INVISIBLE FREQUENCIES

The Untold Story of Wireless Radiation, Regulatory Failure, and Our Fight for a Safer Future

By Keith Gilbert

A Call to Action for Humanity

From 2G to 6G: A Thirty-Year Regulatory Gap That Puts Every Human at Risk

TABLE OF CONTENTS

Foreword A Personal Message from Keith Gilbert

Chapter 1 The Signal That Changed Everything

Chapter 2 Generation by Generation — The Frequency Climb

Chapter 3 The 1996 Problem — A Law Frozen in Time

Chapter 4 What Science Actually Says

Chapter 5 Your Body is Not Immune

Chapter 6 The 6G Frontier — Into the Unknown

Chapter 7 A Vision for a Better Future

Afterword What You Can Do Today

FOREWORD

A Personal Message from Keith Gilbert

There is a conversation that humanity desperately needs to have — and almost no one is having it. It happens in the spaces between our phone calls, in the invisible threads that connect our devices, in the millimeter waves bouncing off our skin a trillion times a second. It is happening right now, whether you choose to engage with it or not.

I wrote this book because I believe we are at a crossroads. Not the kind that makes headlines, but the quiet, creeping kind — where decisions made in boardrooms and regulatory offices, based on science from half a century ago, are reshaping the electromagnetic environment of every living thing on this planet. Without public debate. Without informed consent. Without so much as a question asked.

This is not a book written from fear. It is written from urgency — the kind that comes from looking at the evidence, understanding what regulatory capture looks like, and refusing to pretend that everything is fine simply because a federal agency says so. History has taught us, painfully, that the industries with the most to gain are often the last to acknowledge harm.

> ***"The FCC's 1996 safety limits were based on 5 monkeys and 8 rats, exposed for under 60 minutes. That is the scientific foundation upon which 5G is being deployed to 8 billion people."***

My goal is not to frighten you into putting your phone in a drawer. My goal is to wake you up — and then, together, to imagine something better. Because there IS a better way. There are scientists doing extraordinary work. There are engineers who can build safer systems. There are policymakers waiting for the political will that only an informed public can create.

The future of wireless technology does not have to be a choice between connectivity and health. That is a false dilemma — and one that powerful interests benefit from you believing. The real choice is whether we demand better, or accept what we are given.

I choose to demand better. I hope, by the end of this book, you will too.

— Keith Gilbert

CHAPTER 1

The Signal That Changed Everything

How a revolution in communication left humanity's health behind

On April 3, 1973, a Motorola engineer named Martin Cooper stood on a street in Midtown Manhattan and made a phone call. It was the first cellular phone call in history. The call lasted only a few minutes. The device weighed two and a half pounds. But in that moment, the electromagnetic landscape of human civilization changed forever.

What followed over the next fifty years was a breathtaking cascade of technological generations — each one faster, each one more powerful, each one operating at higher frequencies, each one deploying billions of new transmitters into the bodies and homes and schools of an unsuspecting public. 1G. 2G. 3G. 4G. 5G. And now, on the horizon, 6G.

There is a question that runs underneath every single one of these technological leaps — a question that the telecommunications industry, the FCC, and the U.S. government have spent three decades doing their best to make sure you never ask:

> ***"Was anyone checking whether this was safe?"***

The uncomfortable, documented, court-validated answer is: not really. Not in any meaningful way. The safety standards governing how much radiofrequency radiation the average American is exposed to were set in 1996 — before smartphones existed. Before Wi-Fi existed. Before 5G

existed. Before we had any concept of a world where every pocket, every classroom, every bedroom would be bathed in invisible electromagnetic fields twenty-four hours a day.

5G+	30+	8B
Wireless generations deployed on 1996 safety data	Years since FCC radiation limits were last updated	People living under these unevaluated standards

This is not a conspiracy theory. It is public record. It is confirmed by a 2021 ruling from the United States Court of Appeals for the D.C. Circuit, which found that the FCC's decision not to update its safety standards was "arbitrary and capricious." The court noted that the agency had failed to adequately consider evidence of harm to children, cumulative exposure effects, and long-term health risks.

