



## Case Report

# A 49-Year-Old Man Developed Severe Microwave Syndrome after Activation of 5G Base Station 20 Meters from his Apartment

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**Citation:** Nilsson M, Hardell L (2023) A 49-Year-Old Man Developed Severe Microwave Syndrome after Activation of 5G Base Station 20 Meters from his Apartment. J Community Med Public Health 7: 382. DOI: <https://doi.org/10.29011/2577-2228.100382>

**Received Date:** 01 November, 2023; **Accepted Date:** 08 November, 2023; **Published Date:** 13 November, 2023

### Abstract

The deployment of the fifth generation, 5G, for wireless communication has been rolled out in Sweden since 2019/2020. This has caused increased high-pulsed Radiofrequency (RF) radiation. In four case reports we have described persons that developed the microwave syndrome soon after installation of 5G base stations close to their residence or office. In this new case report a 49-year old previously healthy man is described. A 5G base station was installed 20 meters from his apartment. He rather immediately developed a variety of symptoms that are part of the microwave syndrome. Most severe were headache, dysesthesia (abnormal sensation), loss of immediate memory, high and irregular pulse, chest squeeze, burning and lancinating skin. Very high RF radiation was measured in his apartment, however much lower than the limits recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). After moving to another apartment with low RF radiation the symptoms disappeared or decreased within a short time period but they reappear whenever he returns to his apartment close to the 5G antennas. This must be regarded as a provocation test on health and 5G radiation.

**Keywords:** Base Station; 5G; Radiofrequency Radiation; Electromagnetic Hypersensitivity; Microwave Syndrome; Health

### Introduction

5G base stations for wireless communication have been deployed on a broad scale since 2019/2020 in many countries despite no previous research on possible negative effects from the radiation emitted from 5G on human health and the environment. Exposure to pulse-modulated microwave (radiofrequency; RF) radiation has increased dramatically on a world-wide basis [1,2]. Microwaves are frequencies in the range of 300 MHz to 300 GHz. In city environments in Sweden, frequencies used for 5G are currently in the 3.5 GHz band. 5G may be used in combination with 4G (<https://pts.se/sv/5g/inforande-av-5g/>).

The safety limits for exposure to RF radiation applied by most countries around the world are still based on heating (thermal)

effects that appear within short time of exposure (less than one hour). They offer no protection against long-term exposure and any other harmful effects that are not based on heating (non-thermal) [3-5]. The guidelines for reference values based on heating are set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), a self-appointed private organization based in Germany [3,5]. ICNIRP has world-wide influence and dominance on the evaluation of scientific evidence of negative health effects from RF radiation. Their guidelines are based on evaluations that have rejected non-thermal effects, despite growing evidence of a range of harmful effects well below the ICNIRP levels. The ICNIRP limits are of interest to the telecommunications industry thereby facilitating the deployment of 5G and the other wireless technologies emitting RF radiation [6,7].

Studies on possible health effects from exposure to the 5G frequencies around 3.5 GHz were until recently scarce [8]. In

2009 a study reported oxidative stress in the liver, kidneys, the plasma and increased electrical conductivity of hemoglobin in rats exposed during one month to a 3.5 GHz unmodulated signal with a calculated Specific Absorption Rate (SAR) of 1 W/kg, which is well below the ICNIRP SAR value of 2 W/kg [9].

In a study published in 2022, animals were exposed to the 5G frequency 3.5 GHz (GSM modulated), 1 600 000  $\mu\text{W}/\text{m}^2$ , during 2 hours a day, 5 days a week during one month. The exposure caused oxidative stress and an increase of degenerated neurons in the hippocampus region of the brain. The observed effects may trigger neurodegenerative diseases if exposure is chronic according to the authors [10]. The level of exposure was non-thermal and well below the guidelines recommended by ICNIRP [3,5].

Another study from the same research group published in 2023, with similar exposure (rats exposed to 3.5 GHz, 1 600 000  $\mu\text{W}/\text{m}^2$ , 2 hours/day, 5 days/week during 30 days) reported negative effects on bone strength and oxidative stress parameters in muscle tissue. The latter effect was more pronounced in diabetic rats [11].

