Summary of Part I of the Steorn Tear-Down Thread

The first Tear-Down thread began with a report reviewing the tear-down of Frank's O-Cube, description of test equipment, early test run findings, some speculation that the stair-stepping traces may be indication of the cells exhibiting a Quantum Hall Effect (they are not) and early conclusions that cells were both recharging themselves as claimed by Steorn and were not harvesting energy from the environment.

That was June 30. I'm still pretty confident that we can still discount energy harvesting, but since then found that what appeared to be a quick self-recharging of the cells after a momentary discharge was actually voltage rebound (a characteristic of some capacitors). The stair-stepping during such a recovery was not due to an exotic quantum effect but rather was due to the 8-bit resolution of my scope limiting traces to visually discrete steps.

I began tests by grounding the cell to discharge it but later moved to using resistors in parallel to provide a drain. Beginning with 500K ohm I moved down, and down and down. This required recharging the cells (using two AA cells in parallel) but soon switched to a voltage divider circuit and two 9V batteries, giving me the potential to push out a range of voltages. Normally I only recharged the cells to around 3V.

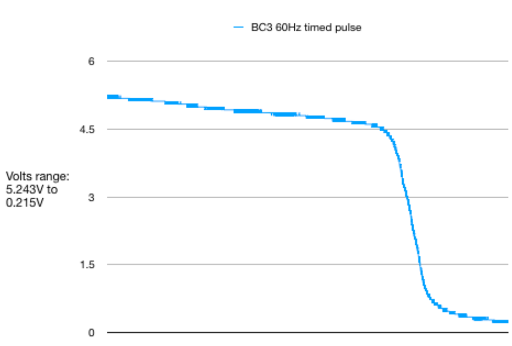
Subsequent testing and reviews of Franks posts from the past indicated that the cell voltages where tests began (generally 1.0V to 3.0V) were too low and might never achieve full stability due to the cell self-recharging. As cells that experienced momentary discharges recovered, their starting voltage was never reached, yet even after days and weeks the voltage did continue to rise slowly. Some self-recharging tests of the cells occurred even after long discharges of six hours or more. This is not typical of capacitors. However, this slow recharge was not going to get us back to the ability to recharge cell phone batteries.

At that low voltage I found that a 100K resistor in parallel across the leads would not drain it (at least not for over an hour), but voltages dropped when a 30K resistor was used. Going down to 50 ohms the voltage dropped quickly. Why 50 ohms? CWattier calculated that a 50 ohm resistor might be the best representative value simulating the load on a cell (cells?) in the O-Cube. So lower resistance means a higher drain rate.

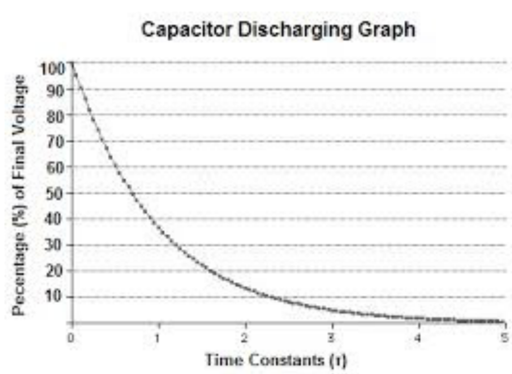
At this point I substituted a 6 VDC transformer as my recharger for biasing (as it kept me from having to replace the 9V batteries in my voltage divider circuit) and ran discharge profiles using a 100 ohm (91.6 ohm actually). I found that cell voltage quickly discharged down from 6.0V to 5.2V. However, I decided instead to not stop just below 5.25V but to let the blue cell discharge for hours to see if it matched the typical discharge profile of a capacitor. It did not.

After the cell ramped down linearly, all of a sudden the discharge profile looked much like the hysteresis curve of a magnet going from saturation toward remanence and down through coercivity toward the opposite saturation:

Blue cell discharge profile:



Typical capacitor discharge profile:



When previously charging the cell to only 1V to 3V I had been capturing only the profile after the cell had begun its steep decline. I had not previously seen the slow ramping down below 5.25V. This demonstrated that for some range of voltages of the blue cells, they were not acting like typical capacitors but possibly were exhibiting indications of being influenced by the actions of magnetic domain alignment, as Steorn had claimed.

