Comparing SPICE to the Bench

One of the most important aspects of circuit analysis and simulation is the resulting accuracy of the mathematical circuit representation. AEi Systems prides itself on the time proven accuracy of our SPICE models.

Listed below are just several examples of highly nonlinear circuits, which were modeled by AEi Systems and measured on the bench for correlation. The simulation results and the measured results are shown together in order to see a "side-by-side comparison. The majority of the bench results were provided by the customers using AEi's models. We think that you will agree that our correlation results are exceptional!

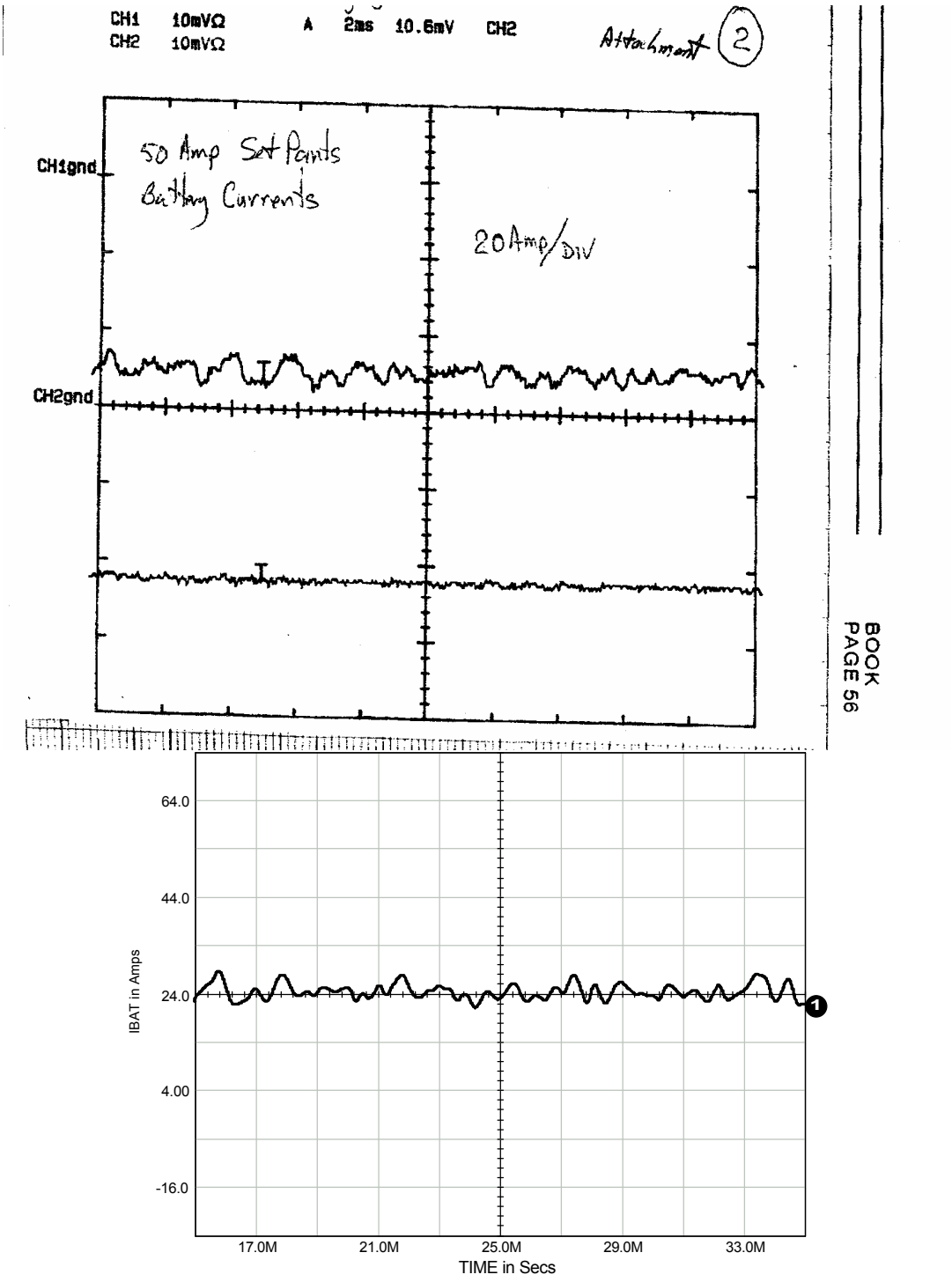
Correlation Examples

These correlation examples include circuit noise (example 1) and the mode transfer between satellite power busses (solar array to battery and battery to solar array) in examples 2 and 3.

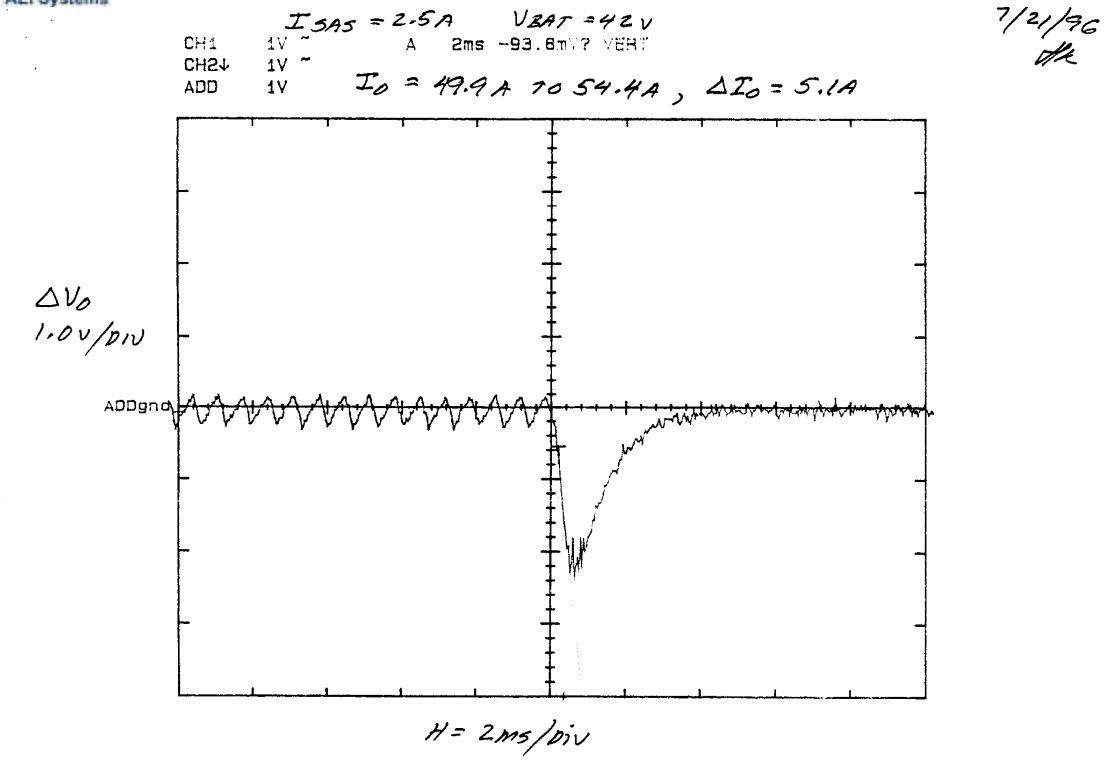
An AC gain-phase analysis is shown in example 4, while an accurate model for an M39006/22 (CLR-79) capacitor is shown in example 5. Example 6 shows a comparison for MPP powdered core dc bias effects.

