

P. Sally Jewell Cox

To Whom It May Concern:

My name is Sally Jewell Cox. I submit this declaration in support of a legal effort to have the Food and Drug Administration (FDA) research, develop and promote health- and science-based human exposure standards for antennas and other devices that emit radiofrequency radiation (RFR), to publicly admit that it has never developed such standards and no such standards exist, and to do so expeditiously to prevent further harm to public health.

I am grateful for this opportunity to share my experience with RFR in the hope that the FDA, as well as the Federal Communications Commission (FCC) and other relevant agencies within the US government will take responsible and immediate action to protect the public from the mounting and ubiquitous dangers of this invisible contaminant. My life and my health have been severely impacted by prolonged exposure to high levels of RFR from cellular antennas on the roof of the building where I reside.

When I learned what was making me so ill – a constant bombardment of microwave radiation – and that the US government was failing to conduct the necessary research to understand its impact on human health and our environment, I was astonished. I wanted to believe that the government of the United States of America was truly “for the people” when it came to basic health and safety, but in this case, tragically and unconscionably, it appears that government action (or inaction) is being directed by big business—i.e., the telecom companies. What is worse, our own government agencies have turned a blind eye to a plethora of scientific and anecdotal evidence that already exists as to the detrimental effects of this radiation on human health¹³⁹.

No insurance company – including Lloyds of London and Swiss Re, the two largest re-insurers in the world, nor any others – will insure purveyors of wireless technology against claims of harm to human health, ostensibly because they know that it is already making many people sick and the inevitable claims will be substantial. Meanwhile, the mega telecom corporations are racking up trillions of dollars and amassing unprecedented power and control. We all appreciate wireless technology and the conveniences it provides, but at what cost? Surely more informed regulation and scientific due diligence is warranted to mitigate harms to the health of those the technology is meant to serve.

¹³⁹ On August 13, 2021, the U.S. Court of Appeals for the District of Columbia Circuit delivered a consequential ruling in the case of Environmental Health Trust et al. v. the Federal Communications Commission (FCC). The court found that the FCC failed to explain why it ignored abundant scientific evidence showing harmful effects from wireless radiation and that the FCC violated the Administrative Procedure Act because the FCC’s decision not to update its 1996 exposure limits failed to address impacts of long-term exposure to RF radiation, the unique impacts to children, the testimony of people injured by wireless radiation, the impacts to wildlife and the environment, and impacts to the developing brain and reproduction, as well as technological developments that have occurred since the Commission last updated its guidelines, among other issues. See <https://ehtrust.org/in-historic-decision-federal-court-finds-fcc-failed-to-explain-why-it-ignored-scientific-evidence-showing-harm-from-wireless-radiation/#:~:text=The%20Court%20ruled%20that%20the%20FCC%20must%20%E2%80%9Cprovide%20a%20reasoned,cellphones%20and%20other%20wireless%20devices.>

I have lived and worked in my apartment at 2701 Connecticut Avenue NW, Apt #702, Washington DC 20008 for the past thirty years, since December 31, 1991. My apartment is on the top floor of an historic, century-old building, now owned by Alonzo Bliss & Co. and managed by WC Smith & Co. Beginning in the mid-1990s, an increasing array of cell phone antennas has been installed on the roof. Now, there are six (6) installations, each with multiple antennas, belonging to Verizon and T-Mobile. (See Figures 1-3.)



Figure 1



Figure 2



Figure 3

Not only has my apartment been my cherished home for half my life, it has also served as the headquarters and logistical hub of the international non-profit organization I co-founded in 1998, the Bonobo Conservation Initiative (BCI). Our mission is to protect the endangered bonobo and its habitat in the heart of the Congo rainforest. Bonobos are humankind's closest great ape relatives, sharing more than 98% of our DNA. I first learned about bonobos while working as a copywriter at National Geographic. Since then, protecting them has become my passion and my life's work. Distinguished by their peaceful, matriarchal society, their remarkable intelligence, and their free-loving nature, bonobos have a great deal to teach us humans about ourselves and our own origins. The last apes to be discovered by modern science, these exceptional primates have been revered for generations by indigenous people of the Congo; they serve as a powerful flagship to protect vast areas of rainforest.

Working with indigenous communities and the government of the Democratic Republic of Congo, BCI has helped to establish legal protection for nine million acres of rainforest to date in the Bonobo Peace Forest. This forest sequesters billions of tons of carbon and provides essential ecosystem services the whole world needs to mitigate climate change and ensure our own survival. See www.bonobo.org.