In a recently published study, rats were exposed from gestational day 8 to 21 days after birth to 3.5 GHz (continuous wave) at 0.07 W/kg for 22 h/day. Behavioral changes were observed in the exposed group compared to the non-exposed group [12].

A study published in 2020 exposed zebrafish embryos to RF radiation 3.5 GHz with SAR calculated to 8.27 W/kg, for 42 hours [13]. No significant impacts on mortality, morphology or photomotor responses were reported, however a slight effect on sensorimotor function which may lead to later effects as “adult neuropsychiatric outcomes, like those detected in previous RFR [Radiofrequency Radiation] studies”. The exposure lacked the characteristics of real life exposure such as modulation, pulsation and simultaneous exposure to multiple frequencies.

In consequence, none of these studies used 5G signals corresponding to the exposure that people are exposed to in real life from 5G base stations that also may be used in combination with 4G technology. However the ones that are most similar to real life exposure are those that used GSM modulation [10,11].

We recently published four case studies on health effects from 5G base stations [14-17]. These studies showed that the study persons developed the microwave syndrome after the installation of 5G base stations that caused high pulsed RF radiation to their dwellings.

### **The Microwave Syndrome**

Microwave syndrome, sickness or illness as an effect of microwave exposure, was reported already in the 1960's and 1970's in the East European countries [18,19]. Most affected

were the neural, cardiovascular, and endocrine functions. Investigations of exposed workers showed that microwave (RF) exposure at non-thermal levels caused symptoms such as fatigue, dizziness, headache, sleep disorders, anxiety, and problems with attention and memory [20]. A review of these studies, as well as studies on animals, concluded that “a surprisingly wide variety of neurological and physiological reactions are to be expected” because of exposure to non-thermal levels of RF/microwave radiation [21].

Other term for the illness was radiofrequency sickness syndrome [22,23]. The non-thermal effects depend primarily on the modulation and/or pulsation of the signal and also on the peak and average intensities. Pulsed signals and simultaneous exposure to several frequencies caused more effects and were thus considered more hazardous. The observed effects increased with time of exposure [23,24].

In general, the symptoms declined after the exposure had ceased. According to Marha et al “at a certain time after exposure had ended (sometimes as long as several weeks or more) (see page 31), the organism usually returns to its original physiological state and all subjective and objective complaints vanish” [20].

### **Previous Studies on Health Effects near Base Stations or Mobile Phone Masts**

Since two decades studies investigating health effects among inhabitants near mobile phone masts or base stations have been published. Some studies have investigated prevalence of symptoms identified within the microwave syndrome, others have investigated other outcomes such as cancer or effects on biochemical parameters, for instance hormones or indications of genetic damage [25,26]. One study from France has studied frequency of ALS [27]. According to a review in 2022 of most of these studies, 17 of 23 studies showed evidence for radiofrequency sickness or the microwave syndrome, 10 of 13 reported increased cancer risks and six of eight studies found changes in biochemical markers among people living in the vicinity of masts or base stations [26].

### **Previous Studies on Health Effects from 5G Base Stations**

Recently we published a case report of two previously healthy persons, a man aged 63 years and a woman aged 62 years, who quickly developed symptoms compatible with the microwave syndrome after installation of a 5G base station on the roof above their apartment [14]. Very high RF radiation with maximum peak level  $>2\ 500\ 000\ \mu\text{W}/\text{m}^2$  was measured in the bedroom located only 5 meters below the new 5G base station on the roof. That is the upper detection limit for the used exposimeter, Safe and Sound Pro II. Before the deployment of the 5G base station maximum peak level of  $9\ 000\ \mu\text{W}/\text{m}^2$  was measured from the 3G/4G base

station that had been located at the same place since several years. Due to the severity of the experienced symptoms, the couple left the apartment within a couple of days for another dwelling with much lower maximum peak RF radiation of  $3\,500\ \mu\text{W}/\text{m}^2$ . Their symptoms abated within few days. This is an example of a provocation test.

