PSB Upgrade

The main magnet damping resistors with the new magnetic cycle.

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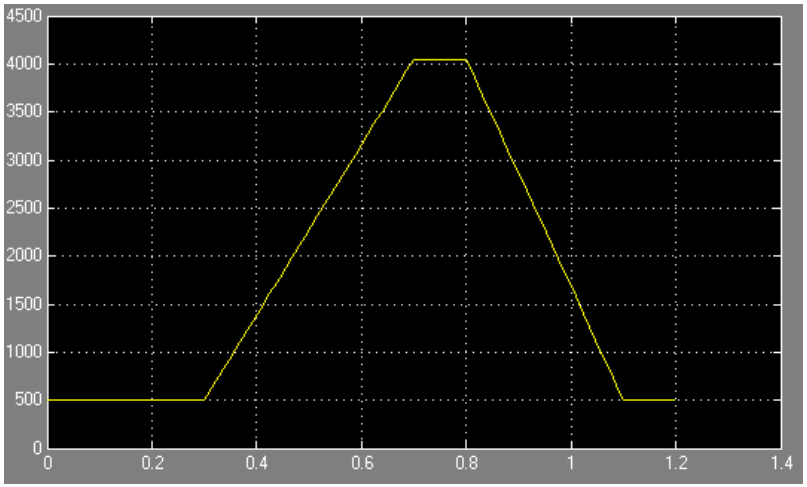
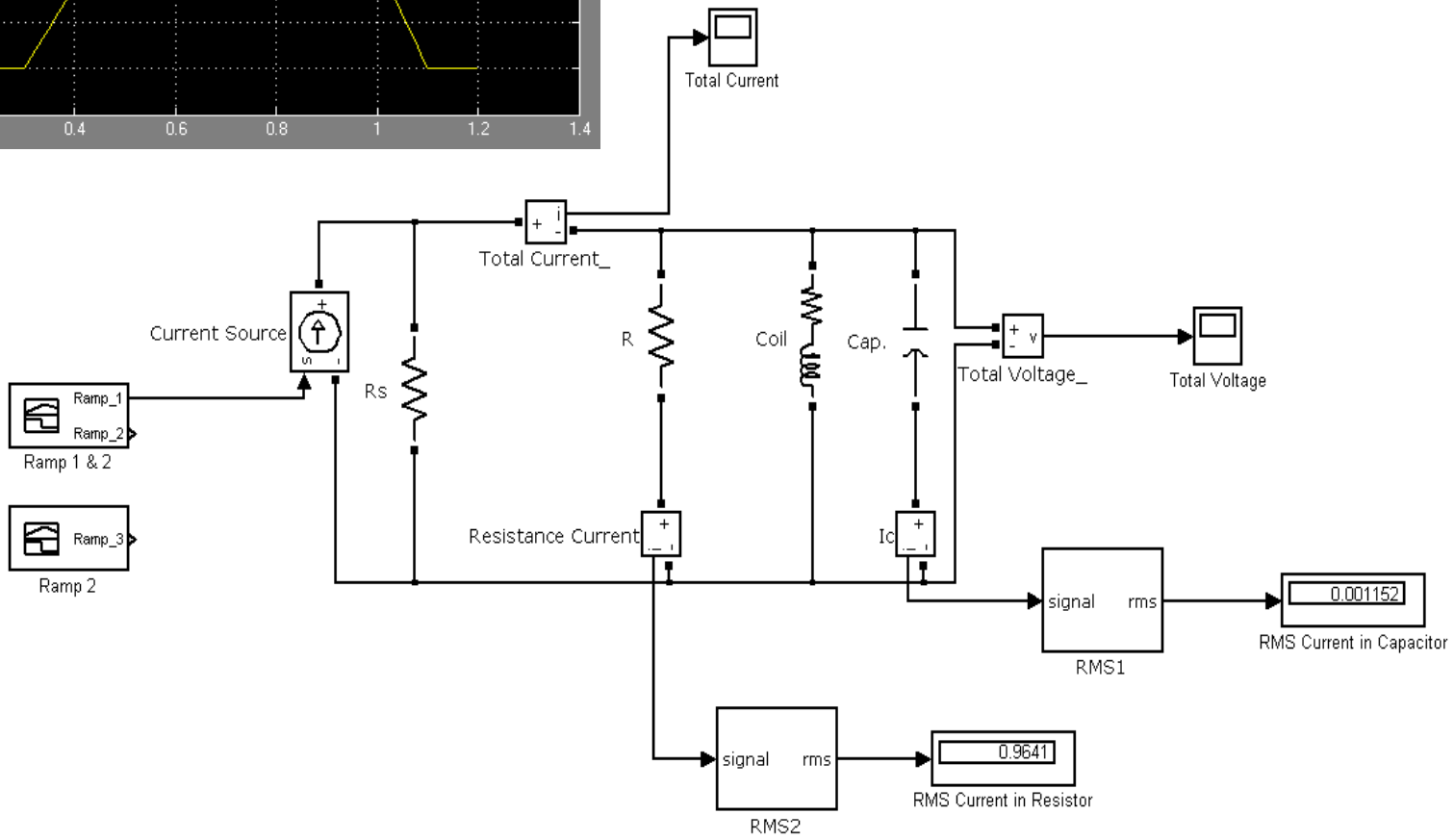
Simulation at 1.4 GeV Cycle