While the existential threat of climate change is finally being addressed by the world at large, I now find myself in the middle of another “inconvenient truth” — the fact that the wireless technology upon which we have come to depend can be toxic to the health of humans and our environment.

Sequence of events and health impacts

- Since the mid 1990s, more and more cell phone antennas have been installed on the roof of the building where I have lived for many years. In the past decade or so, more antennas have been placed in closer proximity to my apartment on the top floor of the building. The roof deck used to be a wonderful sanctuary, a place to relax with friends, with great 360-degree views of Washington. It was one of the main reasons I decided to

move into the building. Now, the views are ruined with so many antennas, which have also made the roof deck an unpleasant and dangerous environment.

- Over the past several years, I have experienced adverse health symptoms that I now know were clearly caused or exacerbated by exposure to inordinately high levels of RFR from the cell phone towers on the roof of my building.
- Some of the symptoms began previously but got much worse in 2019. I began to experience extreme fatigue, low energy, and cognitive problems: brain fog, difficulty concentrating, and memory impairment.
- I had trouble with my eyes—intermittent twitching, burning, vision problems and a blocked tear duct in my left eye.
- My hair started falling out and in the spring of 2019, I suffered a serious hormonal imbalance, which necessitated exploratory OB/GYN surgery. Thankfully, no cancer was found.
- I also had unusual rashes, including one on my back that has persisted since July 2018. The dermatologist did not know what it was nor what caused it.
- More and more, I experienced an overall jittery, anxious feeling. I got headaches more often than usual. My sleep was irregular and I began to exhibit symptoms of depression.
- I thought that some of these problems might be due to stress and perhaps I was “burned out.” I am normally a very energetic person. I have never experienced such feelings of total exhaustion in my life.
- In May 2019, BCI held major events in New York City in honor of our 20th anniversary: a press conference at the United Nations announcing the Democratic Republic of Congo’s endorsement of the Bonobo Peace Forest, and a gala event featuring actress Ashley Judd and renowned activist Gloria Steinem. Despite the excitement and importance of these landmark events, I struggled to keep up as my energy levels were so low and I had an overall feeling of “dis-ease” or discomfort.
- Toward the end of August/early September 2019, my symptoms became even more acute. At this point, I could not work on the computer without feeling ill. I also got nauseated and felt “zapped” in the head when in my apartment. I felt a numbness and tingling on the left side of my face and head when working at my desk—the side just next to the outside wall and window. These symptoms would abate somewhat if I got away from the radiation by going outside, especially around nature.
- Why did my symptoms escalate at this time? Likely reasons: a) Two cranes from Verizon and T-Mobile came in July and August 2019 to replace or upgrade the cellular antennae on our roof, in preparation for 5G. This could have increased the level of radiation exposure in my apartment. b) I had an eye surgery for a blocked tear duct on August 23, 2019 with general anesthesia. According to medical reports, head trauma can bring on or exacerbate electrohypersensitivity (EHS), especially if a person has experienced prolonged or high levels of RFR exposure. c) During 2019, cell phone antennas were installed on the building across the street, 2700 Connecticut Avenue, one of which points directly at my apartment.

- I talked with an old friend and described my symptoms. She thought perhaps I was being affected by EMFs. On September 8, 2019, she came over with a sophisticated EMF/RFR meter (Gigahertz Solutions HF 35C HF-Analyser) that measures non-ionizing radiation, i.e., Powerflux Density, in microwatts per square meter. The moment she turned on the meter, she exclaimed, “my God, you are living in a microwave!”
- We discovered that my apartment had exceedingly high levels of RFR, in some places beyond what the meter would measure (including my office, where I spend most of my time). My next-door neighbor joined us. We measured her apartment, which had much lower radiation levels than mine (about ¼). We discovered that the hallway on the top floor had high levels, the roof was so high it was beyond what the meter would measure, but in a first-floor apartment on the side of the building with only one antenna, the levels were much lower and near the safe range.
- The next day, September 9, 2019, I reported this to the Property Management at WC Smith. At that point, WC Smith was immediately responsive and understood that I needed to evacuate the apartment immediately. I spent 2 weeks in hotels in Washington at first, thankfully arranged by WC Smith.
- I began to research the problem and to alert other neighbors in the building, working in tandem with WC Smith.

Building Inspections

The first action taken by WC Smith was to set up an inspection performed by Site Safe on September 20, 2019. This assessment was actually arranged (and possibly paid for) by Verizon and/or T-Mobile. Their report only measured frequencies and thermal effects of microwave radiation, as per the current FCC guidelines. It was at this time that we learned that the FCC guidelines for RFR exposure are 25 years old—they have not been updated since 1996! They do not take into account the non-ionizing radiation, which many scientific studies show causes health problems in humans and other living things, including cancer, mitochondrial damage, and cognitive problems. The Site Safe report denied any danger and claimed that the antennae and resulting radiation are compliant with FCC standards.

