An Unbiased[1] Critique of Dr. Fredrick Alzofon's 1994 Experiments Attempting to Control Gravity by Means of Dynamic Nuclear Orientation

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diyPhysics.com Technical Note 2019-1, July 2019

Lately, most of my ham radio activity has been in the microwave bands, and I was thinking about developing a demonstration EPR apparatus to combine my amateur radio and experimental physics hobbies. The inspiration was a 1980s paper on building a Nuclear Magnetic Resonance (NMR) spectroscope using HF equipment which was published in one of the ham radio magazines [Holcomb, 1996]. My idea was to come up with a modern version of the concept by performing Electron Paramagnetic Resonance (EPR) at the amateur microwave bands by taking advantage that low-cost SDR transmitter/receivers up to 6GHz, powerful large neodymium magnets, and affordable transistor-based amplifiers are now widely available.

EPR, also known as ESR (Electron Spin Resonance) is an analytical spectroscopy method for studying materials with unpaired electrons. EPR is conceptually similar to NMR, but it is electron spins that are excited instead of the spins of atomic nuclei.

Like in NMR, the resonance frequency $\boldsymbol{\nu}$ in EPR is a function of the strength of an external magnetic field $\boldsymbol{B_0}$ (expressed in Tesla [T]), but using parameters appropriate for the electron:

$$\nu = \frac{B_0 g_e \mu_B}{h}$$

Where $\boldsymbol{g_e}$ is the electron's g-factor = 2.0023 (for free electrons), $\boldsymbol{\mu_B}$ is the Bohr magneton = 9.274×10^{-24} J/T, and $\boldsymbol{h}$ is Planck's constant = 6.626×10^{-34} J·s.

So, the resonant precession frequency for free electrons is approximately 28 GHz/T. $\boldsymbol{g_e}$ varies as a function of chemical composition and crystal structure, which makes it possible to use ESR as an analytical tool.

At 0.335 T (3,350 Gauss), the EPR frequency for free electrons is thus around 9.4 GHz. In actual EPR systems, the frequency of the microwave source is kept constant, while the magnetic field is slowly changed to detect the point at which the sample's electrons meet the resonance condition. So, for example, to obtain the results in Figure 1, the pumping frequency is kept constant at 9 GHz, while the magnetic field is slowly swept between 0.330T and 0.338T. The resonant condition is fulfilled when B_0=0.334 T for this sample.

[1] My professional career is in the design of medical devices, and experimental physics is only my hobby. As such, I have no gain or loss if Dr. Azolfon's model is correct or not. In fact, I looked forward to attempting a replication of his experimental results.