Ramp 1 – 1.4 GeV



Damping Resistor – R = 10 Ohms
Coil = 2.5 mOhms, 1 mH
Capacitance (Unknown) – 1 μF
Resistor Current = 0.96 A RMS



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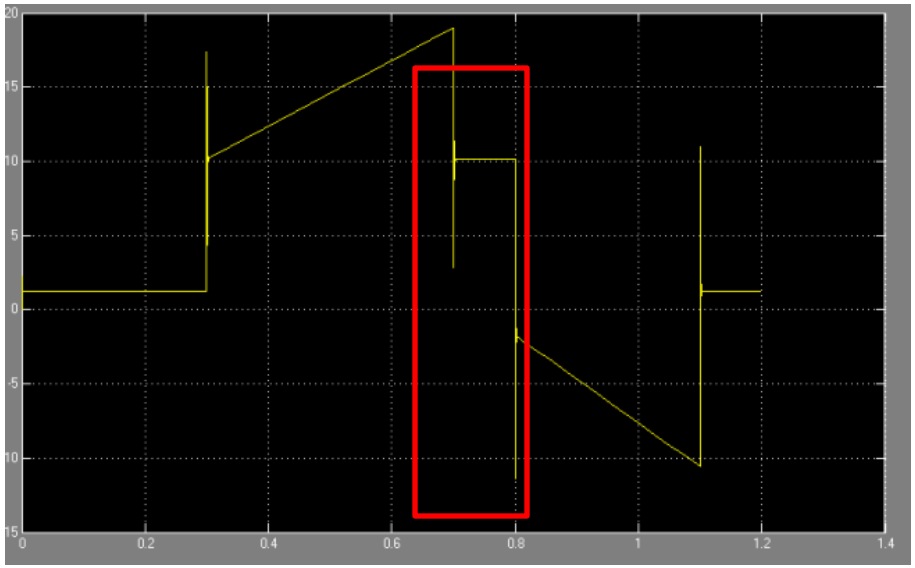
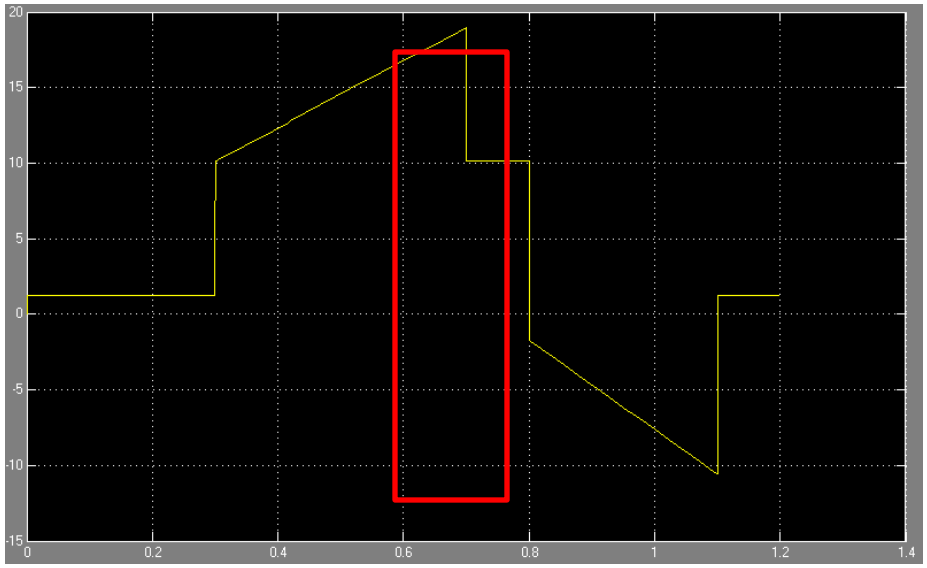
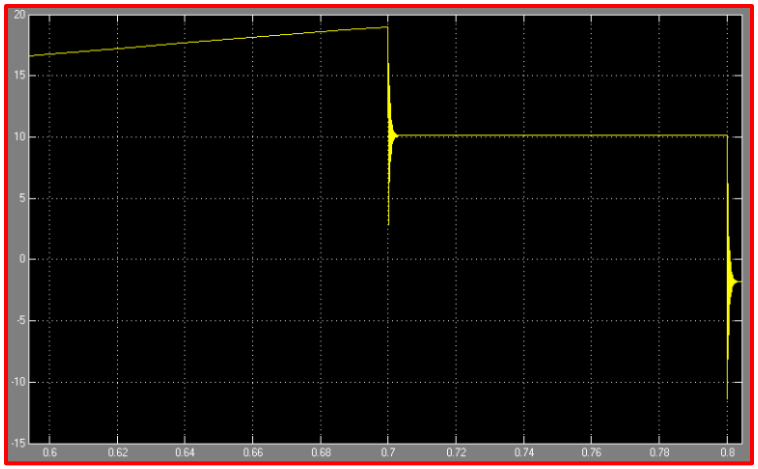
Results - Circuit Voltage at 1.4 GeV Cycle

