

## **Introduction** R1

This whitepaper is offered as an Open Letter to the community and addresses the topic of so-called smart-meters that are used to measure and report electrical power consumption and transmit that acquired information through a wireless connection to a collection station.

In Fairfield, Iowa there is much concern that initiatives by the current electrical power utility to install smart-meters will cause serious effects for those who live in Fairfield.

In the paragraphs below, you will see several summary paragraphs whose title begins: **Take Away**. Be sure to read these - even if the information preceding it is not clear to you.

## **Professional Background**

I am a degreed Electronic Engineer (University of Virginia) with more than 46 years as a research and development engineer and senior program manager with constant involvement during that time period with measurement and characterization of electromagnetic fields (EMF).

I was deeply involved in Electromagnetic Compatibility (EMC) and the attendant disciplines of measurement and characterization both for the afloat U.S Navy as well as 17 Earth-orbiting satellites, 3 upper stage boosters, 2 primary space launch vehicles and 1 shuttle-attached space mission.

In the last 7 years of my aerospace career, I was Chief Engineer and Program Manager of the LACE satellite development. I had 500 engineers and scientists reporting to me. It was a \$154 million program. I reported our progress to a 3-star General who in turn briefed Pres. Ronald Reagan. To be successful in that endeavor, as we were indeed highly successful, it was necessary to be good-to-excellent at management and leadership.

A brief accounting of my work experience is in Appendix A. It includes a link to my full resume and published papers.

## **Background Perspective**

The reader of this document is cautioned that I do not have expertise in human physiology. I report on researchers who speak of harm to human life from EMF exposure, but I do not conclude that myself as it is not my field. You have to decide for yourself, and there are references here in this document that you may find to be very helpful in accomplishing that.

Various references will be made in this whitepaper to individuals who possess credentials in the area of human physiology, and specifically those who have addressed the topic of EMF causing harm to human life.

## **Minimum Requirements For Analysis and Assessment**

It is my opinion that the following document sections are the minimum requirements that must be carefully and deeply considered in order to assess the potential for EMF to cause demonstrable effects to human life.

## [ 1 ] Mechanism In The Physiology For Effects To Human Life

What is the mechanism, within the human physiology that accounts for effects to human physiology? It is critical to understand this. It is entirely inadequate to simply address the heating/thermal effect from EMF. Considering only the heating/thermal effect will invariably lead the analyst to consider only average power.

Considering only average power will lead the analyst to the conclusion that a pulsing EMF source is "a plus" and therefore less virulent.

If one researches the thousands of studies done on this topic - most of which are published in refereed journals - it will be found that:

- the **peak power** of the EMF is of great importance and plays a central role in the exact cellular mechanism of harm-to-human physiology
- pulsing can play havoc with various activities within the physiology that have their own frequencies at the same or near the pulsing repetition rate.

Without this detailed understanding of what exactly is happening (the mechanism) in the human physiology from the EMF, **one has no starting place for an analysis**. It can literally cause any ensuing analysis to be baseless.

What is the actual minimum strength of an EMF signal that can be detected by and cause effects in the human physiology? This must be understood. The use of FCC exposure standards is not the answer.

If there is one and only one expert that the reader of this document listens to, I recommend **Dr. Martin Pall**, interviewed by Dr. Joseph Mercola ( [mercola.com](http://mercola.com) ).

This is a brilliant expose' on the mechanisms in the human physiology, when the human physiology is subjected to EMF.

The interview is found here:

<https://www.youtube.com/watch?v=ZAqmT9KJBC8>

I will briefly relate this point to the EMC Analysis we performed at Naval Weapons Laboratory. It was critical for us to identify, how a piece of equipment, that was suffering from unwanted EMF, was "detecting" the presence of this unwanted EMF. From there we could "track backwards" to identify the coupling mechanism and back to the ultimate source of the unwanted EMF and accomplish an EMC (Electromagnetic Compatibility) solution.

## **FCC (Federal Communications Commission)**

On this topic of the mechanism of effects-to-human-physiology by EMF, it is useful to sidetrack here for a moment and visit the topic of the FCC.

When an analysis is attempted on this topic of effects to human life from EMF, it is easy to "end up" in the heating/thermal effect consideration and reliance on FCC stated allowable exposures.

The reader of this document is encouraged to do their own research and thereby discover that many experts who deeply understand the mechanism that occurs within the physiology as a result of EMF exposure, will often cite that **the FCC limits are 1 million times too high**.

They will also cite that the **long term continuous exposure** and the **effect of pulsing** (amplitude modulation) is not addressed by the FCC.

Interestingly, **other agencies within the US Federal government agree that the FCC limits are inadequate** for a variety of reasons and **they have gone on record** (public record) to recommend that the FCC overhaul it's limits.