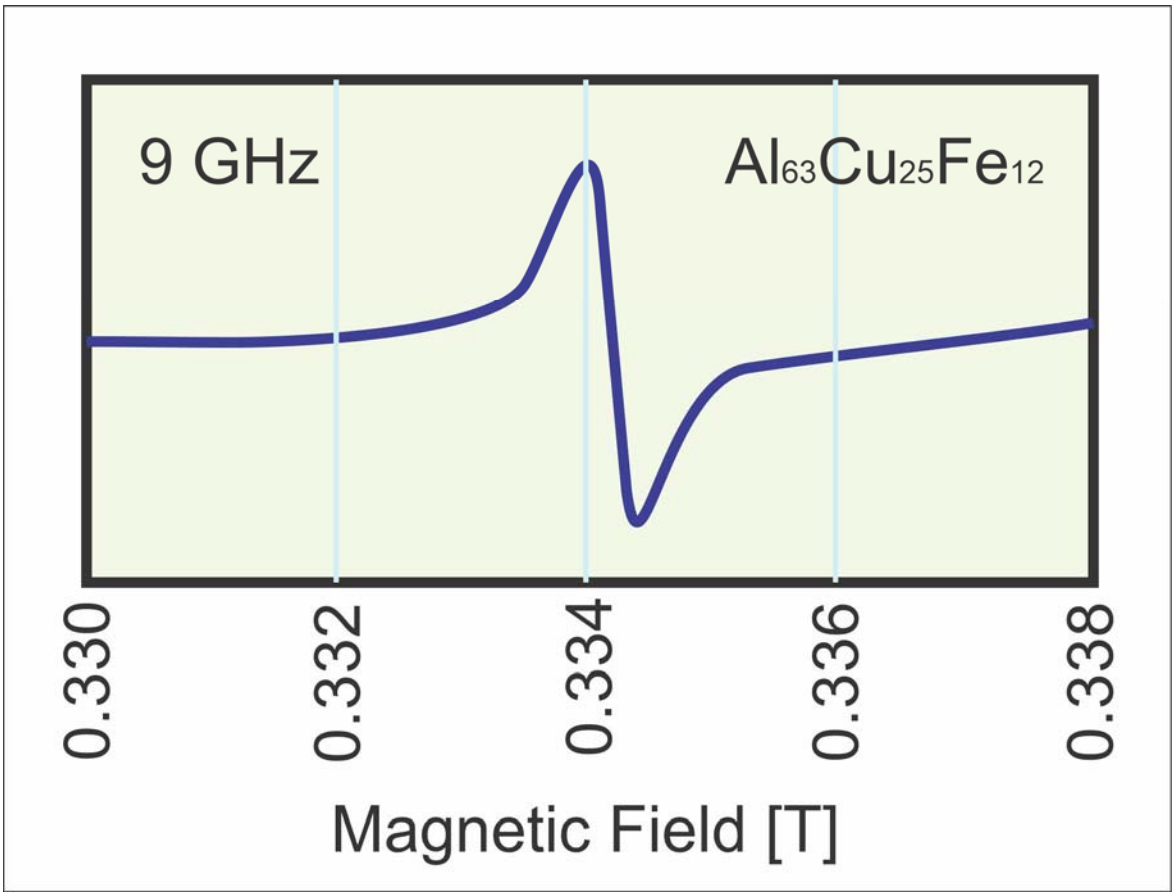

Figure 1 – Stylized EPR spectrum of an $Al_{63}Cu_{25}Fe_{12}$ quasicrystal. The EPR resonance condition is satisfied at 9GHz when B_o=0.334T. It is important to realize that the resonant condition for EPR occurs only at one sharp frequency for a given magnetic field strength.

If you have ever worked on NMR, you would realize 9.4 GHz is much higher than the Larmor frequency for protons, which is 42.58 MHz/T, whereby at 0.335T, protons (hydrogen nuclei) would precess at around 14.3 MHz.

It is important to note that the frequency at which electrons precess is quite exact for a given magnetic field strength, and that dropping the magnetic field strength, for example to the Earth's magnetic field (between 25,000 and 65,000 nT), causes the EPR resonant frequency to drop dramatically into the audio region at around 1.5 kHz. The importance of this will become apparent a bit later.

So, it was researching for the DIY EPR project that I landed on a YouTube interview with David Alzofon. In it he discussed his father's work on "gravity control" through Dynamic Nuclear Orientation, which could be achieved by applying pulsed EPR on a high-purity aluminum sample. I would usually not bite onto antigravity claims, but it intrigued me because of Dr. Fredrick Alzofon's reported understanding of physics[2], and mainly by the claim that he had experimentally demonstrated his theory using a standard laboratory EPR system.

[2] I haven't verified David Alzofon's claims about his father's educational background, but he says that Dr. Frederick Alzofon (1919-2012) was physicist with a world-class reputation in optics and heat conduction who studied particle physics with J. Robert Oppenheimer and David Bohm, relativity and the scientific method with Victor Lenzen, and

The interview was very interesting, so I purchased David Alzofon's book "Gravity Control with Present Technology"[3] and read it carefully. In this critique, page references refer to the 2018 edition of this book.

