

Illegal Levels of Radiation Emitted by Popular Cellphones

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✓ Fact Checked

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STORY AT-A-GLANCE

- › Hidden within your cellphone's manual is a little-known warning that advises you to keep the device at a certain distance from your body — typically 5 to 15 millimeters — to ensure you don't exceed the federal safety limit for radiofrequency (RF) exposure
- › Cellphone testing by the Chicago Tribune reveals several popular cellphones emit far higher levels of RF radiation than legally permitted, which has led to the filing of at least one class-action lawsuit
- › In the U.S. and Canada, the SAR limit for mobile devices used by the public is 1.6 W/kg per 1 gram of head tissue. SAR is a measure of how much RF energy your body will absorb from the device when held at a specific distance from your body
- › At a distance of 5 mm from the body (the distance used by Apple), the iPhone 7 was found to emit anywhere between 2.5 and 3.46 W/kg, which is 1.6 to 2.2 times the legal limit. At 2 mm from the body, the distance of carrying the phone in your pocket, levels were even higher
- › The three Samsung Galaxy smartphones tested were all within the legal limit at 10 to 15 mm from the body (the distance used by Samsung), but RF radiation levels skyrocketed at 2 mm from the body, raising serious questions about the safety of keeping a Galaxy phone in your pocket

This article was previously published September 18, 2019, and has been updated with new information.

Hidden within your cellphone's manual is a little-known warning that advises you to keep the device at a certain distance from your body – typically 5 to 15 millimeters – to ensure you don't exceed the federal safety limit for radiofrequency (RF) exposure.

In the real world, however, most people carry their phones close to their body, usually in a pocket. Many women tuck their phone right into their bra, which may be the absolute worst place for a woman to put it, as it could raise their risk of both heart problems and breast tumors, two leading risks of death for women.

Now, cellphone testing by the Chicago Tribune¹ reveals several popular cellphones emit far higher levels of RF radiation than legally permitted, which has not only reignited discussions about safety but also led to the launch of at least one class-action lawsuit.

How Safety Limits Are Determined

The safe distance (listed in your cellphone manual) is based on your phone's specific absorption rate (SAR). SAR is a measure of how much RF energy your body will absorb from the device when held at a specific distance from your body, typically ranging from 5 to 15 mm, depending on the manufacturer.

Put another way, it's a measure of the degree to which your device will heat body tissue, which we now know is not the primary way that cellphones damage your body.

However, even though heat generated from your phone does not really damage your body, the SAR could be a good surrogate marker for the actual microwave radiofrequency exposure that does indeed cause cellular damage, as it is the microwaves that heat your tissue. So, typically, the lower SAR rating, the safer your phone, but not for the reasons they are telling you.

The SAR limit set by the Federal Communications Commission (FCC)² is currently the only standard set to protect public health, so the fact that even these lenient standards are being exceeded is concerning.

In the U.S. and Canada, the SAR limit for mobile devices used by the public is 1.6 W/kg per 1 gram of head tissue. To understand why and how SAR underestimates radiation absorption and health risks, see "Exposure Limits: The Underestimation of Absorbed Cellphone Radiation, Especially in Children,"^{3,4} published in the journal *Electromagnetic Biology and Medicine* in 2012.

Popular Cellphones Emit Illegal Levels of RF

As mentioned, recent independent SAR testing paid for by the Chicago Tribune⁵ reveals several popular cellphones emit far higher levels of RF radiation than legally permitted. One bestselling cellphone, the iPhone 7, emitted more than double the legal SAR limit. As reported by the Chicago Tribune:⁶

"The Federal Communications Commission, which is responsible for regulating phones, states on its website that if a cellphone has been approved for sale, the device 'will never exceed' the maximum allowable exposure limit. But this phone, in an independent lab inspection, had done exactly that."

In all, Chicago Tribune tested 11 cellphone models from four manufacturers. Because of the surprisingly high level of radiation obtained from the first iPhone 7 tested, four iPhone 7s were tested, using a standard test and a modified test based on manufacturers feedback. While results varied from one device to another, all four exceeded the FCC's limit.

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At a distance of 2 mm from the body – which mimics carrying your phone in your pocket – the results ranged from 3.5 W/kg on the low end to 4.69 W/kg on the high end, which are 2.2 to 2.9 times above the legal limit.

The three Samsung Galaxy smartphones tested, Galaxy S9, S8 and J3, were all within the legal limit at 10 to 15 mm from the body (the distance used by Samsung), but RF

radiation levels skyrocketed at 2 mm from the body, raising serious questions about the safety of keeping a Galaxy phone in your pocket.