In our second study we presented two men that also developed the microwave syndrome after installation of 5G base station on the roof of the building where their office was located at the top floor [15]. High RF radiation levels were measured in the office with highest maximum peak radiation level of  $1\,180\,000\ \mu\text{W}/\text{m}^2$  after the deployment of the 5G base station. Within short time after leaving the offices the symptoms that the two men had developed below the 5G base station disappeared. As in the first study, a base station for 3G/4G was already at the spot since several years prior to the replacement by 5G. This was another clear example of a provocation test with the persons being their own control subjects.

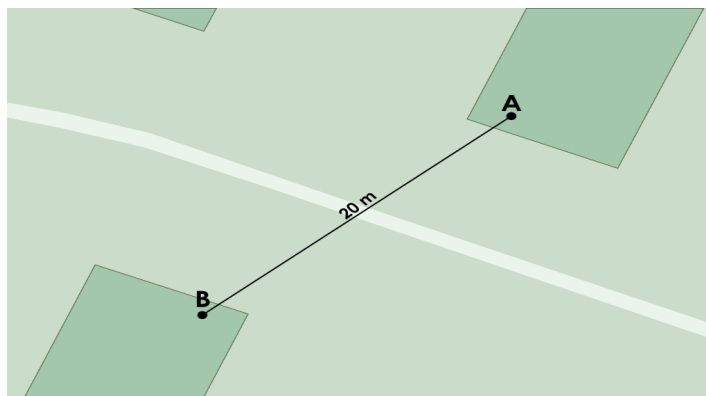
In our third case study we studied the exposure to RF radiation from a 5G base station and the health status of a woman aged 52 years living in an apartment 60 meters from the 5G antennas directed at her apartment. The woman developed symptoms of the microwave syndrome within days after the deployment of the 5G base station [16]. Very high peak RF radiation levels,  $>2\,500\,000\ \mu\text{W}/\text{m}^2$ , were measured on the balcony facing the base station (highest detection limit for the used exposimeter). In the living room maximum peak levels varied between  $222\,000$  and  $758\,000\ \mu\text{W}/\text{m}^2$  at the sofa and window, respectively. The symptoms declined after the woman had left the apartment for another dwelling with considerably lower peak RF radiation levels.

In our fourth case study, we investigated the health of three persons within a family living in an apartment with two 5G base stations at 50 and 70 meters distance, respectively [17]. Maximum (peak) levels of RF radiation measured in the bedrooms of the three studied persons varied from  $1\,200\,000\ \mu\text{W}/\text{m}^2$  to  $166\,000\ \mu\text{W}/\text{m}^2$  near the window and were also high at the pillow in the beds, although lower than at the window. The 5G base stations had been deployed and activated in 2021 and 2022 and there had previously been 3G/4G base stations at the same spot. The family members suffered in various degrees to several of the symptoms identified in the microwave syndrome.

These four studies are to our knowledge among the first that have been published on health effects in persons exposed to real life 5G RF radiation. Thus, we were motivated to investigate further the potential health effects of being exposed to RF radiation from 5G base stations.

## This Case Study

In this article we present a new case study of a man, aged 49 years and living together with his adolescent daughter, at 20 meters distance from a 5G base station with antennas directed towards his apartment situated on the third floor of a three floor building (Figure 1). The base station was deployed in November 2022 and placed on the roof of a three floor building on the opposite side of the street. The man's apartment is situated at the same level as the base station, since the building with the base station is located at a slightly lower height (Figure 2).



**Figure 1:** Map showing the position of the man's apartment (A) and the position of the 5G base station (B). The distance is only 20 meters and the antennas of the base station are directed towards the apartment.



**Figure 2:** Picture of the 5G base station with antennas directed towards the studied apartment.

A base station for 3G/4G had previously been active at least since 2013 on the roof of the same building in front of the man's apartment, however at a distance further away. The man had lived in the apartment during the same period.

The man and his daughter left the apartment for another dwelling only one week after the deployment of the 5G base station due to the severe effects on the man's health. It became unbearable to stay in the apartment and he even feared for his life due to the severity of the experienced health effects. In the new dwelling, levels of measured radiation were very much lower. The man revisited the apartment repeatedly during several months to pick up personal belongings.