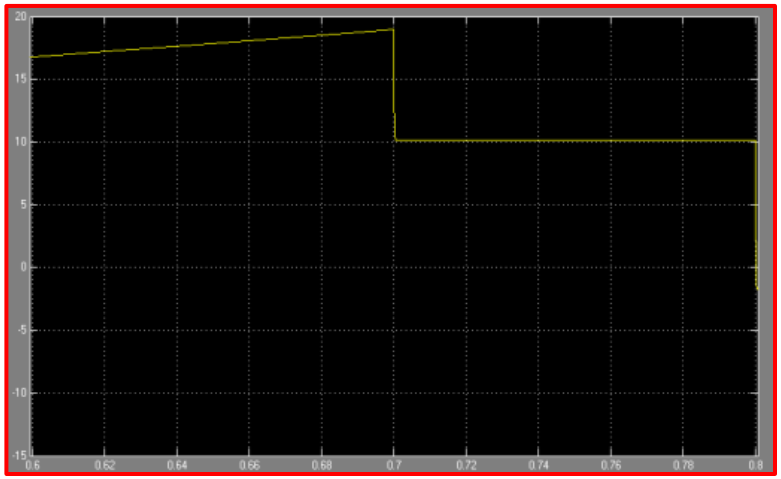




Without Damping Resistance

With Damping Resistance





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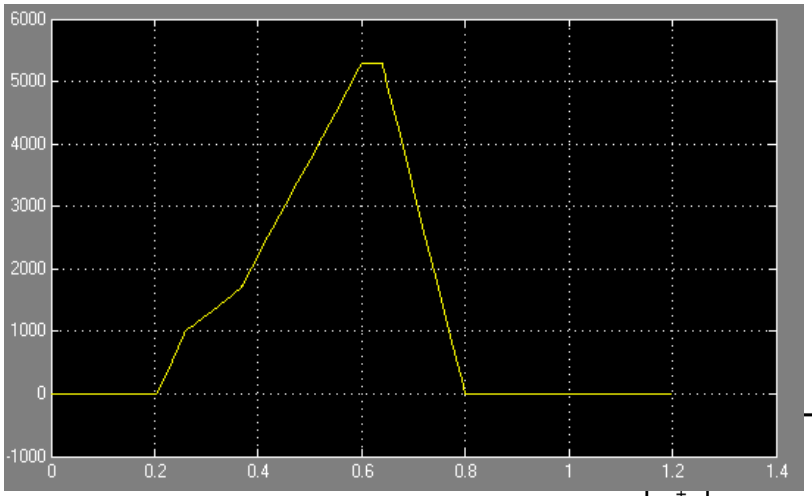
