**Filter Inductor Design**

The inductor that we have designed for the first simulation report suffers from saturation. In addition, there was significant current ripple in the inductor current. Hence, we redesigned the output inductor.

To have less than 10% inductor current ripple, 500µH inductance is required. We did not limit design with available cores in the laboratory, and we selected the cores after some iterations for Magnetics cores. Selected core is 0077258A7 and required number of turns is calculated according to equation (x1).

Calculating number of turns also required some iterations since inductance factor of the core changes with DC bias which is a function of turn number. At the end 88 turns is calculated to have 500µH inductance. For this turns number, AL decreases to 65 nH/T2, it was 121 nH/T2 without DC bias. Since decreased 65 nH/T2 value was used in equation (x1), design iteration is competed.

As the output current is 4.8A in average, we need to use at least 1.31 mm2 cross sectional area AWG#16 wire for inductor winding. However, we increased wire area to 2.63 mm2 (AWG#13), since filling factor for 1.31 mm2 was low. For AWG#13 wire choice, total area of the conductors become 231.5 mm2 which results in k=0.54 fill-factor.

After we decided to use (AWG#13) cable, we calculated the resistance of the cable in equation (x2) according to mean length per turn value of the core and resistivity of wire.

For Kool Mµ-90 cores, core loss is calculated according to equation (x3). In the equation below, . and values are calculated for maximum and minimum inductor currents. Equation (x3) calculates 44mW core loss which is very low thanks to limited inductor current ripple.