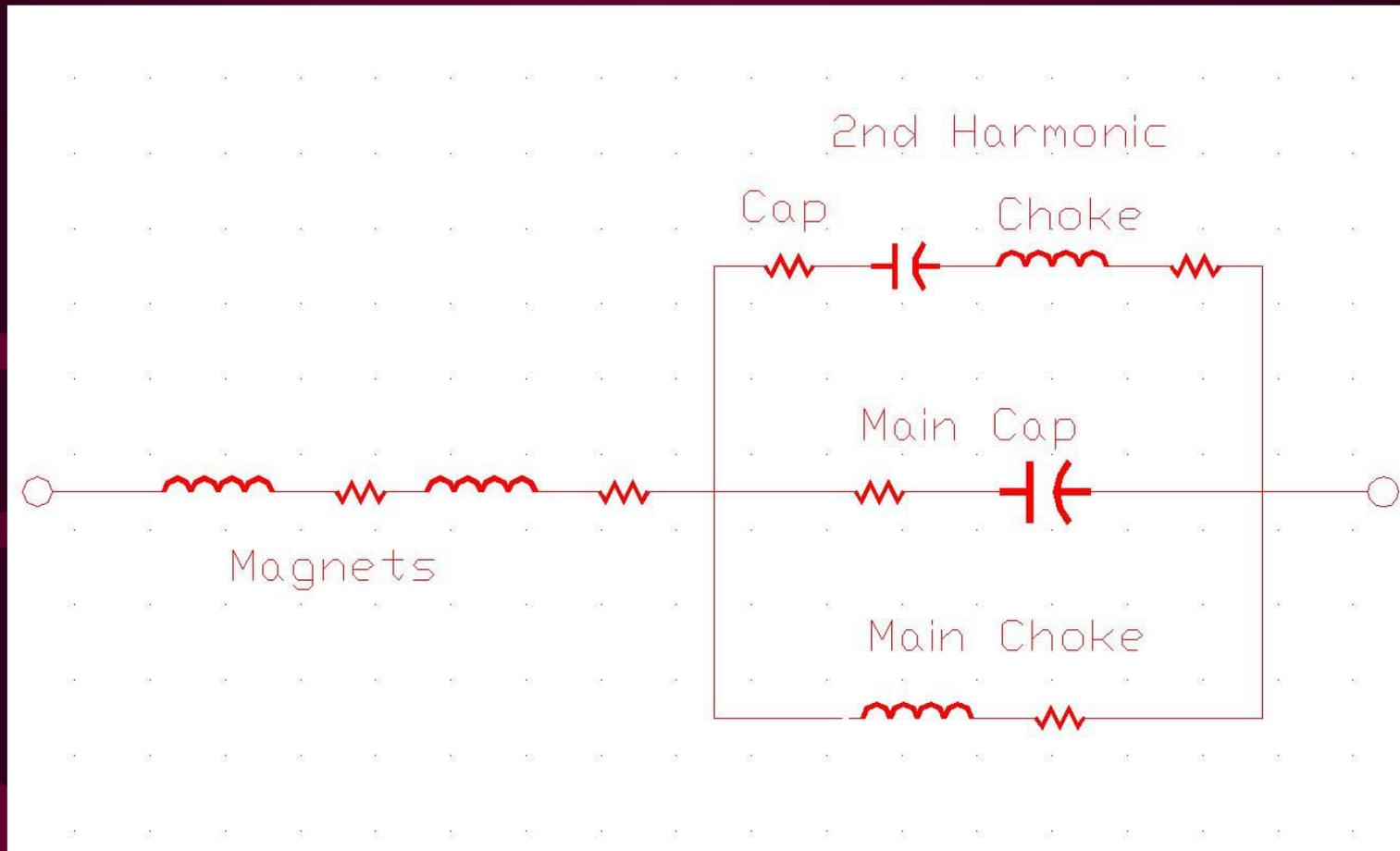


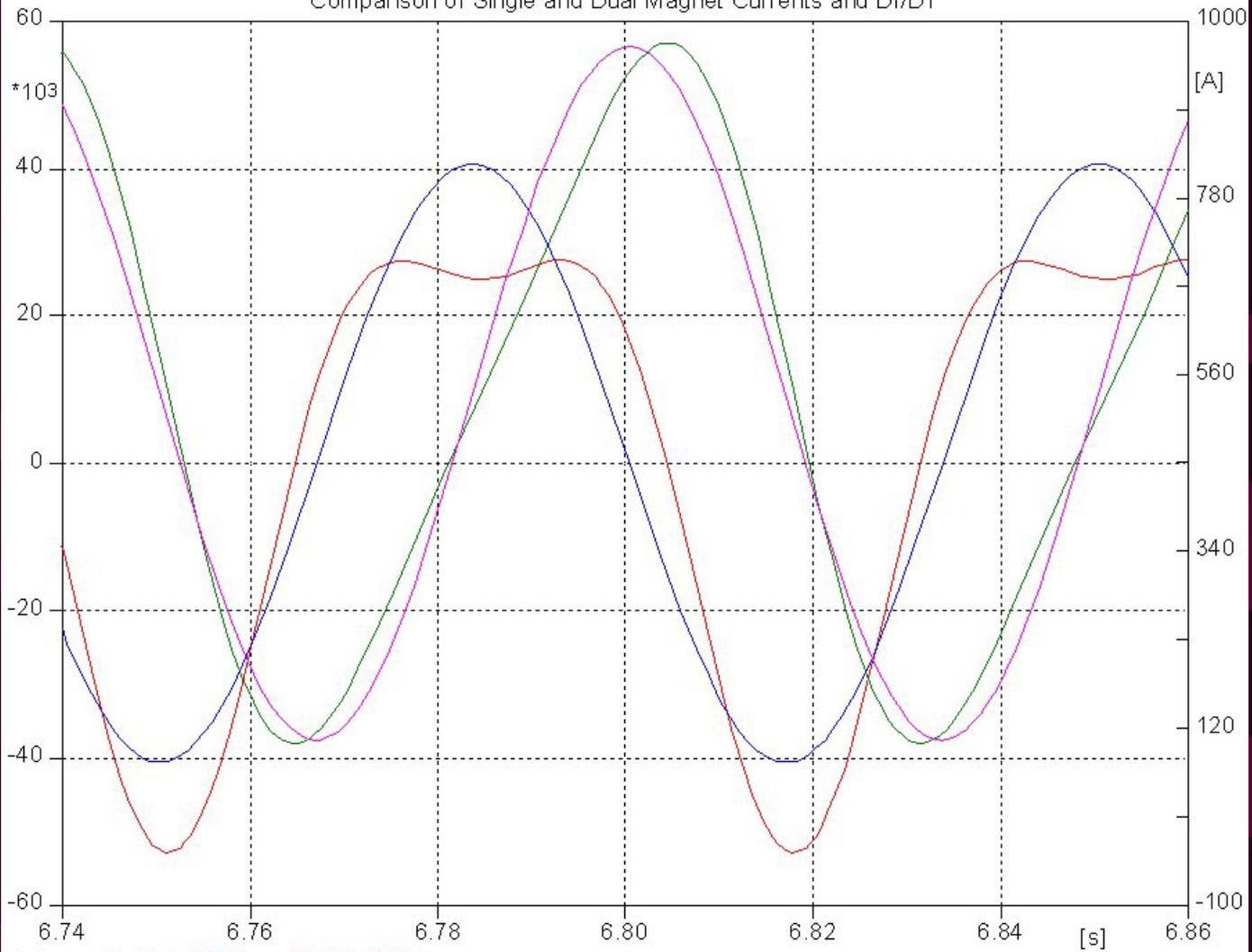
BOOSTER DUAL RESONANCE

- First look at a possible solution for a dual resonant modification to the existing Booster.
- Goal is to keep present magnets, chokes, and capacitors.
- Add additional components as necessary