The Galaxy S9 came in at 3.8 W/kg at 2 mm from the body, while the S8 registered a whopping 8.22 W/kg (more than five times the legal limit) and J3 registered 6.55 W/kg. Based on these test results, the FCC has vowed to conduct its own testing in the near future, the Chicago Tribune reports. FCC spokesman Neil Grace told the Tribune:⁷

"We take seriously any claims on non-compliance with the RF (radiofrequency) exposure standards and will be obtaining and testing the subject phones for compliance with FCC rules."

Safety Standards Leave Lots of Wiggle Room

How could these cellphones exceed the legal limit by such a significant margin? Part of the problem, the Tribune explains, is that manufacturers need only get a passing grade for a single cellphone in order to allow them to put millions on the market. They're also allowed to select their own testing lab, which could give rise to discrepancies.

As noted by the Tribune, Apple disputed the results, saying the lab used by the Tribune "had not tested the phones the same way they do," although the company did not specify what the problem was.

Motorola also disputed the results obtained for its Moto e5 Play, saying the Tribune's test might not have triggered the phone's proximity sensors – sensors that are supposed to detect when the device is in close proximity to your body and lower the phone's power output accordingly. The Tribune writes:

"Motorola ... would not answer questions about its power sensors. 'Our power management techniques and expertise provide Motorola with a significant competitive advantage in the marketplace, and are therefore highly confidential,' the company's statement said."

'The Chicago Tribune's third-party lab was not privy to the proprietary techniques from Motorola necessary to elicit accurate results' ... When the Tribune asked Motorola to explain how it tests its phones, the company declined. It also would not share its lab reports.'

While the Tribune's lab had conducted the testing according to FCC standards, the feedback from Motorola led the Tribune to retest the Apple and Motorola phones using a modified test "aimed at activating sensors that would reduce power."

And, while the modified testing did allow some cellphone models to pass – suggesting proximity sensors in some phones may not work properly under certain conditions – the iPhone 7 still failed to meet the FCC standard. The Tribune writes:⁸

"When informed of the new results, Apple officials declined to be interviewed and requested the Tribune put its questions in writing. The newspaper did, submitting three dozen, but Apple did not answer any of them."

Safety Standards Do Not Match Real-World Exposure

Another problem is that SAR testing companies are allowed to position the cellphone as far as 25 mm (0.98 inches, or nearly 1 inch) away from the body to meet the FCC standard. Today, few people consistently keep their phone at least a quarter of an inch to an inch away from their body, which means overexposure is chronic.

In 2012, the Government Accountability Office stated that because cellphone radiation is not measured under real-world conditions, against the body, the FCC should reassess its limits and testing requirements. In August 2019, the FCC finally announced that "the existing standard sufficiently protects the public and should remain in place," the Tribune writes.⁹

Clearly, the Tribune's independent testing suggests otherwise. As the Tribune points out, 68% of American teenagers take their cellphones to bed with them and nearly 29% sleep with them,¹⁰ often next to or under their pillow. Children are also exposed to RF starting

in utero. Never before has an entire generation been exposed to this amount of RF from cradle to grave. The Chicago Tribune writes:¹¹

"When cellphones hit the market in the 1980s, authorities focused on setting an exposure limit to address only the heating risks of cellphones. Scientists found that animals showed adverse effects when exposed to enough radiofrequency radiation to raise their body temperature by 1 degree Celsius.

Authorities used this finding to help calculate a safety limit for humans, building in a 50-fold safety factor. The final rule, adopted by the FCC in 1996, stated that cellphone users cannot potentially absorb more than 1.6 watts per kilogram averaged over one gram of tissue.

To demonstrate compliance, phone makers were told to conduct two tests: when the devices were held against the head and when held up to an inch from the body.

These testing methods didn't address the anatomy of children and that of other vulnerable populations, such as pregnant women, said Joel Moskowitz, a cellphone expert at the University of California at Berkeley. 'It was like one-size-fits-all.' Plus, he said, 'I don't think anyone anticipated the smartphone and how it would become so integral to our lives.'"

'This Could Be the Chernobyl of the Cellphone Industry'

In the wake of the Tribune's report, the class-action law firm Fegan Scott has announced it will launch an investigation.¹² In a BusinessWire press release,¹³ managing partner Beth Fegan stated:

"This could be the Chernobyl of the cellphone industry, cover-up and all. If we found that produce sold in grocery stores contained twice the levels of pesticides as the law allows, we would be up in arms, demanding the products be pulled from the shelf – this is no different.

In this case, we know the cellphone radiation is dangerous, but the terrifying part is that we don't know how dangerous, especially to kids' brain development.

The fact that the Chicago Tribune can convene a group of experts and develop such convincing findings shows that the phone manufacturers may be intentionally hiding what they know about radiation output."

