# EMF Protection Guide



## A practical and comprehensive guide to effective e pollution protection in the modern world

Less than a year after the tragic passing of my lovely and exceedingly capable wife, my son and I elected to attempt to flee from our pain by moving back to Montana. This would move us closer to grandparents and family support, and as far as possible from searing, painful memories that scorch one's heart. In our emotional haste, we selected a home almost directly under absolutely massive power lines without giving it a notice or second thought.

My son had recently completed the school year with another semester of perfect grades and perfect attendance. Our first year in the new home again produced straight A's and a studentof-the-month award. The following school year however, attendance, grades and attitude were low. The following years quickly worsened until quality sleep escaped him almost completely, while at times anxiety made even leaving his room physically painful. What had changed? Was it my poor parenting, the loss of Mom or was something in our environment hurting my child? At first, as any parent would, I felt I had failed my son and my late wife completely. I dedicated countless hours of tireless research in to my son's symptoms and potential causalities, emotional, physical, nutritional and environmental. Is the cause of his dis-ease connected to what he's thinking, feeling, eating or being exposed to? His symptoms and my research led me to electrohyper sensitivity (EHS) and environmental toxicity resulting from over exposure to e-pollution and EMFs. How could I, as a father, reduce his exposure in order to save my child, this beautiful remaining part of my wife and my reason to live? What he needed didn't exist, so we changed our lives, put a second mortgage on the house, created a vision for our products and the outcome that they would create for my child and EHS sufferers worldwide. I assembled my team of experts and engineers, and together we partnered with industry leaders, advanced existing technologies, and developed new products in the fight back against e-pollution, EMF and their harmful effects.

My name is B.D. Erickson II and I welcome you to the world of SATIC Shield and the clean power paradigm, the result of a single father's decadelong relentless pursuit to save his only child. May everything that we have learned and created, empower you to improve your environment for the betterment of those you love and wish desperately to protect.



B.D. Erickson II CEO | SATIC Inc

# DIRTY ELECTRICITY —

A journey of discovery often begins where a new concept or idea enters one's consciousness. Total belief in the new concept is rarely instantaneous. At some point, enough evidence is revealed to change one's thinking, new beliefs are accepted and the paradigm or perceived reality shifts. This is your personal invitation to the awakening that SATIC calls, "the clean power paradigm."

One may be skeptical as to how the discoveries of the harmful effects of dirty electricity has thus far gone unnoticed. It's well documented that Rome delivered fresh water through a virtual miracle of engineering via lead pipes. While we know lead to be poisonous today, how long did it take the unsuspecting public to catch on to the link between illness and contaminated water? Asbestos was used globally for thousands of years and was a cost-effective construction material with its usage and production peaking in the mid-1970s. By the end of that decade, the public was beginning to understand the connection between asbestos exposure and debilitating lung diseases.<sup>1</sup>

It's nearly impossible to avoid plastics in our everyday lives, because it's literally everywhere. Yet studies show that plastic is loaded with toxic chemicals like BPA which is linked to a whole host of health problems. While the FDA banned the use of BPA in baby bottles and children's sippy cups in 2012, it's likely still found in many other plastics. Studies are showing that its replacement BPS may also be toxic and that plastics leach synthetic estrogen mimickers into the food or liquids stored inside them, which are linked to cancer, infertility, heart disease and other health problems.<sup>2</sup>

With the misguided advice given on the benefits of smoking cigarettes in the not-too-distant past, to the more recent flame-retardant couch cushions, the modern world is full of examples of seemingly safe and even beneficial everyday items, later being revealed as harmful. It's no stretch to imagine that additional similar discoveries will be revealed. In fact, it would be harder to imagine that not being the case, as similar discoveries are being revealed seemingly daily.

This was my experience and where my decadelong journey with dirty electricity began. May your journey of discovery begin with an awakening, and not a rapid declination in your health or the health of your loved ones.

Let it instead begin with a brave declaration of truth. Debunkers and deniers may claim that you wear a foil hat. Do not be deterred. Dirty electricity is indeed real, measurable and has been proven beyond any reasonable contestation to be harmful to the biological, period. It's no longer a

## INTRO



question of whether or not it's harmful, instead a matter of how much you are being exposed to and how much your particular biology can tolerate.

Like carbon monoxide, electrical pollution is not something we can see, smell, taste or touch. It is something only a few people can sense, making it difficult for others to notice.<sup>3</sup> Yet dirty electricity (DE) or "electrical pollution" (e-pollution) has been cited frequently as a major health issue facing our population.<sup>4-7</sup> Electrical pollution is virtually everywhere in the modern world and is almost unavoidable in the urban environment.

With this in mind, it is important to understand what causes electrical pollution and what to look for in your everyday life, environment and home.

Many complain about side effects of electrical pollution such as headaches, ringing in the ears, difficulty focusing or numerous other symptoms.<sup>8</sup> These symptoms are now broadly referred to as electrohypersensitivity or EHS.<sup>9-11</sup>

To prepare your mind for this journey, we begin with sources of electrical pollution and its subsequent dirty electricity, which has four major sources and a list of common culprits this guide will help you to identify and remediate.

- It is delivered with incoming power. Local utilities often inadvertently deliver dirty electricity via substations, exacerbated by your neighbors' devices or solar power delivered right to your distribution panel. Utility or customer generated solar, wind or internal-combustion generators also make dirty electricity delivered to your panel for use in your home.
- 2. We create it in our own homes or office. We inadvertently create dirty electricity with the operation of our appliances, lighting, electronics, switch-mode power supplies found in computers and DC devices.
- 3. Electrical wiring has become an antenna for wireless communications. E-pollution is delivered via wireless communication technologies in the form of radio, TV, WiFi, cellular networks and phones, wireless phones, connected devices etc. Your electrical wiring acts as giant copper antennae, receiving electromagnetic waves like the antenna in your car, but hundreds of times larger.
- 4. Wiring errors, most commonly in the form of a bonded ground-to-neutral bus in a breaker subpanel, shared neutral and ground bars in the panel, improperly wired neutrals in a junction box or incorrectly wired outlets are all major sources of DE in the modern world.

Keeping these four sources in your mind may make what you are about to learn easier to visualize.

As the writers and publishers of this journal our sincerest intent is that you find value in our personal experience, decade of engineering and testing, as well as the many cited sources written by the leaders in the field. From this vast wealth of insight may you become well equipped with the knowledge necessary to act wisely on what you are about to learn, protect yourself and share freely your discovery with others.



# What can you do?

#### Electric pollution is here to stay.

A SATIC Power Perfect Energy Management System<sup>™</sup> wired into your home or office electric panel filters and "cleans" the electricity coming in from your utility or solar. This solution is engineered to constantly filter out unwanted e-pollution from electricity coming into your home or office on one or both "hot" legs or phases.