One such agency is The Department of Health and Human Services, the National Institute For Occupational Safety and Health (NIOSH).

In a letter to the FCC, **NIOSH clearly conveys that the FCC limits need overhauling**. In a compelling, 173 page letter and research report attachments, NIOSH presents a convincing case.

This letter (and attachments) are dated January 1994.

<http://www.rfreduce.com/robertsblog/research - niosh>

## **Harvard University, Edmond J. Safra Center for Ethics**

### **Captured Agency How the Federal Communications Commission Is Dominated by the Industries It Presumably Regulates By Norm Alster**

Many individuals are distrustful of the FCC. This paper from the Harvard Center For Ethics offers insight to that:

[https://ethics.harvard.edu/files/center-for-ethics/files/capturedagency\\_alster.pdf](https://ethics.harvard.edu/files/center-for-ethics/files/capturedagency_alster.pdf)

For a comparison of the exposure standards of the FCC versus other countries, see the following graphic from Arthur Firstenberg and see the comparison shown on the following page.

The following table shows exposure standards for various countries in 2001. (Firstenberg, 2001)

Country	( $\mu\text{W}/\text{cm}^2$ )
New South Wales, Australia	0.001
Salzburg, Austria (for pulsed transmissions)	0.1
Russia	2–10
Bulgaria	2–10
Hungary	2–10
Switzerland	2–10
China	7–10
Italy	10
Auckland, New Zealand	50
Australia	200
New Zealand	200–1000
Japan	200–1000
Germany	200–1000
United States	200–1000
Canada	200–1000
United Kingdom	1000–10,000

Figure 2: RF exposure limits (2001)

The FCC allowable EMF strengths are, in many cases, 100 times higher than the allowable EMF strengths in other countries.

European Academy for Environmental Medicine Recommended Levels are shown in comparison to FCC maximum exposure levels on the page following.

# European Academy for Environmental Medicine Recommended Levels

<https://europaem.eu/en/>

**Table 3 Precautionary guidance values for radio-frequency radiation**

EUROPAEM-EMF-Guideline-2016-for-the-prevention-and-treatment-of-EMF-related-health-problems.pdf

RF Source Max Peal/Peak Hold	Daytime Exposure	Nighttime Exposure	Sensitive Populations
Radio broadcast FM	10,000 uW/m <sup>2</sup>	1,000 uW/m <sup>2</sup>	100 uW/m <sup>2</sup>
TETRA	1,000 uW/m <sup>2</sup>	100 uW/m <sup>2</sup>	10 uW/m <sup>2</sup>
DVBT	1,000 uW/m <sup>2</sup>	100 uW/m <sup>2</sup>	10 uW/m <sup>2</sup>
GSM (2G) 900/1800 MHz	100 uW/m <sup>2</sup>	10 uW/m <sup>2</sup>	1 uW/m <sup>2</sup>
DECT	100 uW/m <sup>2</sup>	10 uW/m <sup>2</sup>	1 uW/m <sup>2</sup>
UMTS (3G)	100 uW/m <sup>2</sup>	10 uW/m <sup>2</sup>	1 uW/m <sup>2</sup>
LTE (4G)	100 uW/m <sup>2</sup>	10 uW/m <sup>2</sup>	1 uW/m <sup>2</sup>
GPRS (2.5G) with PTTCH* (8.33 Hz pulsing)	10 uW/m <sup>2</sup>	1 uW/m <sup>2</sup>	0.1 uW/m <sup>2</sup>
DAB+ (2.4 Hz pulsing)	10 uW/m <sup>2</sup>	1 uW/m <sup>2</sup>	0.1 uW/m <sup>2</sup>
WiFi 2.4/5.6 GHz (10 Hz pulsing)	10 uW/m <sup>2</sup>	1 uW/m <sup>2</sup>	0.1 uW/m <sup>2</sup>

\*PTTCH Packet timing advance control channel

### Smart Meter Comparison; European Academy and FCC

DECT (Digital Enhanced Cordless Telephone) is chosen as a comparison device with a smart-meter because, DECT is spread spectrum and frequency hopping like the smart-meter.

FCC allowable level is 60,000 times higher than Euro Academy **DAYTIME** recommendations  
 FCC allowable level is 600,000 times higher than Euro Academy **NIGHTTIME** recommendations  
 FCC allowable level is 6,000,000 times higher than Euro Academy **SENSITIVE** recommendations

### FCC Maximum Exposure Levels, Document; oet56e4

300 to 1500 MHz max exposure; f/1500 mw/cm<sup>2</sup>

Above 1500 Mhz = 1 mw/cm<sup>2</sup>

	mw/cm <sup>2</sup>	uW/cm <sup>2</sup>	uW/m <sup>2</sup>
900 Mhz =	0.6 mw/cm <sup>2</sup>	600 uW/cm <sup>2</sup>	6 million uW/m <sup>2</sup>
1800 Mhz =	1 mw/cm <sup>2</sup>	1000 uW/cm <sup>2</sup>	10 million uW/m <sup>2</sup>
2.4 Ghz =	1 mw/cm <sup>2</sup>	1000 uW/cm <sup>2</sup>	10 million uW/m <sup>2</sup>

### ***Take Away For The Mechanism of Physiological Effects From EMF***

The interactions between EMF in the environment and human physiology is far more complex than a simple consideration of the human body as a container of salt water, and thereby can be investigated only on the basis of thermal/heating effects.