Booster Cell With 2nd Harmonic

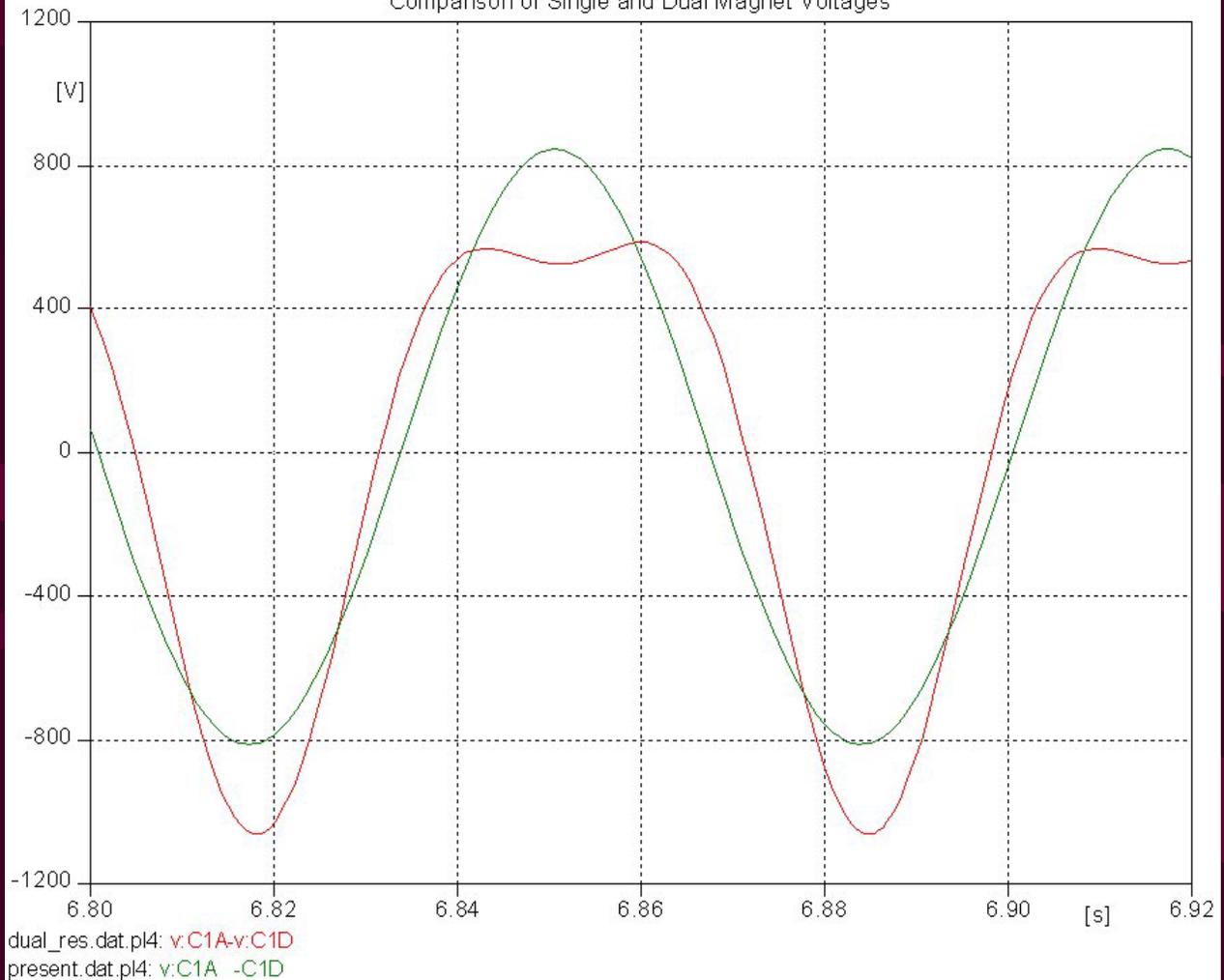


BOOSTER DUAL RESONANT Comparison of Single and Dual Magnet Currents and DI/DT

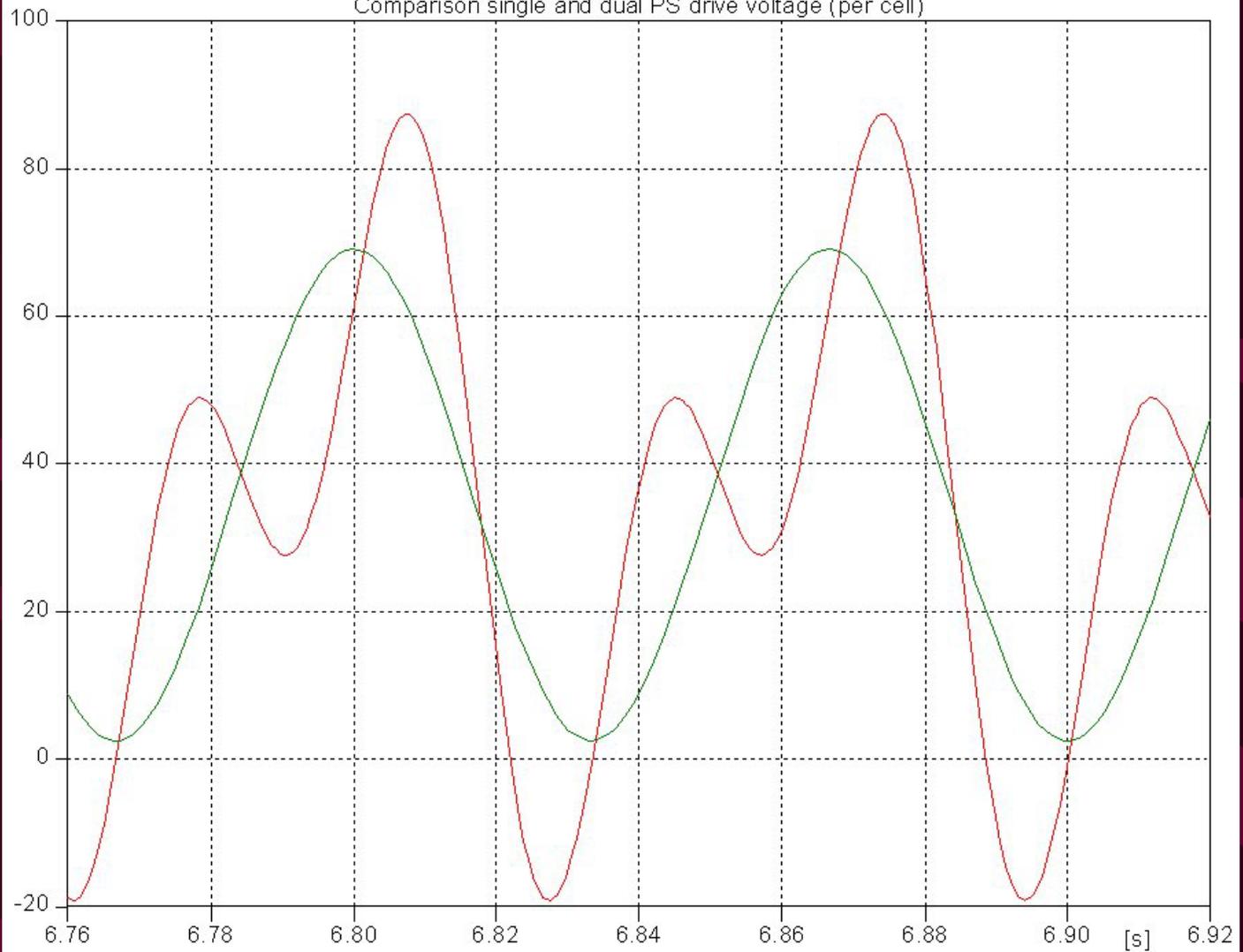


dual_res.dat.pl4: t: DI/DT c: VDRIV-CCR