Electricity does not simply go into an appliance and "disappear." Electrical energy flows through various electronic and electrical technologies and a portion of that electricity becomes heat, light, sound, motion, pressure, radiation or some combination thereof. The remainder of the electricity, now potentially degraded by the operation of a given device, flows back to your electrical panel via the neutral wire. So a lot of a home's dirty electricity is carried by neutral wires.

On a 120-volt two-prong plug you may notice that oftentimes one blade is slightly smaller than the other. The smaller blade is the "hot phase" blade or "in" part of the plug providing power to an appliance or device. The larger blade is the "out" path to the neutral or "common." This big blade completes the circuit, giving electrons at high voltage potential from the small blade a path to neutral after they perform work in your home or office. The third large round prong is the ground, which is bonded (electrically attached) either to metal plumbing that is physically touching the earth or "ground" or through a specially-installed eight-foot copper rod in or near your house foundation. This ground wire reduces your chances of getting shocked or electrocuted by providing a favorable path for high-voltage electrons. As of 2017, National Electrical Code requires neutral in subpanels to remain unbonded from grounded enclosures.<sup>12</sup> In cases when ground and neutral are bonded, greater levels of dirty electricity ensue, thus making mitigation more challenging.

To illustrate how this circuitry plays a role in causing dirty electricity with an appliance, consider when a vacuum cleaner is turned on. When that happens, you may see a line in the TV screen or hear a "pop" on the stereo speakers. The electricity flowing through the vacuum travels through the wires in the wall to the outlet, into the "phase" blade of the plug, to the vacuum motor, out of the motor and then back out on the (neutral) common line that the TV and stereo share. The now-degraded or "dirty electricity" from the vacuum motor affects the TV and stereo through the common line. As a matter of fact, all of the common lines in your home or office are electrically bonded together on the same common bar in your breaker panel, so any circuit in your home can affect any and all other circuits in your home or office.

Did you know that your home and office electrical circuits act as giant copper antennae? Your home wiring circuits, hundreds of times larger than the radio antenna in your car, can



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detect and transmit radio waves, bringing dirty electricity right to any and all of your appliances, electronics and members of your household.

A SATIC Power Perfect Energy Management System<sup>™</sup> wired in at your electrical distribution panel is the most effective way we at SATIC have found to clean dirty electricity as it bridges and directly filters both phases and the neutral line for all circuits in your home or office. A plug-in unit such as the Pure Power Plug-In™ is effective on a single circuit and to some extent cleans all circuits on that particular phase, but not as effectively as a wire-in unit at the breaker panel.<sup>13</sup> A wire-in unit has the shortest path to all circuits and to the incoming power at the breaker panel from the utility, and thus is the most effective technology for cleaning all of your home or office circuits. To our knowledge, SATIC is the only company currently manufacturing a wire-in filter that treats the neutral.

If you or your electrician investigate your electrical system with electricity power meters, you will see variations in voltage as well as harmonics.<sup>14, 15</sup> Some dirty electricity variations come from the power you are getting from the utility or even a neighbor's electricity consumption habits, as well as something that has just turned on in your home or office. Sound crazy? See for yourself! Test one of SATIC'S power conditioning products today with appliance loads such as the refrigerator, freezer, air conditioner or lights turned on and off. The results will be seen and likely felt immediately. Please do not hesitate to ask SATIC for its original third-party observations and datasets.

In the United States, most homes, apartments and office buildings utilize 120-volt "splitphase" electrical systems.<sup>16</sup> Specifically, the "A phase" and "B phase," each have 120 volts of "electrical pressure".<sup>9</sup> Roughly half of a home's outlets are on A phase, pulling power into various appliances and devices and back on neutral (common) for the return path. The remainder are on B phase, which is identical to A phase, only 180 degrees out-of-phase. To achieve 240 volts on a branch circuit, rather than using neutral as the common, the appliance, typically a stove or air conditioner, is simply wired between the two phases with a double breaker.

In general, if you are going to use a SATIC ES120 Pure Power Plug-In<sup>™</sup>, we recommend that you place one ES120 unit on a Phase A circuit and a second ES120 unit on a Phase B circuit.<sup>17</sup> It is best to place this complementary pair of units on circuits that draw the most power or create the worst harmonics.

Seeing variations in voltage or harmonics is normal. Did your neighbor turn something on? Did you? Filtering dirty electricity is an ongoing process: more sources of distortion may require more filters. However, too much of a good thing isn't necessarily always better. Over-filtration has been observed to produce its own undesirable field effects.<sup>18</sup> Our team of licensed professional engineers, our proprietary engineering software and our seasoned technical sales staff ensure that SATIC is always working with you and for you to optimize your home or office solution to give you the cleanest electricity possible.

Some competing filters utilize capacitors instead of harmonic rectifiers. These competing technologies may lower e-pollution levels, but it may require more of their units to lower electromagnetic field (EMF) or Graham Stetzer (GS) units. SATIC manufactures harmonicrectifier and capacitor-based solutions in over a dozen products in 120V, 208V, 240V and 480V models. The Power Perfect Energy Management System<sup>™</sup> and the SATIC ES120 Pure Power Plug-In<sup>™</sup> both use harmonic rectifiers and have been repeatedly verified by 3rd-party studies to reduce harmonics and related electromagnetic fields.<sup>19-26</sup> Several 3rd-party studies have also resulted in a reduction in energy consumption as well as substantial financial savings.<sup>27-30</sup> So, if dirty electricity, electrical pollution and unnecessary energy expenses are concerns for you, your family or your colleagues, SATIC has a solution.

#### HOW TO REDUCE EXPOSURE **USE OF TECH DEVICES BEGIN E-DETOX** HOME PROTECTION $( \bigcirc )$ KEEP THE BEDROOM AVOID/TURN OFF AVOID BLUE TOOTH DEVICES HARD WIRE DEVICES DEVICE FREE WIRELESS TECHNOLOGY 0 DON'T KEEP DEVICES ON REPLACE CFL'S& LED'S FILTER DIRTY ELECTRICITY OUR NEAR YOUR PERSON USE AIRPLANE MODE WITH SATICPULSE USE PLUG IN FILTERS FLECTRICAL SERVICE

## Top ways to protect yourself from e-pollution

It is nearly impossible to live and participate in the modern world without exposing yourself to significant amounts of EMF frequencies and radiation.

However, here are some measures you can take to help buffer your body and allow your cells to recover from overexposure

# Increase the distance between your electronics and your body

EMF exposure rapidly decreases as the distance from a cell phone or laptop (wireless) computer increases. You can mitigate some of the damage by leaving your cell phone in another room when you're not using it and limit your usage as a whole.