When tenants learned that the Site Safe inspection had been arranged by Verizon, they complained and requested an independent assessment. WC Smith arranged another inspection by Washington Labs on October 8, 2019. Their report, although more extensive, basically corroborated that of Site Safe, and only measured frequencies in relation to the outdated FCC standards.

In an effort to get a more thorough and honest third-party assessment of the radiation affecting myself and other tenants, I arranged for an inspection by Ray Pealer of EMR Safety Consulting, which took place on October 9, 2019. Some other tenants on the upper floors participated and representatives of WC Smith were present. During the inspection, Mr. Pealer provided background and shared scientific reports about the dangerous health effects of non-ionizing radiation from cell phone antennas. He also discussed shielding options to reduce radiation within apartments in the building. The [EMR Safety Consulting report](#) confirmed that the antennas on the roof are exposing residents to extremely high and dangerous levels of RFR and

that some apartments are more affected than others—with my apartment and one other on the top floor receiving by far the highest levels—greater by orders of magnitude, due to their proximity and placement in relation to the antennas.

The EMR Safety Consulting report was distributed to WC Smith and a group of concerned tenants. Despite our requests that WC Smith inform all tenants in the building, this was not done. One tenant, who has lived on the sixth floor for many years, in the tier beneath the highest concentration of antennas, had been experiencing fatigue and thyroid issues. **He shared the EMR Safety Consulting report with his endocrinologist, who immediately ordered a sonogram and discovered that he had thyroid cancer.** He had his thyroid gland removed in December 2019 and continues to undergo treatment.

Health Impacts: Medical Diagnosis and Mitigation

I had little to no knowledge about the health effects of RFR until this all came to light in September 2019. Upon this discovery, I began intensive research and networking to learn about the health effects and how to ameliorate my symptoms. In October, I traveled to California for a wildlife conservation conference. Since I could not live in my apartment without getting ill, I arranged to stay with a long-time friend and benefactor, Lori Grace, at her house in Tiburon, CA as I tried to heal and get a handle on the problem.

In California, I was referred to Dr. Toril Jelter who is an expert in EMF/RFR related illness. She diagnosed me with Microwave Radiation Syndrome and Electrohypersensitivity (EHS). She advised me that the first most important thing to ameliorate the symptoms was to live away from radiation and if that was not possible to shield my living space and to reduce or eliminate exposure to non-ionizing radiation (i.e., RFR and EMF) as much as possible.

Beyond that, she provided a number of recommendations including antioxidant supplements and treatments to counteract the oxidative stress caused by microwave radiation. She advised me to engage an Integrative/Functional Medicine Doctor to identify metabolic dysfunction, oxidative stress, imbalances, and deficiencies and to treat them. She recommended that I spend at least one hour each morning doing physical grounding, exercise, and meditation to relieve symptoms and balance the limbic system, which goes into a “fight or flight” mode from the toxic radiation. She also advised me to have dental metal (i.e., metal fillings, crowns) removed by a specialist and replaced with non-metallic materials. She told me that I would probably need some regenerative therapies to help build up more resilience and to reduce the sensitivity, which even under optimal conditions can take up to 2 years.

This all happened at a pivotal time for my non-profit organization when we were developing new sources of funding and gearing up for a new phase of our work. During that time, I was distraught, still experiencing adverse health symptoms, and so sensitive to the computer, Wi-Fi, and my cellphone that I found it very difficult to work. This had real and consequential opportunity costs to my organization and funding proposals that were in progress at the time with USAID and large foundations because I was not able to effectively manage the work, due to this bizarre illness.

I have become a human antenna!

It is hard to describe what it feels like and what happens when you are electro-sensitive, as I have become—not to mention the fact that this condition affects multiple systems in the body, so it is hard to get a handle on it. While in California and up to now I cannot ride in an electric car without instantly getting a headache and nauseous. I experience similar symptoms in other contemporary vehicles with Wi-Fi and built-in GPS, and in offices and areas with high EMF or RFR. In other words, not only is this disabling condition affecting my livelihood and ability to work, but practically all areas of life.

It became clear that the only way I could re-enter my apartment—even long enough to move out—would be to shield it to reduce the radiation. I consulted Ray Pealer, the building biologist, who recommended using shielding paint and clear window film. His estimate was \$8,000 for this work. This was rejected by WC Smith and they forbade the use of the shielding paint. My only recourse was to shield the apartment myself, using heavy duty aluminum and window screens. I had to hire labor to do this work and the WC Smith custodians also pitched in after hours.