### Methods

On April 25, 2023, the authors of this study visited the man and the apartment of this study for measurements of RF radiation in the apartment. He was also asked to reply questions about symptoms identified within the microwave syndrome and the estimated severity of the symptoms. The questionnaire was also used in our previous case studies. The daughter did not participate in this study.

The measurements were made in the evening of April 25, 2023 between 7 and 8 pm, with the device Safe and Sound Pro II broadband RF meter. The true response detection range is between 400 MHz and 7.2 GHz. It was calibrated by the manufacturer and has an accuracy of  $\pm 6$  dB (<https://safelivingtechnologies.com/products/safe-and-sound-pro-ii-rf-meter.html>). The upper detection limit for peak values of the used exposimeter in this study was  $3\,180\,000\ \mu\text{W}/\text{m}^2$  with linear response between  $0.1\ \mu\text{W}/\text{m}^2$  and  $1\,000\,000\ \mu\text{W}/\text{m}^2$ . At every investigated place in the apartment 10 measurements, each during 1 minute, were made and the peak value was documented

On October 6, 2023, new measurements were made in the apartment, also in the evening between 6 and 7 pm. This time the Narda broadband field meter NBM-550, with the probe EF-1891, measuring frequencies between 3 MHz-18 GHz, was used. In addition, new measurements with the Safe and Sound Pro II broadband RF meter were made. This meter shows peak levels of RF radiation whereas the Narda meter shows results in Root Mean Square (RMS) for both maximum and average. All measurements were made once during 2 minutes at each location.

## Results

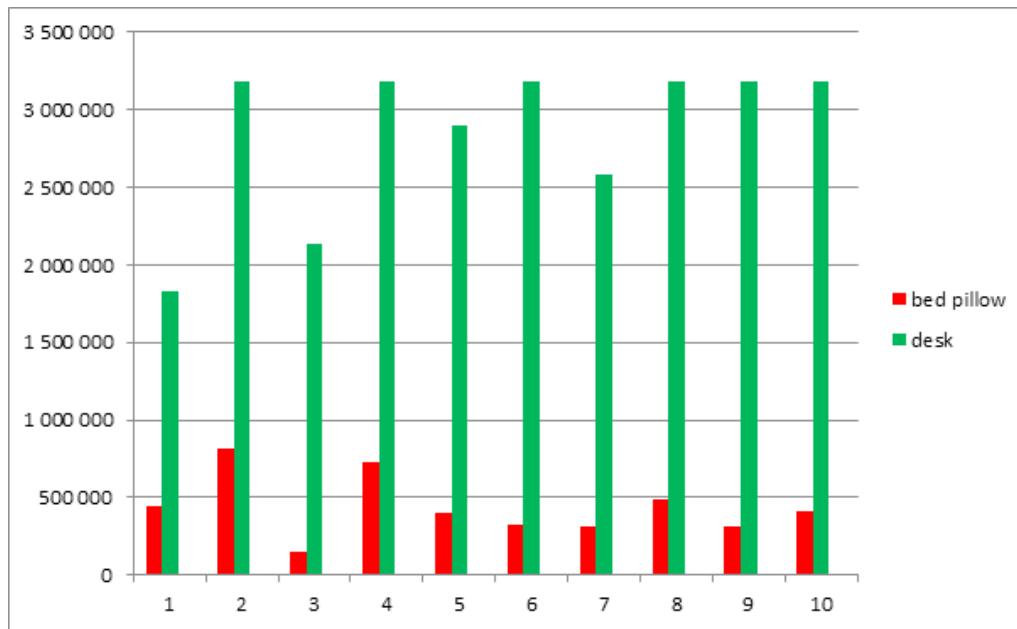
### Measurements of RF radiation

Table 1 shows the results of measurements of RF radiation made April 25, 2023. The highest levels were found in the part of the apartment closest to the 5G base stations; the living room and the daughter's bedroom. The levels reached the maximum peak measureable level  $3\,180\,000$  within 10-15 seconds for each of the ten measurements during one minute at both investigated spots in the living room, the sofa and the table (see Table 1).