Even more interesting, biasing the cell for 8 hours and discharging it versus a quick 10 minute charge showed discharge profiles nearly identical yet still different from that of capacitors. This indicated that the changes in the blue cells were not due to chemical changes, as it might be case with capacitors.

I then moved to recharging and discharging the cells using the voltage divider circuit running through a Crydom SSR and the 91.6 ohm resistor as the drain.   This would be the closest test circuit so far to what the cells experience while in the O-Cube and recharging a phone battery. I was not able to adjust the duty cycle (on/off) signals to the Crydom very well (only down to 21%) but finally figured out how to upload a .csv file to my scope to get duty cycles down to below 1%. But still no indication of reaching a stable point even with occasional recharging from the batteries.

I should also note that the cell (BC3) recharged through many cycles to 6.0V started to show signs of recharging much more slowly, so the higher voltage may have damaged it. I used used the voltage divider on the 6VDC transformer to generate a steady recharge voltage of 5.29V, which is now being used.

Most recently I have been using the Crydom to subject the new cell (BC1) to a range of duty cycles for the drain without any pulsed recharge from a power source. Over the past two weeks I made many tests using 9 hour runs to see what the behavior of the cell looks like over longer discharge cycles using duty cycles of 1-5% and frequencies of 200mHz to 10Hz (5 seconds to 0.1 seconds). No indication of recovery was seen.

Then it was suggested that perhaps the 91.6 ohm resistor was adversely impacting domain alignment and that I should try resistors with higher values. I tried duty cycles of 2% and frequencies of 5Hz using a 91K ohm resistor (1000x higher than the 91.6 ohm resistor) and immediately saw that the trace was stable. Subsequent tests using 470 ohm and then up to 5.58K ohm resistors did not show stability but trended toward less of a decline.

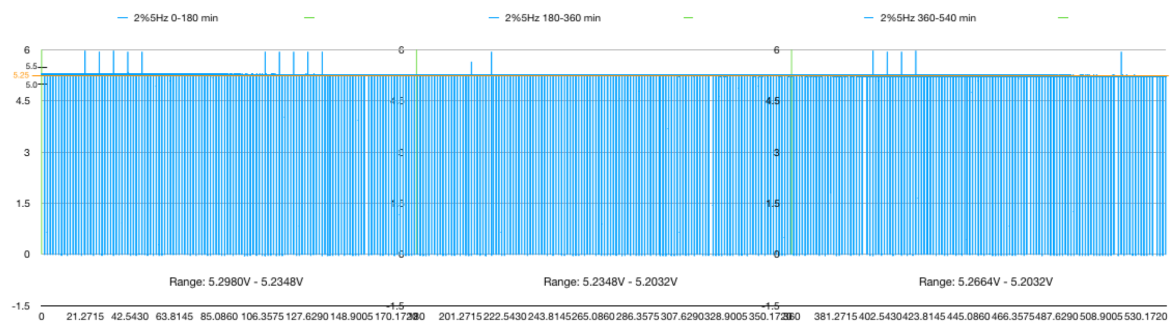
That's where we start Part II with this new thread.

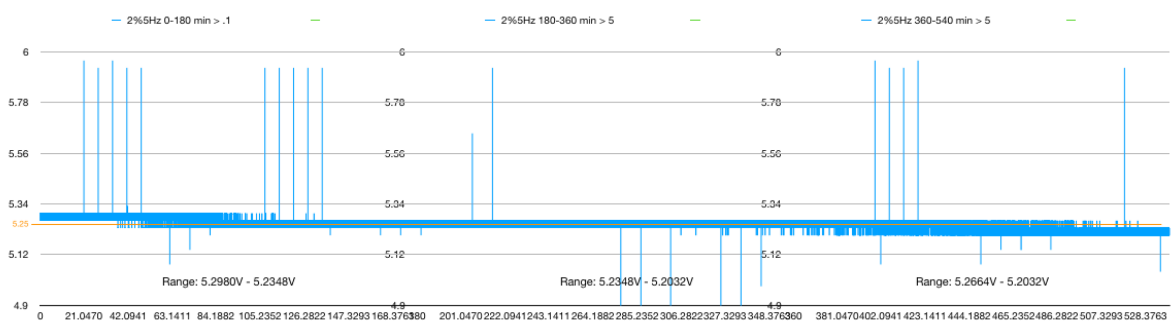
Recall that previously when I used 100K resistor draining the cells recharged to only 0.25V they did not appear to discharge the cell. So is this stable trace when using a 91K ohm resistor across a cell charged to 5.29V just displaying the same behavior as before? Is any resistance in the K ohm range — despite its apparent ability to produce a stable trace — too high to yield a sufficient power calculation to recharge a phone battery?