Don't carry your phone in your pants or shirt pocket – especially not in your front pants pocket if you're male or shirt pocket for ladies. Even package inserts with new cell phones warn not to carry your phone on your body due to radiation concerns.

For long calls, use the speakerphone or wired earbuds. Try to stay away from Bluetooth or wireless connections.

Whenever possible, increase the distance from all electronics, both wired and wireless devices, especially when plugged into the electrical outlet.

# Protect your desk/office and sleeping areas

At night, fields impact you more when you're not moving or when you're stationary during the day. At night shut your phone down and put it in another room to charge. Put your phone in airplane mode any time you're not using it and especially at night if you insist on having it near.

Move your Internet or Ethernet router as far away as possible from sleeping and living areas, turning your router and WiFi on only when you need it. Strongly consider turning your router and WiFi off at night.

Make your sleep area as low-tech as possible. Kill the power on all electronics at night: TVs, speakers, etc. Remove electric blankets and electric sleeping pads from your bed. Alternatively, completely unplug them.

Check the exterior of or the other side of the adjoining wall wall in back of your bed. If there is a breaker box, utility meter or air conditioning/ heating unity on or near the wall where you place your head on the pillow, rearrange your bed so that it is away from those things. If possible, move 6-8 feet away, to lower your electromagnetic radiation exposure. Consider investing in a sufficient amount of SATIC Field Shield<sup>™</sup> to protect your bed and sleeping area.

You can also choose to get really serious and turn off circuit breakers during sleeping hours. Make sure critical devices are not affected: e.g. alarm system, medical devices and refrigerator/ freezer. It's not difficult to flip a switch or twoas you start your day or wind down for the evening.

Many choose to use a SATIC Field Shield<sup>™</sup> to protect sleeping and seated work areas.

Many new devices have an auto-reconnect, so you must check periodically to ensure that airplane mode remains ON and Bluetooth and WiFi remain OFF.

Download books, music, videos and games, rather than streaming, and enjoy with Airplane Mode ON, Bluetooth® OFF and WiFi OFF.

EMFs may impact young people more than adults.







5G towers are acutally much smaller and more compact than 4G towers, even though they are MUCH more powerful.

## Reduce EMF exposure in your home

Replace fluorescent, CFL and LED lighting with SATIC Pulse LEDs, incandescent or incandescent halogen light bulbs.

Turn OFF dimmer switches completely when not using, not just down. If you don't use the dimmer switches you have, consider replacing them with a regular on/off switch.

Maintain a landline phone if possible. Forward your cell phone calls to your landline. Replace all cordless phones with corded landline phones. Make sure there is no cordless headset. The cordless phone base emanates significant levels of radiation 24/7, even when not in use.

**Reject the "SMART HOME" concept.** Maintain older appliances that do not have wireless sensors; i.e., "pre-smart" appliances. If you need to purchase new appliances, research to find an older model in good condition that does not have wireless sensors. Alternatively purchase new appliances that allow deactivation of "smart" features. The more devices that are connected to your WiFi or cellular network, the more EMFs and radiation your family will be exposed to.

Ditch the "smart home" devices.

Decline a "smart" meter if your electric company asks you to install one.

Obtain and elect to use hard-wired electronic devices whenever possible.

Replace your wireless mouse or keyboard with wired ones and hardwire your printer. Disable the wireless sensor embedded in the printer. This is difficult, but doable. Check the owner's manual or call the manufacturer. Also use Ethernet cable instead of WiFi or wireless.

Resist "smart speakers," Bluetooth® speakers and other "SMART HOME" gadgets. These things are pervasive and you may not be aware of how many things might be "smart" in your home or office and currently emitting without your knowledge.



## Avoid high-voltage power lines

Not everyone can choose where they live or work. But if you do have a choice, don't buy or rent housing next to 10,000-volt power lines, especially if you have or plan to have children. Try to be at least 1/4 mile away.

If you currently live near a big power line, a cell tower, a generation station, a radio station or electric train tracks . . . you may want to move. This may be hard, but if you have the opportunity to move, consider it. If moving is not an option, SATIC makes a line of products to combat e-pollution.

Also, check if your home has a smart meter and consider replacing it. If you cannot, you should consider shielding it. Some apartment complexes put all the smart meters outside one apartment's wall. If that wall is yours, you may want to relocate.

## Check for wiring errors

Most wiring errors go undetected for years. AC electricity can be very forgiving to many oldfashioned technologies such as incandescent light bulbs and some appliance motors. However, if you are feeling ill and sense that dirty electricity may be the culprit, don't delay. Call your local SATIC Certified dealer today for an in-person evaluation, or call SATIC World Headquarters for immediate advice on how to begin correcting these potentially harmful errors.

### Take time in Nature to detox and get back in to the natural frequency

Take a tech day off. Disconnect from all electronic devices, both wired and wireless as much as possible. Place your bare feet on the grass and recalibrate with the earth's natural frequencies.

Look for opportunities to take advantage of natural sunlight.

Spend as much time as you can outdoors in a natural environment –barefoot when possible."

# What are EMFS?

# e-pollution is known by various names:

- electro-pollution
- electro-smog (e-smog)
- electromagnetic fields (EMFs)
- electromagnetic radiation (EMR)
- dirty electricity (DE)
- electromagnetic interference (EMI)
- radiofrequency (RF)
- wireless (WiFi)
- Bluetooth Low Energy (BTE)
- microwave radiation ( $\mu$ W)

While we cannot escape the presence of all EMFs, we can take steps and adopt habits that will greatly reduce our exposure to harmful e-pollution. SATIC's tips are simple, often nearly free, can be implemented in a short time and are scientifically measurable.

We live in a sea of man-made electromagnetic radiation

- traveling wirelessly through SPACE or
- traveling via electrical WIRES



## Go outside BAREFOOT!

#### How much is too much?

No one really knows for sure, as there have been very little or no:

- quality or independent premarket studies
- quality or independent long-term studies
- opportunity for an individual to opt-out of this technology

Human-made EMFs, including ELFs (extremely low frequencies) can:

- break DNA single and double strands,<sup>31, 32</sup>
- cause oxidative cell damage,<sup>33</sup>
- disrupt cell metabolism and communication, 34
- break down the blood-brain barrier,<sup>35, 36</sup>
- alter brain glucose metabolism<sup>37, 38</sup>
- generate stress proteins<sup>39, 40</sup> and
- disrupt voltage-gated calcium channels<sup>41, 42</sup>

These health conditions are well-documented, and the debate is over. What remains to be studied are the levels of e-pollution and exposure times that negatively affect human health in measurable ways.

Humans have numerous assaults on our health, immunity and well-being. Let us not allow EMFs, which are somewhat avoidable, to negatively tip the balance of our body's immune defense systems.