present.dat.pl4: t: DI/DT c: VDRIV-C1A

BOOSTER DUAL RESONANT
Comparison of Single and Dual Magnet Voltages

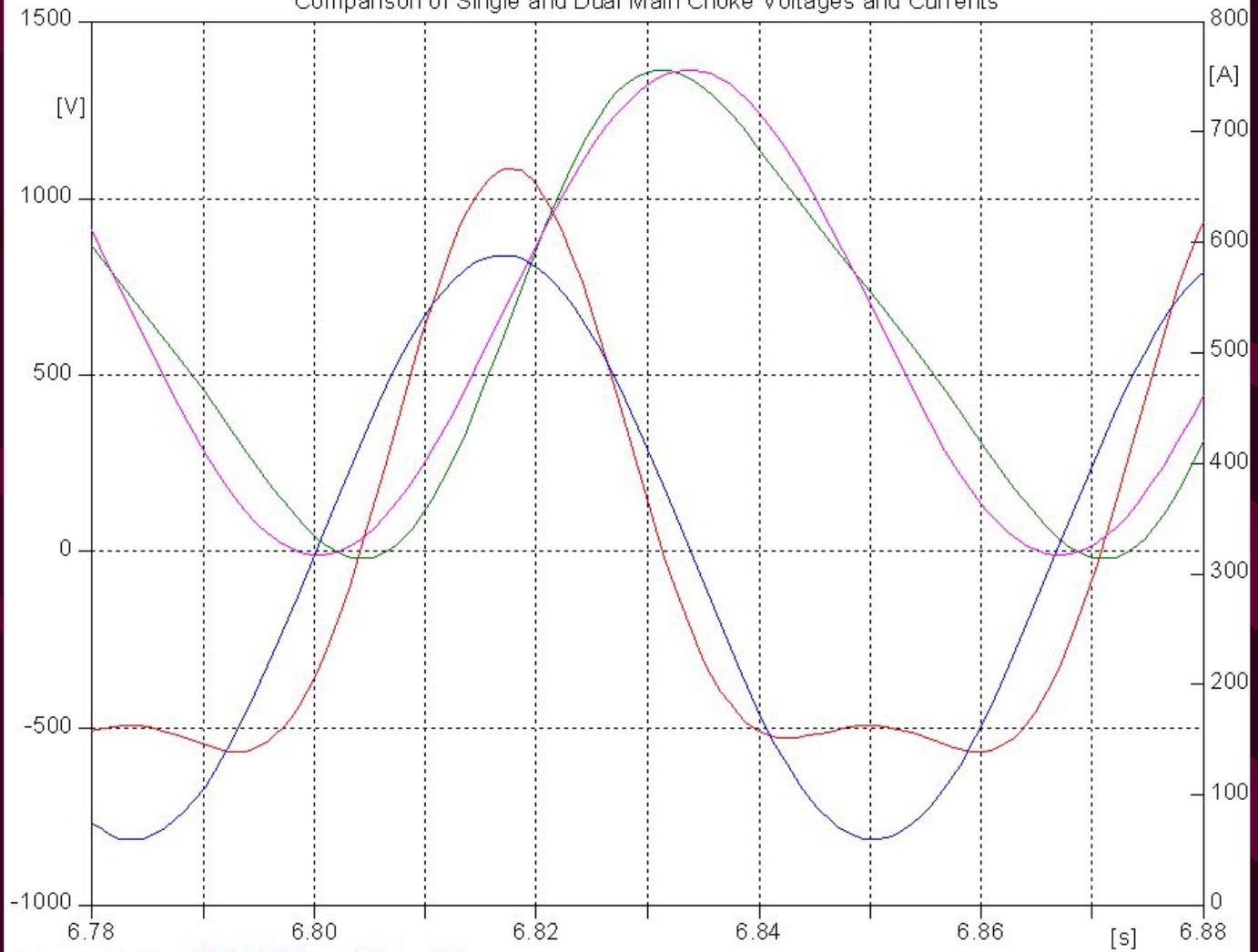


BOOSTER DUAL RESONANT
Comparison single and dual PS drive voltage (per cell)