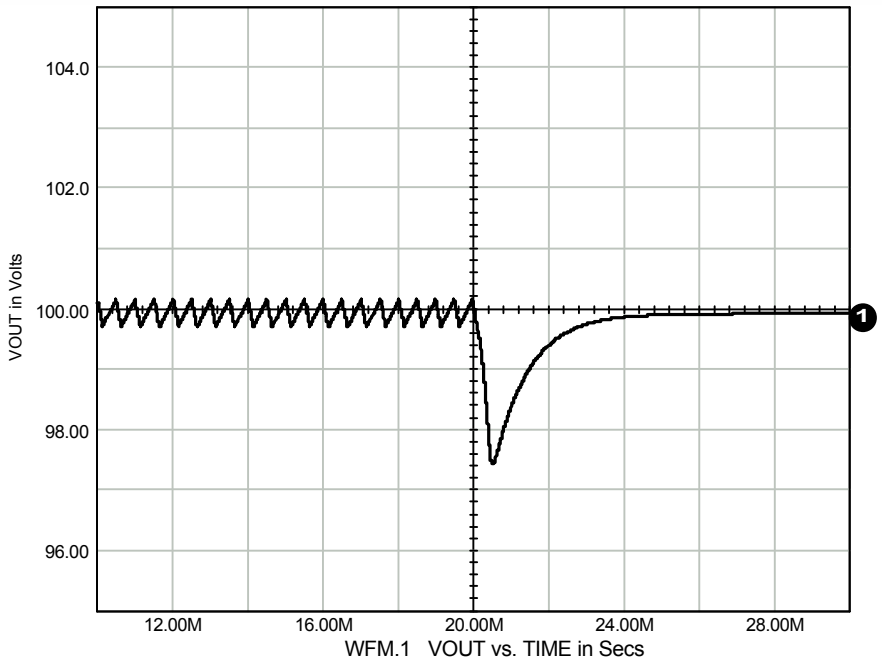
Example 7 shows a simultaneous mode transfer and load step for the International Space Station primary power bus. Examples 8, 9 and 10 show results of a stability analysis for various DC-DC converters.

Example 11 shows the inrush current of an input filter of a power converter. Example 12 is the response of that input filter to a turn on bus transient.



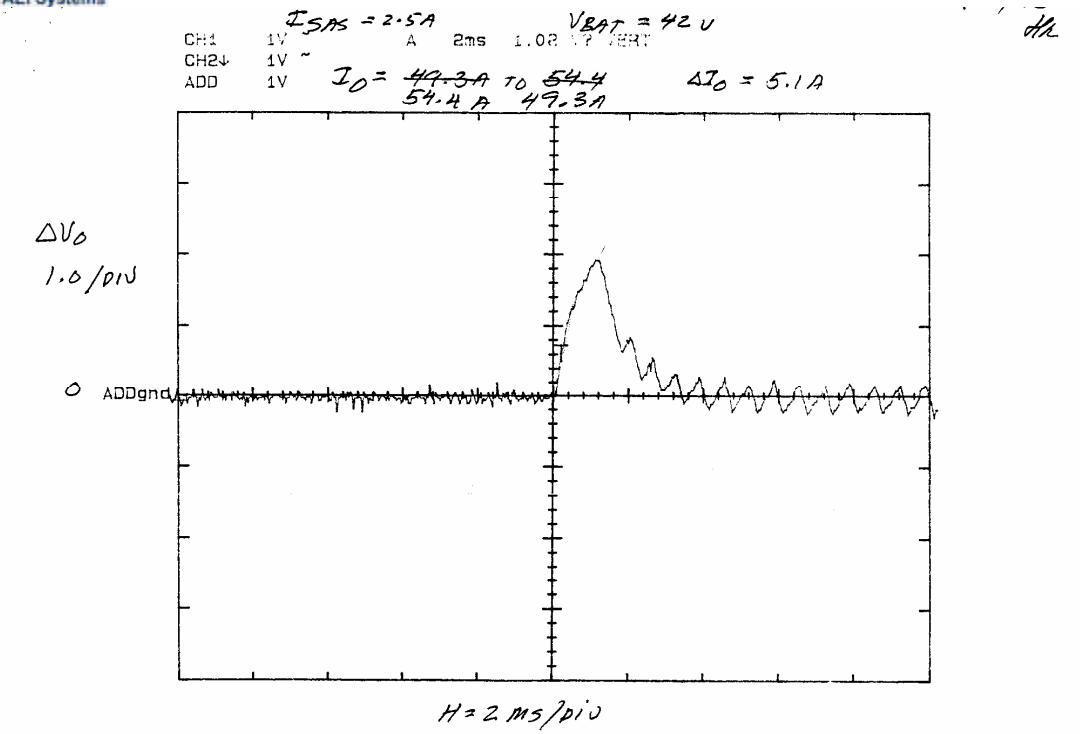
Example 1 – This shows the noise on the output of the ISS (International Space Station) Battery Charger Discharger Unit (BCDU). Rockwell and Space Systems Loral were concerned that the unit was oscillating. It turns out the unit was not oscillating, but it was spurious noise. AEi created the SPICE model to show the effects of the noise.