Here are the most recent three posts of the previous thread so you can see where it left off.

gdaigle • Sept. 7
After the 470 ohm run I acquired a number of resistors between 470 ohm and 91K ohm
I wasn't sure how to select a resistance over that scale, so I went logarithmic, selecting a resistor at 5.58K ohms because it was about the half way point between 470 and 91K.

The 9 hour run began with the cell reading at 5.3V after a 3 hour bias. As with the 470 ohm resistor, the results of the 9 hr run show the trace still trending down.



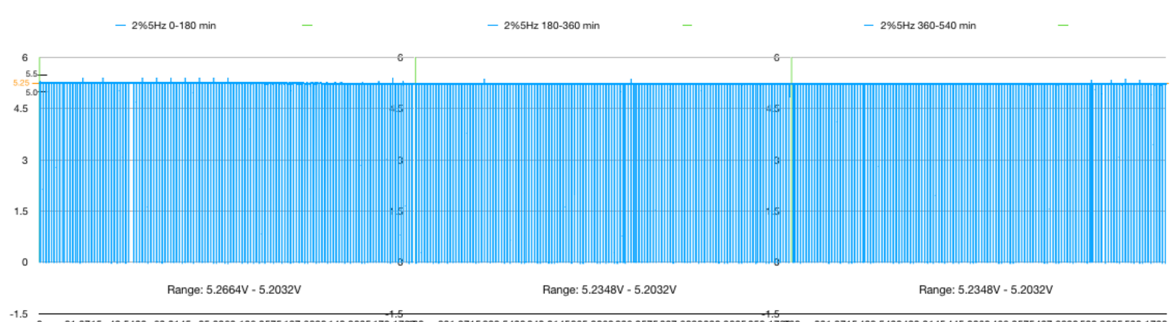


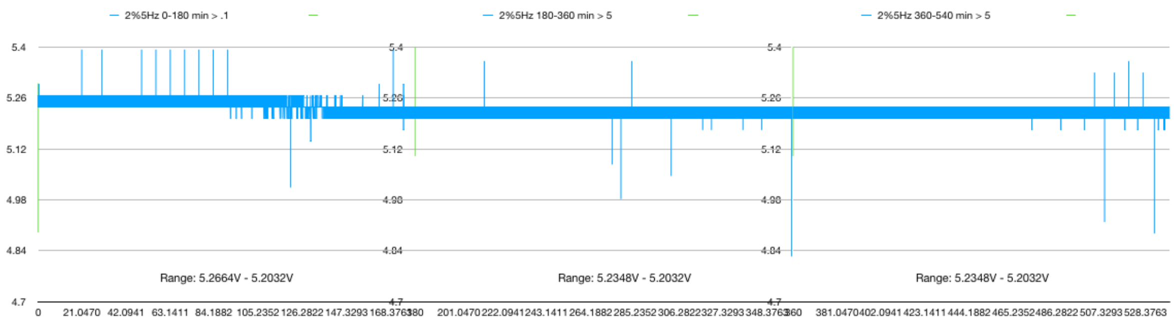
Despite beginning 0.3V higher at the start than the 470 ohm test, this run also moved down to about 5.2V and also showed some large spikes above and below. I'm not sure yet whether those large spikes are artifacts of the recording or not.