dual res.dat.pl4: t: VDRIV
factors: 0.25
offsets: 0
present.dat.pl4: v: VDRIV-VRET

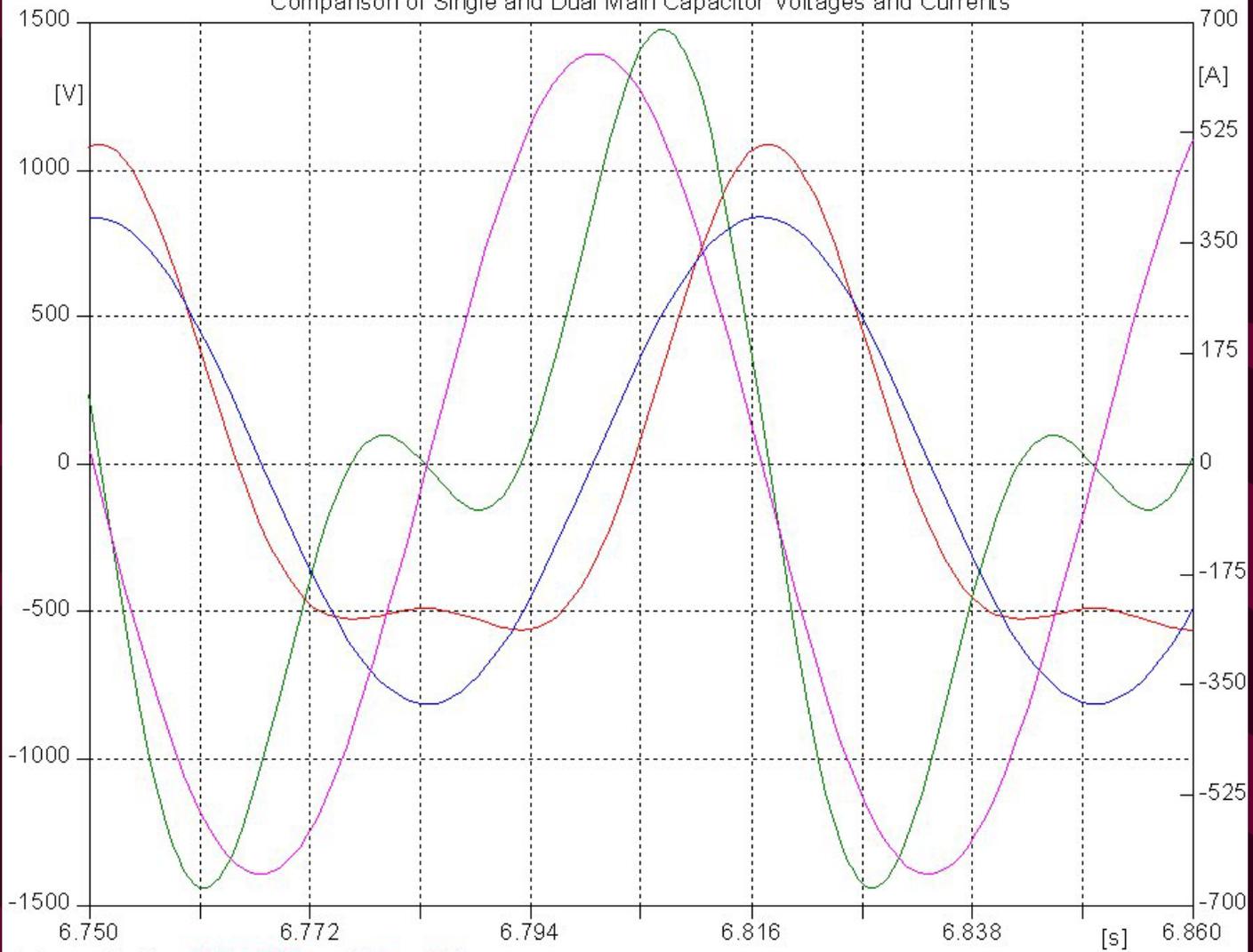
BOOSTER DUAL RESONANT
Comparison of Single and Dual Main Choke Voltages and Currents



