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Cell Tower Radio Frequency Radiation Assessment

[redacted]
Skyline Gateway Apartments, 3rd floor
4601 E Skyline Dr.
Tucson, AZ 85718

May 2022

Conducted by
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1. Background and purpose of assessment

The purpose of this assessment was to measure the levels of Radio Frequency (RF) radiation in the residence of [redacted], who reside on the up-most, third floor of the Skyline Gateway Apartments. The residence's upper west wall is approximately 18 feet from the antennas of a T-Mobile Wireless Telecommunications Facility (WTF), also known as a macro cell tower, located on the roof of the building. The cell tower was first installed in 2018 and then upgraded in December 2021.

Ms. [redacted] reports that in the months since the tower upgrade her six-year old daughter began to develop headaches that she had not experienced previously. She also began to have chronic, back-to-back sinus and ear infections requiring multiple rounds of antibiotics, and her sleep was disturbed. Ms. [redacted] herself began to experience headaches and sleep disturbances, the latter including unusual waking up during the night, falling asleep during the day, and occasional shakiness on waking. One day she woke up feeling "bruised all over." She experienced episodes of feeling off balance (bumping into things) and chronic symptoms of parasympathetic upregulation. She also had recurring sinus infections (three since December 2021), while only one previously in her lifetime.

Several other Skyline Gateway Apartment neighbors with residences in close proximity to the cell tower antennas told Ms. [redacted] that they had been experiencing insomnia since the tower upgrade, with one neighbor being referred to a neurologist and now undergoing a sleep study. The third-floor neighbor in the apartment adjacent to the [redacted] (even closer to the tower site), moved out because "she was dizzy all the time" in the apartment.

Ms. [redacted] also reports that after the tower upgrade she began to hear continual periodic "whooping" and loud humming sounds from the direction of the antennas that disturbed her sleep and the quiet enjoyment of her home.

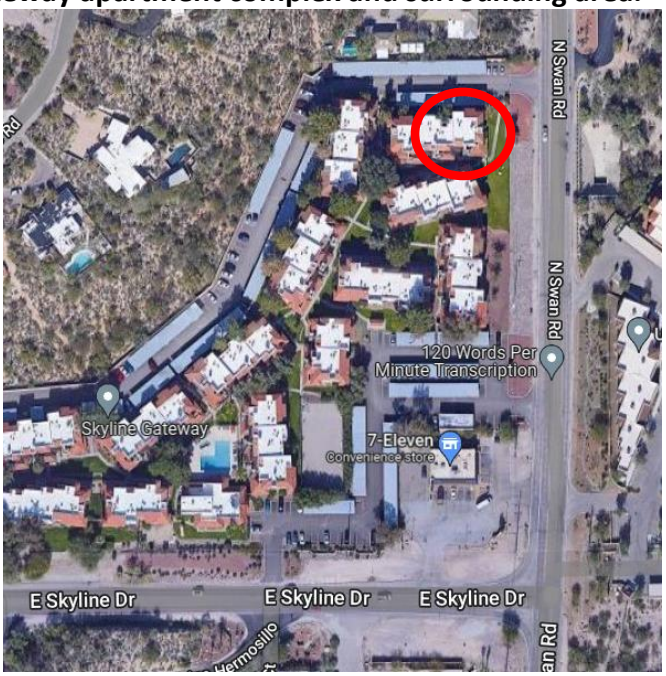
Given the above, the purpose of this assessment was to answer the following questions:

(1) What are the levels of RF radiation in the residence and how do they compare to safe levels?;
(2) What are the sources of the radiation?; and
(3) What can be done to mitigate the [redacted] family's exposure to the radiation?

The assessment measured levels of RF radiation in all main living areas of the residence, with special emphasis on the bedrooms, and compared them to established safety standards for exposure to RF radiation. A primary goal was to determine if radiation is coming into the residence from the exterior and, in particular, whether it is coming from the direction of the WTF. The residence is approximately 800 square feet and consists of two bedrooms, a living and dining room area, a kitchen, and a bathroom.

Figure 1 below shows the location of the [redacted] Family residence and the T-Mobile WTF in relation to the Skyline Gateway apartment complex and surrounding area. Figure 2 gives the location of the WTF in relation to the [redacted] residence.

Figure 1. Location of [redacted] residence and T-Mobile Wireless Telecommunications Facility within the Skyline Gateway apartment complex and surrounding area.



Source: Google Earth.

Figure 2. Location of T-Mobile Wireless Telecommunications Facility in relation to [redacted] family residence



Source: Google Earth.

2. Summary of findings and recommendations

This assessment first verified that there is indeed a T-Mobile Wireless Telecommunications Facility, a macro cell tower, on the rooftop of the Skyline Gateway apartments that is approximately 18 feet from the upper-West perimeter of the [redacted] residence.

Measured Radio Frequency (RF) radiation levels (or "power densities") in the interior of the [redacted] residence were found to be highly unsafe for the general population and especially unsafe for a young child as children are more vulnerable to the negative biological effects of the radiation than adults. RF radiation was measured at 35 points throughout the residence. The average power density was 189,562 $\mu W/m^2$ —190 times above the Extreme Concern safety category of the Building Biology Guidelines, the established standards for assessment of biologically safe levels of RF radiation. The power density in the child's bedroom rose to 616,000 $\mu W/m^2$, which is 616 times the Extreme Concern safety category and far surpasses the maximum allowable exposure limits of numerous countries, including China, Russia, France, Italy, Poland, Hungary, Switzerland, Belgium and Austria.

The assessment determined that the rooftop T-Mobile macro cell tower is the source of the extremely high radiation levels in the [redacted] residence, levels that are highly toxic and dangerous to human beings. As established in a large body of industry-independent, peer-reviewed studies, the elevated levels of radiation are associated with a wide variety of symptoms, including those experienced by Ms. [redacted] and her daughter. They are also linked with serious adverse health effects, including neurological disorders, reproductive and genetic damages, and increased risk of cancer.

When human beings are exposed to such high and continuous doses of RF radiation in their living environment, especially during critical sleep time when the body heals and detoxifies, there is little possibility of symptom relief. Continued exposure will increase the [redacted] family's risk of contracting debilitating, life-threatening illnesses.

In the absence of the ability to completely shield the roof, walls and windows of the residence from the incoming radiation, it is recommended that the [redacted] family move to a new home with safe levels of RF radiation as soon as possible. A relocation is particularly urgent as continual exposure to RF radiation at unsafe levels can lead to permanent Electromagnetic Sensitivity (EMS), a disability in which people become sensitive to all sources of RF radiation and other Electromagnetic Fields.