I also had to purchase a protective bed canopy woven with silver fibers, which cost \$2,000. Despite the exorbitant cost, this made all the difference and is the one place in the apartment that is truly an oasis of relief. Building biologists and medical experts advise that it is extremely important to sleep in a radiation-free area. With good sleep, the body produces melatonin, which acts as a powerful anti-oxidant that helps to recover from the effects of the RFR and strengthen resilience. I hired a technician to hard-wire my internet and eliminate Wi-Fi in the apartment. I purchased shielding clothing—a hoodie, pants, and lap blanket—to help mitigate the effects so that I could be out in the apartment.

I was able to partially shield my large two-bedroom apartment – most ceilings and outside walls – and screens over the windows. All of these measures have cost thousands of dollars and still the radiation in the apartment is too high to be comfortable or safe. It has also destroyed the aesthetics of my once beautiful apartment. It's like living in a tin can with aluminum all over the place.

It became clear that either the antennas would have to go, WC Smith would agree to provide better shielding, or I would have to move out. We were negotiating how to work it out when the Covid 19 pandemic hit. This further complicated matters.

I was able to arrange temporary lodging with family in my hometown of Asheville, NC, where I stayed during the lockdown in 2020. I was able to start getting work back on track. Since then, I have continued to seek medical advice from experts familiar with RFR illness. I found that most physicians are not even aware of it. I have consulted with Dr. Elizabeth Seymour of the Environmental Health Center of North Texas, which offers comprehensive integral medical services for EHS/microwave illness. Because treatment is an iterative process, depending on test results, she provided a reasonable estimate of the kinds of tests and treatments for people with my condition. Treatment usually takes at least two years and can run up to \$15,000.

I have also consulted with Dr. Sharon Goldberg, Internal Physician, who is an expert on Microwave Radiation Illness. Highly recommended, Dr. Goldberg organized the recent EMF Medical Conference (<http://conference2021.com>) and she has also testified before US Congress about this public health issue. I have continued to consult with Dr. Goldberg regularly. Dr. Goldberg has advised me on ways to ameliorate my condition and to create a safe living environment where I can heal, until I am able to pursue comprehensive treatment. Integrative medical services are not covered by my health insurance policy. As of now, I have not been able to afford specialized medical care and have paid out of pocket for consultations so far.

The proper testing will elucidate what further treatment is needed and if I have any other serious conditions beyond what is already known. RFR is proven to be cancerous and to cause cellular and cognitive damage. I have never been more concerned about my health.

Disruption and Damages

In October 2020, I went back to Washington, thinking that I would try to shield the apartment better and see if I could hold out a few more months while trying to work out solutions and raise funds to move. Within 15 minutes of being in the apartment, my entire face went numb and I realized that I really had to move out ASAP. I found a place to rent in Asheville in a rural setting, and sort of camped out there until I was finally able to arrange for movers, which was also a very expensive and exhausting enterprise. In addition to my apartment, I have rented two storage rooms in the building for myself and all of BCI's files and field equipment. Pulling up stakes after thirty years is no easy feat.

As of this moment, I am still holding out hope that WC Smith will do the right thing and stand up for the health of its tenants—and do right by me. Earlier this year, T-Mobile was preparing to install 5G on the roof. Due to ongoing concerns from tenants, WC Smith asked T-Mobile to wait on the 5G, at least until the pandemic had subsided. T-Mobile threatened to sue WC Smith for breach of contract, and the 5G equipment was installed at the end of March 2021. Since then, when I have been in the apartment, I experience extreme tinnitus – a very high pitched sound that is unnerving.

On November 3, 2021, additional measurements were conducted by Cardinal Communications using a large inventory of calibrated antennas and spectrum analyzers, which were operated by a professional radio site testing analyst. A report was subsequently issued December 19, 2021. Measurements revealed that according to Crest Factor analysis, the emissions routinely spike to 132-to-264% beyond the FCC Human RF exposure standard. Other very concerning data revealed that (i) Human RF exposure standards may be further impacted, and (ii) industry mobile telephone usage Specific Absorption Rate (SAR) guidelines may also be distorted, especially when people bring their mobile telephones to the rooftop terrace. [See ATTACHMENT 1]. Relatedly, the IEEE Microwave Magazine for January 2022 includes an article *Health Safety Guidelines and 5G Wireless Radiation* that validates that material gaps exist in studies across the

full range of wireless mobile bands and that there are “significant anomalies” in recently updated safety recommendations.¹⁴⁰

I have appealed to WC Smith for “reasonable accommodation” as permitted by the Americans with Disabilities Act (ADA) and the Fair Housing Amendments Act (FHAA), but my requests have been denied. WC Smith and the telecom companies continue to rely on the false and outdated FCC standards as justification to avoid compliance.

My life, my health, and my organization’s mission have all been severely damaged as a result of extremely high and prolonged exposure to RF radiation from the cell phone towers on the roof above my apartment. My requests to WC Smith for reasonable accommodation to provide safe living conditions and to ameliorate my injuries have not yet been honored—nor have requests from other tenants to address the problem, which also puts them at risk. Now more than two years after the problem came to light, I am still suffering from considerable financial losses and debilitating health issues. Up to now, I have not received the consideration and remuneration required to even begin to recover from these losses and the damages to my health, nor to cover the costs of moving to a new location.

The bottom line is: cell phone antennas should not be placed so close to human habitation! Having multiple cell phone tower installations right over our heads on a 100-year old building, just a few feet overhead, is extremely dangerous. It is proven that the magnitude of microwave radiation decreases with distance. No matter how convenient, or how much money can be made by renting space to telecom companies, it is not worth it because it is jeopardizing the health of people in close proximity. I am urgently calling on the FDA to do its job and please put reasonable safety standards on this health hazard before many more people become seriously ill or die from the exposures.

I hope that my experience can help to shed light on this growing problem and help others who are suffering from RFR exposure. A clarification of the FDA policy will contribute significantly to ameliorating my situation, and that of thousands of other tenants and real estate managers across the country.

Under penalty of perjury, I declare that the foregoing is true and correct to the best of my knowledge and belief.

¹⁴⁰ IEEE Microwave Magazine: For the Microwave & Wireless Engineer, Volume 23, Number 1, January 2022. *Health Safety Guidelines and 5G Wireless Radiation*, by Dr. James C. Lin. <https://ieeexplore.ieee.org/document/9632507>

Dr. Lin is Professor Emeritus in the Department of Electrical and Computer Engineering at the University of Illinois Chicago. He is an expert on the biological interactions of wireless radiation. He is a fellow of the American Association for the Advancement of Science and the Institute of Electrical and Electronics Engineers (IEEE). Since 2006 he has been the Editor-in-Chief of the [Bioelectromagnetics journal](#) published on behalf of the [Bioelectromagnetics Society](#) (BEMS), an international organization of biological and physical scientists, physicians and engineers.

/s/ Sally Jewell Coxe

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November 16, 2021

ATTACHMENT 1

RF Exposure Analysis: 2701 Connecticut Avenue, NW, Washington, DC
Cardinal Communications, a Division of Thought Delivery Systems, Inc.
for THE BALANCE GROUP

Version: 12/19/2021, 8:20pm

SUBJECT: EXECUTIVE SUMMARY: HUMAN RF EXPOSURE ANALYSIS

LOCATION: 2701 Connecticut Avenue, NW, Washington, DC



Overview:

A detailed radio frequency (RF) emission field study was conducted on November 3, 2021 at 2701 Connecticut Avenue, NW, Washington, DC. Mobile network base stations are operating on and near the premises.

Insufficient Prior Studies: Previous Human RF exposure studies conducted at this location by carriers and also by private entities were reviewed. These studies appeared to not conduct and/or report measurements in critical tenant-accessible locations, nor to utilize calibrated instrumentation capable of measuring all the necessary cumulative emissions, nor to assess other aspects of RF emissions present.

FCC Human RF Exposure Standard Exceeded: Using very conservative measurements and analysis, the Federal Communications Commission (FCC) Human RF exposure standard appears to be regularly exceeded in the publicly accessible rooftop terrace area by a factor of at least 132.31% of the appropriate maximum FCC value when accounting for a mitigated Crest Factor.

- Approximately 43.23% of the FCC Human RF public standard was measured *without* accounting for mobile phone operations, especially SPECIFIC ABSORPTION RATE (SAR) and *without* accounting for any CREST FACTORS and *without* measuring all the radiation impacting the premises using ADDITIONAL EQUIPMENT.¹

¹ For example, both spectrum analyzers detected a very strong approximately 660 MHz signal, using an AARONIA Omnilog Model 735 (700MHz-to-2.5 GHz uncalibrated whip antenna). A more sophisticated antenna, calibrated for that band may have provided additional measurements that may have added to the cumulative exposure values.

- This apparent 132.31% exposure over the FCC standard may be actually significantly higher because it does not account for:

(1) Human RF exposure from mobile phones on the premises. Mobile phone base stations communicate with mobile phones and typically other base stations (depending on backhaul systems, and hand-off architecture, etc). Mobile phones operated next to a base station, for example on a rooftop terrace that also houses base-station installations, add to the cumulative RF exposure of those human beings which may be on the rooftop, in the building, or nearby. The mobile phones and the base stations are part of the same network operation. Mobile phones also have separate FCC Human RF exposure standard Specific Absorption Rate (SAR) requirements. When operated so close to mobile network base stations, (i) mobile phone operations may also have their usage guidelines distorted or violated, and (ii) reasonable and normal mobile phone usage on the premises may require alteration, and (iii) people on or near the premises may not be sufficiently noticed as to these mobile phone usage dynamics.

(2) No Crest Factor Mitigation. In the event that the rooftop and nearby mobile base stations were not deployed with Crest Factor mitigation techniques, the FCC Human RF exposure standard appears to be regularly exceeded by a factor of at least 264% of the appropriate maximum value.²

(3) No Additional Calibrated Antennas for Specific Spectrum Bands. It is possible that cumulative RF exposure levels may be detected if additional instrumentation is brought to the premises, such as additional, specialty calibrated antennas (as noted in footnote 1), and signal analyzers.

Assessments conducted by:

T.Brinkoetter (measurements and analysis) J. Sandri (research and development)

² The actual cumulative exposure levels may be higher when also accounting for:

- (i) Human RF exposure from mobile phones on people and/or on premises. Mobile phones have separate FCC Human RF exposure standard Specific Absorption Rate (SAR) requirements. When combined with the mobile network base stations, the mobile phone operations may also have their usage guidelines violated. By engaging in reasonable and normal mobile phone usage on the premises, mobile phone users may not be sufficiently noticed about safety concerns or possible Human RF exposure violations by the radio frequency licensees whose base station emissions are contributing 5% or more of the cumulative signal; and
- (ii) Introducing additional calibrated antennas to more accurately measure exposures in other spectrum bands, such as at 660 MHz (as noted in footnote 1).

Cardinal Communications, A Division of Thought Delivery Systems, Inc.:

www.ThoughtDelivery.com ph: 202.223.2003 Cardinal@ThoughtDelivery.com

EQUIPMENT & METHODS

NOTES
NOTE 1: The 143dBuV/m field strength measurement was arrived at using CALIBRATED ANRITSU Spectrum Analyzer Model MS2090A coupled with ANRITSU 2000-1791-R EMF isotropic antenna probe.
NOTE 2: Two calibrated spectrum analyzers were used (i) ANRITSU MS2090A Spectrum Analyzer, which can assess from zero (0) MHz-to-43 GHz, and (ii) Rhode & Schwarz Model FPH, which assesses from zero (0) MHz-to-4GHz. ANRITSU found on the rooftop approximately 43.23% of the FCC Human RF public standard <i>without</i> accounting for mobile phone operations, especially SPECIFIC ABSORPTION RATE (SAR) and <i>without</i> accounting for CREST FACTORS. Both spectrum analyzers detected a very strong approximately 660 MHz signal, using an AARONIA Omnilog Model 735 (700MHz-to-2.5 GHz uncalibrated whip antenna).
NOTE 3: 4G and 5G modulation CREST FACTORS are typically 20x (i.e., 13dB). CREST FACTORS currently cannot be completely eliminated in field operations. In the event that the mobile operators deployed CREST FACTOR mitigation, a conservative analysis was also conducted that only calculated using a much reduced 10x (ie, 10dB) crest factor. CITE for 20x (13dB) standard CREST FACTOR: http://justinpanzer.com/wp-content/uploads/2019/04/RF-Globalnet-Talkin-Test_Aug11_08.pdf
NOTE 4: The number reaches 132.31% (apparently violating FCC standard when including conservative 10x (10dB) CREST FACTOR). This 132.31% does not even include calibrated measurements related to the (Approx 660 MHz band) base station signal found using both the ANRITSU Model MS2090A and the Rhode & Schwarz Model FPH spectrum analyzers.
NOTE 5: The HUMAN RF standard reaches 264% (apparently violating FCC 100% standard when including the normal 20x (13dB) CREST FACTOR).
NOTE 6: Impacts to mobile telephone operational guidelines based on these measurements are analyzed elsewhere in this study.
NOTE 7: Measurements of the millimeter wave (mmWave) band from 26.5 GHz-to-40 GHz were conducted using the ANRITSU MS2090A Spectrum Analyzer coupled with the WR-28 Omni Directional Antenna made by Sage Microwave.
NOTE 8: CREST FACTOR measurements can be taken using signal analyzers, such as the Tektronix RSA 306B Analyzer. For example, a recent 4G LTE base station's 751 MHz operations were measured at another location and revealed a peak to average of 14.88 dB. The measurements and analysis at 2701 Connecticut Ave, NW, Washington, DC used a more conservative 10 dB Crest Factor and still resulted in apparent FCC Human RF Exposures spiking over the FCC Human RF exposure value by at least 132%.



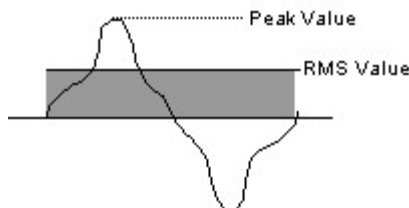
DIRECT HUMAN EXPOSURE CALCULATED AT *LEAST OVER 132%* OF THE ALLOWABLE FCC HUMAN RF EXPOSURE LIMIT WHEN INCLUDING AN ASSESSED, MITIGATED CREST FACTOR. IF THERE IS NO CREST FACTOR MITIGATION, THE EMISSIONS *MAY BE AT LEAST OVER 264%* OF THE ALLOWABLE HUMAN RF EXPOSURE LIMIT.

XIII. Crest Factor

What is Crest Factor

The crest factor is the ratio of peak value to RMS¹⁴¹ value of waveform as shown in below figure.

This ratio is also called to peak-to-RMS ratio. The crest factor is expressed as follows: Crest Factor (peak-to-RMS ratio)= (peak value)/(RMS value)

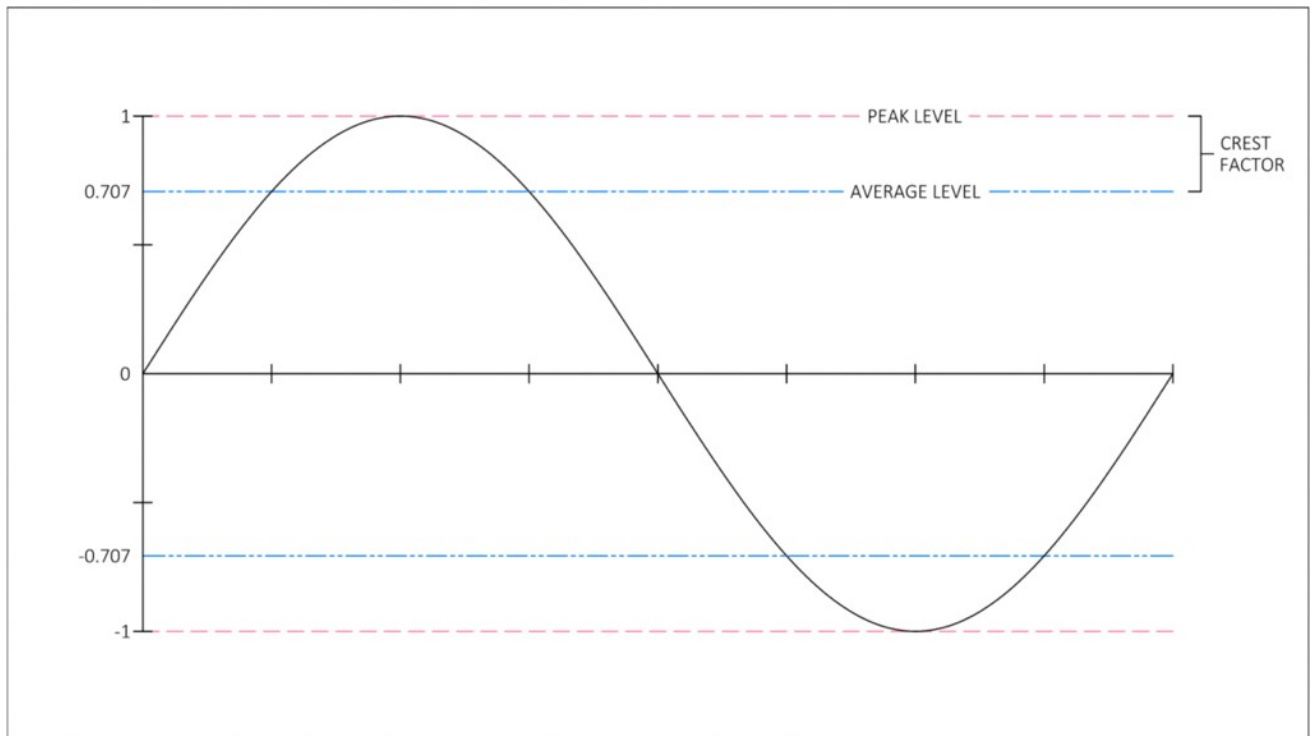


"Crest factor, defined. Simply stated, crest factor—sometimes called peak-to-average ratio—is the difference in decibels between the peak and average levels of a signal. In the strictest technical sense, it only applies to steady-state signals like sine, square, saw, or triangle waves."¹⁴²

