Interpolation Formulas:

Coil	Interpolation Formula
1	$T[K] = 194.31 \times R(t) + 41.348$
2	$T[K] = 194.31 \times R(t) + 41.348$
3	$T[K] = 121.8 \times R(t) + 41.348$
4	$T[K] = 121.8 \times R(t) + 41.348$
5	$T[K] = 61.88 \times R(t) + 41.348$

Formula for *R(t):*

$$R(t) = \frac{VTXX\_DAQ}{I_C}$$

I_C = *Current in Coil [Amps]*

VTXX_DAQ = voltage in corresponding voltage tap (from table below) [Volts]

Voltage Tap – Coil Relation:

Coil	Voltage Tap
1	VT6_DAQ
2	VT14_DAQ
3	VT8_DAQ
4	VT12_DAQ
5	VT10_DAQ