3. Information on the T-Mobile Wireless Telecommunications Facility

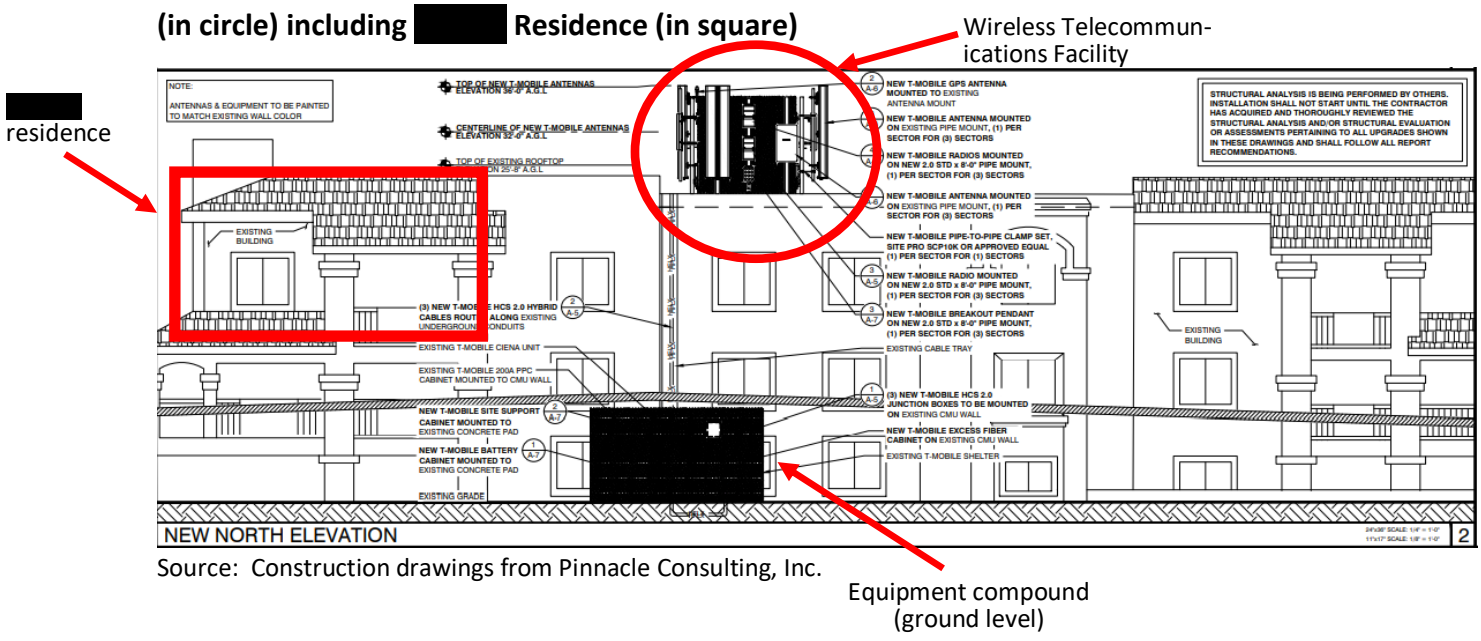
Permit documents obtained from the office of the Pima County Chief Zoning Inspector verify that a T-Mobile Wireless Telecommunications Facility is indeed located at 4601 E. Skyline Dr. and at the location indicated by the Google Earth photos above (latitude 32.3245 degrees N, -110.8930 degrees W). The T-Mobile site identification number is PH50497A, and the property owner is HSL Skyline Gateway Properties, LLC. The WTF was approved for code compliance by Pima County on 03/04/21. It is a macro cell (as opposed to small-cell) tower.

According to construction documents, after the upgrade the facility contained six antennas, three Commscope FFVV-65c-r3 antennas and three Nokia AEHC 41 antennas. The center line of the antennas is at 32 feet above ground level.

Cellmapper.net, a crowd-sourced cellular tower and coverage mapping service, indicates that the antennas are part of T-Mobile's 4G and 5G networks with frequencies ranging from 632 to 2,599.35 MHz. These frequencies fall within the measurement ranges of the RF meters used for this assessment (see Section 5 below). T-Mobile's coverage map indicates that the 5G antennas provide coverage for the company's "5G Ultra Capacity" service. Detailed information from cellmapper.net on the frequency bands being emitted from the six antennas can be found in Appendix 1.

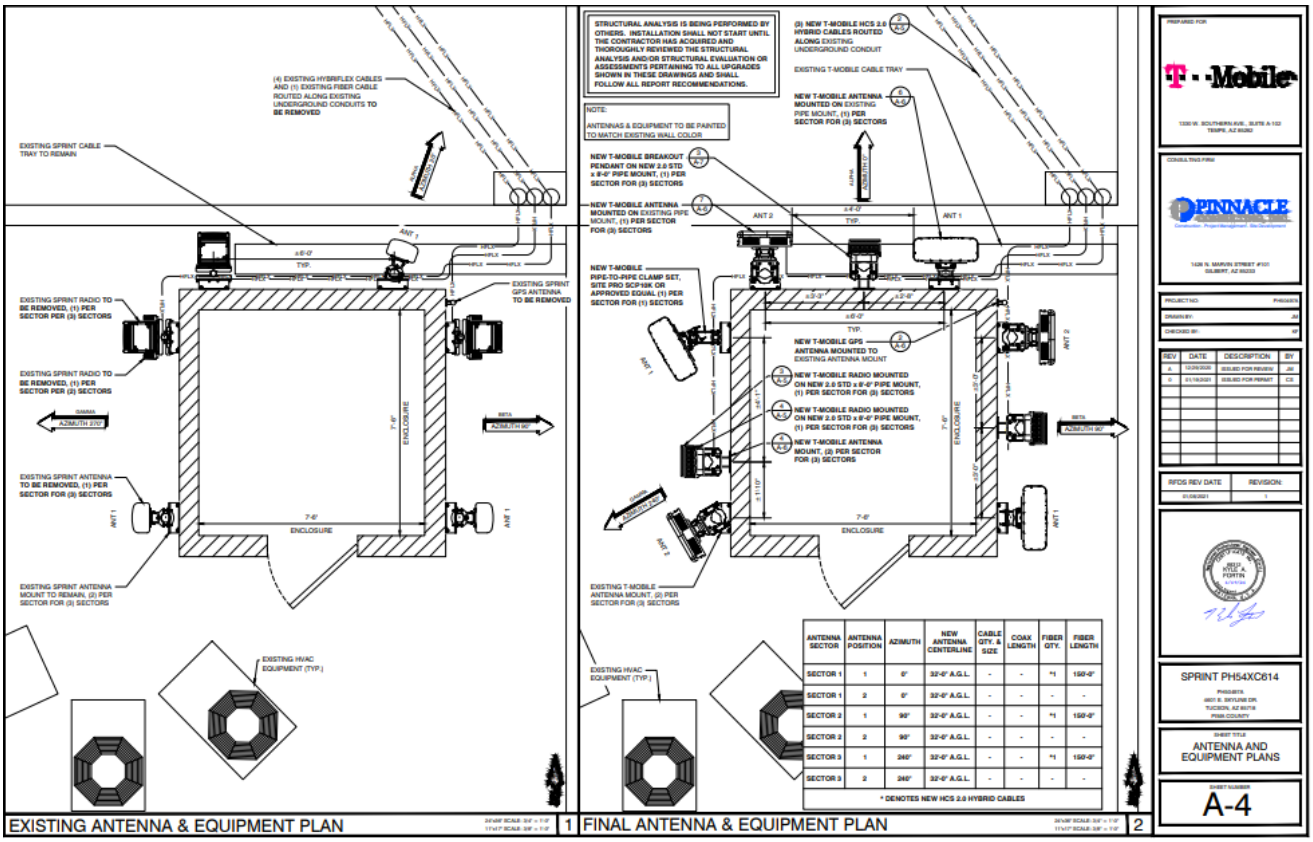
Figure 3 is a diagram of the position of the WTF in relation to the [redacted] residence from the Construction Drawings provided in the Pima County permit documents. Figure 4 displays the WTF antenna configuration before and after the December 2021 upgrade. It verifies that the roof-top WTF contains three antennas capable of emitting RF radiation in the direction of the [redacted] residence (Azimuth 90°, due East).