Researchers like Dr. Martin Pall have elucidated complex interactions within the human cellular structure and have described a wide range of effects - especially long term effects - from EMF exposure.

The differences between the FCC so-called safe exposure levels and those levels recommended by organizations that are concerned about human health and by specialists who measure and mitigate EMF, is often more than, or much more than, 10,000 to 1.

## [ 2 ] Dynamic Range of Human Sensitivity To EMF

This is a second critical area to consider. Dynamic Range means from the smallest influence to the highest.

### **Important To Understand $1 / R^2$**

It is important to understand the  $1 / R^2$  (one over R squared) effect. If you are not familiar with this effect, please read Appendix B, now, and see how this phenomenon works.

## **Human Hearing**

For human hearing, the strength of the smallest detectable sound that a normal person can hear, up to a sound that is so loud that it causes pain is:

**1 trillion to 1, ( 120 db )**

**This is a tremendous dynamic range.**

The  $1 / R^2$  reduction in sound strength, as sound moves in the atmosphere, will cause a sound level to fall off rapidly with distance from the sound source, but because of the tremendous dynamic range of human hearing, it would allow a person to be listening to very loud sound coming, say, from a train horn that is at the threshold of pain, and then move many miles away and still be able to hear that sound.

Here is a reference for human hearing;

<http://hyperphysics.phy-astr.gsu.edu/hbase/Sound/intens.html>

### ***Take Away For The Human Hearing***

Those who downplay the possibility of effects-to-health from smart-meters, and offer some analysis of the EMF transmitted from the smart-meter, will often cite the  $1 / R^2$  effect and claim that because of this effect, the radiated EMF (from the smart-meter) becomes negligibly weak, after the EMF has traveled a relatively short distance from the smart-meter.

The extremely important question that they will seldom, if ever, address is;

**What is the sensitivity of the human physiology, what is the dynamic range of the human physiology, in detecting and being harmed by, this EMF?**

**Said another way, how weak can an EMF signal be  
and still cause effects to human life?**

In this section of this document, it has just been shown that there is an **extreme dynamic range of human hearing**, and this gives us the idea that the sensitivity of the human physiology to EMF may extend over a very wide dynamic range as well.

## Human Sight

From the smallest strength of light that a human can possibly detect (2 photons of green light) to light that is so strong it is at the threshold of pain, the ratio is approximately;

**100 trillion to 1**, ( 140 db ).

**This is considerably more dynamic range than was considered with human hearing.**

Here is a reference for human sight;

[https://en.wikipedia.org/wiki/Human\\_eye](https://en.wikipedia.org/wiki/Human_eye)

### *Take Away For The Human Sight*

Those who downplay the possibility of effects-to-health from smart-meters, and offer some analysis of the EMF transmitted from the smart-meter, will often site the  $1 / R^2$  effect and claim that because of this effect, the radiated EMF (from the smart-meter) becomes negligibly weak, after the EMF has traveled a relatively short distance from the smart-meter.

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## **Apparent EMF Dynamic Range of The Human Physiology**

Many times, people who are naysayers of potential EMF effects to the human physiology, when analyzing the possible effects of smart-meters and other EMF transmitters, will perform a very limited analysis of a EMF source (like a smart-meter) at some distance from a person, maybe 5 to 50 feet. Then they will draw some conclusions for that configuration concerning whether or not they think that it is safe for humans.

Furthermore, when they are then asked about EMF from all of the other EMF sources (smart-meters) that are distributed throughout the neighborhood, they will claim that due to the  $1 / R^2$  phenomenon, those other sources are negligible.

### **But are those other sources throughout the neighborhood actually negligible?**

What is the threshold of sensitivity of the human to EMF as discussed in Item [1] above?  
And what is the dynamic range of this human sensitivity to EMF?

The presumption that such analysts make, is that the human is only sensitive near the FCC maximum exposure levels, and that even a small amount of reduction of the EMF strength with increased distance (Range) will make these other sources negligible, for effects to human life.

**It is my considered opinion that this is far from correct.**

### **FCC Exposure Levels**

For a smart-meter operating at **900 MHz** we will retrieve the FCC exposure limit.