As 5G is implemented, it will only exacerbate the issue as numerous smaller antennas will be brought very close to our homes, offices and schools. 5G commonly uses a type of microwave frequency (300MHz-300GHz) called millimeter waves (mmW) (30-300 GHz). These wave frequencies are higher than those used for 4G and are separated into low (600-850 MHz), medium (2.5-3.7 GHz) and high (25-39 GHz). Plans are currently underway for global 5G deployment.<sup>43, 45</sup>

This is not simply an upgrade of 4G, this is a major evolution in wireless communication. 5G is the central platform for connecting everything to everyone at all times. It will be the necessary technological backbone for all "smart" and Internet-of-Things (IoT) devices.

Network density (i.e., adding more base stations and towers) will be necessary to get network access closer to individual users - along city streets, in buildings and everywhere communication providers deem necessary. This means adding more antennas and small cell sites. Cell towers can now be as close as 250 feet, or one every three to twelve homes in urban areas, mounted on lampposts or even buried under the street. Speeds will be over 20 times faster than the current 4G technology.

In addition to bringing sources of electromagnetic radiation closer to us, it provides an avenue of extreme surveillance. 5G is one of the most insidious invasions of privacy ever promoted. Privacy will be lost potentially to the point of extinction. Surveillance capability beyond what could have been imagined by novel writers only decades ago.

This new technology, like previous iterations remain untested and unavoidable as there is no "opt-out" program. If you live in the urban environment, it will be omnipresent and unavoidable.

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Most people, including regulatory agencies who are tasked with and paid to protect our health, may not be paying full attention to the science regarding the health risks of EMFs and it's common for people to be gaslighted if they express concern. Who looks to gain from this technology being implemented and who's hiring the few studies being done? We know that it's all too common for the testing agency to find in favor of those paying for the study to be conducted. The reality is that many people, especially those with chronic health conditions, are indeed sensitive to e-pollution. Studies show that even if you don't notice the effect, EMFs are almost certainly negatively impacting your health.<sup>5, 46</sup> This is especially concerning as 5G wireless towers and 5G "cells" are being added to city infrastructure across the country with little or no oversight and "smart" meters continue to be added to more homes daily.<sup>47, 48</sup>

# EMFs may impact young people more than adults.

No, people are not dropping dead left and right from using electronic technology. Lead pipes, plastics and smoking cigarettes may often take years to manifest illness, allowing government and industry scientists plenty of room to contend that the effects of EMFs are not significant.

The reality, however, that all man-made EMFs do affect living cells should be a concern to all of us, whether we are presently symptomatic or not.<sup>49, 50</sup>

5G towers are actually much smaller and more compact than 4G towers, even though they are MUCH more powerful.

Some companies even bury 5G networks under the street, making it even harder to see when you're close to massive EMF exposure.

JUST SAY NO. . . to the 5G upgrade. Don't wear a wireless fitness device or use a smart phone. If you must wear a fitness device or are tethered to a smart phone for business, take the device off at night or when not exercising. Never use a Bluetooth or wireless ear piece. If you must use one, turn it off and remove it from your head immediately when you are not using it or use a wired earpiece instead.

## What are electric & magnetic fields?

Electric and magnetic fields (a form of massless radiation) are invisible forms of energy that are produced by electricity, which is the movement of electrons via electric current, through a wire or other medium.

An electric field is produced whenever a voltage difference or voltage gradient is present.<sup>51,52</sup> Voltage can be thought of as "electrical pressure" used to push electrons through a wire, or lightning through the sky, much like a water tower's elevation generates pressure to push water through a pipe. As voltage increases, the electric field strength also increases. Electric fields are typically measured in units of volts per meter (V/m).

A magnetic field results whenever alternating current or direct electric current flows through wires or electrical devices. Magnetic field strength also increases as current increases. The strength of a magnetic field decreases rapidly with increasing distance from its source. Magnetic fields are measured in microteslas (µT or millionths of a tesla).

Electric fields are produced whether or not a device or appliance is turned on, whereas magnetic fields are produced only when current is flowing, which usually requires a device to be turned on. Power lines produce magnetic fields continuously because current is almost always flowing through them. Electric fields are easily shielded or weakened by walls and other objects, whereas magnetic fields can pass through or around buildings, living things and most other materials.

Electric and magnetic fields together are referred to as electromagnetic fields, or EMFs. The electric and magnetic forces in EMFs cause and are caused by electromagnetic radiation. There are two main categories of EMFs:

- **Higher-frequency EMFs**, which include x-rays and gamma rays. These EMFs are in the ionizing radiation part of the electromagnetic spectrum and can damage DNA<sup>31-33</sup> or cells directly.
- Low- to mid-frequency EMFs, which include a) static fields (electric or magnetic fields that do not vary with time), b) magnetic fields from electric power lines and appliances, c) radio waves, d) microwaves, e) infrared radiation and f) visible light. These EMFs are in the nonionizing radiation region of the electromagnetic spectrum and are not proven to damage DNA or cells directly.<sup>31-33</sup> Low- to mid-frequency EMFs include extremely low frequency EMFs (ELF-EMFs) and radiofrequency EMFs. ELF-EMFs have frequencies of up to 300 cycles per second, or hertz (Hz), and radiofrequency EMFs range from 3 kilohertz (3 kHz, or 3,000 Hz) to 300 gigahertz (300 GHz, or 300 billion Hz). Radiofrequency radiation intensity is typically measured in watts per square meter  $(W/m^2)$ .



The electromagnetic spectrum represents all of the possible frequencies of electromagnetic energy. It ranges from extremely long wavelengths (extremely low frequency exposures such as those from power lines) to extremely short highfrequency wavelengths (x-rays and gamma rays) and includes both non-ionizing and ionizing radiation.

### What are common sources of non-ionizing EMFs?

There are both natural and human-made sources of non-ionizing EMFs. The earth's magnetic field, which causes the needle on a compass to point north, and which shields earth's biosphere from damaging solar wind is one example of a naturally-occurring EMF.

Human-made EMFs fall into both the ELF and radiofrequency categories of non-ionizing radiation. These EMFs can come from a number of sources:

**Extremely low frequency EMFs (ELF-EMFs)** emanate from power lines, electrical wiring and electrical appliances such as electric ovens, electric shavers, hair dryers or electric blankets, to name a few. **Radio-frequency radiation** emanates from numerous human-made sources such as wireless telecommunication devices and equipment such as cell phones, smart meters or portable wireless devices such as tablets and laptop computers. In the United States, cell phones currently operate in a radio frequency range of about 1.8 to 2.2 GHz.