Dr. Alzofon's gravity theory is very elegant. However, I've seen many beautiful, but wrong explanations of gravity before, so I looked forward to the claimed experimental proof. His claim of positive results from an experiment conducted in May of 1994 using a Chemistry Department's EPR system looked promising, so as I was reading the book, I was already planning to design my EPR device to work within the 10 GHz amateur band (for which I have the necessary equipment with power capabilities of up to 10.5W) and to add a precision scale to try to replicate Dr. Alzofon's results.

Although no block diagram or pictures of the experimental setup are shown in the book, I think that it's reasonable to assume that the block diagram of Figure 2 represents the system used by Dr. Alzofon in his 1994 experiments.

applied mathematics with Griffith C. Evans at Cal Berkeley in the 1940s and 1950s. A search for publications by Dr. Fredrick Alzofon results in many high-level publications in the fields of heat transfer and non-destructive testing.

[3] On Amazon.com the book shows as authored by Fredrick Alzofon, with David Alzofon providing commentary.

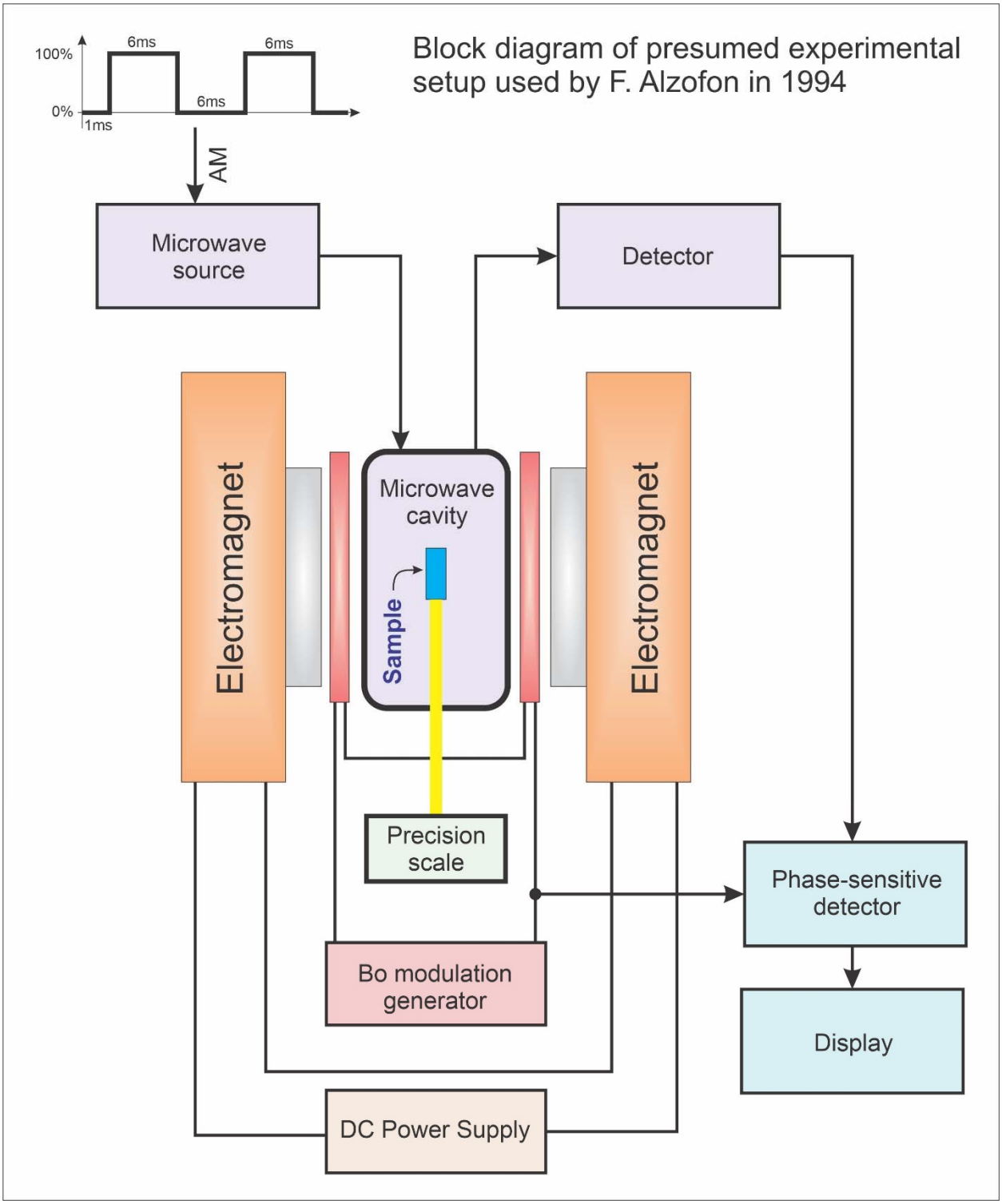

Figure 2 – Presumed EPR experimental setup used by Dr. Fredrick Alzofon in his 1994 experiments attempting to control gravity.

Based on the information provided in the book [Page 136], an electromagnet was powered to produce a constant magnetic field of around 3,300 Gauss (=0.33T). The aluminum/iron sample was placed in a

resonant microwave cavity that was pumped at the electron paramagnetic resonant frequency (around 9.5GHz).

I assume that the exact magnetic field to satisfy the resonance condition was found by modulating the magnetic field and using a phase-sensitive detector (e.g. a lock-in amplifier) as is usually done in EPR spectrometers. I assume that once the resonant field strength was found, the B_0 modulator was set to maintain resonance, and the actual "gravity control" experiment was started.

The experiment consisted of monitoring the weight of the sample using a precision scale connected to a computer while the microwave field was pulsed on for 6 ms, followed by a 6 ms off period, and on again for 6 ms. Recording and averaging by the computer was started 1 ms prior to the first microwave pulse, but in the first set of experiments the recording seems to have started 5-6 ms prior to the first pulse [Page 138].

Figure 3 shows my analysis of results from two runs of Alzofon's first experiment. Although averaged, the data are noisy, so I hand-drew a smoothed line for the results of the chart labeled AF003. AF006 is clean enough that it's easy to see that the measured weight loss correlates with the presumed[4] delivery of microwaves into the EPR instrument's cavity.

[4] I say presumed, because as identified by Alzofon, a shortcoming of the data acquisition setup was that it could not record weight while at the same time registering the operation of the microwave generator