And yet, the buildout continues. The spectrum auctions proceed. The 6G planning meetings are underway. The towers go up. And the question remains, hanging in the air like a radio wave, invisible and unanswered:

> ***"Who is protecting us — and why has no one updated the rules in thirty years?"***

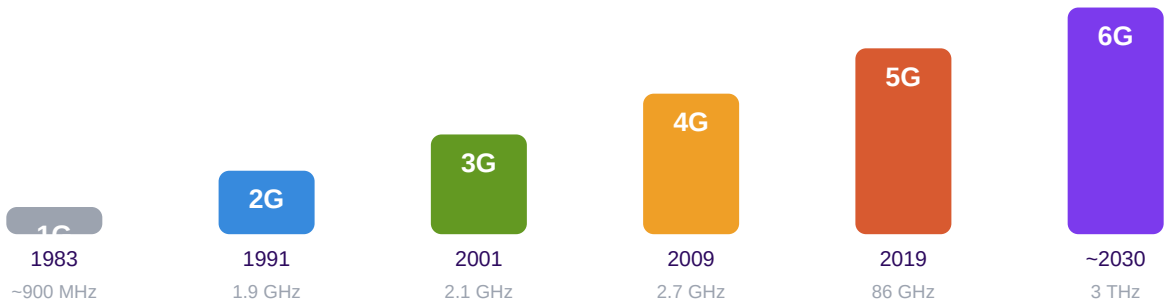
CHAPTER 2

Generation by Generation

The relentless climb up the frequency spectrum

To understand what is at stake, you need to understand what frequencies are — and why the relentless push to higher and higher frequencies is not just an engineering choice. It is a biological experiment being run on the entire human population without our knowledge or consent.

The Frequency Climb — Six Generations



Each bar represents the peak frequency ceiling per generation. 6G's terahertz bands are approximately 10,000x higher than 1G.

1G — The Analog Dawn (1983) | 800–900 MHz

The original cellular network. Analog voice only. Frequencies similar to FM radio. Range was the priority; health was not a consideration. Almost no long-term exposure studies existed because almost no one was chronically exposed. A phone was a luxury item you used occasionally.

2G — Digital Revolution (1991) | 850 MHz – 1.9 GHz

The shift to digital. SMS was born. The mobile phone began its transformation from business tool to personal companion. Exposure time per person increased dramatically. The Telecommunications Act of 1996 was written in this era — and crucially, Section 704 made it illegal for local governments to consider health effects when deciding on cell tower placement.

3G — The Mobile Internet (2001) | 850 MHz – 2.1 GHz

The smartphone revolution began. For the first time, people were carrying transmitters in their pockets all day. The device that had been an occasional luxury became a constant companion pressed against bodies, held near heads, sleeping on nightstands inches from brains. Chronic, cumulative exposure became the new reality — but the 1996 safety limits remained unchanged.

4G/LTE — Always On (2009) | 700 MHz – 2.7 GHz

4G made us permanently connected. Streaming. Social media. The Internet of Things. The number of transmitting devices in the average home exploded. Cell towers multiplied. Wi-Fi routers in every room. Smart meters on every house. The electromagnetic environment of human civilization was being transformed in real time — with no parallel update to safety standards.

5G — The Millimeter Wave Leap (2019) | 600 MHz – 86 GHz

This is where the story takes a genuinely new turn. 5G introduced millimeter waves — frequencies so high that they are almost entirely absorbed in the outer millimeter of human skin. These are frequencies that have never before been used for consumer telecommunications. The research base is thin. The deployment is massive. And the 1996 rules — written for 900 MHz devices — still govern them.