Other common sources of radiofrequency radiation include:

- Radio and television signals from AM/FM radios and older VHF/UHF televisions operate at lower radio frequencies than cell phones. Radio signals are AM (amplitude-modulated) or FM (frequency-modulated). AM radio is used for broadcasting over very long distances, whereas FM radio covers more localized areas. AM signals are transmitted from large arrays of antennas that are placed at high elevation on sites. FM radio antennas and TV broadcasting antennas, which are much smaller than AM antennas, are generally mounted at the top of high towers.
- Radar, satellite stations, magnetic resonance imaging (MRI) devices and industrial equipment operate at somewhat higher radio-frequencies than cell phones.
  53, 54

### EMFs are also emitted from:

**Microwave ovens used in homes** also operate at somewhat higher radio frequencies than cell phones. Microwave ovens are manufactured with effective shielding that has reduced the leakage of radiofrequency radiation from these appliances to barely detectable levels.

**Cordless telephones** can operate on analog or DECT (Digital Enhanced Cordless Telecommunications) technology and typically emit radiofrequencies similar to those of cell phones. However, because cordless phones have a limited range and require a nearby base, their signal strengths are generally much lower than those of cell phones.

**Cell phone base stations**, consisting of antenna towers or base stations, including those for mobile phone networks and for broadcasting for radio and television, emit various types of radiofrequency energy. Because the majority of individuals in the general population are exposed only intermittently to base stations and broadcast antennas, it is difficult to estimate exposures for a population.<sup>55, 56</sup> The strength of these exposures varies based on the population density of the region, the average distance from the source and the time of day or the day of the week (lower exposures on the weekends or at night).<sup>54</sup> In general, exposures decrease with increasing distance from the source.<sup>57</sup> Exposures among maintenance workers have been found to vary depending on their tasks, the type of antenna and the location of the worker in relation to the source.<sup>58, 59</sup> Cumulative exposures of such workers are very difficult to estimate.

**Televisions and computer screens** produce electric and magnetic fields at various frequencies, as well as static electric fields. The liquid crystal displays found in some laptop and desktop computers do not produce substantial electric or magnetic fields. Modern computers have conductive screens that reduce static fields produced by the screen to normal background levels.

Wireless local area networks, commonly known as WiFi. These are specific types of wireless networking systems and an increasingly common source of radiofrequency radiation. Wireless networks use radio waves to connect WiFi–enabled devices to an access point that is connected to the Internet, either physically or through some form of data connection. Most WiFi devices operate at radiofrequencies that are broadly similar to cell phones, typically 2.4 to 2.5 GHz, although in recent years WiFi devices that operate at somewhat higher frequencies (5, 5.3 or 5.8 GHz) have appeared. Radiofrequency radiation exposure from WiFi devices is considerably lower than that from cell phones. Both sources emit levels of radiofrequency radiation that are far below the guideline of 10 W/m2 as specified by the International Commission on Non-Ionizing Radiation Protection.<sup>60</sup>

Digital electric and gas meters, also known as "smart meters" are notorious emitters of e-pollution. These devices, which typically operate at about the same radiofrequencies as cell phones, transmit information on consumption of electricity or gas to utility companies. Smart meters can produce fields ranging from lowlevels that sometimes cannot be distinguished

#### What have studies shown about possible associations between non ionizing EMFs and cancer in children?

Numerous epidemiologic studies and comprehensive reviews of the scientific literature have evaluated possible associations between exposure to non-ionizing EMFs and risk of cancer in children.<sup>38, 56, 65-80</sup> Magnetic fields are the component of non-ionizing EMFs that are usually studied in relation to their possible health effects. Most of the research has focused on leukemia and brain tumors, the two most common cancers in children. Studies have examined associations of these cancers with living near power lines, with magnetic fields in the home and with exposure of parents to high levels of magnetic fields in the workplace.

**Exposure from power lines.** Although a study in 1979 pointed to a possible association between living near electric power lines and childhood leukemia72, more recent studies have had mixe findings.<sup>67, 70, 73</sup>

Several studies have analyzed the combined data from multiple studies of power line exposure and childhood leukemia:

- A pooled analysis of nine studies reported a twofold increase in risk of childhood leukemia among children with exposures of 0.4 μT or higher.<sup>74</sup>
- A meta-analysis of 15 studies observed a 1.7fold increase in childhood leukemia among children with exposures of 0.3 μT or higher.<sup>73</sup>
- More recently, a pooled analysis of seven studies published after 2000 reported a 1.4fold increase in childhood leukemia among children with exposures of 0.3 µT or higher.<sup>73</sup>

from the total background radiofrequency radiation levels inside a home, up to levels great enough to trigger electrohypersensitivity symptoms.<sup>61-64</sup>

For household appliances and other devices used in the home that require electricity, magnetic field levels are highest near the source of the field and decrease rapidly the farther away the user is from the source. Magnetic fields drop precipitously at a distance of about 1 foot from most appliances. For computer screens, at a distance of 12–20 inches from the screen that most persons using computers sit, magnetic fields are similarly dramatically lower.



**Exposure from electrical appliances.** Another way that children can be exposed to magnetic fields is from household electrical appliances. Magnetic fields near many electrical appliances are higher than those near power lines. Appliances contribute less to a person's total exposure to magnetic fields because most appliances are used for only short periods of time, and moving even a short distance from most electrical appliances reduces exposure dramatically. Again, studies have not found consistent evidence for an association between the use of household electrical appliances and risk of childhood leukemia.<sup>67, 75</sup>

**Exposure to WiFi.** In view of the widespread use of WiFi in schools, the UK Health Protection Agency (HPA, now part of Public Health England) has conducted the largest and most comprehensive measurement studies to assess exposures of children to radiofrequency electromagnetic fields from wireless computer networks.<sup>76</sup>

**Exposure to cell phone base stations.** Few studies have examined cancer risk in children living close to cell phone base stations or radio or television transmitters. None of the studies that estimate exposures on an individual level found an increased risk of pediatric tumors.<sup>77</sup>

#### What have studies shown about possible associations between non-ionizing EMFs and cancer in adults?

Many studies have examined the association between non-ionizing EMF exposure and cancer in adults, of which few studies have reported evidence of increased risk.<sup>78, 79</sup>

**Residential exposures.** The majority of epidemiological studies have shown no relationship between breast cancer in women and exposure to extremely low frequency EMFs (ELF-EMFs) in the home,<sup>65, 80, 81</sup> although a few individual studies have suggested an association; to our knowledge, only one study reported results that were statistically significant. <sup>82</sup> Clearly more testing is needed.

Workplace exposures to ELF radiation. Several studies conducted in the 1980s and early 1990s reported that people who worked in some electrical occupations that exposed them to ELF radiation (such as power station operators and telephone line workers) had higher-than-expected rates of some types of cancer, particularly leukemia, brain tumors and male breast cancer.<sup>83, 84</sup>



# How EMFs Affect Us

We can't see them, smell them or feel them, so how can EMFs be harmful?Although, people who are extremely sensitive can feel EMFs, most people don't take the issue seriously because EMFs are invisible.