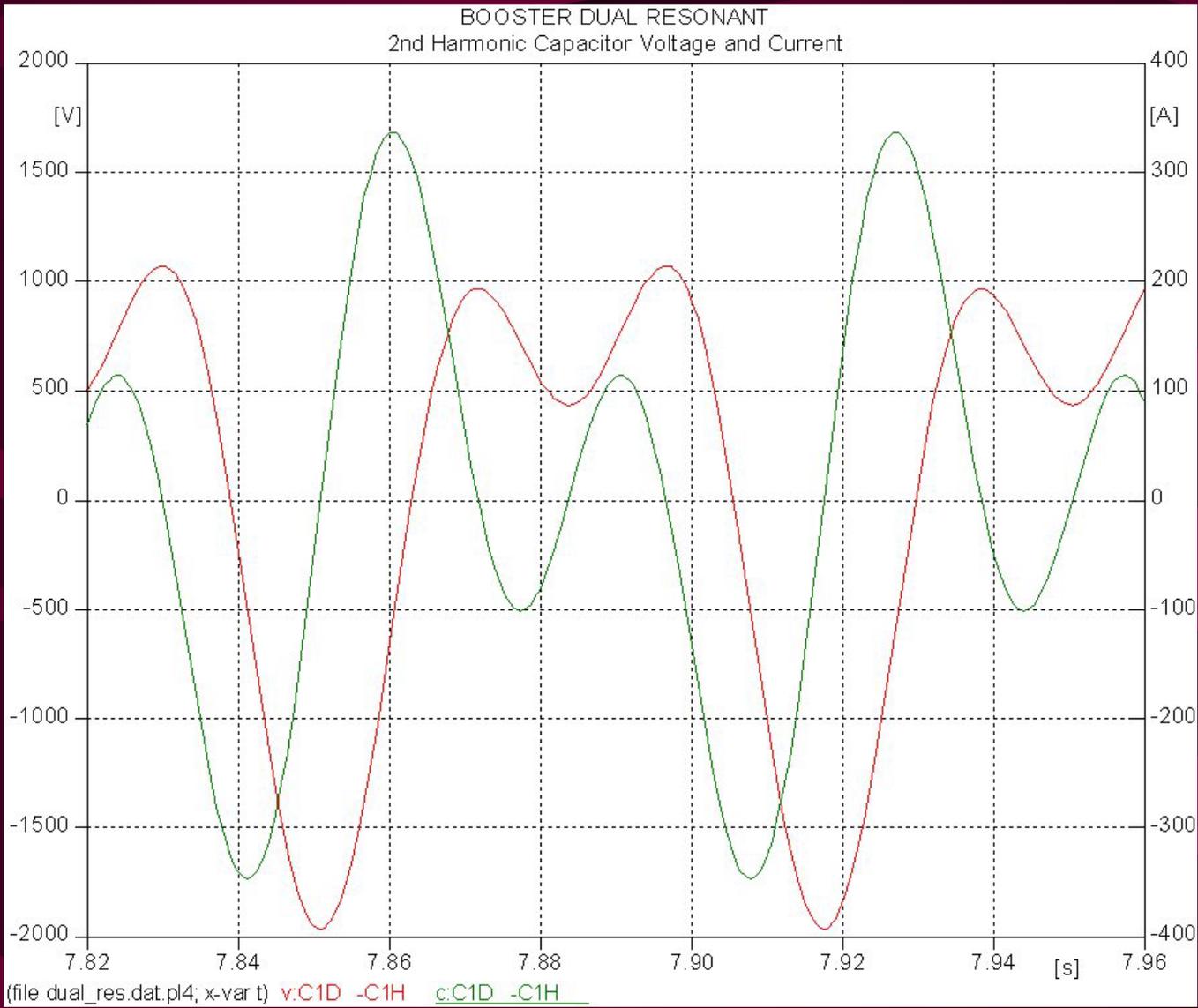
dual_res.dat.pl4: v:C1D -C1G c:C1D -C1E
present.dat.pl4: v:C1D -C1H c:C1E -C1F

BOOSTER DUAL RESONANT

Comparison of Single and Dual Main Capacitor Voltages and Currents



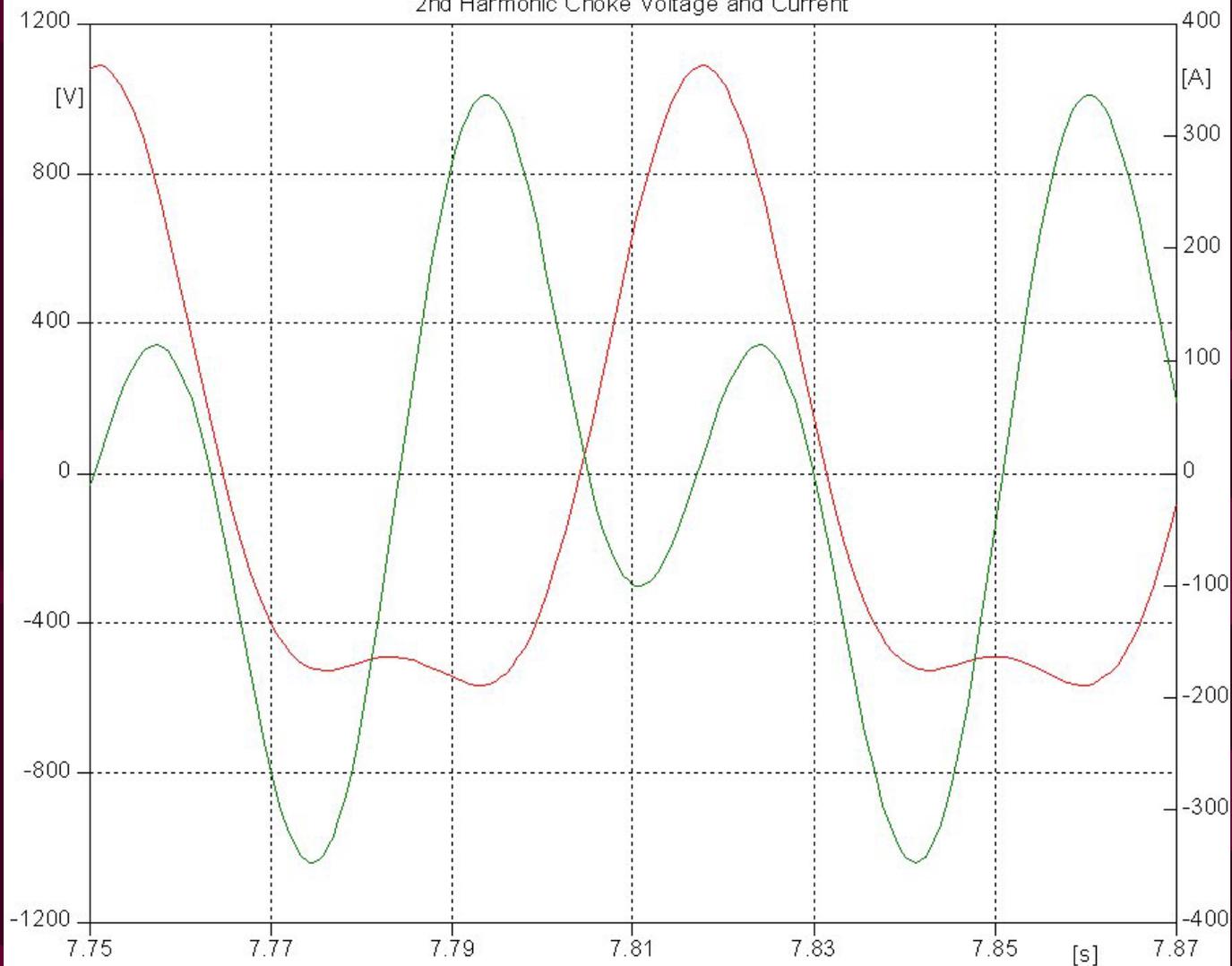
dual_res.dat.pl4: v:C1D -C1G c:C1D -C1G
present.dat.pl4: v:C1D -C1H c:C1D -C1H