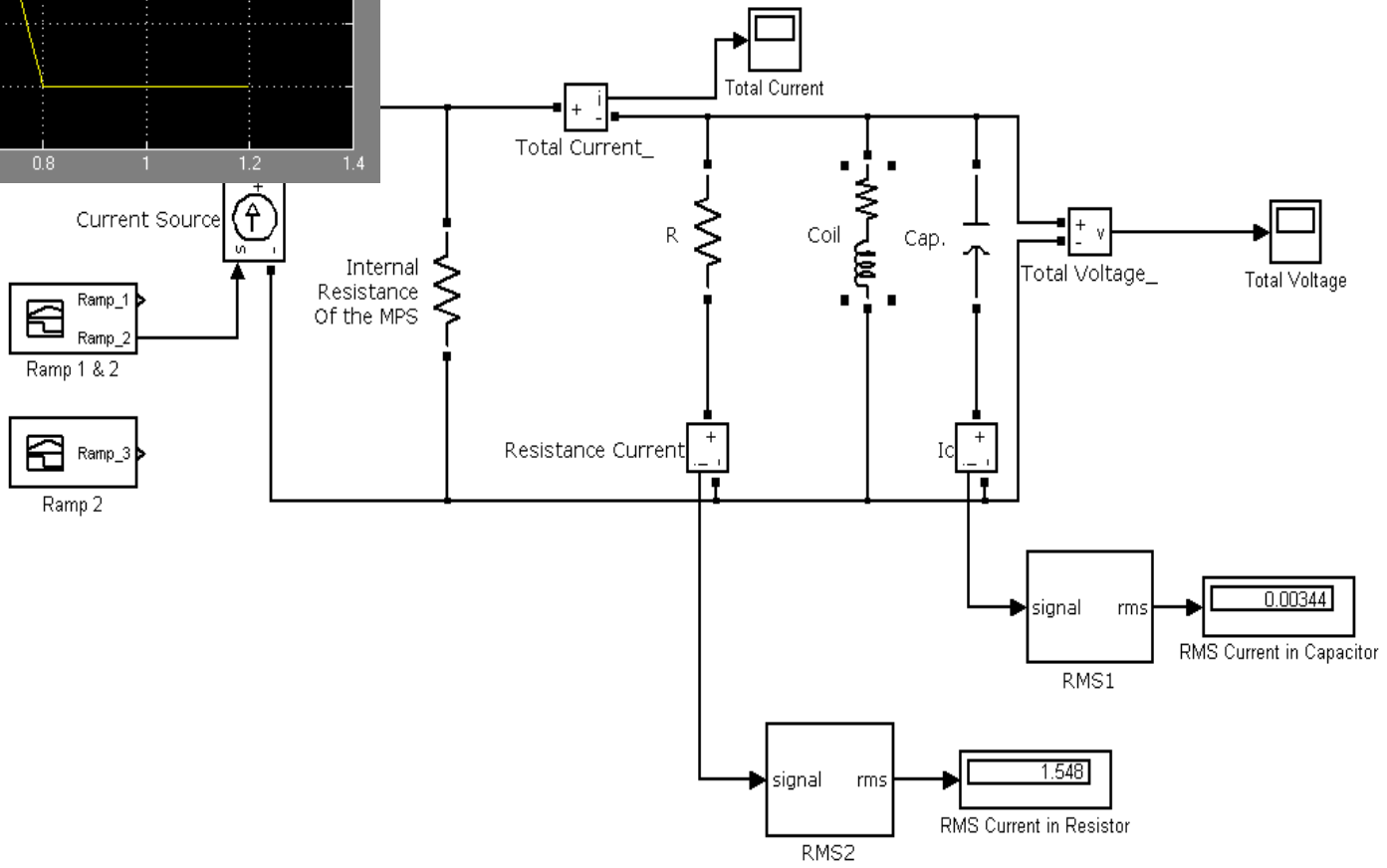
Simulation at 2 GeV Cycle

Ramp 2 - 2 GeV



Damping Resistor – R = 10 Ohms
Coil = 2.5 mOhms, 1 mH
Capacitance (Unknown) – 1 μF
Resistor Current = 1.55 A RMS