The first thing to understand is that the body is a biochemical and bioelectric organism that runs on chemistry and magnetism. The heart, brain and many cellular and metabolic processes operate through electrical charges, which can be disrupted by EMFs and e-pollution.

The healthy function of these organs depends in part on natural and healthy electromagnetic frequencies generated by the earth (the Schumann resonance), the atmosphere and the sun. This is one reason people feel so much better when they spend time in nature away from cities and buildings.

These natural, beneficial EMFs are blocked and drowned out in our modern environments by pavement, buildings and an ever-present bombardment of various forms of e-pollution. When was the last time your bare feet touched the ground or you were out of cell range?

Our own delicate electrical processes lose their synchronization with natural-frequency EMFs and instead become overwhelmed by man-made ones. This triggers the breakdown in cellular communication and symptoms begin to emerge.

As with radioactive radiation, the effect of EMFs can be cumulative, meaning your "EMF toxicity" may get worse the longer you are exposed.

5G towers are actually much smaller and more compact than 4G towers, even though they are MUCH more powerful.

Some companies even bury 5G networks under the street, making it even harder to see when you're close to massive EMF exposure.

# ELF & RF Radiation Health Risks.



# Learn more at saticshield.com

Everyone is exposed to an elaborate mix of weak electric and magnetic fields at home and at work from 1) the generation and transmission of electricity, 2) domestic appliances and industrial equipment and 3) broadcasting and telecommunications. As seen in the medical literature cited in this pamphlet and available through SATIC Certified<sup>™</sup>, recent medical research has shown links between extended exposure to electromagnetic radiation and many health impacts.

## EVERYDAY EFFECTS OF EMF

- tingling or vibration-like feelings where you normally keep your cell phone
- memory loss or problems with concentration
- exhaustion or tiredness
- sleep disturbance
- lack of mental clarity or focus
- aches and pains
- depression

## **NEUROLOGICAL EFFECTS**

- brain tumor
- Alzheimer's disease
- cognitive impairment
- sleep disturbances
- reduction in melatonin production
- acoustic neuroma
- Lou Gehrig's disease

## CELLULAR EFFECTS

- DNA damage
- leukemia
- cancers, including breast and skin
- infertility and decreased sperm motility
- miscarriage
- blood-brain barrier disruption

## WELL-BEING EFFECTS

- toasted skin syndrome
- electromagnetic sensitivity
- "subliminal stress:" the reduction of blood and oxygen flow to vital systems

## Bioeffects of electromagnetic radiation on The Human Energy System

The ill-healtheffects from extremely low frequency (ELF) electric and magnetic fields (0 to 300 Hz) generated by power lines and radio/microwave frequencies (RF) (10 MHz - 300 GHz) <sup>85, 86</sup> emitted by radio antennas and wireless networks have been well studied.

Bioelectromagnetics or bioelectromagnetism, is the study of the interaction between electromagnetic fields and biological entities. Areas of study include electromagnetic fields produced by living cells or organisms and the effects of man-made sources of electromagnetic fields and electromagnetic radiation.

In the late eighteenth century, the Italian physician and physicist Luigi Galvani first recorded the phenomenon while dissecting a frog where he had been conducting experiments with static electricity. Galvani coined the term animal electricity to describe the phenomenon.<sup>87</sup> Intercellular communication is possible because of the electrochemical gradient or difference in voltage on either side of a cell membrane. Several animals are suspected to have the ability to sense electromagnetic fields, and are even

capable of sensing changes in voltage caused by a changing magnetic field. We know that dairy cows purposefully avoid electric fences and in some fantastic way birds migrate.

Most of the molecules in the human body interact with electromagnetic fields in the radio frequency or extremely low frequency bands. One such interaction is the absorption of energy from the fields, which can cause tissue to heat up.<sup>88</sup> Many nations and regulatory bodies like the International Commission on Non-Ionizing Radiation Protection have established safety guidelines to limit EMF exposure to a non-thermal level.

Many behavioral effects at different intensities have been reported from exposure to magnetic fields, particularly with pulsed magnetic fields. A whole-body exposure to a pulsed magnetic field was found to alter standing balance and pain perception in other studies.

A strong changing magnetic field can induce electrical currents in conductive tissue such as the brain. Since the magnetic field penetrates tissue, it can be generated outside of the head to induce currents within, causing transcranial magnetic stimulation (TMS).

Common manifestations are less sleep, less restful sleep, uneasiness and anxiety.

Atoms are in a constant state of motion, producing both electrical and magnetic fields of energy.



Consisting of atoms, every human being has layers of energy fields that begin at the sub or atomic energy field, a cellular energy field, an organ energy field, a meridian energy field, a lower mental energy field, a higher mental energy field, an emotional energy field and so on.

Energy points in the body line up to create an interconnected field which directs the flow of energy through the physical body by means of imperceptible energy points within the physical body called meridians that act as energy gateways or exchange points. Human beings have several hundred of these energy exchange points throughout our energetic fields but the seven that are connected to the spinal column and head are the most well-known.

For energy points to function properly the body requires a balance of energy flow to maintain optimum health and wellbeing. Unfortunately, energy flow may be obstructed by negative emotions, patterns or beliefs, as well as toxic environments like poor eating habits, polluted air, water, EMF's and the various forms of e-pollution and radiation.

We would be remiss if we did not mention the form of clean energy that is perhaps less easily measured. That of good old positive energy or PMA (positive mental attitude!), as thoughts, feelings and emotions also produce energy fields that interact with other people, places and things. Emotions are vibrations that consistently influence our reality. The emotional state in which you spend most of your time "is" the quality of your life, and may have the most profound impact on your overall health, as the main causes of dis-ease and chronic illness are related to the energy and frequency imbalances that exist within and around your body. Negative feelings and emotions have a low vibration and frequency and over extended periods of time often lead to physical and emotional breakdown. Positive feelings and emotions are often typified as "having a higher vibration frequency," which often leads to improved attitude and physical health. Positive feelings and emotions certainly result in greater enjoyment of life and mental well-being.

We are just beginning to unravel the miraculous power of the 'Clean Power Paradigm' yet the practical steps in this guide should help you begin living in an e-pollution free environment where you can concentrate your personal energy on creating a happier future and recognizing, appreciating and experiencing the vast amount of good present in your life right now.



Energy Points in the Human Body



# Dirty Electricity from Wiring Errors

## Wiring errors writeup for EMI Guide

Dirty electricity may also be caused by wiring errors, which in SATIC's experience are more common than one might initially expect, are straightforward to detect and fairly straightforward to correct. In this section, we categorize wiring errors into two categories and look at five case studies and how to correct them.