We will also retrieve the exposure limit for **2.4 GHz** because in addition to the 900 MHz frequency that the smart-meter is using to communicate with the relay radio (usually mounted on a power pole), that relay radio might be using 2.4 GHz to communicate "upstream" to other collection radios.

In FCC Bulletin OET 56, exposure levels are given for General Public, page 15.

[https://transition.fcc.gov/Bureaus/Engineering\\_Technology/Documents/bulletins/oet56/oet56e4.pdf](https://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet56/oet56e4.pdf)

The FCC exposure power density at 900 MHz is;  
600  $\mu\text{W} / \text{cm}^2$  (microwatts per square centimeter)

See Appendix C for more information on this.

The FCC exposure power density at 2.4 GHz is;  
1000  $\mu\text{W} / \text{cm}^2$  (microwatts per square centimeter)

**For right now, For 900 MHz keep the number: 600 uW/cm<sup>2</sup> in your mind.**  
**For right now, For 2.4 GHz keep the number: 1000 uW/cm<sup>2</sup> in your mind.**

We will now consider a few examples of research on EMF induced into human or animal subjects that caused negative health reactions. This will allow us to gain an idea of what the dynamic range might be for sensitivity to EMF.

## **Cite 1**

In the International Journal of Radiation Biology, Guler et al in a research paper,  
**Increased DNA oxidation (8-OHdG) and protein oxidation (AOPP) by low level electromagnetic field (2.45 GHz) .....**

The authors say:

*Conclusions:* "It may be concluded that low level EMF at 2.45 GHz MWR increases the DNA damage in both brain tissues and plasma ...."

The abstract and conclusions can be found here:

<https://www.ncbi.nlm.nih.gov/pubmed/24844368>

The authors give their radiation level as: 3.68 V/M

This converts to; 3.59 uW/cm<sup>2</sup>

Yet the FCC allowable exposure level is considerably higher than used in this research.

$1000 \text{ uW/cm}^2 / 3.59 \text{ uW/cm}^2 = 279$

**In this study, at 2.4 GHz, the EMF effect was found at  
279 times lower than the FCC allowable exposure level.**

NOTE: MWR; Microwave Radiation

## Cite 2

In Biotech Histocam 2016, Turgut et al, **Effects of long-term exposure to 900 megahertz electromagnetic field on heart morphology and biochemistry .....**

The authors say:

900 MHz electromagnetic field might induce oxidative stress causing morphological alterations in the heart.

The abstract and conclusions can be found here:

<https://www.emf-portal.org/en/article/30444>

The authors give their radiation level as: 8.4 V/M

This converts to: 18.7 uW/cm<sup>2</sup>

The FCC allowable exposure level is considerably higher than used in this research.

600 uW/cm<sup>2</sup> / 18.7 uW/cm<sup>2</sup> = 32

**In this study, at 900 MHz, EMF effect was found at 32 times lower than at the FCC allowable exposure level.**

## Cite 3

Arthur Firstenberg et al documents on range of EMF strengths and the effects that have been studied. An impressively wide dynamic range is documented.

[http://www.goodhealthinfo.net/radiation/radio\\_wave\\_packet.pdf](http://www.goodhealthinfo.net/radiation/radio_wave_packet.pdf)

[https://maisonsaine.ca/wp-content/uploads/2013/12/CAVI\\_Society\\_attachment.pdf](https://maisonsaine.ca/wp-content/uploads/2013/12/CAVI_Society_attachment.pdf)

<http://www.bioinitiative.org/report/wp-content/uploads/pdfs/BioInitiativeReport-RF-Color-Charts.pdf>

### *Take Away For EMF Dynamic Range*

The idea of considering dynamic range is important for several reasons. Among them are:

--- The FCC limits seem to convey that an EMF strength somewhat below their stated exposure limit will somehow be safe. In fact many researchers find EMF effects hundreds or thousands of time below that limit. This can help explain why **many countries in the world have maximum exposure limits 100 times less than the US.**

--- If potential EMF from a nearby smart-meter, namely on your home, is eliminated by an opt-out arrangement, does that mean that you can forget about smart-meter EMF effects? An opt-out is a good beginning, but due to the demonstrated wide dynamic range of the Human physiology for sensitivity to EMF effects, the EMF from other locations in the neighborhood could well be an important consideration. What is really desirable is for the whole city to opt-out.

### [ 3 ] Pulsing On and Off of an EMF Signal

There are a variety of reasons why the design of communication equipment might include an EMF signal that pulses On and Off. The reasons for this are not important in this discussion.

It is very important to understand the effect on the human physiology from this pulsing.

It is worth noting that naysayers of the potential harm to human life from EMF will often cite that the pulsing is, somehow, "a plus". They will mention that pulsing can effectively lower the average power and since they are only considering the simple heating/thermal effect of damage to the physiology, they count the inclusion of pulsing as better than no pulsing.