Figure 3. Construction drawing of upgraded T-Mobile Wireless Telecommunications Facility (in circle) including [redacted] Residence (in square)



Source: Construction drawings from Pinnacle Consulting, Inc.

Figure 4. Construction drawings of pre-upgrade and upgraded T-Mobile Wireless Telecommunications Facility



Source: Construction drawings from Pinnacle Consulting, Inc.

The following photos, taken from ground level below and to the West of the [redacted] residence, verify the physical existence of the WTF and its ground-level equipment compound.





This close-up of the NOTICE sign on the door of the equipment compound makes it clear that people who are in close proximity to a cell tower antenna, as are the members of the [redacted] family when in their home, should (1) have electromagnetic energy awareness training; (2) not stop in front of an antenna; and (3) use personal RF monitors while near antennas.



4. Radio Frequency Radiation safety standards

This assessment used safety standards developed by the Building Biology Institute (BBI) that were established based on analysis of industry-independent scientific studies of the biological effects of RF radiation on the human body.

The standards are as follows:

	Unit of measure	No Concern	Slight Concern	Severe Concern	Extreme Concern
RF Radiation	$\mu W/m^2$	<0.1	0.1 - 10	10 – 1,000	>1,000

Source: Building Biology Evaluation Guidelines for sleeping areas (SBM-2015).

Any RF radiation level above 1,000 $\mu W/m^2$ is considered of "extreme concern" and dangerous for long-term exposure, such as daily exposure over many hours.

For reference, Table 1 contains national Radio Frequency radiation exposure limits of countries across the globe, including the United States.

Table 1. National Radio Frequency radiation exposure limits

Country	Maximum legal exposure limit (uW/m2)
Austria (outdoor)	1
Lichtenstein	1,000
Belgium, Bulgaria, Luxembourg, Ukraine	24,000
Switzerland	95,000
China, Russia, Italy, France, Poland, Hungary	100,000
United States	10,000,000

Most countries' exposure limits are far above the Extreme Concern cut-off of the above safety limits yet below 100,000 $\mu W/m^2$. The United States exposure limit—which is used to regulate the amounts of radiation emitted from cell tower antennas—is 10,000 times higher and currently the least protective in the world. Set by the Federal Communications Commission (FCC) in 1996, it is based on heating effects of RF radiation rather than on the avoidance of a wide expanse of biological effects that do not involve tissue heating (see Section 7 below). No *biological* exposure guidelines exist for long-term exposure to RF radiation in the United States. The current RF exposure limit is not relevant to cell tower radiation, the subject of this assessment, because it is based on only 30 minutes of exposure. Cell towers typically emit radiation 24 hours a day as long as a cell tower is operational.

It is important for parents, teachers and government officials to understand that children are more vulnerable to the negative health effects of RF radiation because their developing brains are more sensitive, they absorb higher levels of radiation deeper into their brains (as their skulls are thinner), and they will have a lifetime of exposure in front of them. Despite this greater vulnerability, no exposure guidelines have been developed specifically for children.[1]

Note also that on August 13th 2021, the US Court of Appeals, DC Circuit (the second-highest court after the Supreme Court), officially ruled that the FCC's limits do not take into account the now voluminous science showing adverse health effects and, specifically, that it has failed to take into account (1) the impacts of long-term exposure; and (2) the impacts of wireless radiation on children's developing brains and bodies. The court ordered the FCC to address these impacts in an update of its limits, but gave no deadline to do so. Meanwhile, the United States is in a period where federal exposure limits are not based on the available science regarding the negative health effects of RF radiation, especially the effects of long-term exposure, such as that from continuously emitting cell towers, and effects on children.[2]

[1] A recent study published in *Environmental Health* thus calls for radiation exposure limits for children hundreds of times lower than current FCC limits (Uloma Igara Uche & Olga V. Naidenko. 2021. "Development of health-based exposure limits for radiofrequency radiation from wireless devices using a benchmark dose approach." *Envir. Health*, Volume 20).

[2] To learn more about the August 2021 ruling see https://ehtrust.org/in-historic-decision-federal-court-finds-fcc-failed-to-explain-why-it-ignored-scientific-evidence-showing-harm-from-wireless-radiation/

5. Meters employed for this assessment

This assessment employed four meters:

(1) **Safe and Sound Pro II** (covering 200 MHz to 8 GHz), a meter used by the Global RF Monitoring Network for tracking RF radiation levels globally. This meter was used for spot measurements throughout the home.

(2) **Gigahertz Solutions HFE59B Ultra Broadband Quasi Isotropic UBB27 Antenna** (27 MHz to 3.3 GHz). This meter was used to log RF radiation levels over a short (15 minute) time period to identify any short-term temporal patterns and pulsations.

(3) **Gigahertz Solutions HF35C directional antenna** (800 MHz to 2.7 GHz). This meter was used to identify sources of RF radiation from within the apartment and determine the direction from which exterior sources of radiation enters the residence.

(4) **Gigahertz Solutions NFA1000**, along with the NFASoft Software, was used to record the data logging using (2) above.

6. Assessment results: Measured levels of Radio Frequency Radiation

RF radiation power densities were measured with all wireless devices in the home, including a wireless router, a television, and a wireless printer, disabled. The wireless antennas on cell phones were also disabled (cellular, wi-fi and Bluetooth).

Table 2 summarizes the findings. Levels of RF radiation throughout the home are far above the upper limit of the Extreme Concern safety category of the Building Biology Guidelines (1,000 $\mu W/m^2$). The whole-home mean measured power density is 189,562 $\mu W/m^2$.[3]

The highest and most hazardous levels found were in the middle of the child's bedroom. In this room the power densities rose to 616,000 $\mu W/m^2$, a full 616 times above the Extreme Concern level of the Building Biology guidelines. The extreme levels found in the child's bedroom also fall far above the maximum legal exposure limits of numerous countries: China, Russia, Italy, France, Poland, Hungary, Switzerland, Belgium, Bulgaria, Luxembourg, Ukraine, Lichtenstein and Austria.

[3] Note that RF radiation power densities measured before disabling the home's wireless devices differed little from those measured after the devices were disabled.