The first three case where these errors occur are:

- 1. In a breaker subpanel
- 2. In a junction box
- 3 At an outlet

#### WIRING ERRORS IN DISTRIBUTION SUB-PANELS



# Bonded ground-to-neutral bus in breaker subpanel

National Electric Code 250.24.(A)(5) requires that in any subpanel that the neutral bus and the ground bus remain unbonded. While it may be typical to see the neutral bus and the ground bus bonded in the main distribution panel, per NEC 250.26(1) "...the conductor to be grounded shall be...the neutral conductor", this is forbidden in subpanels.

To correct this problem, simply have your licensed electrician remove the wire or conductor that bonds the neutral busbar to the ground busbar in the subpanel.

Be sure to also confirm that there are no bare copper ground wires on the neutral busbar and no white neutral wires on the ground busbar.





One of the most common wiring errors SATIC encounters is a situation where neutrals from two or more branch circuits are shared (ioined, electrically bonded) in a junction box, a violation of NEC 300.3.B.



When this type of wiring error is present, unwanted magnetic fields can be created. Shared neutrals can not only cause an excessive magnetic field, but is a dangerous code violation.

## Imbalanced current

An incorrectly wired junction box commonly results in imbalanced circuits. When the neutral from a single branch circuit is paired with its hot, the magnetic fields created by the incoming and outgoing currents cancel. If you have imbalanced currents in an electric conduit or raceway, unwanted alternating magnetic fields are likely to result.



These errors along with a correctly wired outlet show just how difficult it can be to get even a simple outlet wired properly.



Sometimes these wiring errors at the outlet can be corrected immediately at the outlet itself. Sometimes, however, the error must be traced back to a junction box or even the distribution panel or subpanel.

The final two errors are common in either older homes or occur during a remodel.

## Long-run ground

If this is the case, a current on the ground wire, which should have simply traveled back to ground near the distribution panel, instead must travel the length of the dwelling via a path of least resistance. To correct this, create a new, shorter, code-compliant path.





In a scenario like this a metallic fixture such as a stove vent, metallic water pipe or aluminum trim might inadvertently create an alternative neutral or ground electrical path. The current in a branch circuit may become imbalanced, resulting in stray current, imbalanced circuits, dirty electricity, EMFs and unwanted magnetic fields.





with metal stovepipe

## **EMF Protection Solutions**



We recommend the SaticShield EMF Pluse Test Kit for residential homes and businesses. The purpose of the test kit is to assess the level of dirty electricity and detect wiring errors in your home or office. Two SATIC Pure Power Plug-Ins are included in this kit to allow for testing and filtering both phases. Use the SATIC EMI Meter to determine the impact of one filter on a single phase and to determine if additional filtering on that phase is needed. Repeat the exercise for the second phase and record your results on the SATIC Clipboard.



#### The SaticShield EMF Plus Test Kit includes:

- SATIC EMI Meter
- Two SATIC Pure Power Plug-Ins
- SATIC Outlet Tester
- SATIC Clipboard & LED Pen
- SATIC Pulse LED & Adapter
- SATIC Test Kit Tool Bag

The 'EMI Meter' will help to assess the current level of dirty electricity.

The 'Outlet Tester' will detect potential wiring issues.

The Pure Power plug-in units will measure the potential for EMF mitigation and begin filtering your electricity immediately.

The SaticPulse LED light bulb and light bulb adapter socket are also included to compare your current lighting to SATIC's "clean power" light bulb.

#### Complete instructions on the clipboard include:

- EMI Meter Readings Recording Sheet
- Pure Power & Power Perfect Demo FAQs
- Pure Power & Power Perfect Product FAQs
- Pure Power Plug-In versus Power Perfect Wire-In comparison

## The meters and recording sheets are included to help you:

- 1. Identify the quality of the power you are presently purchasing.
- 2. Identify electrical or wiring issues.
- 3. Identify dirty electricity causing culprits.
- 4. How the product actively filters, cleans and regulates the power.



## SATIC Pure Power Plug-In

A simple, yet effective plug-in solution that filters harmonics, providing clean power and reduced EMF.



### SaticPulse Lightbulbs

The only line of clean power energy-conscious lighting available on the market.



The most effective product line for filtering and conditioning power at the distribution panel.

For more information on our products or to purchase visit www.saticsheild.com

# Engineered Clean Power & EMF Radiation Protection



www.saticusa.com

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## Frequently Asked Questions

### What is 'dirty electricity' or 'harmonic distortion' really?

Dirty electricity is a form of electromagnetic pollution or radiation. It is also called electromagnetic interference (EMI) or electrical "noise." It refers to powerful, high frequency electrical energy traveling along the wiring in buildings where only standard 60-Hertz AC electricity should be. It is also frequently referred to as harmonic distortion as it interferes with and distorts the fundamental 60 Hertz sinusoidal wave form. This distortion also results in unusable energy that is usually called reactive energy.

# Why is EMF or EMR bad for us?

The human nervous system is in essence an electrical system that through electromagnetism governs our bodily functions. Because it is electrical, it can be influenced by outside electrical and magnetic fields which in turn can impact how effectively the nervous system and related systems communicate and function. In particular it may result in neuro-endocrine stress as a result of its impact on both the sympathetic and parasympathetic control systems. Symptoms such as high blood pressure, sleep disorders due to melatonin deficiencies, nervousness, etc. are common. Multiple studies correlate EMF exposure with diseases such as cancer, neurological disease, reproductive disorders, immune dysfunction and electromagnetic hypersensitivity.

# Is there really such a thing as EMF hypersensitivity?

Definitely so, electrohypersensitivity (EHS) effects individuals have who are physically affected by the presence of electromagnetic fields and frequencies (EMF) and the subsequent electromagnetic radiation (EMR). While sensitivity and symptoms can vary by individual, it has become a well-known fact that EMF and EMR can manifest as physiological and neurological symptoms in those who have EHS.

#### Are there any health professionals using this technology that have endorsed it?

Building biologists, medical researchers and academics have run third party assessments and found Satic technology to be effective.

# Is this technology proven to be scientifically sound?

Yes, the technology is actually an adaptation of that developed by NASA to be used on the space shuttle with several of the components that Satic uses, currently in space, and has been verified via numerous third-party tests.

#### What does an EMI meter tell me? Can my EMI meter tell me how well my SATIC PowerPerfect box is performing?

EMI Meter's measures the relative amount of dirty electricity, or electromagnetic interference (EMI), on wiring in buildings. It measures the amount of EMI in millivolts (mV). The amount of EMI correlates to the amount of sound emitted by the EMI meter which also relates to the amount of EMF on the wiring. The Power Perfect Box Plug-In acts as an EMI filter and reduces the amount of EMI. Using the EMI Meter to measure before and after adding a Power Perfect product will demonstrate how it can reduce the amount of EMI and related EMF radiation.