They are ignoring crucial responses of the human physiology to pulsing, as the following researchers discuss.

#### **Pulsing Research Cite 1**

**Andrew Goldsworthy, PhD**, specifically discusses the pulsing (On and Off) of various microwave signals, on Pg 22, **The Biological Effects of Weak Electromagnetic Fields**; [http://rfreduce.com/robertsblog/Biol\\_Effects\\_EMFs\\_Dr\\_Andrew\\_Goldsworthy\\_2012\\_NZ2rev.pdf](http://rfreduce.com/robertsblog/Biol_Effects_EMFs_Dr_Andrew_Goldsworthy_2012_NZ2rev.pdf)

Dr. Goldsworthy writes:

"It would appear that the mobile telecommunications industry had not done their homework before electing the pulse frequencies for their digital communications, since they virtually all fall within this biologically active range; e.g.,  
2G GSM cell phones (217Hz),  
TETRA (17.6Hz), DECT phones (100Hz), WiFi (10Hz), and  
3G UMTS signals with time division duplex (100Hz and 200Hz)  
all of which are potentially harmful."

#### **Pulsing Research Cite 2**

The negative health effect of pulsing EMF is even seen at ELF (Extremely Low Frequencies).  
international Journal of Neuroscience

Electromagnetic Hypersensitivity: **Evidence for a Novel Neurological Syndrome**

**A.A. Marino et al**

<http://andrewamarino.com/PDFs/173-IntJNeurosci2011.pdf>

An electro-sensitive female medical doctor was the test subject for this study. The subject reported little or no physiological complaints when no EMF was applied. Further, the subject reported little or no physiological complaints when EMF was applied constantly but no pulsing. However, when the EMF was made to pulse at a low frequency (10 Hz) significant symptoms arose including; temporal pain, mild-to-strong headache, skipped heartbeats, and muscle twitch.

## Pulsing Research Cite 3

**Carl F. Blackman, PhD**, in his paper Disruption by the Modulating Signal he reveals important insights and mechanisms and offers recommendations with regards to pulsing EMF.  
<http://rfreduce.com/robertsblog/Disruption-by-the-Modulating-Signal-Blackman.pdf>

NOTE: Pulsing is formally called; Amplitude Modulation.

NOTE: RFR is Radio Frequency Radiation

Dr. Blackman writes:

- There is substantial scientific evidence that some modulated fields (pulsed or repeated signals) are bioactive, which increases the likelihood that they could have health impacts with chronic exposure even at very low exposure levels. Modulation signals may interfere with normal, non-linear biological processes.
- Modulation is a fundamental factor that should be taken into account in new public safety standards; at present it is not even a contributing factor.
- To properly evaluate the biological and health impacts of exposure to modulated RFR (carrier waves), it is also essential to study the impact of the modulating signal (lower frequency fields or ELF-modulated RF).
- Current standards have ignored modulation as a factor in human health impacts, and thus are inadequate in the protection of the public in terms of chronic exposure to some forms of ELF-modulated RF signals.
- The current IEEE and ICNIRP standards are not sufficiently protective of public health with respect to chronic exposure to modulated fields (particularly new technologies that are pulse-modulated and heavily used in cellular telephony).
- The collective papers on modulation appear to be omitted from consideration in the recent WHO and IEEE science reviews. This body of research has been ignored by current standard setting bodies that rely only on traditional energy-based (thermal) concepts.
- More research is needed to determine which modulation factors, and combinations are bioactive and deleterious at low intensities, and are likely to result in disease-related processes and/or health risks; however this should not delay preventative actions supporting public health and wellness.
- If signals need to be modulated in the development of new wireless technologies, for example, it makes sense to use what existing scientific information is available to avoid the most obviously deleterious exposure parameters and select others that may be less likely to interfere with normal biological processes in life.
- The current membership on Risk Assessment committees needs to be made more inclusive, by adding scientists experienced with producing non-thermal biological effects.

### ***Take Away For Pulsing EMF***

Research has been provided that shows that not only is the idea that "**pulsing is a plus**" **not valid**, but that pulsing causes a significant increase in effects caused to the human physiology.

## [ 4 ] Number of transmissions per day

### **Be Wary of Word Magic**

"Word Magic" is not a term invented by the author of this document. It is well known in law. In the context of smart-meters, be wary when you see or hear that the "number of transfers per day" or "number of data transfers per day" is x.

A "data transfer" means conveying information, such as usage information. The question is, does the smart-meter fire up and transmit EMF for any other reason? If so, what are the total "transmissions" **for any reason?**

### **Examples**

It only takes a little bit of time researching the Internet to find report after report of a utility saying that the number of transmissions per day is a number - that is seemingly a low figure as 2, 3, 6 per day etc. However when users with their own EMF instruments make measurements on any smart-meter in the neighborhood they discover that the number of transmissions are many times more - meaning 1,000 10,000, 100,000 per day or more.