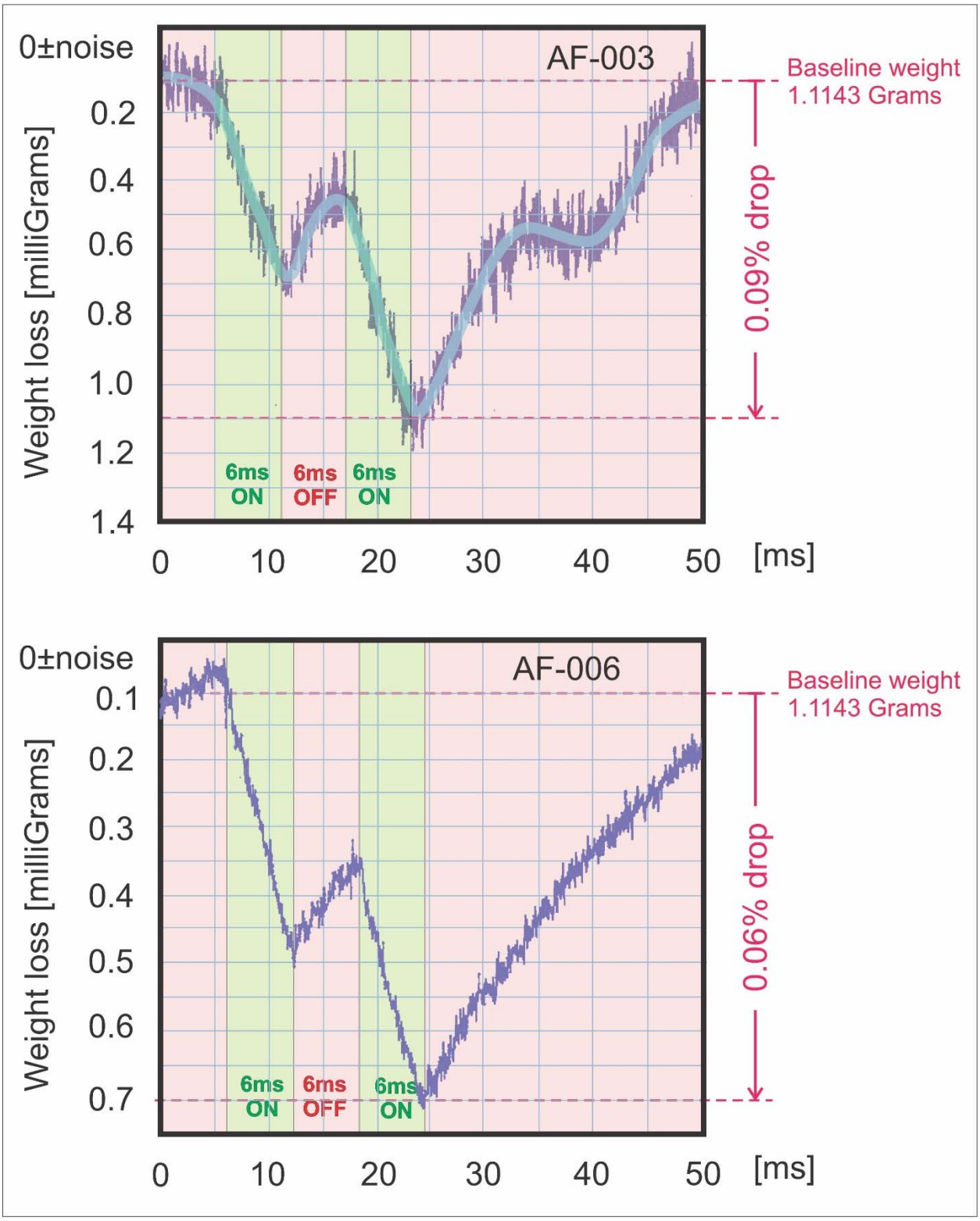

Figure 3 - My analysis of two of the published results from Alzofon's first experiment dated May 26, 1994.

All was going well, until I saw the results of Experiment 3, Test 4, labeled "Control" [Page 157] which shows that the exact same "weight loss" results were obtained with the magnet off!

Based on Dr. Alzofon's model, weight loss should not have occurred with the magnetic field OFF, since dynamic nuclear orientation couldn't happen if the EPR resonance condition was not satisfied during the microwave ON periods!

To this effect, in the third paragraph of page 133 Alzofon writes: "Could the weight alteration be caused by anything other than the configuration of the fields? ... Microwaves alone would have no effect on weight, either."