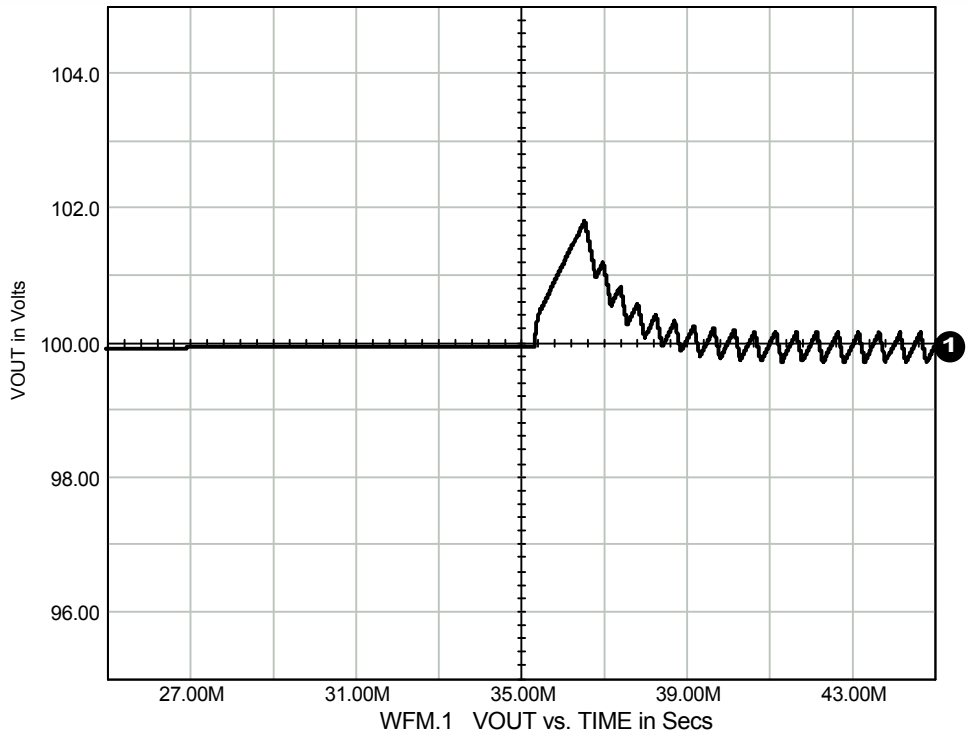




EXAMPLE 2

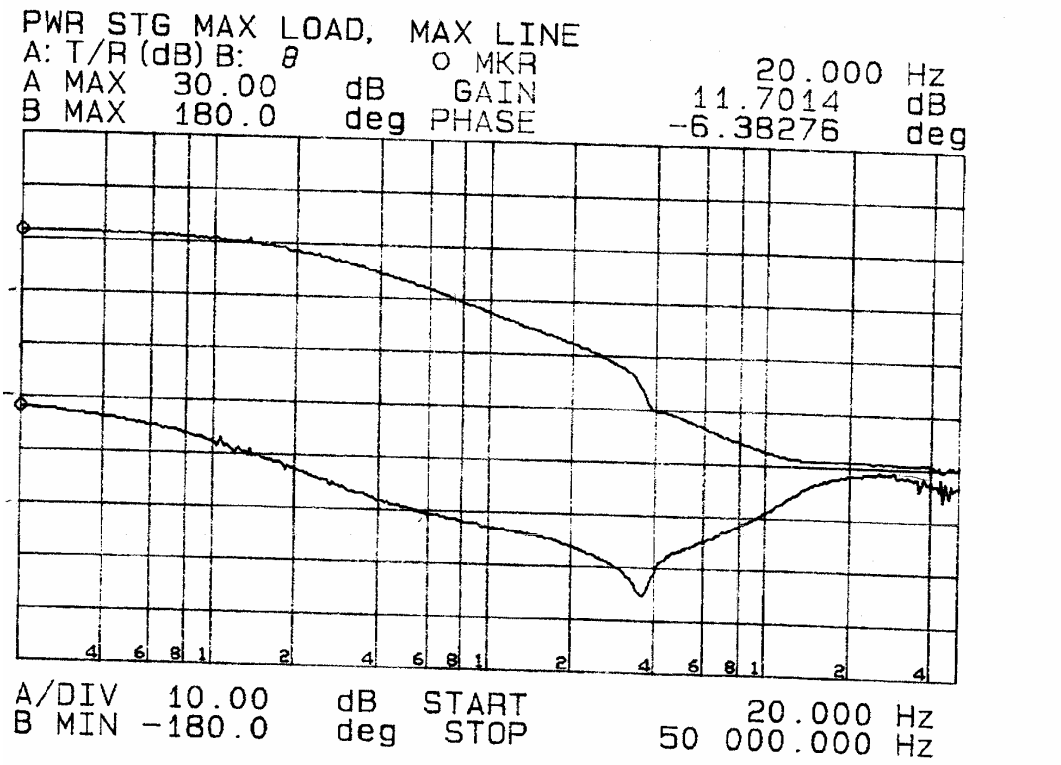
Example 2 – This shows a Space Systems Loral Satellite main Power Bus as it transitions from solar power to battery power.