6G — The Terahertz Unknown (~2030) | 100 GHz – 3,000 GHz

6G will use frequencies so high they approach infrared light. Terahertz radiation. There are essentially no long-term biological studies for these frequencies at population scale. The FCC opened this spectrum in 2019 for experimental use, and planning is already underway. The same regulatory framework — built in 1996 for 2G phones — will govern it.

> *"Each generation promised us speed. Each generation increased our exposure. And through every single one, the safety question went unanswered."*

CHAPTER 3

The 1996 Problem

A law written for a different world — governing technologies it never imagined

Imagine hiring a building inspector from 1996 to certify a skyscraper built using materials invented in 2020, techniques developed in 2022, and structural loads that didn't exist in the 1990s. You would rightly call that insane. Yet this is precisely what the United States is doing with its wireless radiation safety standards.

The Regulatory Gap — At a Glance

The Telecommunications Act of 1996 was a landmark piece of legislation. It opened telecommunications markets to competition after decades of AT&T; monopoly. It accelerated the rollout of the internet. By any measure, it transformed American communications.

It also did something else — something that receives almost no attention. Section 704 of that Act explicitly prohibited state and local governments from considering "the environmental effects of radio frequency emissions" when making decisions about cell tower placement. In plain language: no local official, no matter how concerned, could legally say "we don't want this tower here because we're worried about the health effects."

> ***"Section 704 made health arguments illegal at the local level. It stripped communities of their most basic right — the right to ask 'is this safe?'"***

What the 1996 Safety Limits Were Actually Based On

Here is where the story becomes genuinely shocking. The FCC's radiofrequency radiation exposure limits — the standards that govern every cell tower, every smartphone, every Wi-Fi router, every 5G antenna in America — were derived from the following scientific foundation:

- Behavioral studies from the 1970s and 1980s
- A total of 5 monkeys and 8 rats as test subjects
- Exposures lasting under 60 minutes
- A single measurement: at what temperature did the starved animals stop pressing a food lever?
- The assumption that ALL biological effects come from tissue heating only
- No testing of chronic, long-term, or cumulative exposure
- No testing of children, pregnant women, or electromagnetically sensitive individuals
- No testing of pulse-modulated signals — the kind used by every modern wireless device
- No consideration of effects on wildlife, trees, or ecosystems

That is the entire scientific foundation. Five monkeys. Eight rats. Under an hour. Starved animals stopping lever-pressing due to heat. And from this, the FCC concluded: if it doesn't noticeably heat your tissue in under an hour, it is safe for all people, at all ages, for unlimited cumulative exposure, forever.

> ***"In 2019, the FCC formally decided these 1996 limits were 'still adequate.' In 2021, a federal court told them they were wrong. In 2026, they are fast-tracking 6G. Nothing has changed."***

The Court That Said No

In 2021, the United States Court of Appeals for the D.C. Circuit issued a remarkable ruling. It found that the FCC's 2019 decision to maintain its 1996 limits without update was "arbitrary and capricious" — a legal term that means the agency acted without adequate reason or evidence.

The court ordered the FCC to address specific scientific concerns it had completely ignored: the effects on children, long-term exposure risks, cumulative exposures from multiple sources, electromagnetic hypersensitivity, and impacts on wildlife and ecosystems. The FCC had dismissed hundreds of scientists, medical associations, and public health organizations without explanation.

As of 2026, the FCC has not meaningfully complied. The 6G planning continues. The "rocket docket" to fast-track tower permitting is in motion. And the 1996 limits remain in force.

CHAPTER 4

What Science Actually Says

Thirty years of research the FCC chose not to read

The FCC's position rests on a foundational claim: that radiofrequency radiation only causes harm through thermal effects — tissue heating. If it doesn't heat you beyond a certain threshold, it is safe. Period. Full stop.

The problem with this claim is that thirty years of peer-reviewed, published, replicated science says it is wrong.

Non-Thermal Effects: The Evidence

National Toxicology Program (NTP), 2018

The U.S. government's own National Toxicology Program — after a $30 million, ten-year study — found 'clear evidence' of cardiomyopathy in rats exposed to cell phone radiation, and 'some evidence' of malignant tumors in the brain and heart. These exposures were below the FCC's current safety limits.