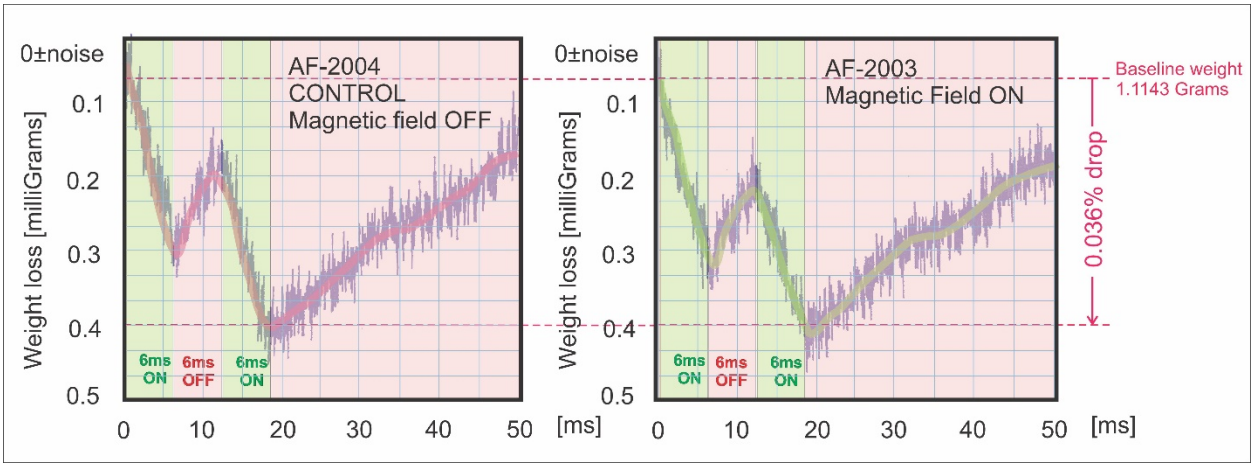

Figure 4 – My analysis of published results for the results obtained by Alzofon during Experiment 3, dated June 18, 1994 and labeled as "Demonstration for a potential investor". In the graph of the left side, the electromagnet was turned off while delivering microwaves. This should have resulted in no measured weight loss, since the resonance condition was not satisfied.

According to the book, Experiment 3 was conducted as a demonstration for a potential investor, and I can just imagine Dr. Alzofon and his colleagues playing their version of "Pay no attention to the man behind the curtain" trying to distract their guests when the AF2004 graph appeared on the screen.

The book provides the following explanation to accompany the AF2004 (Control) graph:

> "The current supplying the electromagnet to produce a constant magnetic field was switched off for Test No. 4 in order to test the role of the constant magnetic field in the correlations noted above. There remained a weak residual magnetic field whose magnitude was not measured. The correlation between the microwave field intensity and weight increments is still present.
>
> It is felt that a plausible explanation for this persistence is that the fractional alteration in resonant microwave frequency is equal to the fractional variation in the constant magnetic field. Since the resonant frequency is so large (about 9.5 GHz), the bandwidth must also be very large, corresponding to alterations in the magnetic field. Plot AF2004 illustrates the correlation observed."

The "plausible explanation" doesn't make any sense to me, since any residual remaining field would be significantly lower than the field strength necessary to satisfy the conditions for EPR at 9.5 GHz. This would be especially true for the type of EPR spectroscope used in Dr. Alzofon's experiments, since these

use a very narrow frequency band to be able to look at the fine differences in a sample's electron g-factor.

Given that experiment AF2004 is labeled as "Control," I believe that the proper way to use it would be to subtract AF2004 from AF2003. In Figure 5 I present an overlay of the AF2003 (magnetic field ON) and AF2004 (magnetic field OFF). I fail to see any difference between the two outside the noise limit of the system, so I have to conclude that there is absolutely no variation that could be legitimately attributed to a reduction in weight of the test sample.