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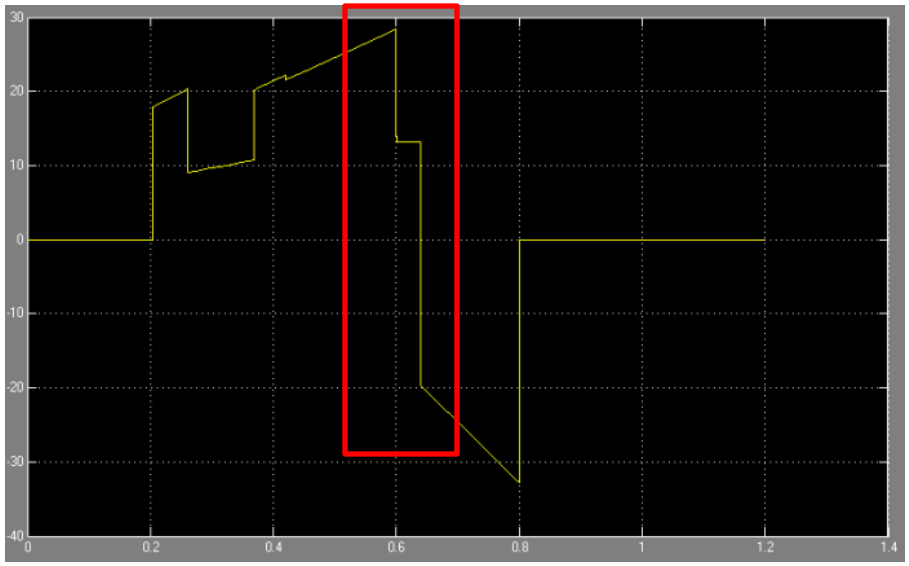
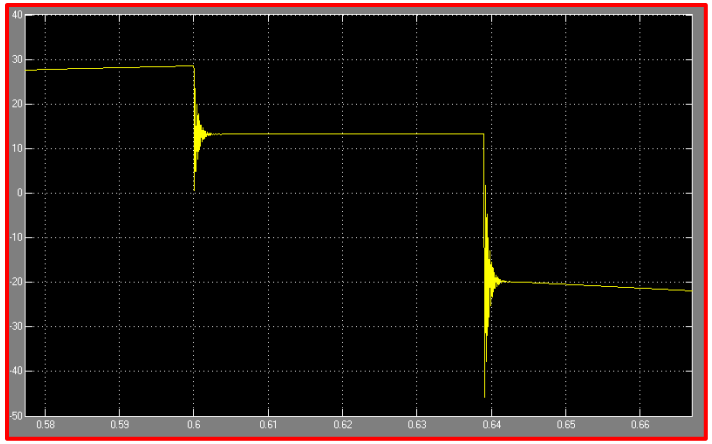
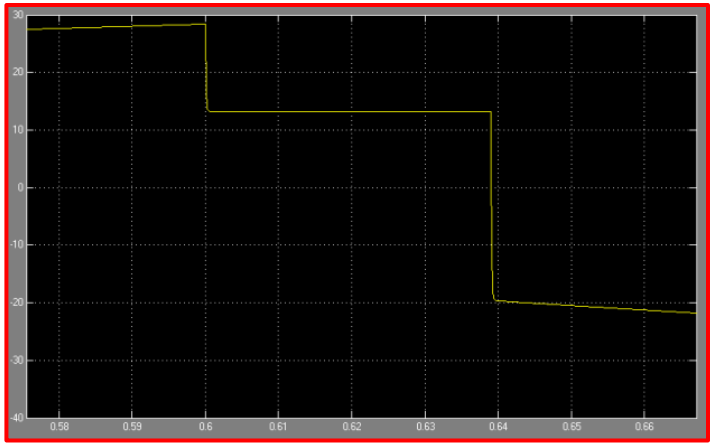
Circuit Voltage at 1.4 GeV Cycle