Ramazzini Institute, Italy, 2018

An independent study replicating NTP findings found similar tumor results at even lower exposure levels — levels comparable to those near cell towers in everyday life.

European Parliament Report, 2021

The European Parliament commissioned a comprehensive review of the science. It concluded that commonly used RFR frequencies (450–6,000 MHz) are 'probably carcinogenic for humans' and 'clearly affect male fertility,' with possible adverse effects on the development of embryos, fetuses, and newborns.

Blood-Brain Barrier Research

Multiple studies have demonstrated that non-thermal levels of RFR can disrupt the blood-brain barrier — the protective membrane separating circulating blood from the brain. A compromised blood-brain barrier allows toxins direct access to the central nervous system.

DNA Damage Studies

Research published in peer-reviewed journals has documented DNA strand breaks in cells exposed to RFR at levels below the FCC's thermal threshold. DNA damage is a mechanism through which cancers develop.

Sleep and Brain Wave Research, 2024

A double-blind, sham-controlled study published in 2024 found that 5G signals at 3.6 GHz modulated brain spindle activity during sleep — measurable changes in brain function from wireless exposure while asleep.

> ***"The science is not missing. It exists. Hundreds of peer-reviewed studies document biological effects at non-thermal levels. The question is not whether the research exists. The question is why regulators keep choosing not to read it."***

The Ionizing vs. Non-Ionizing Distinction

A common response to these concerns is: "Relax — it's not ionizing radiation. It's not like X-rays. It can't damage DNA directly." This is technically true and dangerously misleading at the same time.

Yes, radiofrequency radiation is non-ionizing — it does not have enough energy to strip electrons from atoms the way nuclear radiation does. But non-ionizing does not mean biologically inert. The human body is an extraordinarily sensitive electrochemical system. Our hearts run on electrical signals. Our brains communicate through ion channels. Our cells regulate themselves through calcium signaling cascades. To suggest that bathing this exquisitely sensitive system in artificial electromagnetic fields has no effect — at any power level, at any frequency, for any duration — is not science. It is assumption.

And it is an assumption that is increasingly contradicted by evidence.

CHAPTER 5

Your Body is Not Immune

The documented human experience of electromagnetic exposure

Perhaps you have experienced it yourself. A persistent high-pitched tone in your ears that wasn't there before. A strange tingling or numbness that comes and goes. Headaches that appear in certain locations and lift when you leave. A buzzing vibration you can't trace to any mechanical source. Sleep disruptions in a new location. Brain fog that your doctor can't explain.

If so, you are not imagining things. And you are not alone.

Electromagnetic Hypersensitivity (EHS)

Electromagnetic hypersensitivity — previously called "microwave syndrome" before that name became politically inconvenient — is a documented condition in which individuals experience non-specific physical symptoms following exposure to electromagnetic fields. The symptoms are real. The suffering is real. The debate is about mechanism and causality.

Documented EHS Symptoms:

- Headaches, often location-specific
- Tinnitus — ringing, buzzing, high-pitched tones, or chirping sounds
- Dizziness and balance disturbances
- Fatigue and profound exhaustion
- Insomnia and disrupted sleep architecture

- Cognitive difficulties — memory, concentration, mental clarity
- Heart palpitations and blood pressure variability
- Tingling, numbness, or burning sensations in the skin
- Nausea and gastrointestinal disturbances
- Pressure sensations in the head or ears
- Muscle and joint pain
- Eye irritation and light sensitivity

> ***"After 5G was deployed near their workplace, two men developed headache, tinnitus, dizziness, balance disorder, and concentration deficiency. Radiation measurements showed peak levels of up to 1,180,000 microwatts per square meter. This is not anecdote. It is published, peer-reviewed case research."***

The Havana Syndrome Connection

Perhaps the most dramatic evidence that radio frequency fields can cause precisely the symptoms many people near 5G infrastructure report comes from an unexpected source: the U.S. State Department.