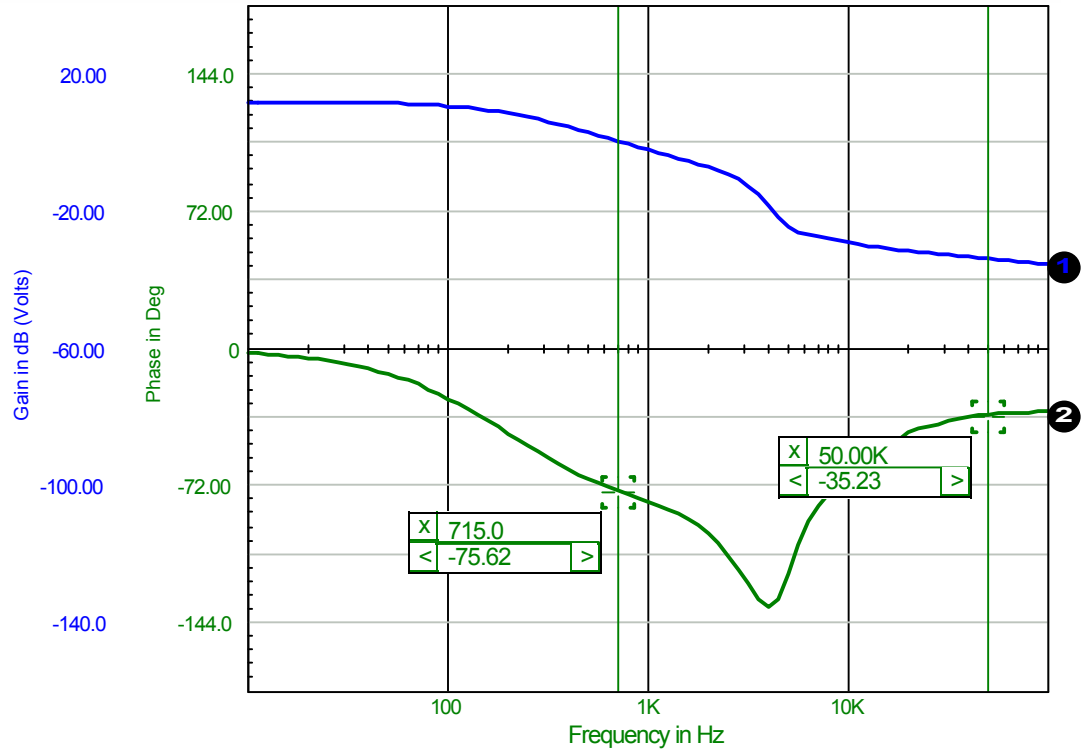




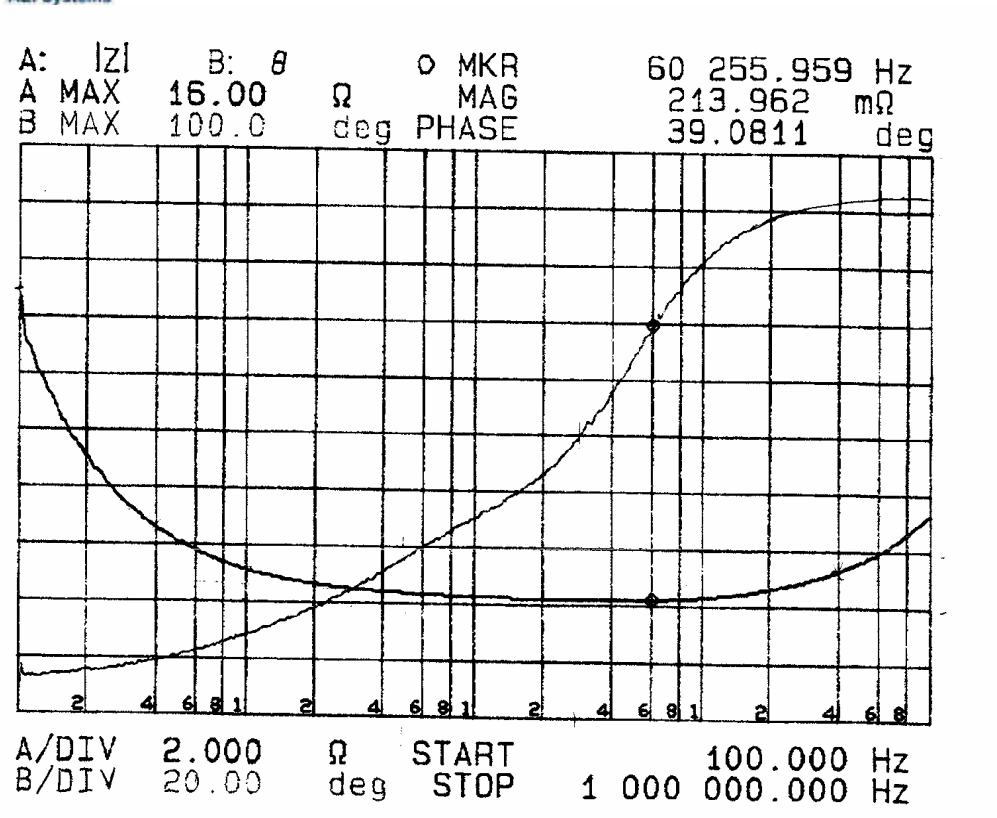
EXAMPLE 3

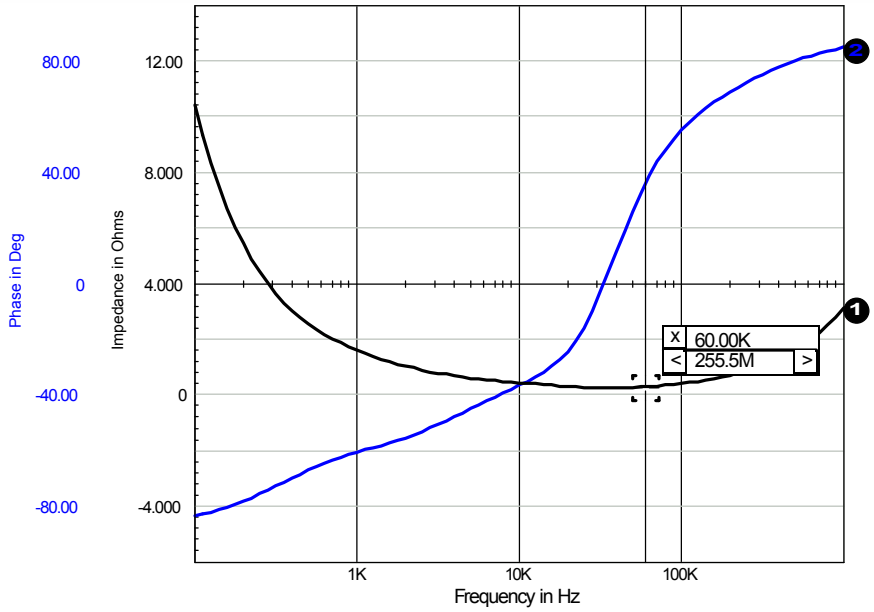
Example 3 - This shows a Space Systems Loral Satellite main Power Bus as it transitions from battery power to solar power.