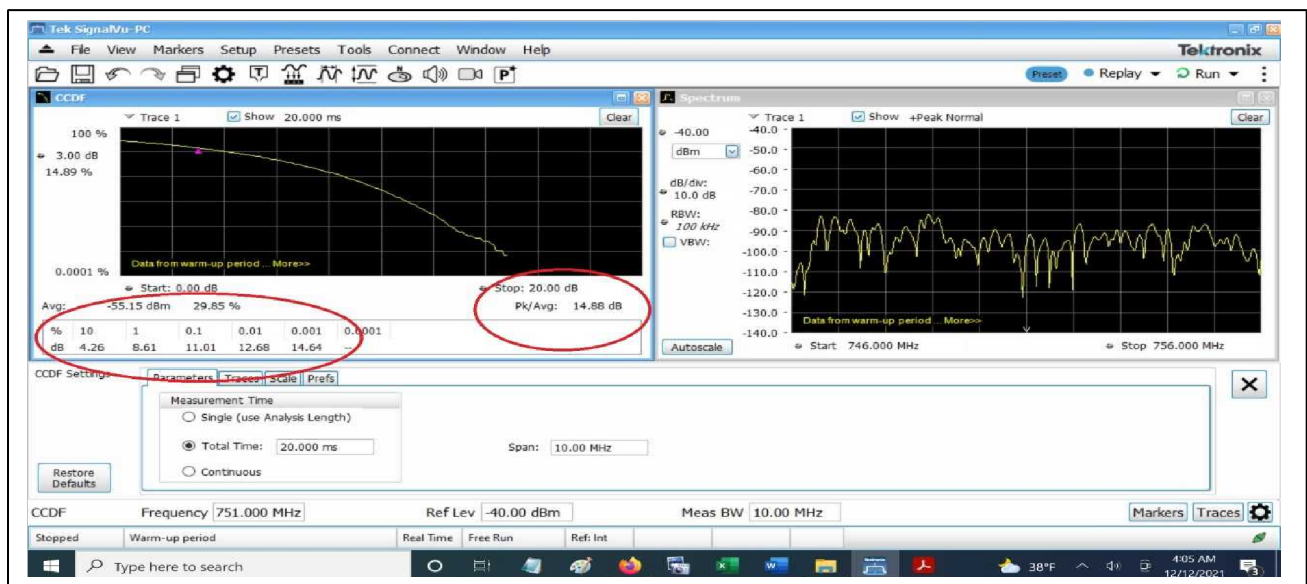
¹⁴¹ The RMS value of a set of values (or a continuous-time waveform) is the square root of the arithmetic mean of the squares of the values, or the square of the function that defines the continuous waveform. In physics, the RMS current value can also be defined as the "value of the direct current that dissipates the same power in a resistor."

"Root-mean-square value". A Dictionary of Physics (6 ed.). Oxford University Press. 2009. ISBN 9780199233991

¹⁴² "What Is Crest Factor and Why Is It Important?" by Ian Stewart, iZotope Contributor July 28, 2020, <https://www.izotope.com/en/learn/what-is-crest-factor.html> (last accessed, Nov. 17, 2021).; For further information on Crest Factor see also: (i) L. D. da Silva and E. G. de Lima, "A Novel Limiter with Application in Crest Factor Reduction Techniques for Wireless Communications," *2018 31st Symposium on Integrated Circuits and Systems Design (SBCCI)*, 2018, pp. 1-6, doi: 10.1109/SBCCI.2018.8533234, [A Novel Limiter with Application in Crest Factor Reduction Techniques for Wireless Communications | IEEE Conference Publication | IEEE Xplore](#), [last accessed, December 10, 2021] ; and (ii) "Wireless Base Station With Reduced Crest Factor," by Manoj Gupta, Hamid Ali, *International Journal of Scientific & Engineering Research*, Volume 6, Issue 5,



A typical Crest Factor measurement using a Tektronix RSA306 Analyzer at a 4G LTE base station at 751 MHz: Peak to average is 14.88 dB.



May-2015 ISSN 2229-5518 <https://www.ijser.org/researchpaper/WIRELESS-BASE-STATION-WITH-REDUCED-CREST-FACTOR.pdf>