Table 2. Radio Frequency Radiation power densities (µW/m²) at various locations in the [redacted] residence

Area	Mean	Minimum	Maximum		
			Measured level	Multiple of BBI "extreme concern" level	Multiple of 100,000 exposure limit
Balcony	107,300	70,900	164,000	164	1.64
Master bedroom	136,040	76,400	210,000	210	2.1
Master bed					
Head	80,267	68,400	88,600	88.6	0.886
Middle	108,367	67,100	149,000	149	1.49
Foot	78,967	72,300	83,800	83.8	0.838
Child's bedroom	386,000	235,000	616,000	616	6.16
Child's bed					
Head	192,500	183,000	202,000	202	2.02
Middle	230,000	152,000	308,000	308	3.08
Foot	144,000	115,000	173,000	173	1.73
Living room, dining room, kitchen	230,000	164,000	403,000	403	4.03

Note: Measured using the Safe and Sound Pro II meter.

Based on current scientific research included in the Biolinitative Report, a compendium of industry-independent, peer reviewed studies compiled by the Bioinitiative Working Group (see Section 7 for more details), these RF radiation levels pose a significant health hazard. Figure 5 gives a snapshot of the types of symptoms and diseases associated with RF radiation exposure at different power densities. It shows that the power densities found in the [redacted] residence are far higher than levels for which there is evidence of negative health effects, including childhood leukemia and retarded learning, and symptoms such as headaches and sleep disturbances.

The Gigahertz Solutions HF35c directional meter was used to ascertain that the radiation is coming from an exterior source to the West side of the residence, that is, from the direction of the rooftop T-Mobile WTF. The noise signal from the meter mimics the uninterrupted, high-pitched signature of a typical cell tower of the frequencies listed in Section 3 (see https://safelivingtechnologies.com/emf-sounds-1/).

The Gigahertz Solutions HFE-59B omni-directional meter was used to log RF radiation levels in the middle of the child's bed for a period of 15 minutes. The results are presented in Figure 6.

Figure 5. Reported biological effects of Radio Frequency radiation compared to the levels measured in the child's bedroom of the [redacted] residence

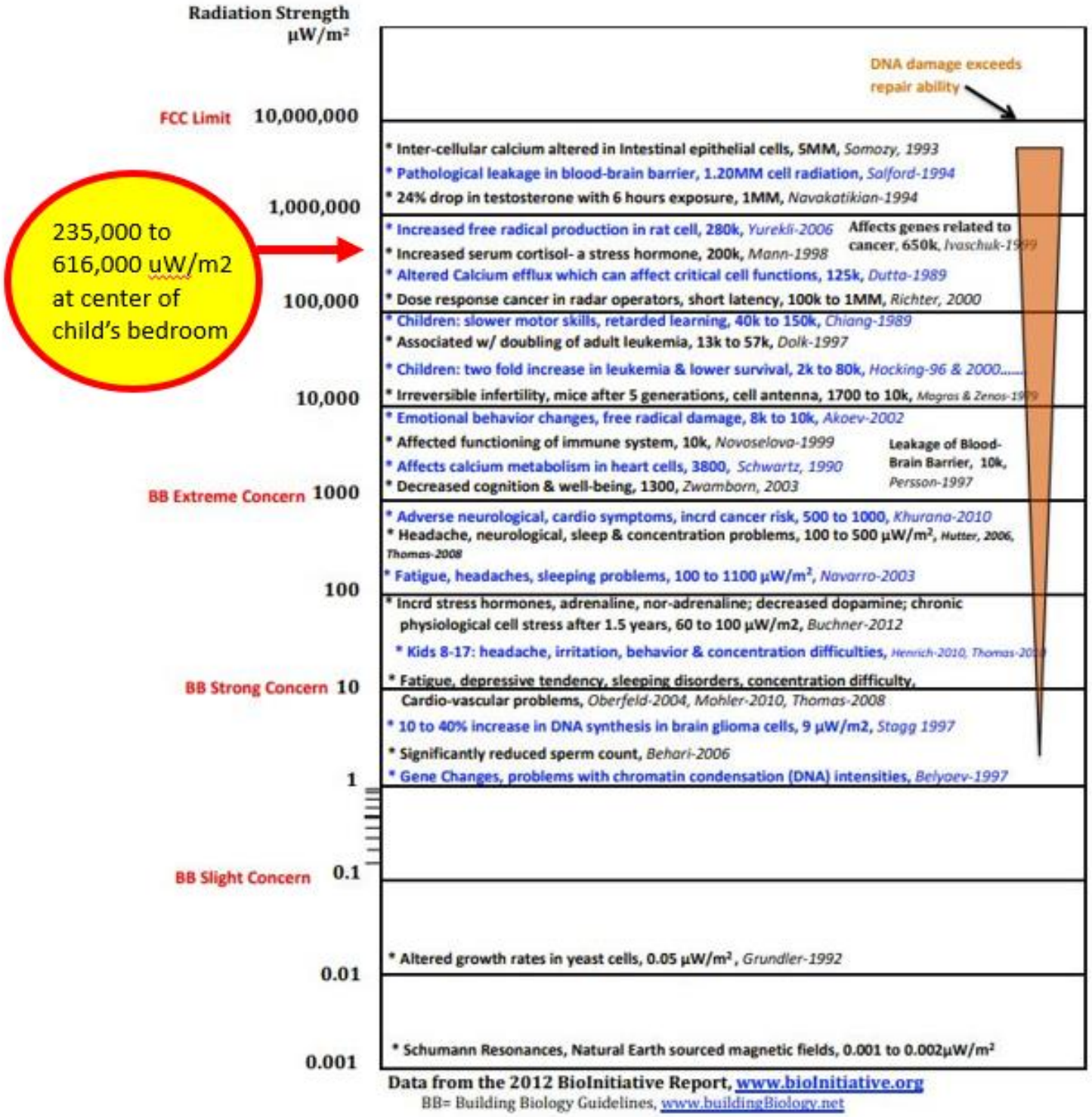


Figure 6. Radio Frequency radiation power density data log (child's bed, 4:35 to 4:50 pm, May 21, 2022).



The average recorded level of RF radiation is 28,926 µW/m^2, confirming that the child is being exposed to RF radiation at a level far above the Extreme Concern safety category limit. This number is much less than the average level detected by the Safe and Sound Pro II meter at the same position (230,000 µW/m^2) because the HFE-59B meter's maximum reading is 30,000. Note in Figure 6 a continual fluctuation of the power density between 28,000 and 30,000 µW/m^2. This type of pulsation is known to be more detrimental to human health than a stable radiation level.

In sum, the current radiation levels in the [redacted] residence are highly unsafe for the general population and especially unsafe for a young child. The source of the radiation is the T-Mobile cell tower located on the roof of the Skyline Gateway apartments approximately 18 feet from the upper West perimeter of the [redacted] residence.

7. Biological effects of exposure to Radio Frequency radiation

Radio frequency radiation is a form of air pollution, sometimes referred to as "electro-smog" (as opposed to chemical smog, such as car exhaust). Contrary to information provided by the wireless industry, including T-Mobile, there is substantial, conclusive evidence for adverse health effects of RF radiation at levels several orders of magnitude lower than current FCC exposure limits and much lower than the [redacted] family is currently being exposed to in their home. These effects occur at the cellular level and thus they affect a wide range of body systems, with some of the strongest effects being for the organs that depend most fully on electromagnetic energy for their functioning: the brain and heart.

An overview of the health effects of electromagnetic fields (EMFs), including radio frequency radiation, can be found at www.emf-wellness.com/emfhealtheffects. The most comprehensive source of peer-reviewed, independently-funded studies is the Bioinitative Report (2020 update), which publishes "RF color charts" that summarize studies of the biological and adverse health effects from exposure to RF radiation from cell towers as well as cell phones, wireless land-line phones, wi-fi, "smart" utility meters, wireless laptops and wireless baby monitors.

The report breaks down the health effects into eight color-keyed categories that capture the wide range of biological effects of RF radiation. The categories are:

1. Sleep, neuron firing rate, EEG, memory, learning, behavior
2. Reproduction, fertility effects
3. Brain tumors and blood-brain barrier effects
4. Cancer (other than brain), cell proliferation
5. Cardiac, heart muscle, blood pressure, vascular effects.
6. Disrupted immune function, stress proteins and HSP
7. Oxidative damage, reactive oxygen species, DNA damage and repair failure
8. Disrupted calcium metabolism.

The Bioinitiative Report color charts can found in Appendix 2 of this report. They show the RF radiation levels at which various health effects occur.

Effects on children. Tech Safe Schools provides the most pertinent studies on the health effects of RF radiation on children, including cancer, neurological/cognitive effects, and reproductive effects, at this link: https://www.techsafeschools.org/science.

Cancer. Specifically regarding cancer, in 2011 the International Agency for Research on Cancer (IARC) of the United Nations World Health Organization classified RF radiation as a possible carcinogen (cancer causing). Given the strengthened evidence of RF radiation carcinogenesis since then, this "Class 2b" designation is expected to rise to a "Class 1" known carcinogen (like smoking and asbestos). Write Miller et al. in their 2018 cancer epidemiology update[4]: "Based on the evidence reviewed it is our opinion that IARC's current categorization of RFR as a possible human carcinogen (Group 2B) should be upgraded to Carcinogenic to Humans (Group 1)." The IARC has committed to revising its classification in 2024.

Neurological effects. It is also important to be aware that electro-smog is a neuro-toxin and contributes to a broad range of neurodegenerative disorders, including:[5]

- Alzheimer's Disease
- Dementia
- Amyotrophic Lateral Sclerosis (ALS)
- Parkinson's Disease
- Multiple Sclerosis
- Attention Deficit Hyperactivity Disorder (ADHD
- Autism Spectrum Disorder
- Cognitive Disorders affecting concentration, memory and learning
- Stress Response
- Mood disorders: anxiety and depression.

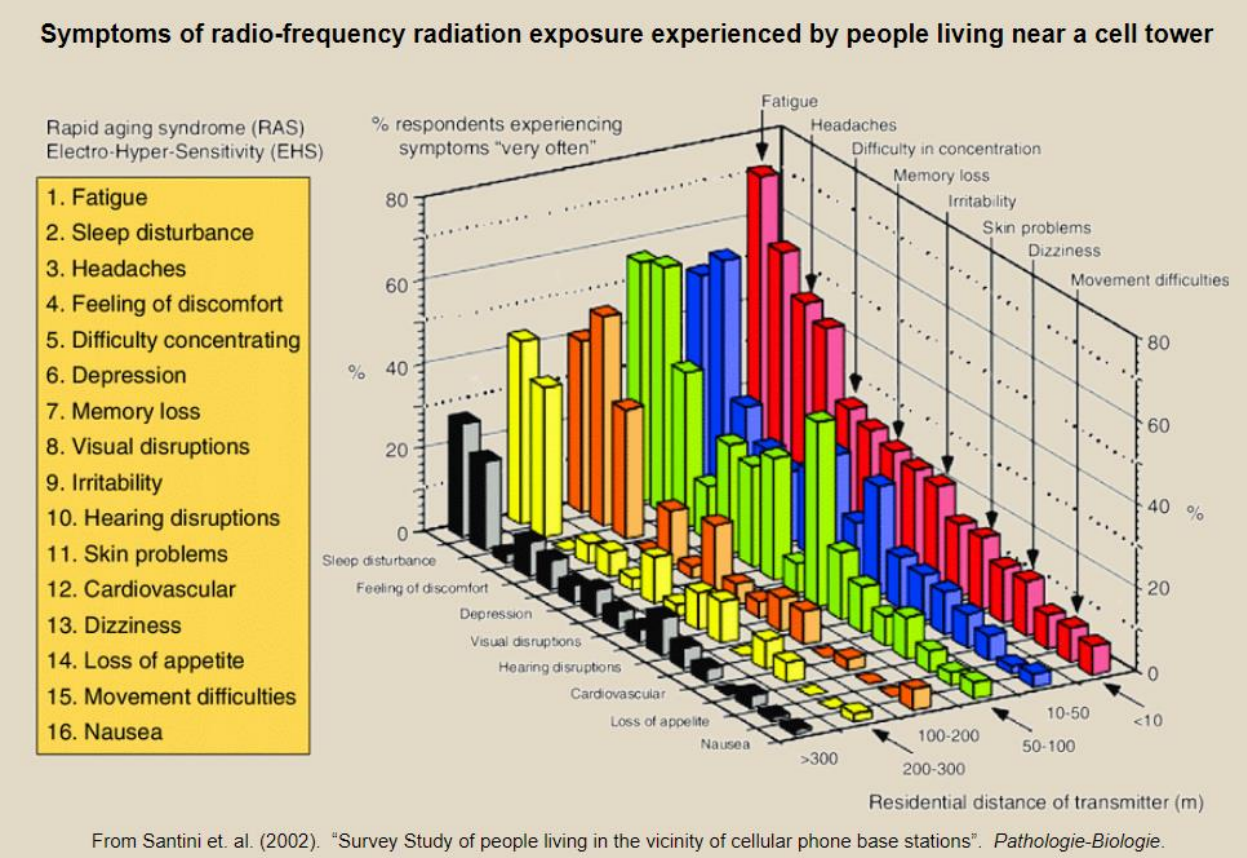
[4] Anthony B. Miller, L. Lloyd Morgan, Iris Udasin, Devra Lee Davis, Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102), *Environmental Research*, Volume 167, 2018, Pages 673-683, ISSN 0013-9351.

[5] Sources: Havas, Magda (2019). Electrohypersensitvity (EHS) is an environmentally-induced disability that requires immediate attention. *Journal of Scientific Discovery* 3(1). DOI:10.24262/jsd.3.1.18020; Pall, Martin L. Microwave frequency electromagnetic fields (EMFs) produce widespread neuropsychiatric effects including depression. *Journal of Chemical Neuroanatomy*, 75(Part B): 43-51.

Studies on the effects of cell tower radiation. The Environmental Health Trust lists 61 studies to date specifically addressing the health effects of cell tower radiation (see https://ehtrust.org/health-effects-studies-on-cell-tower-radiation/).

Two of these studies are particularly relevant to the Nelson family's situation of living in very close proximity to a cell tower. The first was conducted in France where researchers surveyed 530 people living near a cell tower (see Figure 6). The study found that the closer a person lived to the tower, the more symptoms associated with overexposure to RF radiation they experienced. ***The researchers concluded that people shouldn't live within 300 meters (about 1/5 of a mile) of a cell tower.***

Figure 6. Study of symptoms of exposure to RF radiation versus distance from a cell tower



From Santini et. al. (2002). "Survey Study of people living in the vicinity of cellular phone base stations". *Pathologie-Biologie*.

The second is a study conducted in Okinawa, Japan of symptoms of exposure to RF radiation experienced by residents of a condominium on which a WTF had been mounted. Symptoms were recorded during medical examinations and interviews conducted before and after removal of the facility (see Figure 7). The frequencies of the antenna emissions are similar to those mounted on the roof at the Skyline Gateway apartments (800 MHz and 2 GHz). The results of the study clearly indicate a connection between adverse health effects among the residents and RF radiation emitted from the WTF installed on top of the building they live in. Write the authors: "***These results lead us to question the construction of mobile phone base stations on top of buildings such as condominiums or houses***".

Figure 7. Study of symptoms of exposure to Radio Frequency radiation before and after removal of Wireless Telecommunications Facility transmitter on a building roof top



Figure 7: Rooftop cell antennas in study

Symptoms	Removal of the 800 MHz antennas Before	After	P-value
Tinnitus	13	4	<0.05
Myodesopsia	7	2	>0.05
Arthralgia, shoulder stiffness	7	1	<0.05
Headache	5	1	>0.05
Hypertension	4	1	>0.05
Nasal bleeding	4	0	>0.05
Tumours (lymphoma, tongue cancer, bladder cancer)	3	1	>0.05
Insomnia, sleep problems, sleep disturbances	3	1	>0.05
Dizziness, vertigo	3	1	>0.05
Eye pain, ocular infection, dry eyes	3	0	>0.05
Astigmatism, deteriorated eyesight	2	0	>0.05
Palpitation (tachycardia), arrhythmia	2	0	>0.05
Tremor	1	1	>0.05
Glaucoma	1	0	>0.05
Hearing loss	1	0	>0.05
Rhinitis (nasal discharge)	1	0	>0.05
Otitis media	1	0	>0.05
Invertebral disc hernia	1	0	>0.05
Numbness	1	0	>0.05
Skin problems	1	0	>0.05
Angina pectoris	1	0	>0.05
Complex regional pain syndrome (CRPS)	1	0	>0.05
Total	66	13	

Table 3: Health comparison before and after the removal of the 800 MHz antennas. The statistical evaluation was carried out using Fisher's exact test and the chi-square test.
Symptoms appearing during the operation of both the 800 MHz antennas and the 2 GHz antennas are printed in bold letters.



Figure 8: Rooftop cell antennas in study

Symptoms	Removal of the 2 GHz antennas Before	After	P-value
Fatigue, loss of motivation	21	0	<0.01
Eye pain, ocular infection, dry eyes	14	0	<0.01
Insomnia, sleep problems, sleep disturbances	11	2	<0.01
Dizziness, vertigo, Menière's disease	11	0	<0.01
Jitteriness	11	0	<0.01
Astigmatism, deteriorated eyesight	10	6	>0.05
Headache	9	1	<0.01
Impaired consciousness	8	0	<0.01
Arthralgia, shoulder stiffness	7	3	>0.05
Tinnitus	7	1	<0.05
Nasal bleeding	6	0	<0.05
Palpitation (tachycardia), arrhythmia	5	2	>0.05
Numbness	5	0	<0.05
Dyspnoea, shortness of breath	3	1	>0.05
Tumours (colon polyp, vocal chord polyp)	3	0	>0.05
Skin problems	3	0	>0.05
Memory loss	3	0	>0.05
Hyperthyroidism and hypothyroidism	2	2	>0.05
Lack of concentration	2	0	>0.05
Hypertension	2	0	>0.05
Mental confusion	2	0	>0.05
Rhinitis (nasal discharge)	2	0	>0.05
Gastritis	2	0	>0.05
Cataract	1	0	>0.05
Angina pectoris	1	0	>0.05
Facial nerve palsy	1	0	>0.05
Facial flushing	1	0	>0.05
Sweating	1	0	>0.05
Taste disorder	1	0	>0.05
Hearing loss	1	0	>0.05
Slurred speech	1	0	>0.05
Drowsiness	1	0	>0.05
Total	158	18	

Table 4: Comparison of the symptoms appearing during and after operation of the 2 GHz antennas. The statistical evaluation was carried out using Fisher's exact test and the chi-square test.
Symptoms appearing during the operation of both the 800 MHz antennas and the 2 GHz antennas are printed in bold letters.

From Shinjyo,T. and Shinjyo A. (2014). Significant reduction in clinical symptoms after transmitter removal—An intervention study. *Environmental Medicine Society*, 27(4): 294-301 (graphic provided by Eric Windheim of Windheim EMF Solutions).

Information on health effects of RF radiation from local Tucson experts

Professor Russell Witte, College of Medicine at the University of Arizona
Video + list of peer-reviewed studies on the harmful effects of Rf (or "microwave" radiation), including cancer. https://www.safetechtucson.com/harmful-effects-of-microwave-radiation

Dr. Hillel Baldwin, Carondelet Neurological Institute of St. Joseph's Hospital
Video on why we should take precautionary measures to protect from cell tower radiation.
https://ehtrust.org/doctors-slam-fda-report-on-cell-phones-cancer-and-health-effects (min 10:50)

8. Recommendations

The measured levels of RF radiation in the [redacted] residence are highly toxic and dangerous for all residents, but especially for a six-year old child. The health symptoms reported by Ms. [redacted] are consistent with exposure to Extreme Concern levels of RF radiation according to the biologically-based safety guidelines of the Building Biology Institute.

Without thorough and costly mitigation, it is not possible for the [redacted] family members to avoid exposure to this radiation as long as they are living at their current residence and the T-Mobile WTF is operational. Mitigation would necessarily include shielding the entire roof, some walls, and some windows of the home. This mitigation is not possible as the [redacted] family is not in a financial position to implement the costly measures. Further, the family may not be permitted to do so under their rental contract with HSL properties.

When human beings are exposed to such high and continuous doses of RF radiation in their living environment, especially during the critical sleep time when the body heals and detoxifies, there is little possibility of relief from current symptoms. Continued exposure will increase the [redacted] family's risk of contracting debilitating, life-threatening illnesses.

It is thus recommended that the family avoid additional exposure by relocating to a new home with safe levels of RF radiation. A recommended temporary measure is to sleep in RF-shielding bed canopies.[6]

The family should also monitor current and new symptoms of overexposure to RF radiation, including:

- Heart palpitations
- Ringing in the ears (tinnitus)
- Skin rashes
- Headaches
- Dizziness
- Nausea

[6] A selection of RF-shielding bed canopies can be found at the Safe Living Technologies website https://safelivingtechnologies.com/products/bed-canopies/. In an upper-floor apartment it is important to include a floor sheet. Use the discount code EMFWELLNESS at checkout for a 5% discount.

- Sleep disturbances, chronic fatigue
- Immune system problems
- Memory loss, difficulty concentrating, ADHD
- Mental health issues (e.g., depression, anxiety, anger).

As symptoms develop, the urgency of moving to a safe location becomes greater. Continual exposure to RF radiation at such extreme levels can lead to full-fledged Electromagnetic Sensitivity (EMS), in which a person becomes sensitive to all sources of RF radiation and other electromagnetic fields.[7] Currently 1.5% of the population has severe EMS, 5% has moderate EMS, and 30% mild EMS. EMS is a disability recognized by the United States' Government Access Board for consideration as a protected disability under the Americans with Disabilities Act (ADA).[8] For some, it can become a permanent disability. Note also that "Exposure to microwave radiation" has been assigned its own World Health Organization -authorized international medical ICD billing code: W90.0XX.

On a final note, as mentioned above, U.S. federal regulations only protect the public from thermal (that is, heating) effects of short-term exposure to cell tower radiation. Further, the U.S. Telecommunications Act of 1996 may prevent communities from stopping the siting of cell towers for health reasons. Given the thousands of studies that find harmful effects of long-term exposure to non-thermal levels of RF radiation, it is thus important for people living near cell towers like the [redacted] and their neighbors to take matters into their *own* hands by determining whether levels of radiation in their home are reasonably safe, putting mitigation measures into place to shield from it, or moving to a safer location. It is also important to keep in mind the possibility of taking legal action. According to Joel Moskowitz, PhD, Director of Public Health at UC Berkeley, landlords may be liable for any harm caused by RF radiation emitted by cell towers situated on their property.

[7] Other types of electromagnetic fields (EMFs) are: electric fields, magnetic fields and dirty electricity.
[8] The United States' government Access Board recognizes that EMS may be considered a disability under the Americans with Disabilities Act (ADA) if it so severely impairs the neurological, respiratory or other functions of an individual that it substantially limits one or more of the individual's major life activities.

Appendix 1. Frequency bands of T-Mobile Wireless Telecommunications Facility antennas at 4601 E. Skyline Drive as reported on cellmapper.net

Band	Uplink frequency	Downlink frequency
4G-LTE (Long-term evolution)		
Band 2	1857.5	1937.5
Band 2	1877.5	1957.5
Band 12	701.5	731.5
Band 41	2538.2	2538.2
Band 41	2518.4	2518.4
Band 66	1745	2145
Band 71	693	647
5G-NR (New radio)		
Band 41	2599.35	2599.35
Band 71	678	632
Band 71	672.45	626.45

Appendix 2. Radio Frequency Radiation color charts from the Bioinitiative Report (2020 update)

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

	Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
	As low as (10^{-13}) or 100 femtowatts/cm2	Super-low intensity RFR effects at MW reasonant frequencies resulted in changes in genes; problems with chromatin conformation (DNA)	Belyaev, 1997
	5 picowatts/cm2 (10^{-12})	Changed growth rates in yeast cells	Grundler, 1992
	0.1 nanowatt/cm2 (10^{-10}) or 100 picowatts/cm2	Super-low intensity RFR effects at MW reasonant frequencies resulted in changes in genes; problems with chromatin condensation (DNA) intensities comparable to base stations	Belyaev, 1997
3.4 uW/m²	0.00034 uW/cm2	Chronic exposure to mobile phone pulsed RF significantly reduced sperm count,	Behari, 2006
	0.0005 uW/cm2	RFR decreased cell proliferation at 960 MHz GSM 217 Hz for 30-min exposure	Velizarov, 1999
6.0 uW/m²	0.0006 - 0.0128 uW/cm2	Fatigue, depressive tendency, sleeping disorders, concentration difficulties, cardio- vascular problems reported with exposure to GSM 900/1800 MHz cell phone signal at base station level exposures.	Oberfeld, 2004
	0.003 - 0.02 uW/cm2	In children and adolescents (8-17 yrs) short-term exposure caused headache, irritation, concentration difficulties in school.	Heinrich, 2010
	0.003 to 0.05 uW/cm2	In children and adolescents (8-17 yrs) short-term exposure caused conduct problems in school (behavioral problems)	Thomas, 2010
50 uW/m²	0.005 uW/cm2	In adults (30-60 yrs) chronic exposure caused sleep disturbances, (but not significantly increased across the entire population)	Mohler, 2010
	0.005 - 0.04 uW/cm2	Adults exposed to short-term cell phone radiation reported headaches, concentration difficulties (differences not significant, but elevated)	Thomas, 2008
	0.006 - 0.01 uW/cm2	Chronic exposure to base station RF (whole-body) in humans showed increased stress hormones; dopamine levels substantially decreased; higher levels of adrenaline and nor-adrenaline; dose-response seen; produced chronic physiological stress in cells even after 1.5 years.	Buchner, 2012
100 uW/m²	0.01 - 0.11 uW/cm2	RFR from cell towers caused fatigue, headaches, sleeping problems	Navarro, 2003

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
Reproduction/fertility effects	Sleep, neuron firing rate, EEG, memory, learning, behavior
Oxidative damage/ROS/DNA damage/DNA repair failure	Cancer (other than brain), cell proliferation
Disrupted calcium metabolism	Cardiac, heart muscle, blood-pressure, vascular effects

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

	Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
	0.01 - 0.05 uW/cm2	Adults (18-91 yrs) with short-term exposure to GSM cell phone radiation reported headache, neurological problems, sleep and concentration problems.	Hutter, 2006
	0.005 - 0.04 uW/cm2	Adults exposed to short-term cell phone radiation reported headaches, concentration difficulties (differences not significant, but elevated)	Thomas, 2008
150 uW/m²	0.015 - 0.21 uW/cm2	Adults exposed to short-term GSM 900 radiation reported changes in mental state (e.g., calmness) but limitations of study on language descriptors prevented refined word choices (stupified, zoned-out)	Augner, 2009
	0.05 - 0.1 uW/cm2	RFR linked to adverse neurological, cardio symptoms and cancer risk	Khurana, 2010
500 uW/m²	0.05 - 0.1 uW/cm2	RFR related to headache, concentration and sleeping problems, fatigue	Kundi, 2009
	0.07 - 0.1 uW/cm2	Sperm head abnormalities in mice exposed for 6-months to base station level RF/MW. Sperm head abnormalities occurred in 39% to 46% exposed mice (only 2% in controls) abnormalities was also found to be dose dependent. The implications of the pin-head and banana-shaped sperm head. The occurrence of sperm head observed increase occurrence of sperm head abnormalities on the reproductive health of humans living in close proximity to GSM base stations were discussed."	Otitoloju, 2010
	0.38 uW/cm2	RFR affected calcium metabolism in heart cells	Schwartz, 1990
	0.8 - 10 uW/cm2	RFR caused emotional behavior changes, free-radical damage by super-weak MWs	Akoev, 2002
	0.13 uW/cm2	RFR from 3G cell towers decreased cognition, well-being	Zwamborn, 2003
1,600 uW/m²	0.16 uW/cm2	Motor function, memory and attention of school children affected (Latvia)	Kolodynski, 1996
	0.168 - 1.053 uW/cm2	Irreversible infertility in mice after 5 generations of exposure to RFR from an 'antenna park'	Magras & Zenos, 1997
	0.2 - 8 uW/cm2	RFR caused a two-fold increase in leukemia in children	Hocking, 1996
2,000 uW/m²	0.2 - 8 uW/cm2	RFR decreased survival in children with leukemia	Hocking, 2000
	0.21 - 1.28 uW/cm2	Adolescents and adults exposed only 45 min to UMTS cell phone radiation reported increases In headaches.	Riddervold, 2008