According to MacRumors,¹⁴ Fegan Scott has not provided any additional information about its investigation or what kind of legal action it might pursue. Those wanting to learn more about the investigation and/or to receive updates are urged to email phoneradiation@feganscott.com.

That said, at least one class-action lawsuit has already been filed.¹⁵ August 23, 2019, a dozen individuals filed a class action complaint¹⁶ against Apple Inc. and Samsung Electronics America Inc., saying excessive RF radiation has placed them at increased risk for cancer, cellular stress, genetic damage, learning and memory deficits and neurological disorders.

As noted by Tech Wellness,¹⁷ the lawsuit stresses that while the cellphone industry used to warn against holding your cellphone against your body, people are now encouraged to carry their phones in their pockets rather than a bag.

Tech Wellness also notes that,¹⁸ "Both Samsung and Apple have commercials showing people lying in bed with their phones and Samsung shows a pregnant woman holding the phone to her belly," which presents the false perception that these devices are safe even when in direct contact with the body.

Government Research Confirms Safety Concerns

Indeed, there's plenty of scientific evidence showing there's cause for concern and prudence. Among the more damning studies are two government-funded animal studies¹⁹ that reveal GSM and CDMA radiation has carcinogenic potential.

The finalized report²⁰ of these two studies – conducted by the National Toxicology Program (NTP), an interagency research program under the auspices of the National Institute of Environmental Health Sciences – was released November 1, 2018.

While the preliminary report released in February 2018 significantly downplayed the findings,²¹ subsequent peer review upgraded the findings of risk. The NTP rates cancer risk based on four categories of evidence: "clear evidence" (highest), "some evidence," "equivocal evidence," and "no evidence" (lowest). According to the NTP's final report, the two studies, done on mice and rats of both sexes, found:²²

- Clear evidence for heart tumors (malignant schwannomas) in male rats. These types of tumors started developing around week 70, and are very similar to acoustic neuromas found in humans, a benign type of tumor that previous studies have been linked to cellphone use.
- Some evidence of brain tumors (malignant gliomas) in male rats. Glial cell hyperplasias – indicative of precancerous lesions – began developing around week 58.
- Some evidence of adrenal gland tumors in male rats, both benign and malignant tumors and/or complex combined pheochromocytoma.
- Equivocal or unclear evidence of tumors in female rats and mice of both genders.

While the NTP insists the exposure – nine hours a day for two years, which is the lifetime of a rodent – is far more extensive than that of heavy cellphone users, I would disagree, seeing how many have their cellphones turned on and near their body 24/7. As mentioned, many teens are literally sleeping with their phone beneath their pillow.

NTP Findings Reproduced at Power Levels Below FCC Limits

Corroborating evidence was also published by the Ramazzini Institute just one month after the NTP released its preliminary report in February 2018. The Ramazzini study²³ reproduces and clearly supports the NTP's findings, showing a clear link between

cellphone radiation and Schwann cell tumors (schwannomas)^{24,25,26} — but at a much lower power level than that used by NTP.

While NTP used RF levels comparable to what's emitted by 2G and 3G cellphones (near-field exposure), Ramazzini simulated exposure to cellphone towers (far-field exposure). Ramazzini's rats were exposed to 1.8 GHz GSM radiation at electric field strengths of 5, 25 and 50 volts per meter²⁷ for 19 hours a day, starting at birth until the rats died either from age or illness.

To facilitate comparison, the researchers converted their measurements to watts per kilogram of body weight (W/kg), which is what the NTP used. Overall, the radiation dose administered in the Ramazzini study was up to 1,000 times lower than the NTP's — and below the U.S. limits set by the FCC — yet the results are strikingly similar.

As in the NTP studies, exposed male rats developed statistically higher rates of heart schwannomas than unexposed rats. They also found some evidence, although weaker, that RF exposure increased rates of glial tumors in the brains of female rats.

Cellphone Radiation Can Do a Great Deal of Harm

In my view, the fact that popular cellphones are exceeding the legal limit of RF is a significant health concern, as the primary hazard of cellphone radiation is not brain cancer but systemic cellular and mitochondrial damage,^{28,29,30,31} which can contribute to any number of health problems and chronic diseases.

Cellphone radiation has also been shown to have a significant impact on neurological and mental health,³² contributing to and/or worsening anxiety, depression and dementia, for example, and all of these conditions are rampant and growing more prevalent.

Research also suggests excessive EMF exposure is contributing to reproductive problems. For example, researchers have found prenatal exposure to power-frequency fields can nearly triple a pregnant woman's risk of miscarriage.³³ Studies have also shown cellphone radiation can reduce sperm motility and viability.^{34,35}

It's really important to realize that the harms of cellphone radiation are not related to the heating of tissue. Rather, it causes a cascade of molecular events that end up causing severe oxidative damage. This mechanism of harm is reviewed in more detail in my interview with professor Martin Pall below.