Beginning in 2016, American diplomats and intelligence officers stationed in Havana, Cuba, began reporting a constellation of symptoms: hearing unexplained sounds (chirping, ringing, grinding), pressure sensations, vibration, balance problems, cognitive difficulties, and in some cases, measurable neurological damage. The syndrome spread to personnel in China, Germany, Australia, Russia, and Washington D.C. itself.

The leading scientific explanation — supported by the National Academies of Sciences — is directed, pulsed radiofrequency microwave energy. In other words: the symptoms reported by U.S. government officials as evidence of a foreign attack are essentially identical to the symptoms reported by civilians living near high-power 5G infrastructure. The difference is only the source.

Let that sink in for a moment.

CHAPTER 6

The 6G Frontier

Racing into the unknown — at terahertz speed

If 5G raised serious questions, 6G should trigger an emergency scientific reckoning. Instead, it is triggering spectrum auctions.

The FCC opened spectrum up to 3,000 GHz for experimental 6G use in 2019. To put that in perspective: 5G's highest millimeter wave frequencies top out around 86 GHz. 6G's terahertz bands are ten to thirty times higher. At these frequencies, the waves interact with biological tissue in ways that are fundamentally different from everything that came before — and almost entirely unstudied.

What We Know About Terahertz

Terahertz radiation sits between microwave and infrared light on the electromagnetic spectrum. At these frequencies:

Skin penetration changes completely

THz waves interact intensely with the outermost layers of skin, sweat glands, and peripheral nerves in ways that differ fundamentally from lower frequencies. The sweat duct in human skin acts as a helical antenna at THz frequencies — potentially amplifying absorption.

The research base is essentially zero

There are no long-term population studies of chronic THz exposure. The existing safety limits were not designed for these frequencies. We are proposing to expose 8 billion people to a technology for which we have no meaningful safety data.

Short range demands ultra-dense infrastructure

THz waves are absorbed quickly and blocked easily. To achieve coverage, 6G will require an extraordinarily dense network of small cells — estimated by some researchers at one transmitter per 10-50 meters in urban environments. This would represent an unprecedented increase in the density of electromagnetic exposure sources.

The same 1996 rules will apply

Unless the FCC updates its standards — and as of this writing, there is no indication it plans to do so in a meaningful, science-based way — 6G terahertz networks will be governed by safety limits derived from studies of monkeys and rats that predate the smartphone.

> ***"We are planning to bathe 8 billion people in terahertz radiation starting around 2030. The health studies to support that decision do not yet exist. This is not progress. This is recklessness "***

CHAPTER 7

A Vision for a Better Future

Because we can have connectivity AND safety — if we choose to

This book is not a eulogy for wireless technology. It is a demand that we do it right. Because here's what they don't want you to know: there are better paths. There are engineers designing safer antennas. There are researchers developing exposure monitoring systems. There are countries setting more protective standards. There are communities proving that thoughtful technology deployment and public health can coexist.

The choice between "connected world" and "safe world" is false. It is a choice manufactured by those who benefit financially from the fastest possible, cheapest possible, least-regulated possible deployment. We can build a connected world that is also a healthy one. But only if we demand it.

What a Better Future Looks Like

1. Updated, Science-Based Safety Standards

The FCC must fulfill the court's mandate and conduct a genuine, comprehensive review of radiofrequency safety limits — based on 2020s science, not 1970s animal studies. Limits must account for long-term exposure, children's vulnerability, electromagnetic hypersensitivity, cumulative effects from multiple sources, and the biological effects of pulse-modulated signals. Independent scientists — with no industry funding conflicts — must lead this process.

2. Pre-Deployment Health Studies for New Technologies

Before 6G frequencies are deployed to the public at scale, independent long-term biological studies must be completed. This is not an unreasonable ask. We require this of pharmaceuticals. We require this of food additives. We should require it of technologies that will expose every person on Earth to novel electromagnetic frequencies for the rest of their lives.