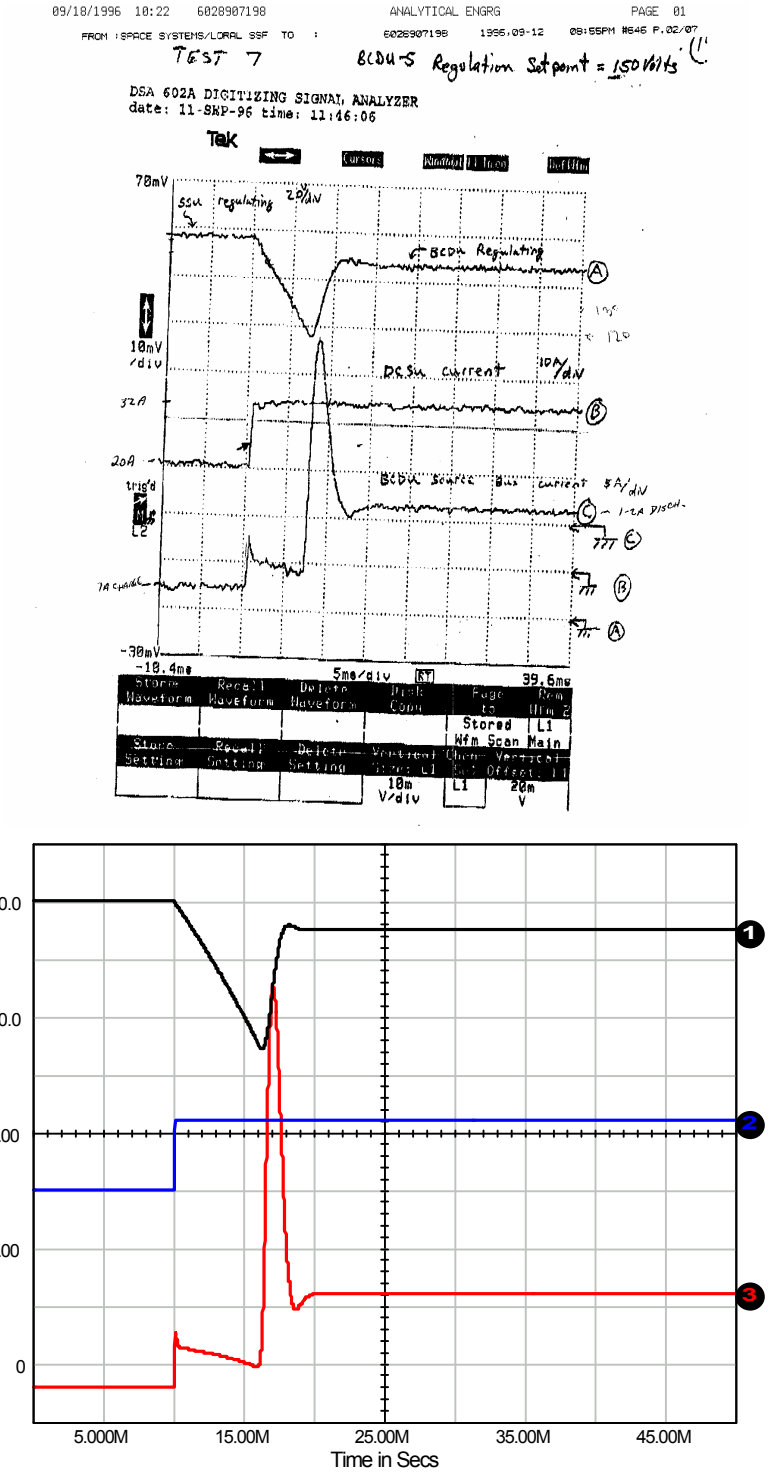
Example 4 – This shows the comparison between the SPICE model result and the measured result for a DC power converter loop gain measurement.