The results indicate that I should still go higher in resistance. It was pointed out that the 91K ohm run did dip down 8 hours into the run, but quickly recovered, so I still consider 91K as having reached stability, so my selection from the resistors will still be below 91K.

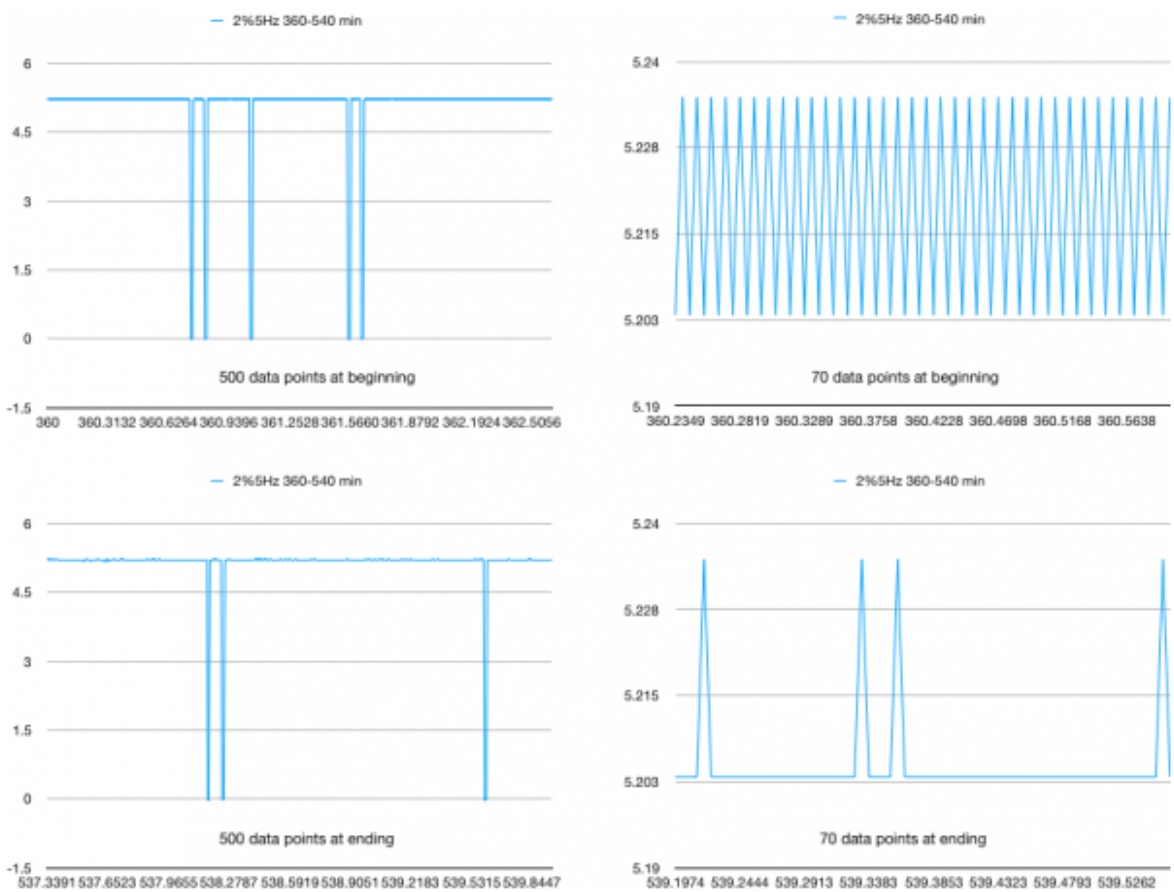
Having reached these interesting results, I'm going to open a new thread and repeat the postings from the run at 91K, plus a little background.

gdaigle • Sept. 6
I've upped the resistance from 91.6 ohm only 5-fold to 470 ohm. Otherwise, the settings are the same. What I see is an improved trace, but it still does drop, particularly after the first 2 hours of this composite of another 9 hour run. As before, the entire trace, then the trace with recording anomalies removed:





Although it looks like the trace is pretty stable at the end of the run, a look at a closeup of the first 500/70 data points and the last 500/70 data points shows that the trend of the trace is still going down:



So this indicates that moving to a higher ohm values still well under 1K ohm moves us closer to stability (other variables being held steady), but it is not being reached. The next step up in my resistor kit is 15K ohm, so I need to get some other resistors between 500 ohm and 15K ohm. Will be back at it later today.