2nd Harmonic Capacitor Specifications:

- Capacitance: 1480 uF
- Peak Current: 350 amps
- RMS Current: 200 amps
- Peak Voltage (differential): 2000 volts
- Peak Voltage (common mode): 1500 volts
- Total Loses: < 500 watts

BOOSTER DUAL RESONANT
2nd Harmonic Choke Voltage and Current



(file dual_res.dat.pl4; x-var t) v:C1D-v:C1G c:C1H -C1I

2nd Harmonic Choke Specifications:

- Inductance: 26 mH
- Peak Current: 350 amps
- RMS Current: 200 amps
- Peak Voltage (differential): 1100 volts
- Peak Voltage (common mode): 1500 volts
- DC Resistance: < 0.010 ohms
- DC Loses ($I^2 * R$): 400 watts
- AC Loses: < 500 watts

NECESSARY MODIFICATIONS

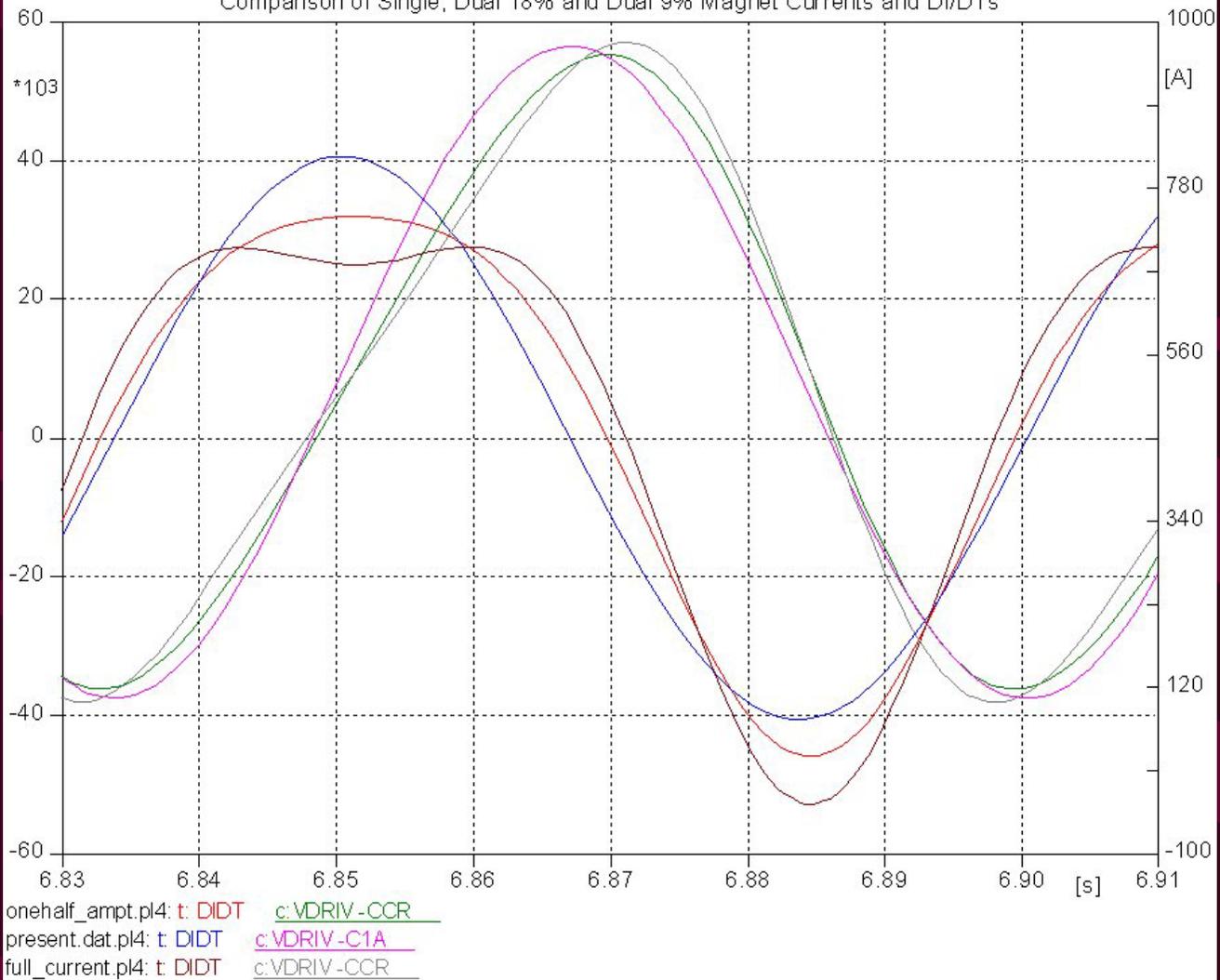
- Power supplies need to invert
- All power supplies will be needed for normal operation.
- New second harmonic cap bank is needed.
- New second harmonic choke is needed.
- New regulation system needs to be developed.

Very crude cost estimate:

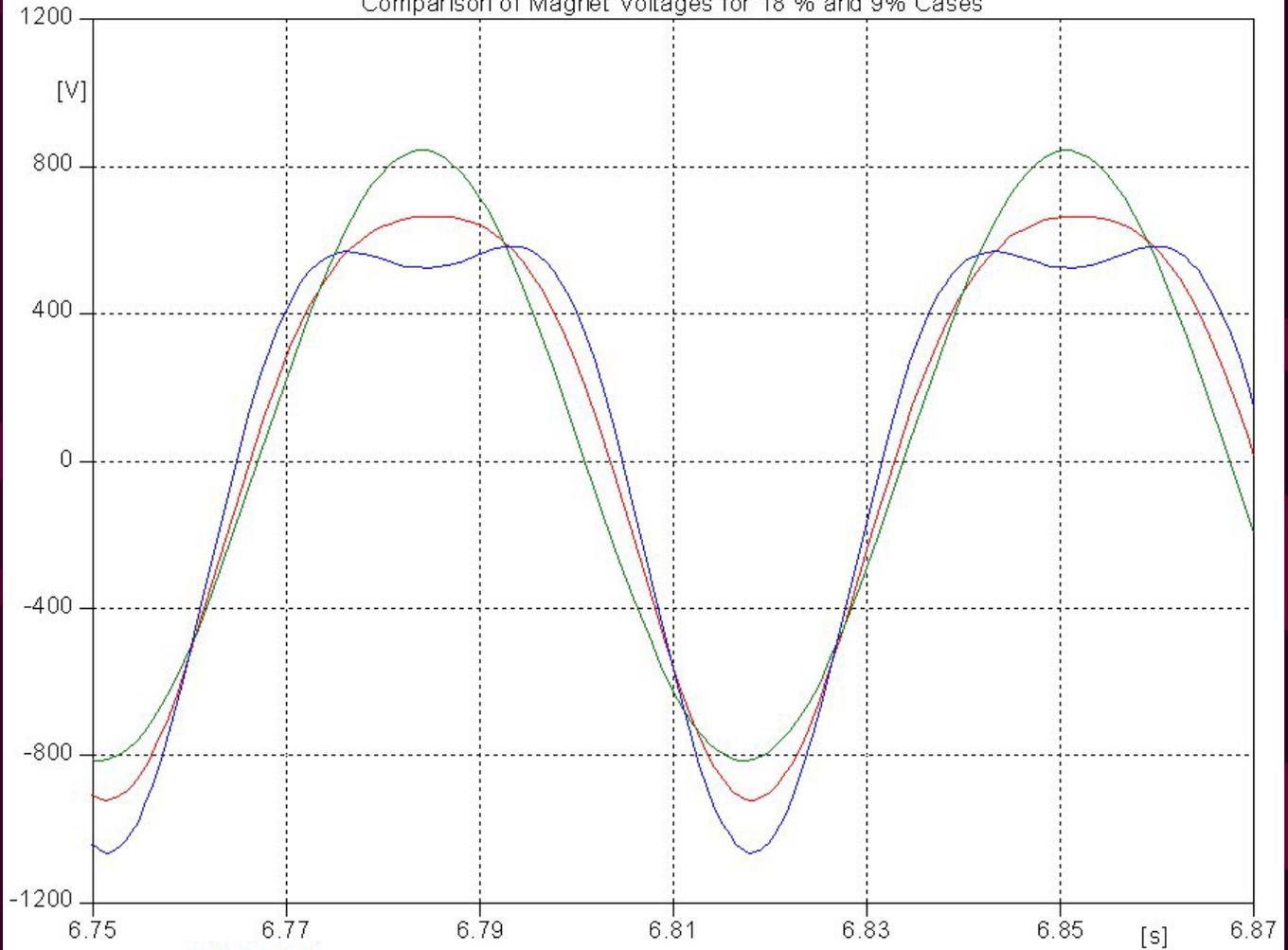
- New capacitors: $\frac{1}{2} * C * V^{**2} = 3\text{kJoules}$ per cell. Assuming \$1.5/joule = \$4.5k per cell. (present caps were \$1/joule)
- New chokes: $\frac{1}{2} * L * I^{**2} = 2 \text{ kJoules}$ per cell. Assuming \$2.5/joule = \$5k per cell.
- Total for 48 cells: about \$480k
- Does not include spares, labor or EDIA.

Following Slides Compare the 18% 2nd
Harmonic Addition with 9%

BOOSTER DUAL RESONANT
Comparison of Single, Dual 18% and Dual 9% Magnet Currents and DI/DTs