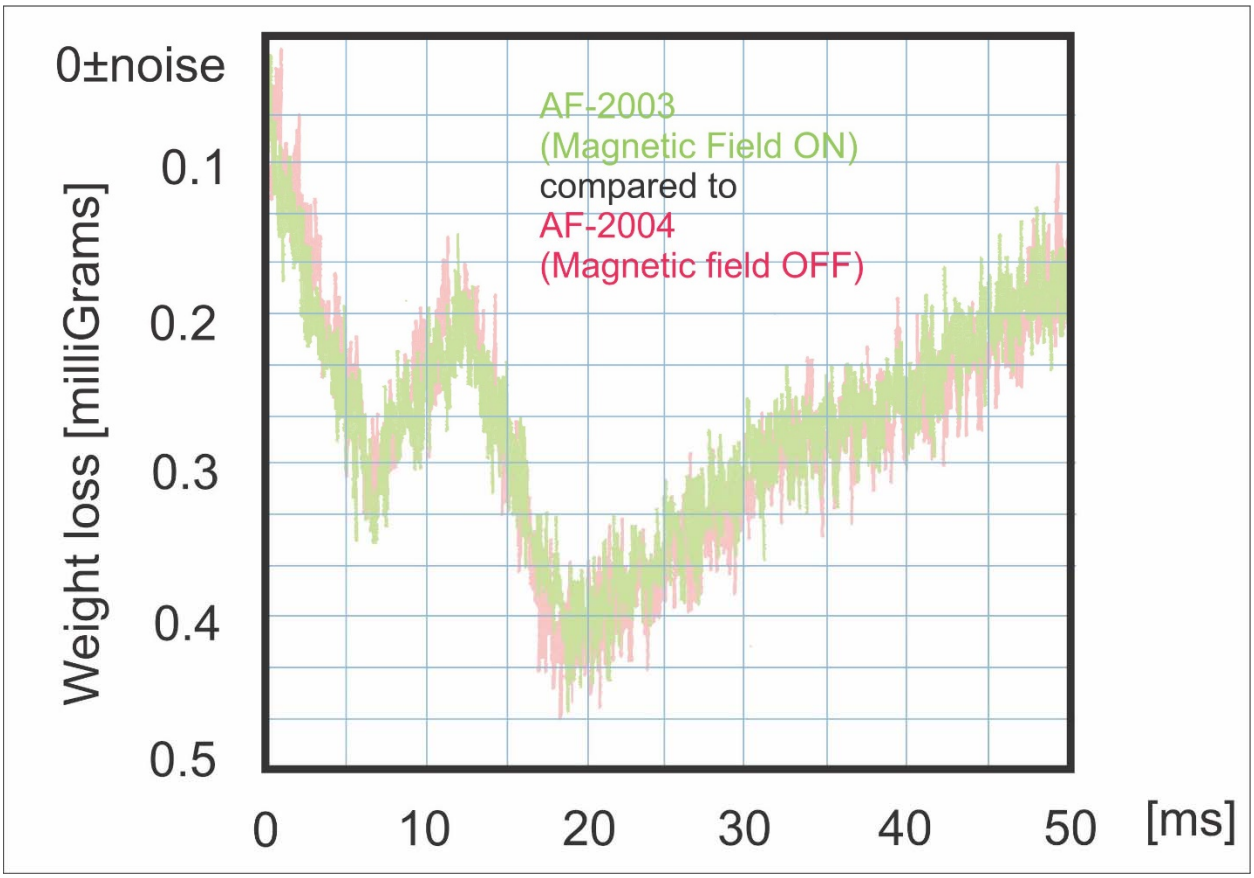

Figure 5 – I fail to see any difference between the results obtained with the magnetic field on vs. with the magnetic field off. This tells me that the reported weight loss is simply an artifact of the microwave source being turned on and off.

Next during Experiment 3, both the constant magnetic field and the microwave field were switched off. The graph labeled AF2005 showed no significant variation in weight, just a low-level noise baseline (Figure 6). This confirms to me that something in the switching of the microwave source produced an artifact in the weight measurement system which was incorrectly attributed by Dr. Alzofon as a valid signal.