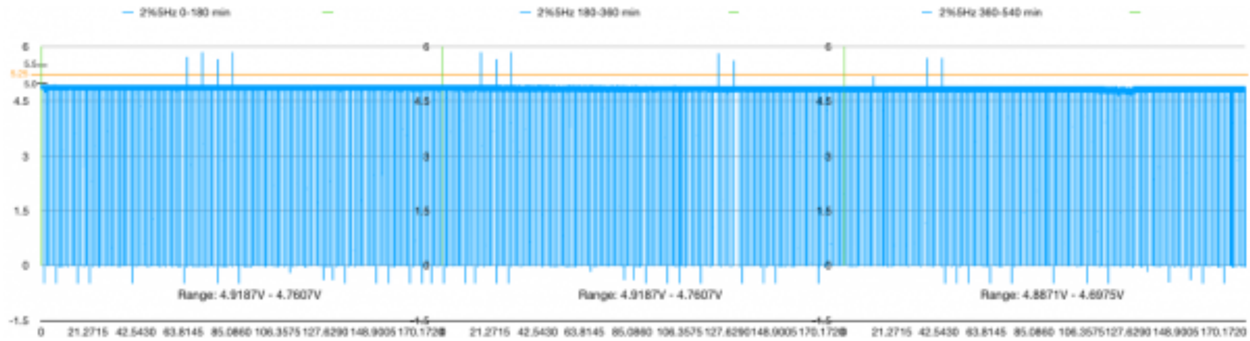
gdaigle • Sept. 5
In talking with a former member of the group SKDB (Steorn Knowledge DataBase) where I was under a non-disclosure for some years, a thought came up that was previously not considered.

Assuming that the duty cycle and recovery time are not completely out of whack, another possibility might be that the low ohm resistor (91.6 ohm) being used as the drain during the duty cycle might be causing too great of a drain, impacting domain alignment adversely. How exactly, I'm not sure but thought it worth a try. Remember that this cell is not a capacitor and does not act like a capacitor (around 5.25V anyway).

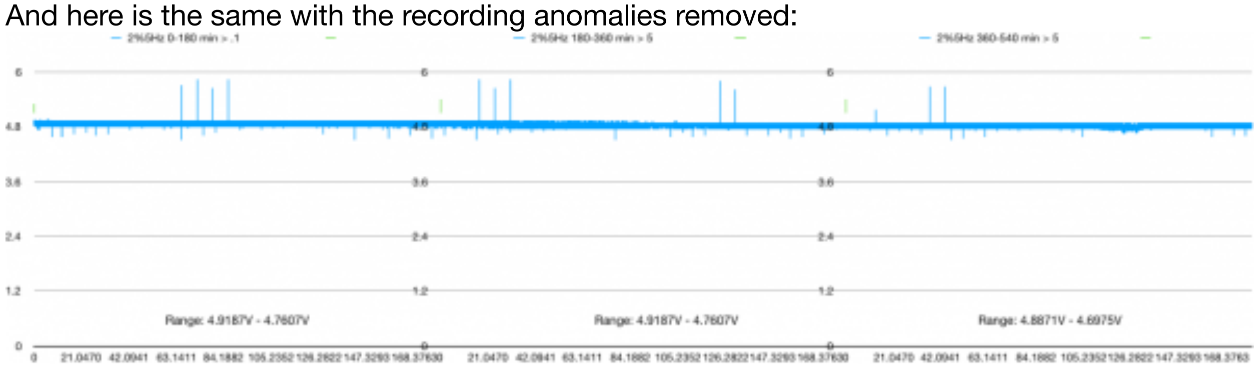
The solution would simply be to increase the ohms of the resistor. But by how much?

I decided to set a distant value by using a 91K ohm resistor, 1000x the ohms of the current resistor. Let's see what happens.