Maybe you do not want to believe the Internet reports, so below is an example of a report published by MDs and NDs that chronicle a similar accounting.

### **West Coast Example of Excessive Transmissions Per Day**

#### **Biological and Health Effects of Microwave Radio Frequency Transmissions**

Paul Dart, M.D., (lead author), Kathleen Cordes, M.D., Andrew Elliott, N.D.,

James Knackstedt, M.D., Joseph Morgan, M.D., Pamela Wible, M.D.

Steven Baker (technical advisor)

<https://olis.leg.state.or.us/liz/2013I1/Downloads/CommitteeMeetingDocument/42624>

In the following industry and literature research findings, the authors report on the smart-meter roll out by PG&E in California.

PG&E was served with a court order to provide clear documentation of what the meters were actually doing. (Yip-Kikugawa, 2011) In the response to that court order, PG&E provided documentation from the manufacturer of the meters that the average meter in the mesh network transmitted data signals to the utility 6 times a day; network management signals 15 times a day; timing signals 360 times a day; and beacon signals to the mesh network 9,600 times a day. (Kim et al., 2011) This penciled out to an average of roughly 7 transmissions a minute, 24 hours a day, coming from every meter in the community.

Keep in mind that the dynamic range of the human is likely such that the transmissions from many, many neighbors is also incident upon everyone, and might well be felt and cause physiological effects. How many transmissions is that in a day?  
96,000 ? 960,000 ?

### ***Take Away For The Number of Transmissions Per Day***

Be very careful here of what it is that you believe. Other than a court order to a utility, the only way that many individuals have discovered the true number of transmissions per day is to measure it themselves in a location where that some utility already has installed smart-meters.

Also, it is my strong opinion that the number of transmissions per day and a wide, wide variety of other "settings" can be set and adjusted from a central location for a smart-phone network. This then means that pulsing could be set to one repetition rate today and a different repetition rate tomorrow.

I hear people talk about, the utilities having the ability to "install new software" in the future and thereby allowing them to change (including increase) the transmissions per day (the repetition rate). While I agree that this is certainly possible, it is my opinion, as stated above, that they will have the ability to make such changes and adjustments in the transmissions per day from their NOC (network operations center) at the point of the initial deployment. It is likely that new software will not be required.

## [ 5 ] Precautionary Principle

“The precautionary principle or precautionary approach states that if an action or policy has a suspected risk of causing harm to the public or to the environment, in the absence of scientific consensus that the action or policy is harmful, the burden of proof that it is not harmful falls on those taking the action.

This principle allows policy makers to make discretionary decisions in situations where there is the possibility of harm from taking a particular course or making a certain decision when extensive scientific knowledge on the matter is lacking. The principle implies that there is a social responsibility to protect the public from exposure to harm, when scientific investigation has found a plausible risk. These protections can be relaxed only if further scientific findings emerge that provide sound evidence that no harm will result.”

[https://en.wikipedia.org/wiki/Precautionary\\_principle](https://en.wikipedia.org/wiki/Precautionary_principle)

### *Take Away For The Precautionary Principle*

It is really not your job to prove that there are effects from the EMF radiated by smart-meters. It is the responsibility of the utilities and governments (Utilities board, City Councils, etc) to prove to you that there is no harm.

Said another way, this Open Letter should have never been necessary to write.

## [ 6 ] Responding To Claims That There Is No Research That Shows Harm to Human Physiology from EMF

US Navy in 1972 cited **2,311 studies** on EMF harm to life.

**BIOLOGICAL PHENOMENA ('EFFECTS') AND CLINICAL MANIFESTATIONS  
ATTRIBUTED TO MICROWAVE AND RADIO-FREQUENCY RADIATION**

[http://www.justproveit.net/sites/default/files/prove-it/files/military\\_radiowave.pdf](http://www.justproveit.net/sites/default/files/prove-it/files/military_radiowave.pdf)

**360 research reports** cited on harm to life from EMF

**Beatrice Alexandra Golomb, MD, PhD Professor of Medicine**

**UC San Diego School of Medicine**

[http://rfreduce.com/robertsblog/Dr.Golomb\\_UC-SanDiego\\_School-of\\_Medicine\\_SB-649-5G-letter\\_2017-08-18b-1.pdf](http://rfreduce.com/robertsblog/Dr.Golomb_UC-SanDiego_School-of_Medicine_SB-649-5G-letter_2017-08-18b-1.pdf)

**More than 120 research reports** cited on harm to life from EMF.

Published papers by Andrew Marino, PhD and colleagues at Louisiana State University

<http://andrewamarino.com/journalarticles.html>

**More than 100 research reports** cited on harm to life from EMF.

**BIOLOGICAL AND HEALTH EFFECTS OF MICROWAVE RADIO FREQUENCY  
TRANSMISSIONS**

Paul Dart, M.D., (lead author), Kathleen Cordes, M.D., Andrew Elliott, N.D.,

James Knackstedt, M.D., Joseph Morgan, M.D., Pamela Wible, M.D.