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Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

	Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
	0.5 uW/cm2	Significant degeneration of seminiferous epithelium in mice at 2.45 GHz, 30-40 min.	Saunders, 1981
	0.5 - 1.0 uW/cm2	Wi-FI level laptop exposure for 4-hr resulted in decrease in sperm viability, DNA fragmentation with sperm samples placed in petri dishes under a laptop connected via WI-FI to the internet.	Avendano, 2012
10,000 uW/m²	1.0 uW/cm2	RFR induced pathological leakage of the blood-brain barrier	Persson, 1997
	1.0 uW/cm2	RFR caused significant effect on immune function in mice	Fesenko, 1999
	1.0 uW/cm2	RFR affected function of the immune system	Novoselova, 1999
	1.0 uW/cm2	Short-term (50 min) exposure in electrosensitive patients, caused loss of well-being after GSM and especially UMTS cell phone radiation exposure	Eltiti, 2007
	1.3 - 5.7 uW/cm2	RFR associated with a doubling of leukemia in adults	Dolk, 1997
	1.25 uW/cm2	RFR exposure affected kidney development in rats (in-utero exposure)	Pyrpasopoulou, 2004
15,000 uW/m²	1.5 uW/cm2	RFR reduced memory function in rats	Nittby, 2007
	2 uW/cm2	RFR induced double-strand DNA damage in rat brain cells	Kesari, 2008
	2.5 uW/cm2	RFR affected calcium concentrations in heart muscle cells	Wolke, 1996
20,000 uW/m²	2 - 4 uW/cm2	Altered cell membranes; acetycholine-induced ion channel disruption	D'Inzeo, 1988
	4 uW/cm2	RFR caused changes in hippocampus (brain memory and learning)	Tattersall, 2001
	4 - 15 uW/cm2	Memory impairment, slowed motor skills and retarded learning in children	Chiang, 1989
50,000 uW/m²	5 uW/cm2	RFR caused drop in NK lymphocytes (immune function decreased)	Boscolo, 2001
	5.25 uW/cm2	20 minutes of RFR at cell tower frequencies induced cell stress response	Kwee, 2001
	5 - 10 uW/cm2	RFR caused impaired nervous system activity	Dumansky, 1974
	6 uW/cm2	RFR induced DNA damage in cells	Phillips, 1998

Stress proteins, HSP, disrupted immune function	Brain tumors and blood-brain barrier
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Disrupted calcium metabolism	Cardiac, heart muscle, blood-pressure, vascular effects

Reported Biological Effects from Radiofrequency Radiation at Low-Intensity Exposure
(Cell Tower, Wi-Fi, Wireless Laptop and 'Smart' Meter RF Intensities)

	Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
	8.75 uW/cm2	RFR at 900 MHz for 2-12 hours caused DNA breaks in leukemia cells	Marinelli, 2004
	10 uW/cm2	Changes in behavior (avoidance) after 0.5 hour exposure to pulsed RFR	Navakatikian, 1994
100,000 uW/m²	10 - 100 uW/cm2	Increased risk in radar operators of cancer; very short latency period; dose response to exposure level of RFR reported.	Richter, 2000
	12.5 uW/cm2	RFR caused calcium efflux in cells - can affect many critical cell functions	Dutta, 1989
	13.5 uW/cm2	RFR affected human lymphocytes - induced stress response in cells	Sarimov, 2004
200,000 uW/m²	20 uW/cm2	Increase in serum cortisol (a stress hormone)	Mann, 1998
	28.2 uW/cm2	RFR increased free radical production in rat cells	Yurekli, 2006
	37.5 uW/cm2	Immune system effects - elevation of PFC count (antibody producing cells	Veyret, 1991
	45 uW/cm2	Pulsed RFR affected serum testosterone levels in mice	Forgacs, 2006
500,000 uW/m²	50 uW/cm2	Cell phone RFR caused a pathological leakage of the blood-brain barrier in 1 hour	Salford, 2003
	50 uW/cm2	An 18% reduction in REM sleep (important to memory and learning functions)	Mann, 1996
	60 uW/cm2	RFR caused structural changes in cells of mouse embryos	Somozy, 1991
	60 uW/cm2	Pulsed RFR affected immune function in white blood cells	Stankiewicz, 2006
600,000 uW/m²	60 uW/cm2	Cortex of the brain was activated by 15 minutes of 902 MHz cell phone	Lebedeva, 2000
	65 uW/cm2	RFR affected genes related to cancer	Ivaschuk, 1999
	92.5 uW/cm2	RFR caused genetic changes in human white blood cells	Belyaev, 2005
	100 uW/cm2	Changes in immune function	Elekes, 1996
1,000,000 uW/m²	100 uW/cm2	A 24.3% drop in testosterone after 6 hours of CW RFR exposure	Navakatikian, 1994
	120 uW/cm2	A pathological leakage in the blood-brain barrier with 915 MHz cell RF	Salford, 1994

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Reproduction/fertility effects	Sleep, neuron firing rate, EEG, memory, learning, behavior
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Disrupted calcium metabolism	Cardiac, heart muscle, blood-pressure, vascular effects

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5,000,000 uW/m²

Power Density (Microwatts/centimeter2 - uW/cm2)		Reference
500 uW/cm2	Intestinal epithelial cells exposed to 2.45 GHz pulsed at 16 Hz showed changes in intercellular calcium.	Somozy, 1993
500 uW/cm2	A 24.6% drop in testosterone and 23.2% drop in insulin after 12 hrs of pulsed RFR exposure.	Navakatikian, 1994

STANDARDS		
530 - 600 uW/cm2	Limit for uncontrolled public exposure to 800-900 MHz	ANSI/IEEE and FCC
1000 uW/cm2	PCS STANDARD for public exposure (as of September 1,1997)	FCC, 1996
5000 uW/cm2	PCS STANDARD for occupational exposure (as of September 1, 1997)	FCC, 1996
BACKGROUND LEVELS		
0.003 uW/cm2	Background RF levels in US cities and suburbs in the 1990s	Mantiply, 1997
0.05 uW/cm2	Median ambient power density in cities in Sweden (30-2000 MHz)	Hamnierius, 2000
0.1 - 10 uW/cm2	Ambient power density within 100-200' of cell site in US (data from 2000)	Sage, 2000

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