#### Why are the EMI Meter readings different in other areas of the house where I test?

The EMI Meter will measure what the reading is on any particular phase and circuit at a particular time. Although your entire electrical system is interconnected at the distribution panel, the proximity of devices on a particular circuit will have a greater influence on the EMI meter than a more distant place in the house, on a different circuit or on a different phase.

#### How does the Power Perfect Box Wire-In protect someone from the negative effects of smart meters?

Smart meters are well-known for introducing harmonics into the electrical system by nature as well as a means of monitoring and potentially controlling usage of electronic devices and appliances. These harmonics create electromagnetic interference (EMI) and electromagnetic frequencies (EMF) that produce increased electromagnetic radiation (EMR). So those with EHS may be impacted by and affected by smart meters. In addition, with increased harmonics and related dirty energy, it would seem that smart meters are actually making electrical systems less efficient. Many report much higher electrical bills after smart meters are installed.

The Power Perfect Box Wire-In will effectively filter and clean the electricity coming in from your utility or smart meter as well as the harmonics that are created within your electrical system. This filtering of harmonics also protects your privacy as smart meters use various harmonics across the electrical wires to query information from smart appliances and then communicates that information to the power company. The Power Perfect Box Wire-In also filters out these harmonics and as a result protects your privacy.



### What does the Pure Power Plug-In do?

The SATIC Pure Power Plug-In will help your appliances and electronics run cooler, smoother, last longer and run more efficiently, thereby ultimately saving energy. No other system has this extraordinary combination of circuit board design, optimized power factor correction modules, line conditioning, voltage regulation, nano-surge filtration, electromagnetic field reduction and negative harmonics reduction with extremely robust surge protection. All this is packaged into SATIC's unique plug-in design, allowing it to be smaller, more affordable and more effective than anything else on the market today, at any price.

#### Where do I go to purchase SATIC products?

Visit: www.saticshield.com

OR

Please call 1-866-99-SATIC (1-866-997-2842) local 406-493-1861.

## Electrical Terminology

Each SATIC Power Perfect<sup>™</sup> product was thoughtfully engineered and manufactured in the USA.

SATIC's #1 commitment is to clean power.

SATIC's line of power conditioners are truly effective, easy to install and affordable.



#### Voltage ~ volts (V)

are a unit of electrical force or potential difference that will cause a steady current of one amp to flow through a resistance of one ohm.

**SATIC Simplified** ~ voltage is a measure of the "electrical pressure" or how hard the amps are being pushed.



#### Amperage ~ amperes (A)

also commonly referred to as amps are a unit of electrical current or flow rate of electrons. One volt across one ohm of resistance causes a current flow of one ampere.

**SATIC Simplified** ~ amperage is measure of how much current or how many electrons are flowing and is therefore the flow rate of electrical energy (electricity).



#### Power ~ watts (kW)

are a measure of REAL power and the product of amperage squared and the rate of energy transfer equivalent to one ampere under the electrical pressure of one volt. One watt equals one joule per second.

**SATIC Simplified** ~ watts are the measure of real working power.

#### Energy ~ kilowatt-hour (kWh)

The kWh is a unit of energy produced or consumed by one thousand watts acting over a period of 1 hour.

**SATIC Simplified** ~ kilowatt-hours are the measure of real working energy used over time and are the standard of measure utilities use to bill for electricity.

#### Power factor ratio (PF)

is the ratio of actual real power being used, measured in watts, to the total power that is being drawn from a power source, expressed in voltamps (VA)<sup>87</sup>

**SATIC Simplified** ~ Power Factor is the ratio of real working power measured in watts to total apparent power measured in volt-amps (VA). PF = W / VA.

PF = real power / apparent power. When apparent power equals real power, the power factor equals one, which is ideal.

A common misconception about electrical billing and real power is that volts × amps = watts. This is inaccurate, volts × amps = volt-amps or in engineering jargon, "apparent power."

To find real power: volts × amps × power factor = watts or "real power." Correcting power factor typically does not lower utility costs for residential consumers, yet frequently will for industrial consumers, as has been demonstrated by numerous SATIC industrial customers, e.g. <sup>30, 90</sup>



**Total harmonic distortion ~ ratio (THD)** is the measure of the harmonic content carried by unwanted frequencies in the output waveform in addition to the primary or desired frequency (50 or 60 Hz). Energy in these harmonic frequencies is lost as heat, occasional audible distortion and may cause excessive and potentially damaging heat loads.

**SATIC Simplified**  $\sim$  THD is how far the real-time waveform is from ideal (60Hz or 50Hz) and how many undesired frequencies are present on the wave.



#### Interference (EMI)

Any unwanted signal that's combined with the desired signal is called interference and can come from external systems as well as from within a circuit itself. External sources include, but are not limited to power lines, RF transmitters, nearby conductors, ignition systems or motors that turn on and off drawing sudden large currents.

Electromagnetic interference (EMI) is the noise caused by current in nearby conductors or cables.

**SATIC Simplified** ~ Radio frequency interference (RFI) is also a source of external noise caused by radiating signals from wireless systems.

As with radioactive radiation, the effect of EMFs can be cumulative, meaning your "EMF toxicity" may get worse the longer you are exposed.





#### Electromagnetic fields (EMF)

Electric and magnetic fields are invisible forms of energy (also called radiation) produced by electricity, which is the movement of electrons, or current, through a wire. V/m, µT, W/m2.

The electric field is produced by voltage. As the voltage increases, the electric field increases in strength. Electric fields are measured in volts per meter (V/m).

The magnetic field results from the flow of current through wires or electrical devices and increases in strength as the current increases. The strength of a magnetic field decreases rapidly with increasing distance from its source. Magnetic fields are measured in micro teslas (µT, or millionths of a tesla).

**SATIC Simplified** ~ Electric and magnetic fields together are referred to as electromagnetic fields or EMFs. The electric and magnetic forces in EMFs are caused by electromagnetic radiation.



#### Resistance ~ ohms ( $\Omega$ ):

A unit of electrical resistance of either a resistor or conductor which opposes the flow of an electric current resulting in the generation of heat in the conducting material. The measure of the resistance of a given conductor is the electromotive force needed for a unit current flow, stated in ohms.

**SATIC Simplified** ~ Ohms law of resistance is a measure of how much of the electrical energy is being converted to heat, sound, light or mechanical work as electricity travels through the circuit.

#### Hertz ~ frequency (Hz)

The number of repetitions per unit time of a complete waveform, expressed in Hertz (Hz).

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**SATIC Simplified**  $\sim$  Frequency (Hz) is how often an event repeats itself. How many waves hit the beach in one minute is their frequency.

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