Steven Baker (technical advisor)

<https://olis.leg.state.or.us/liz/2013I1/Downloads/CommitteeMeetingDocument/42624>

### *Take Away For Claims of No Research*

There are thousands of studies ..... what else must be said ?

## Final Comments

I am an "engineer's engineer". I hold by these maxims;

--- Safety First

--- If it's not broken, don't fix it.

--- Don't attempt to reinvent the wheel simply because it seems "cool" to do so.

--- The simplest solution that solves the need, is the best solution.

--- The aforementioned, said another way, "I love the old analog meters".

--- Don't be beguiled by some war cry for efficiency. Efficiency is appropriate in some cases and irresponsible in others. Be Safe, first.

--- We are NOT experiencing an energy crisis or even an "energy concern". The energy in the oceans alone could power this plant for a billion years - literally. The technology to do so has been developed .... and suppressed.

Just keep your eyes open for what the US Navy is doing to convert sea water into energy to power their fleet. Soon they will be at a point where **the US Navy will never buy another drop of petroleum for their flotillas**. And yes, nuclear subs and carriers will go into moth balls.

Yes .... just my opinion.

### My Design and Management Experience As Relevant To Exploding Smart-Meters

I have 46 years designing everything from little electronic circuits to launch vehicles and spacecraft. I am not bragging here, just making a point.

When in the Navy Space Program I ran the Power Systems and Instrumentation Section for 15 years, and had 43 engineers and technicians in my group. We designed a great number of switching power supplies for spacecraft and launch vehicles and published papers in refereed journals on our novel creations. And we had to work really hard, to keep our switching power supplies from polluting the spacecraft power bus with Dirty Electricity.

In the last 7 years of my aerospace career, I was Chief Engineer and Program Manager of the LACE satellite development. I had 500 engineers and scientists reporting to me. It was a \$154 million program. I reported our progress to a 3-star General who in turn briefed Pres. Ronald Reagan. To be successful in that endeavor, as we were indeed highly successful, it was necessary to be good-to-excellent at management and leadership.

Why am I mentioning all this? When I read of the exploding smart meters, I see the problem at the meter manufacturer's as both a technical and management concern. There was apparently (my opinion) factors with the design, as it integrates with the power infrastructure, that were ignored or glossed over from a technical perspective or from a management perspective, or both - probably both.

It is my opinion that this is a fatal flaw in the management and/or engineering, and I would be very wary of any claims that "the problem has been fixed with a new model". Why? Because it is likely that the same management and engineering folks are still there .... just my opinion.

## **We Don't Want Digital Meters Either**

I define a "digital meter" as a meter not of the old analog/mechanical, gears and dials design, but with a digital readout, but not with EMF (RF) transmitter.

So we don't want the smart-meters, and we also do not want digital-meters, as the switching power supplies in the digital-meters put Dirty Electricity on the power lines, which in turn radiates EMF into the living spaces by way of all of the house wiring, and you are faced with a very similar EMF situation.

## **Jobs, Jobs, Jobs**

This is America. We want to work in areas that interest us, and raise families in a safe and not-oppressed environment. Notice that I said "we want to work". The war cry of the utilities to eliminate jobs is not music to my ears. I love the meter readers!

Just a reminder that all of these kinds of articles include opinions of the author.

Blessings to All,

Robert Palma  
President and Chief Engineer, Midwest Research Corp.

## Appendix A Background Brief

Undergraduate at University of Virginia. While I was a full time student I worked continuously in both college radio broadcasting and commercial radio broadcasting. During my schooling, in my second year, I became the Chief Engineer of the college radio station, WUVA (640 KHz AM). In my third year of school, I became the Chief Engineer of WCCV FM (97.5 MHz). This is a 50 KW stereo FM station. In addition to the main 50 KW transmitter, I was responsible for operation, maintenance and repair of the auxiliary 3.4 KW FM transmitter, and a 5 KW AM transmitter, and 2 remote pickup transmitters and receivers at 26 MHz and 150 MHz.

### Naval Weapons Laboratory, Electromagnetic Compatibility

As a graduate of University of Virginia's Electrical Engineering program, my first position in industry was at the Naval Weapons Laboratory in Dahlgren, VA. I worked in the Electromagnetic Vulnerability Division, the Electromagnetic Compatibility (EMC) Branch. Our Branch of 33 Electronic Engineers addressed and solved every EMC problem in the entire afloat US Navy. We worked from Extremely Low Frequencies (ELF), well into the microwave region (18 GHz).

In that position, I designed the first-ever HERO High Impedance Voltmeter to measure aircraft-to-deck RF (EMF) voltages. HERO is: Hazards of Electromagnetic Radiation to Ordnance. Numerous catastrophic incidents had occurred on US Naval aircraft carriers where RF (EMF) had inadvertently initiated ordnance. NOTE: ordnance is explosives.

### Naval Research Laboratory (NRL), Electro-Explosive Subsystem Design

I was later hired at NRL and became the lead designer for Electro-Explosive Device (EED) Subsystems. For the uninitiated, these are not weapon systems. EEDs are used to accomplish staging, to release solar panels that were stowed for launch, and many other release and mechanical articulation functions. EEDs are used extensively in Aerospace because they are small, light, and highly reliable in their intended functioning. Unfortunately they are sensitive to inadvertent initiation by EMF.

Much care is required in the analysis and characterization of the **exact initiation mechanism**, as well as the **coupling mechanism** for EMF fields that induce voltages and currents into these devices.

The sensitivity of these EED devices covers an extremely broad range of frequencies.

Throughout my 23-year career I was deeply involved in this area. When the Space Shuttle came around I was one of 2 government engineers who set an EMC-Ordnance safety regulation in place for all Space Shuttle launches. NASA and the Air Force gave me an award for my efforts:

The award is here:

<http://rfreduce.com/award.html>

## **Current Professional Activities**

For the past 26 years, in Fairfield, Iowa I have worked as a consultant in EMF environmental fields and with my brother Greg Palma, have produced various products that mitigate (reduce) EMF. Our principle activities are now in the arena of reducing the Dirty Electricity (DE) that is produced by inverters that are associated with solar and wind generating systems.

I thank the reader of this document for indulging me in the very brief work experience description that I have presented. I believe that it was most important to do so, so that you can see that this is a specialty of mine for 46+ years.

My complete resume, including papers published in refereed journals, is here;  
<http://ketufile.com/whitepapers.php - resume>

## **Appendix B The $1 / R^2$ (one over R squared) Effect**

### **Understanding $1 / R^2$**

Let us review the often heard  $1 / R^2$  ( one over R squared ) relationship between a signal strength at 2 different distances from a source. This "signal" can be of the EMF type or it can be a sound.

In this relationship, R means Range. Range simply means the distance from one object to another object.

Since we have R in the denominator (  $1 / R^2$  ), it means that as Range increases, the signal strength decreases.

Since the R in the relationship is squared, that means as Range is increased, the strength goes down by the square of Range.

So if the Range increases by 3 times, the strength of the signal will decrease 9 times;  
 $1 / ( 3 ^ 2 ) = 1 / 9$

## Appendix C FCC Maximum Exposure at 900 MHz

In FCC Bulletin OET 56, exposure levels are given for General Public.

[https://transition.fcc.gov/Bureaus/Engineering\\_Technology/Documents/bulletins/oet56/oet56e4.pdf](https://transition.fcc.gov/Bureaus/Engineering_Technology/Documents/bulletins/oet56/oet56e4.pdf)

If we take a 900 MHz smart-meter as an example, the above bulletin gives the exposure level as;  
 $f/1500$  in  $\text{mw}/\text{cm}^2$  ( milliwatts per square centimeter )  
 $f$  is in MHz.

Therefore the level at 900 MHz is;

$$900/1500 = 0.600 \text{ mw}/\text{cm}^2$$

This is the same as:  $600 \text{ uW} / \text{cm}^2$  (microwatts per square centimeter)

## Appendix D Conversions

To convert a field strength in Volts per Meter to power density

$$\text{PD} = (\text{V}/\text{m})^2/377 \text{ watts per meter squared } (\text{W}/\text{m}^2)$$

To convert watts per meter squared to microwatts per meter squared;

$$\text{W}/\text{m}^2 \times 1,000,000 = \text{uW}/\text{m}^2$$

To convert  $\text{uW}/\text{m}^2$  to  $\text{uW}/\text{CM}^2$ ;

$$\text{uW}/\text{m}^2 / 10,000 = \text{uW}/\text{cm}^2$$

Combining the above, to convert  $\text{V}/\text{m}^2 = \text{uW}/\text{cm}^2$ ;

$$(\text{V}/\text{m})^2/377 \times 100 = \text{uW}/\text{cm}^2$$

Example;

Convert  $3.68 \text{ V}/\text{m}$  to  $\text{uW}/\text{cm}^2$

$$(( 3.68 * 3.68 ) / 377 ) \times 100 = 3.59 \text{ uW} / \text{cm}^2$$