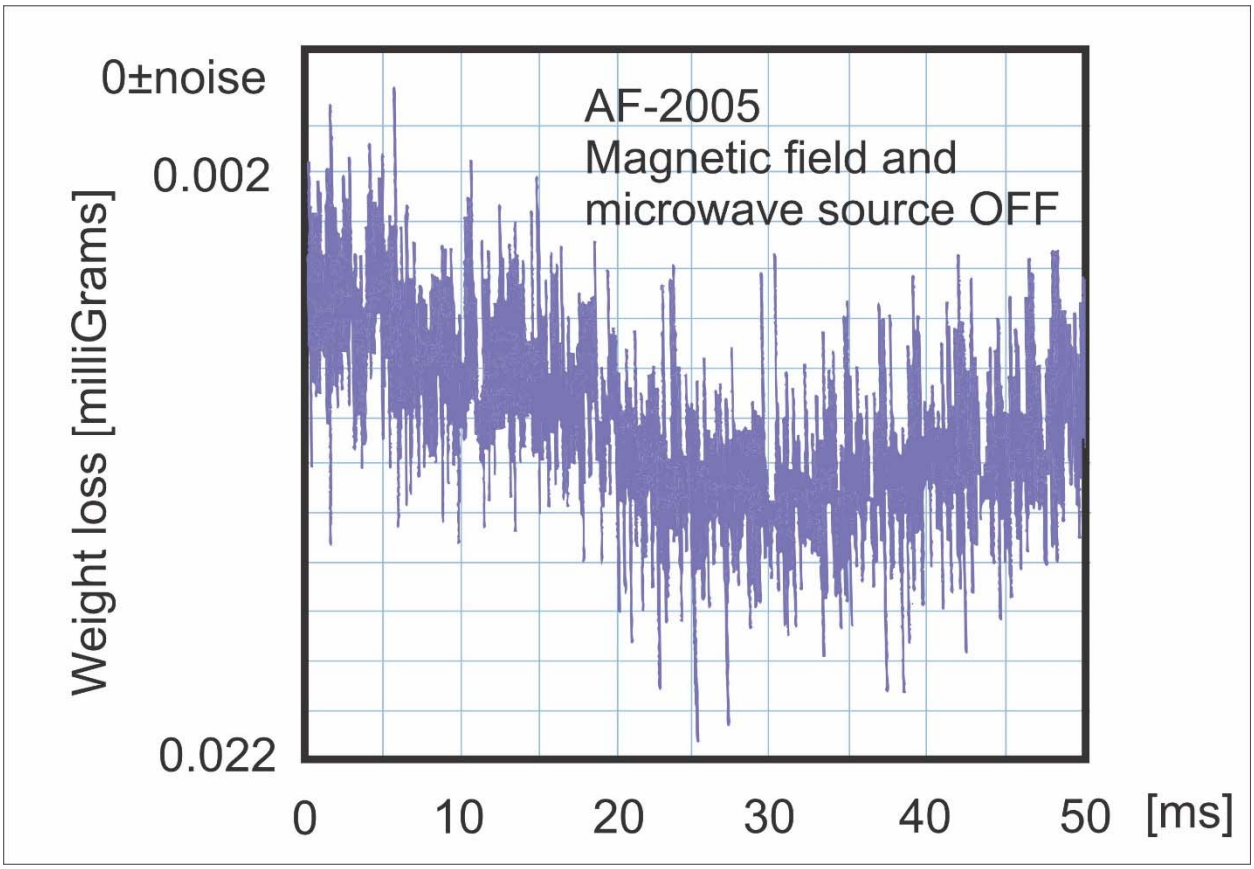

Figure 6 - My view of published results obtained by Alzofon during Experiment 3, dated June 18, 1994 and labeled AF2005. In this run the magnetic field and microwave source were turned OFF. As expected, the averaged results under these conditions is just the noise baseline.

In conclusion, I believe that the graph of AF2004 (Control, with magnetic field turned OFF) completely invalidates the claim that Dr. Alzofon's model has been "experimentally demonstrated."

In his book and interviews David Alzofon invokes the usual suppression conspiracies to explain the lack of interest by Academia, Industry, the Military, and even Hollywood in pursuing his father's model. However, I believe that the actual reason is much more mundane – any physicist or engineer who saw AF2004 would have immediately realized that the experimental data shows absolutely no effect on the gravitational pull experienced by the sample.

I laud David Alzofon for his honesty in including the AF2004 graph, because it not only invalidates the alleged experimental demonstration of the effect, but actually provides negative evidence against it.

I tried contacting David Alzofon via email at gravity@gravitycontrol.io seeking comments regarding this matter, but received no response.

References

Alzofon F, and Alzofon D, *Gravity Control with Present Technology*, CreateSpace Independent Publishing Platform, 2018.

Holcomb W., “Try NMR with your old CW rig”, *Communications Quarterly*, Winter 1996, 23-28, 1996.

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