5G Will Exponentially Magnify Your Health Risks

The planned implementation of 5G is bound to further magnify the health risks associated with cellphones and other wireless devices. A call for a moratorium on 5G was issued in September 2017 by more than 180 scientists and doctors from 35 countries,^{36,37} "until potential hazards for human health and the environment have been fully investigated by scientists independent from industry."

The moratorium points out that "RF-EMF has been proven to be harmful for humans and the environment," and that "5G will substantially increase exposure to radiofrequency electromagnetic fields (RF-EMF) on top of the 2G, 3G, 4G, Wi-Fi, etc. for telecommunications already in place."

Despite that, and an appeal for protection from nonionizing EMF exposure by more than 230 international EMF scientists to the United Nations in 2015,³⁸ the U.S. and many other countries are still moving ahead without any health or environmental impact studies.

At a February 6, 2019, senate commerce hearing (above), the FCC admitted that no 5G safety studies have been conducted or funded by the agency or the telecom industry, and that none are planned.^{39,40}

The added concern 5G brings is the addition of the millimeter wave (MMW). This bandwidth, which runs from 30 gigahertz (GHz) to 300GHz,⁴¹ is known to penetrate up to 2 millimeters into human skin tissue,^{42,43} causing a burning sensation.

Research has shown sweat ducts in human skin act as receptors or antennae for 5G radiation, drawing the radiation into your body,^{44,45,46,47} thereby causing a rise in temperature. This in part helps explain the painful effect. As noted by Dr. Yael Stein —

who has studied 5G MMW technology and its interaction with the human body – in a 2016 letter to the Federal Communications Commission:⁴⁸

"Potentially, if 5G Wi-Fi is spread in the public domain we may expect more of the health effects currently seen with RF/ microwave frequencies including many more cases of hypersensitivity (EHS), as well as many new complaints of physical pain and a yet unknown variety of neurologic disturbances.

It will be possible to show a causal relationship between 5G technology and these specific health effects. The affected individuals may be eligible for compensation."

Aside from pain,⁴⁹ MMW has also been linked to eye damage,^{50,51,52} heightened stress through its impact on heart rate variability,^{53,54,55} arrhythmias,^{56,57} suppressed immune function⁵⁸ and increased antibiotic resistance in bacteria.⁵⁹

If Stein is right about being able to demonstrate a causal relationship between 5G and certain health effects, then the class action against Apple and Samsung will be just the beginning of a flood of lawsuits.

Beyond its health ramifications, a global 5G network will also threaten our ability to predict weather, which will put civilians at risk and jeopardize the Navy.⁶⁰ According to a recent paper⁶¹ in the journal Nature, widespread 5G coverage will prevent satellites from detecting changes in water vapor, which is how meteorologists predict weather changes and storms. Time will tell if that will be yet another avenue for legal action.

The National Cancer Institute Continues to Deny the Risk

The National Cancer Institute is a federal agency funded by Congress. As such its mission is to conduct and support cancer research, yet,⁶² when it comes to researching and supporting radiation dangers from cellphones, it posts studies denying the dangers on its website⁶³ while studies like one published in late 2020, which found that “every 1,000 hours of cellphone use, or about 17 minutes a day over a 10-year period, is associated with a statistically significant 60% increase in brain cancer.”^{64,65}

This research directly contradicts the NIH's statement that "the evidence to date suggests that cell phone use does not cause brain or other kinds of cancer in humans." Another study by the former director of the National Center for Environmental Health at the CDC concluded that there is a "high probability" that radiofrequency radiation emitted by cellphones causes gliomas and acoustic neuromas, two types of brain tumors.⁶⁶ So why would the NCI ignore safety signals?

Take Precautions Sooner Rather Than Later

Clearly, a key take-home message from the Tribune's testing is that you should never carry your phone in your pocket unless it's in airplane mode. Carrying it on your body while it's on is a surefire way to ensure overexposure, and this appears to be true for many different models.

The radiation may even differ from one phone to the next, of the same model, so even if your model happened to rate well at the 2-mm distance in this particular test, it's not a guarantee your individual phone will not overexpose you.

To address these issues, I've written a book on EMF dangers, called "EMF'd," which is a comprehensive resource on current technologies. It was published in 2020. You can also learn more about 5G and help educate others by downloading a two-page 5G fact sheet⁶⁷ from the Environmental Health Trust. On their website, you can access a long list of published scientific studies showing cause for concern.⁶⁸

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