BOOSTER DUAL RESONANT
Comparison of Magnet Voltages for 18 % and 9% Cases

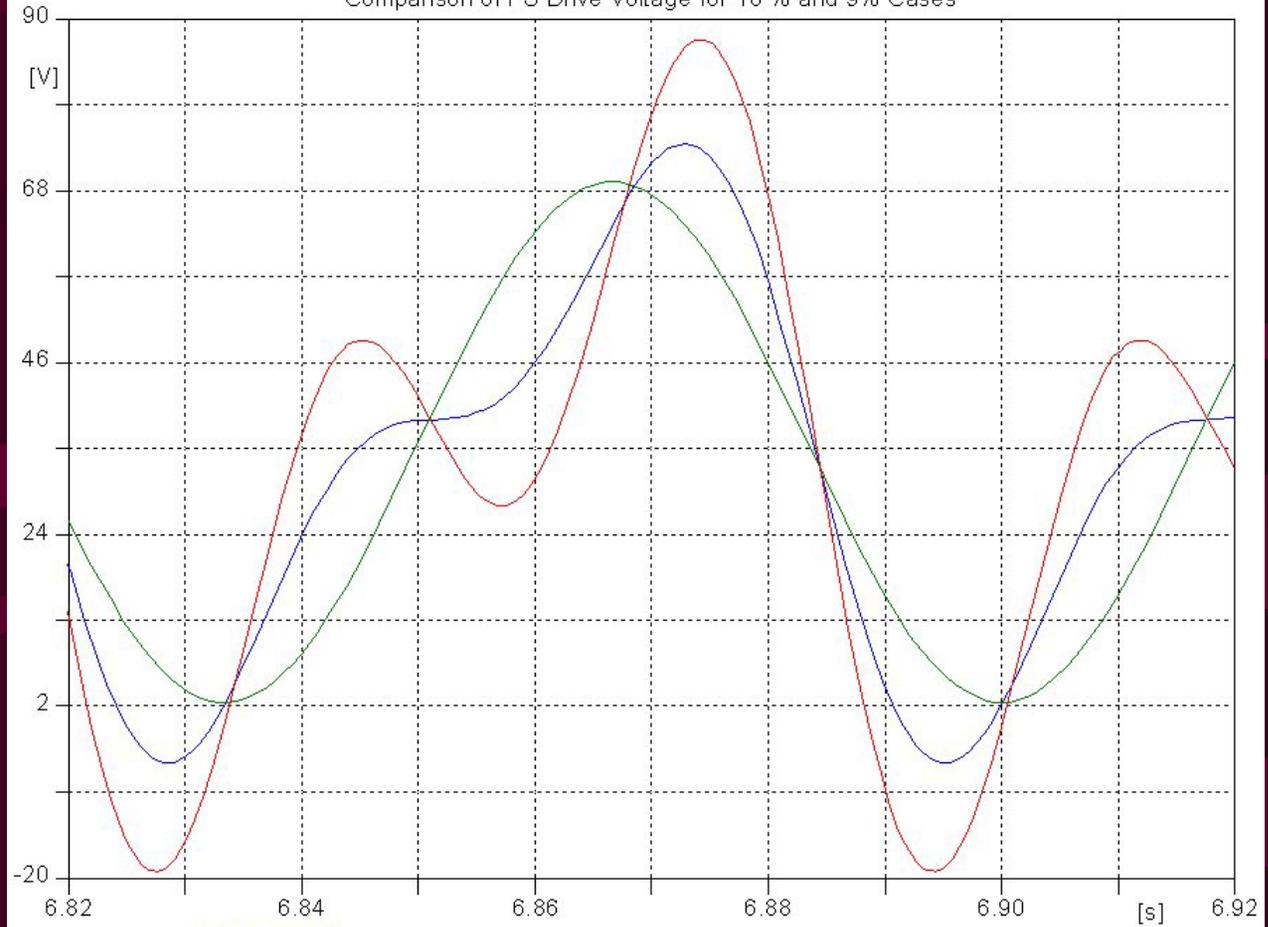


onehalf_ampt.pl4: v:C1A-v:C1D

present.dat.pl4: v:C1A -C1D

full_current.pl4: v:C1A-v:C1D

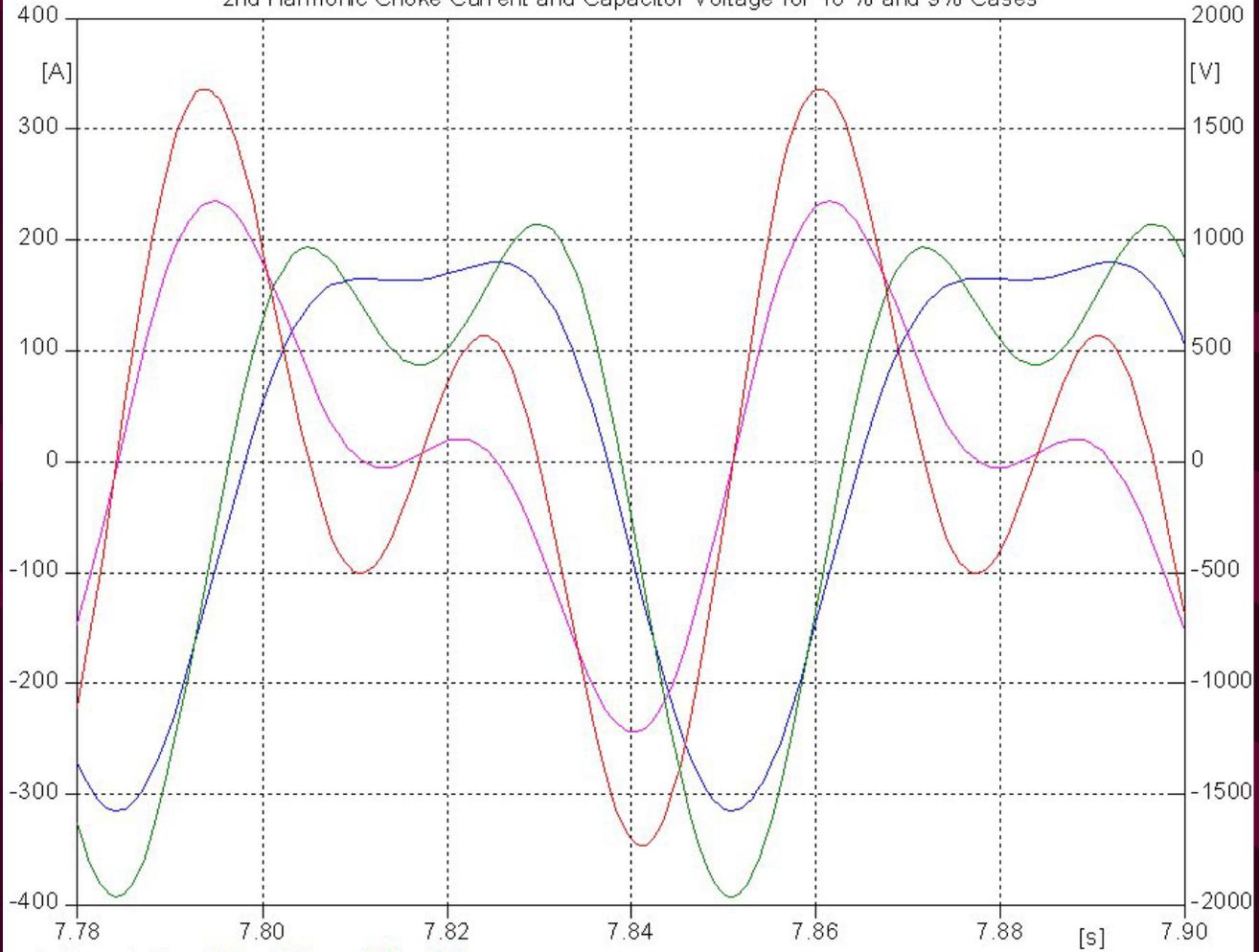
BOOSTER DUAL RESONANT
Comparison of PS Drive Voltage for 18 % and 9% Cases



onehalf_ampt.pl4: v:VDRIV -VRET
factors: 0.25
offsets: 0
present.dat.pl4: v:VDRIV -VRET
full_current.pl4: v:VDRIV -VRET
factors: 0.25
offsets: 0

BOOSTER DUAL RESONANT

2nd Harmonic Choke Current and Capacitor Voltage for 18 % and 9% Cases



onehalf_ampt.pl4: y:C1D -C1H c:C1H -C1I

full_current.pl4: c:C1H -C1I y:C1D -C1H