Without Damping Resistance



With Damping Resistance



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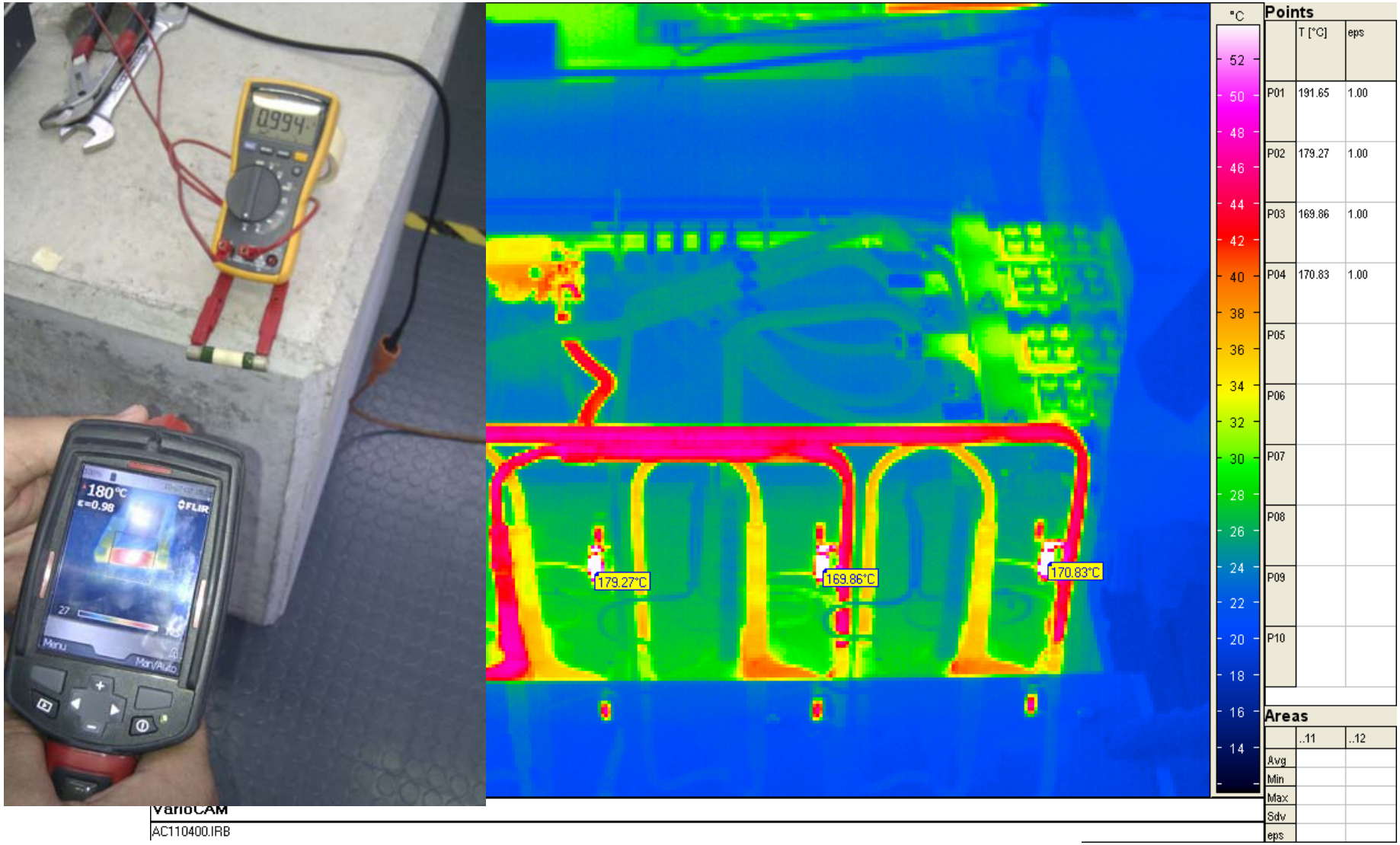
Thermal Measurements at 1.4 GeV cycle



Test at 1 Amp (1.4 GeV), 180 Deg C, confirms machine measurements .

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Thermal Measurements at 2 GeV cycle

Test at 1.5 Amp, 296 Deg C

Conclusions:

- The temperatures measured in the machine are consistent with the simulations and measurements made in the lab.
- The resistors dampen the effects on the voltage caused by the coil parasitic capacitance, the value of the coil capacitance is un-known but will be measured.
- For the 2 GeV upgrade the power rating of the resistors will need to be increased to maintain an acceptable temperature.
- The Quadrupole magnet resistors must also be considered.

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