3. Restored Community Rights

Section 704 of the Telecommunications Act must be reformed. Local communities must have the right to ask health and safety questions about infrastructure placed in their neighborhoods, schools, and homes. This is not anti-technology. It is democracy.

4. National Exposure Monitoring

The United States should establish a network of independent RF exposure monitors across the country — measuring actual public exposure, publishing the data transparently, and flagging areas where cumulative exposure approaches or exceeds updated safety thresholds. We monitor air quality. We monitor water quality. We must monitor electromagnetic quality.

5. Investment in Safer Technology Design

Federal funding should incentivize the development of wireless technologies that achieve the same connectivity with lower emission levels. Beamforming, intelligent power control, and fiber-to-antenna architectures can dramatically reduce unnecessary radiation while maintaining performance. Safety and speed are not mutually exclusive engineering goals.

6. International Coordination on Standards

The United States should work with the European Union — where multiple nations have already adopted more protective standards — to develop genuinely science-based international guidelines. The current race to the regulatory bottom serves industry profits. A race to scientific rigor would serve humanity.

7. Protection for Vulnerable and Sensitive Populations

Schools, hospitals, pediatric care facilities, and senior living communities should be prioritized for the lowest exposure infrastructure designs. Children's developing nervous systems deserve

specific, evidence-based protection — not a 1996 standard that was never tested on children at all.

> ***"We built the internet. We put rovers on Mars. We mapped the human genome. We are more than capable of building wireless networks that do not compromise the health of the species using them. We simply have to decide that human health matters more than the speed of the next spectrum auction."***

AFTERWORD

What You Can Do Today

Knowledge without action is just anxiety. So let this book end not with despair but with a list — concrete, achievable things that any person, any community, any elected official can do starting today.

For Individuals

- Reduce unnecessary RF exposure: use speakerphone or wired earbuds, keep devices away from your body when not in use, turn off Wi-Fi at night.
- Educate yourself: follow the work of the Environmental Health Trust, ICBE-EMF, and Physicians for Safe Technology.
- Talk to your doctor: if you are experiencing symptoms consistent with EHS, document them and advocate for yourself.

For Communities

- Attend local planning meetings when cell towers are proposed in your neighborhood.
- Contact your city council and county commissioners — even under current law, communities have procedural rights worth asserting.
- Support local officials who ask hard questions about wireless infrastructure.

For Citizens and Voters

- Contact your U.S. Senators and Representatives and demand FCC accountability: updated safety standards, pre-deployment health studies for 6G, and reform of Section 704.

- Support candidates who take environmental health seriously and understand the difference between technology advocacy and corporate capture.
- Sign petitions supporting science-based RF exposure standards — several are currently active through the Environmental Health Trust.

For Researchers and Scientists

- Prioritize independent, industry-conflict-free research on millimeter wave and terahertz biological effects.
- Publish. Speak publicly. Engage policymakers. The science exists; it needs to reach the people making decisions.

For Policymakers

- Commission an independent, comprehensive review of FCC RF safety standards.
- Mandate pre-deployment health studies for 6G frequencies before commercial rollout.
- Reform Section 704 to restore community health rights in infrastructure decisions.
- Fund a national RF exposure monitoring network.

The invisible frequencies are real. The regulatory gap is real. The health questions are real. And the possibility of a better future is also real — if enough people care enough to demand it.

We live in a civilization shaped by those who refused to accept "good enough" when they knew better was possible. The scientists who proved lead paint was poisonous. The doctors who documented the link between smoking and cancer. The advocates who forced the removal of asbestos from schools. They were called alarmists. They were dismissed. And then, eventually, they were proven right.

History is watching how we handle this one.

The future is not written yet. Let's write a better one.

— Keith Gilbert

Phoenix, Arizona, 2026

Invisible Frequencies is dedicated to every person who ever reported a symptom and was told it was in their head. Your experience was real. This book is for you.