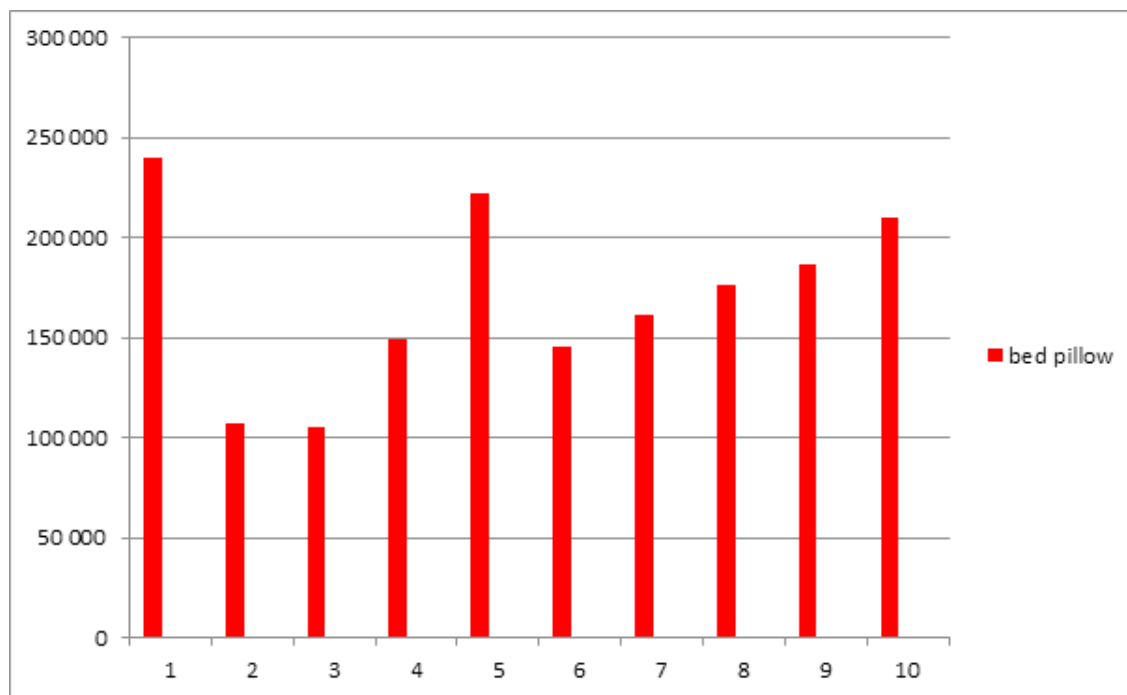
Location	Max (peak)
Living room, sofa <sup>1</sup>	> $3\,180\,000$ to > $3\,180\,000$
Living room, table <sup>2</sup>	> $3\,180\,000$ to > $3\,180\,000$
Sleeping room, pillow, man	105 000 to 240 000
Sleeping room, pillow, <sup>3</sup> daughter	146 000 to 820 000
Sleeping room, desk, <sup>4</sup> daughter	1 830 000 to > $3\,180\,000$
Kitchen, table	67 000 to 731 000
<sup>1</sup> 50 cm from outer wall; <sup>2</sup> 140 cm from outer wall; <sup>3</sup> 200 cm from outer wall; <sup>4</sup> 50 cm from outer wall.	

**Table 1:** Measurement of RF radiation in an apartment on April 25, 2023. Results are given in  $\mu\text{W}/\text{m}^2$ . Ten measurements with Safe and Sound Pro II were made at every place, each during one minute. Lowest and highest peak levels are displayed.