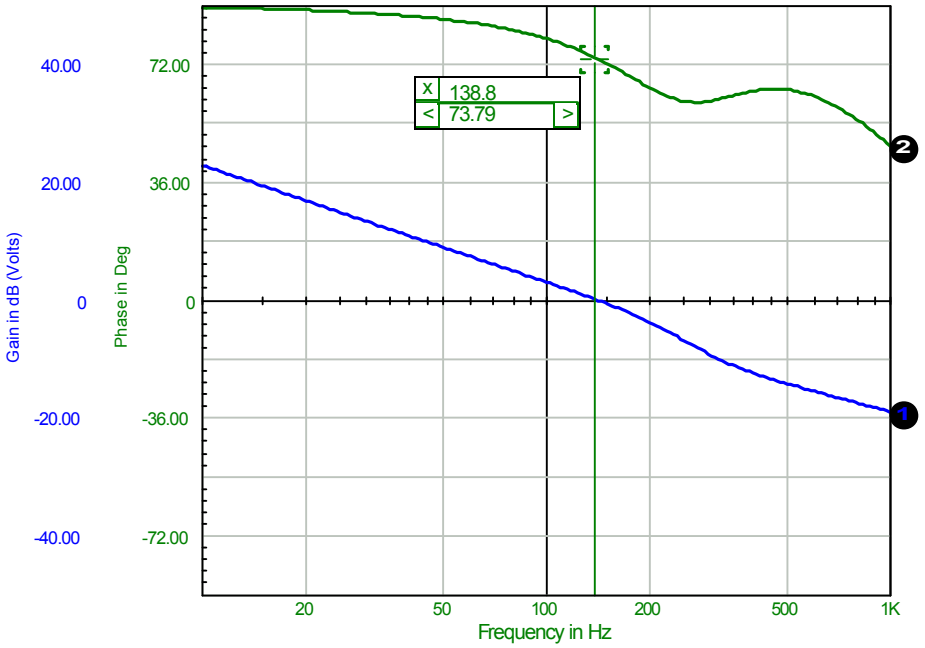


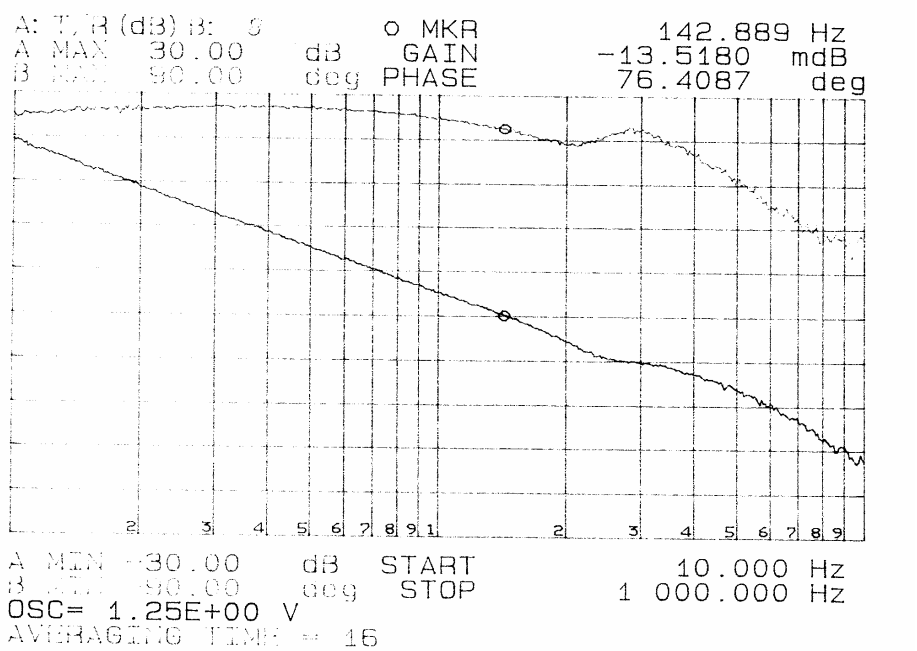
EXAMPLE 5

Example 5 – This shows the comparison between the AEi Systems custom SPICE capacitor model and the measured results for an electrolytic capacitor.

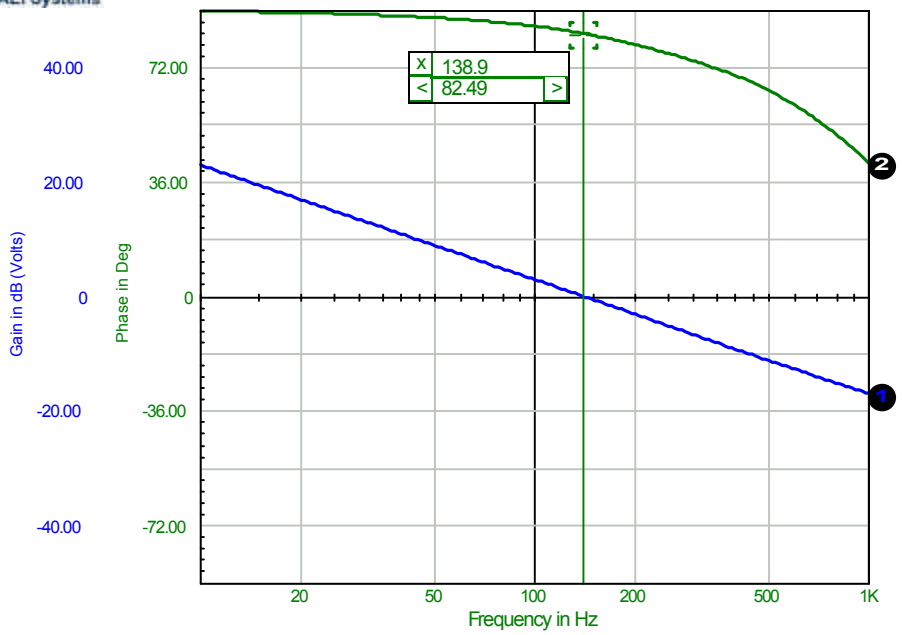


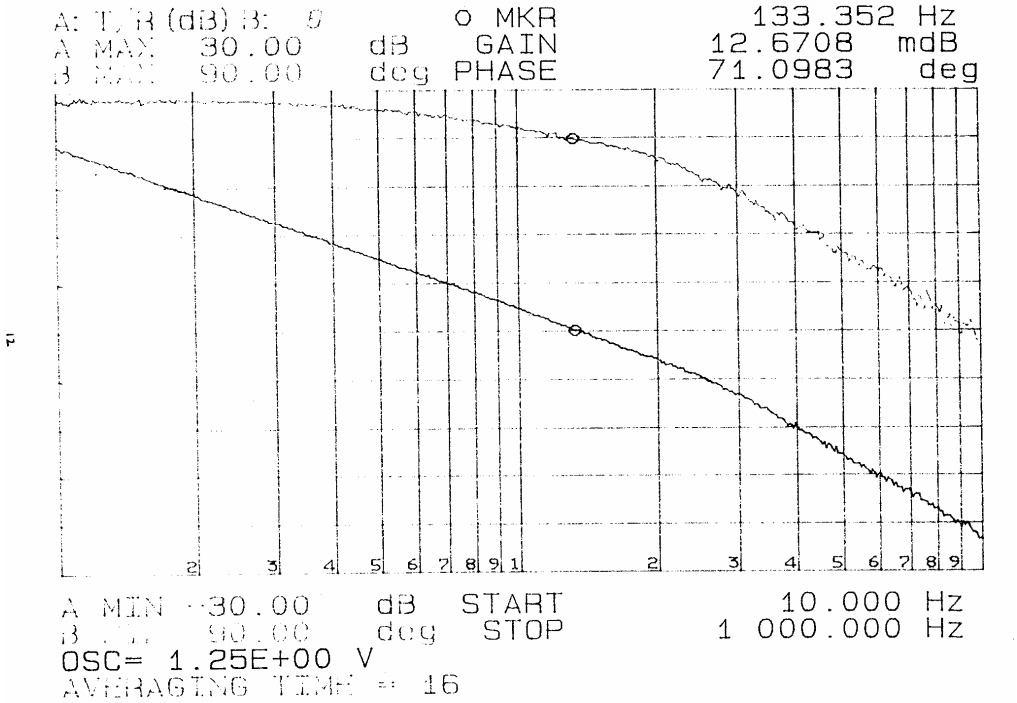
Example 7 - This shows the main power bus of the ISS (International Space Station) as the unit transitions from Solar Array power to battery power. This was an early simulation which showed a problem that was detected early and the circuit was redesigned to correct the deficiency.