The BC1 cell was biased back to 5.26V. Here is the scope using the same 2%5Hz settings as before but a 91K ohm resistor as the drain for a 9 hour run:

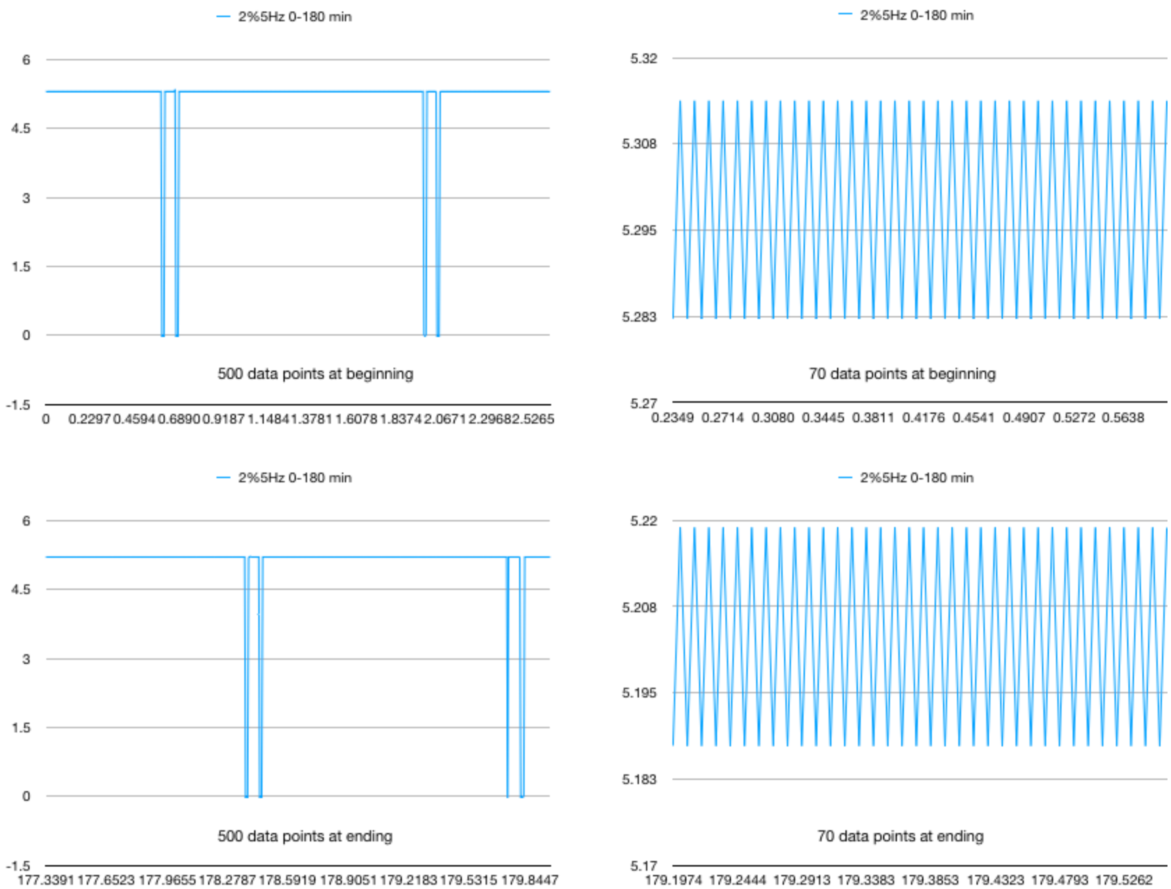


And here is the same with the recording anomalies removed:



The first thing I noticed is that it is remarkably flat. The second is that the reading of the cell during the trace did not go above 4.8871V except for a few stray spikes, yet the multimeter before the test had read 5.28V. After the run I checked the voltage of the cell again and the scope read 5.27V. I suspect that the high resistance is lowering the voltage reading of the scope.

The traces are not just oscillating between the resolution of the scope at those setting. Here is a sample of the first 3 hours when the draining resistor was 91.6 ohm:



And here is the sample of the first 3 hours when the draining resistor was 91K ohm: