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A common source of compound error in experiments leading to overunity claims is spiky electrical signals; that is, signals with a very high noise content. The largest source of systematic error comes from the incorrect use of average, or partially-averaged, values of current and/or voltage in power calculations. Still, many opportunities to corrupt the instantaneous data must also be suspect.

First of all, with low sampling rates, maxima and minima may be more extreme than the acquired data points indicate, and a line drawn between two consecutive data points might actually hide high-frequency fluctuations. Low-end sampling equipment is also notorious for skipping data points. To minimize this problem in his investigations of overunity claims, George Hathaway of Hathaway Consulting Services uses a HP 434A calorimetric bolometer for waveforms of any shape, from 0 to 12.4 gHz. However, Scott Little of Earth Tech International highly recommends the Clarke-Hess 2330 power analyzer. Among other outstanding features, the 2330 can accurately measure electrical power at frequencies up to 400 kHz, and can also track two traces with extraordinary synchronism.

This is important for power calculations made from a current and voltage trace. Data from normal oscilloscopes often appear to represent synchronous measurements of current and voltage when they don't. The ramifications of only a 0.1 microsecond delay in the acquisition time for two corresponding data points can be critical, according to Hathaway. In numerous situations, he has illustrated how offsetting the data collected from two apparently synchronous, oscillating functions, by a phase angle of only a few degrees, can cause the best algorithms to bring power calculations from under- to overunity, or negative to positive.

Assumptions about the mathematics of spiky, sampled waveforms account for the largest portion of overunity claims. The best approach to minimizing errors (assuming circuit connections are correct, measuring instruments are operating within specifications, etc.) is to multiply the current and voltage point-by-point, and then average or integrate the instantaneous products so obtained. The average of the products is not equal to the product of the averages. As a simple illustration, take two data points for voltage, 10 and 0 V; and two for current, 10 and 0 amps.

The average of the products is:

$$\frac{(10)(10) + (0)(0)}{2} = 50,$$

and the product of the averages is:

$$\left(\frac{10 + 0}{2}\right)\left(\frac{10 + 0}{2}\right) = 25.$$

As Scott Little points out, in power calculations, the product of two averaged spiky waveforms systematically underestimates the result. Because many data acquisition devices use built-in averaging techniques to eliminate stray data points and smooth out the final data presentation, the experimenter must select his measuring devices accordingly. At the inception of Earth Tech's investigation into Jean-Louis Naudin's replications of the Mizuno experiments, Little called Fluke, the manufacturer of Naudin's oscilloscope, and found out that the model in question, the 123, can indeed condition its input with averaging techniques. This indicates that the current in Naudin's experiments was likely spikier than it appeared, and the actual input power was probably higher.

Though the problems discussed above are the likeliest sources of error in power calculations, overunity values are often obtained because experimenters underestimate the pervasiveness of electromagnetic induction, somewhere in their apparatus or instrumentation. In the near future, Hathaway and Little hope to draw up a succinct summary of the experimental errors leading to most overunity claims. In the meantime, Hathaway cites the technical applications notes, available online from either Agilent (www.agilent.com) or Tektronix (www.tektronix.com), as great sources of information on the topic.

Some of the general checkpoints include:

- Use the best equipment and instruments obtainable for measurement. If measuring oscillating quantities, seek equipment with the highest frequency resolution. Data is no better than the cheapest, lowest-frequency piece of the assembly used to get it. For instance, don't use a cheap probe with a great oscilloscope.
- Know the limits of the instrumentation used, especially when employing it in applications for which it was never intended.
- Be wary of measurements taken toward the limits of any measuring scale.
- Avoid impedance mismatches between an oscilloscope and probe and between the probe and the device under test.
- Select current-viewing resistances with values appropriate for load and source impedances. For example, avoid applications where the resistors in the meter circuitry may actually load the device under test.
- Minimize or account for induced voltages from capacitances and inductances (and sometimes even resistances) used as loads or even inside meters. Clamp-on meters are sometimes a good way to avoid this problem, if used within specifications.
- Use a real ground. Don't connect to conductors or equipment that will be picking up currents from the experiment or elsewhere.
- Minimize or account for normal induction in wires. Use the shortest leads possible.
- Realize that spikes in current and voltage are great sources of induction, and try to minimize the potentially large electrodynamic effects they can induce in equipment.
- Simple motion of anything in the lab that has picked up a net charge or become polarized as a side effect of a high-voltage experiment can produce extraneous, high-voltage readings on the oscilloscope with no current counterpart. These need to be filtered from power calculations.
- Import oscilloscope data into a PC program for analysis. This will allow the researcher to see to what extent slight timing offsets affect the results.
- Use the setup in question to acquire and assess data from a null experiment, one that incorporates no features of the phenomenon suspected of delivering overunity results.

Both George Hathaway and Scott Little have higher-end laboratories for rigorously analyzing overunity claims. They view the practice of trying to find commonplace explanations for anomalous phenomena as a strategic necessity in the search for revolutionary scientific breakthroughs. They would like nothing more than to discover or verify the existence of some remote operating regime in which an as yet unconsidered phenomenon reveals tremendous potential for the world's future energy needs.