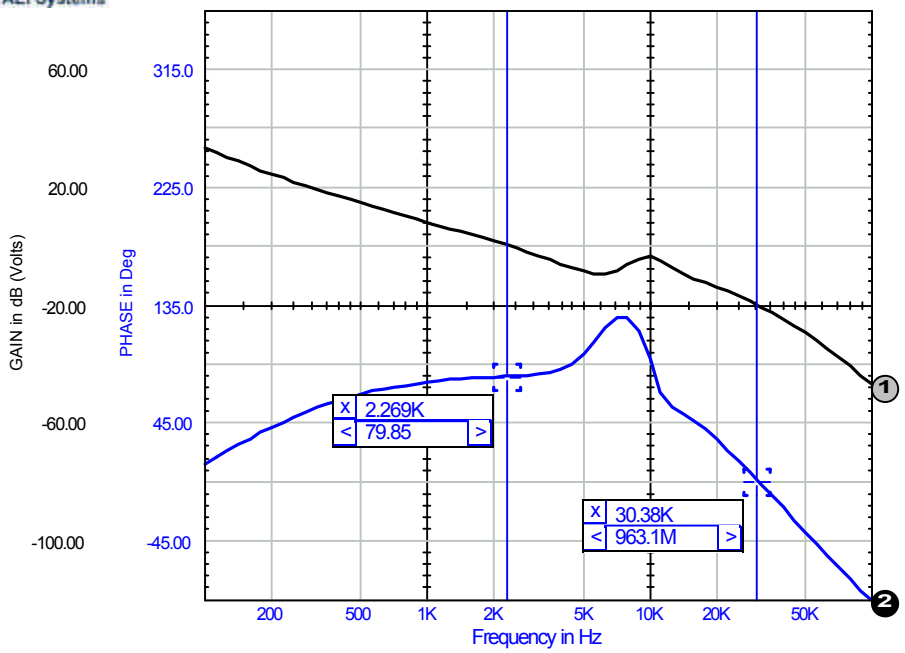
Example 8 - Another example of a non-linear DC converter loop gain measurement. The unusual response in the 200Hz to 400Hz region is due to a very long input cable between the input power and the converter which AEi Systems modeled accurately.

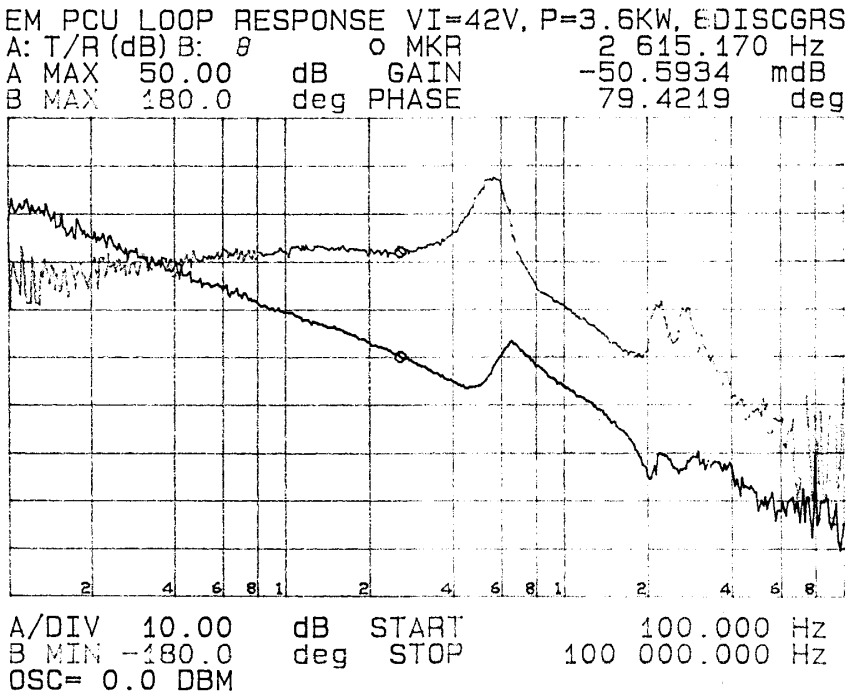




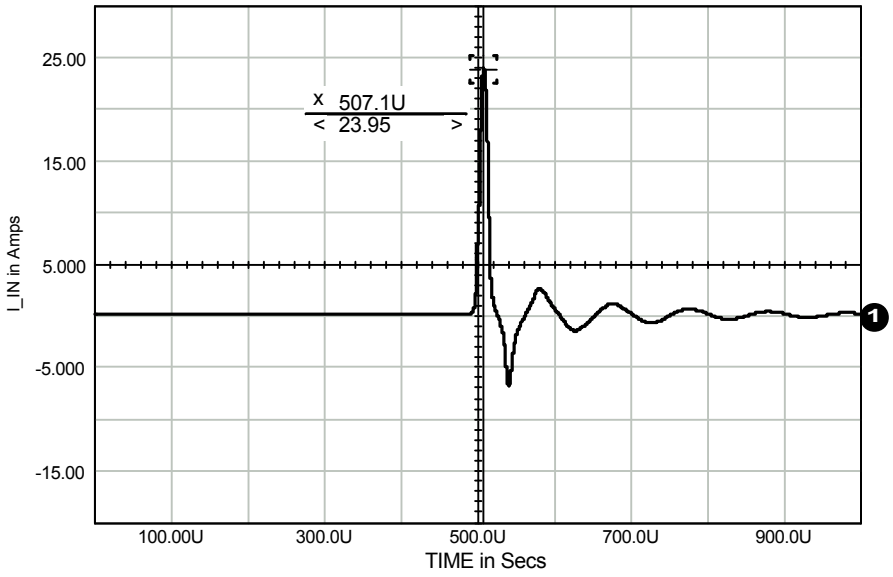
Example 9

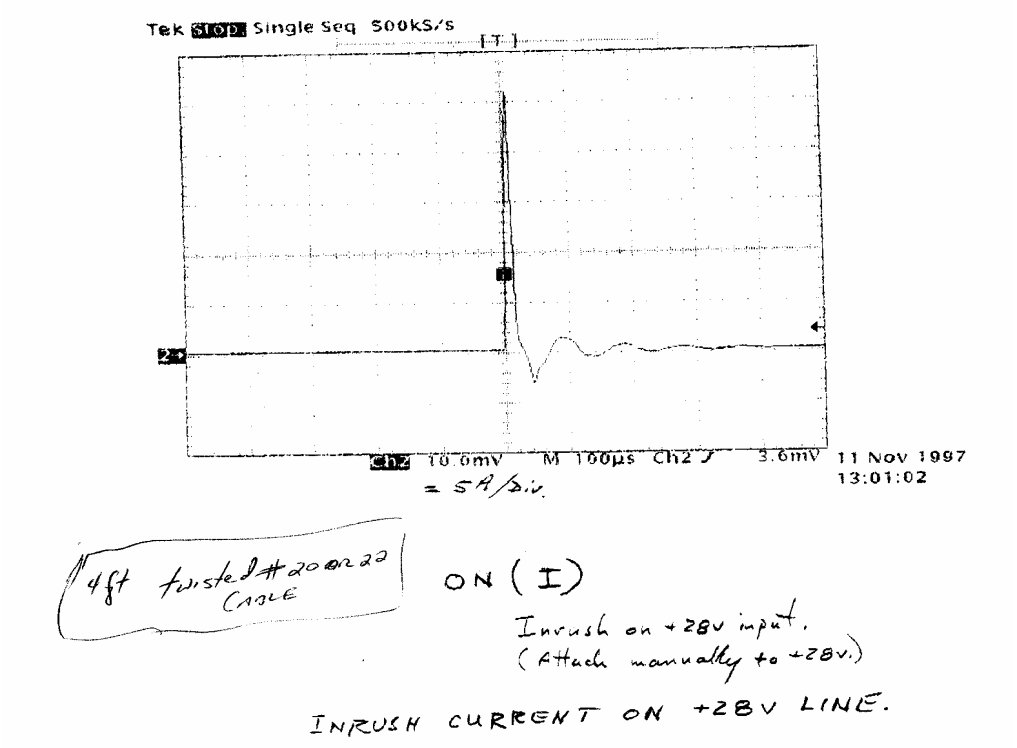
Example 9 - A bode plot loop gain comparison – DC-DC converter.





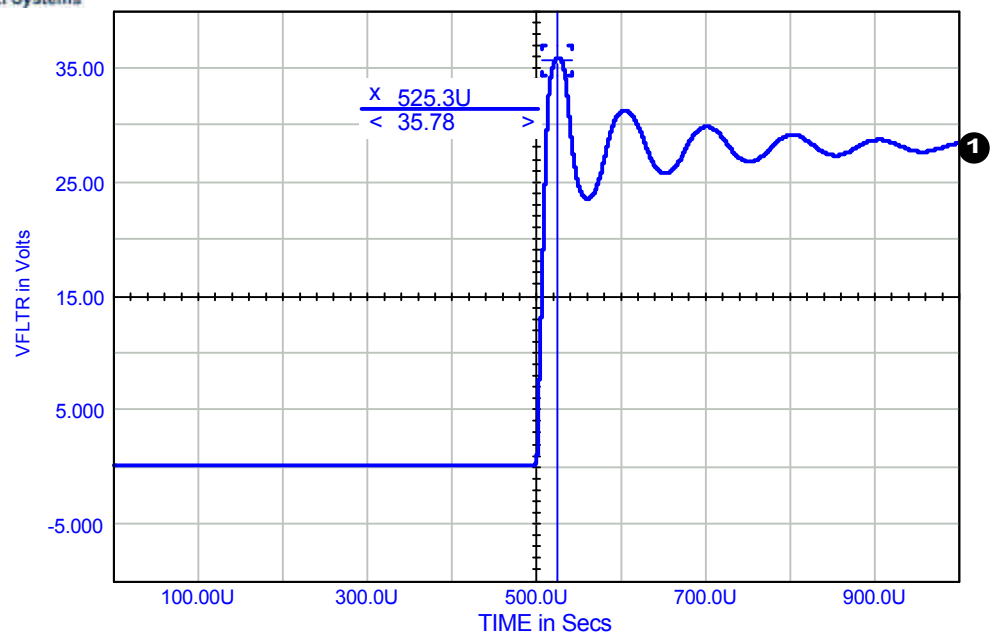
Example 10 - A bode plot loop gain comparison – DC-DC converter.

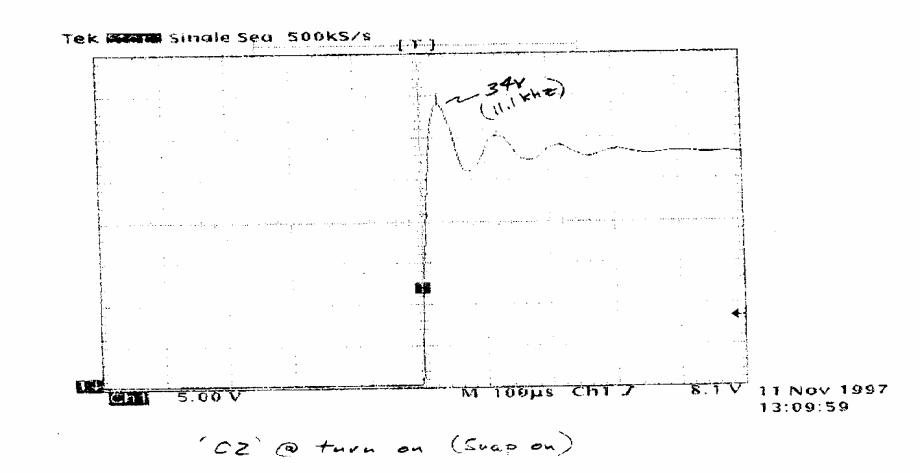




EXAMPLE 11

Example 11 - This shows excellent correlation between the measured and simulated results for the inrush current into a DC/DC converter. This example shows off the accuracy of the saturation characteristics of the AEi MPP core SPICE model.





Example 12 - This is the output voltage from the EMI filter in example 11 again showing off the accuracy of the model's saturation characteristics.