Also in the daughter's room very high levels were measured with a peak level at the desk that varied from  $1\,830\,000\ \mu\text{W}/\text{m}^2$  to  $>3\,180\,000\ \mu\text{W}/\text{m}^2$  for the 10 measurements. (see Table 1 and Figure 3). The desk was only 50 cm from the outer wall, thus the bed situated at 200 cm from the wall was slightly less exposed. Measured levels varied from 146 000 to 820 000  $\mu\text{W}/\text{m}^2$  (see Table 1 and Figure 3). In the man's bedroom, measured levels at pillow in the bed ranged from 105 000 to 240 000  $\mu\text{W}/\text{m}^2$ , (See Table 1 and Figure 4). In the kitchen the levels varied between 67 000  $\mu\text{W}/\text{m}^2$  and 731 000  $\mu\text{W}/\text{m}^2$ .



**Figure 3:** Measurements of RF radiation ( $\mu\text{W}/\text{m}^2$ ) April 25, 2023 in daughter’s room at the pillow situated 200 cm from outer wall, and at the desk situated 50 cm from outer wall. Ten measurements with Safe and Sound Pro II were made at every place, each during one minute.



**Figure 4:** Measurements of max (peak) RF radiation ( $\mu\text{W}/\text{m}^2$ ) April 25, 2023 in the man’s bedroom at the pillow. Ten measurements with Safe and Sound Pro II were made, each during one minute.

Table 2 shows the results of the follow-up measurements on October 6, 2023. The highest levels of maximum RF radiation, measured with the Narda-550 meter in RMS were at the door entrance to the daughter’s sleeping room, 1 368 021  $\mu\text{W}/\text{m}^2$ . The average RMS value was 332 732  $\mu\text{W}/\text{m}^2$  at the same place. In the entrance hall and the living room also very high levels were obtained with the Narda meter. Maximum RMS levels between 1 043 047 (hall entrance), 997 274 (living room sofa), and 571 624  $\mu\text{W}/\text{m}^2$  (living room table) were documented.

In the living room and at the door entrances to the hall and the daughter’s sleeping room, peak levels with the Safe and Sound Pro II were  $>3\ 180\ 000\ \mu\text{W}/\text{m}^2$ , thus higher than the maximum RMS values obtained with the Narda-550 meter (Table 2). It should be noted that the upper detection limit for Safe and Sound Pro II was  $3\ 180\ 000\ \mu\text{W}/\text{m}^2$ .

Location	Narda RMS Max	Narda RMS Average	S & S Pro Max Peak
Living room, sofa	997 274	135 983	$>3\ 180\ 000$
Living room, table	571 624	101 306	$>3\ 180\ 000$
Sleeping room, pillow, daughter	88 616	24 491	504 000
Sleeping room, door, daughter	1 368 021	332 732	$>3\ 180\ 000$
Sleeping room, desk, daughter	137 889	47 686	749 000
Sleeping room, pillow, man	30 483	13 668	269 000
Kitchen, table	38 302	12 838	249 000
Entrance hall	1 043 047	303 687	$>3\ 180\ 000$

**Table 2:** Measurement of RF radiation in an apartment on October 6, 2023 with Narda-550, probe EF-1891, and Safe and Sound (S & S) Pro II. Results are given in  $\mu\text{W}/\text{m}^2$  and for Narda results are given as Root Mean Square (RMS).

### Health symptoms

The results for self-assessed symptoms by the man, before and after the deployment of the 5G base station as well as after moving to another apartment, are presented in Table 3.

Symptom	October 2022, before 5G	November 2022, with 5G	Other dwelling, without 5G, May 2023
Headache	2	10	0
Dysesthesia	0	10	0
Myalgia	0	0	0
Arthralgia	0	0	0
Ear heat/otalgia	0	0	0
Tinnitus	0	0	0
Hyperacusis	0	0	0
Dizziness	0	0	0
Balace disorder	0	0	0
Concentration/Attention deficiency	2	8	0
Loss of immediate memory	2	10	0
Confusion	0	3	0

**Citation:** Nilsson M, Hardell L (2023) A 49-Year-Old Man Developed Severe Microwave Syndrome after Activation of 5G Base Station 20 Meters from his Apartment. J Community Med Public Health 7: 382. DOI: <https://doi.org/10.29011/2577-2228.100382>

<b>Fatigue</b>	3	8	0
<b>Sleeping difficulty</b>			
- insomnia	2	7	0
- waking night time	1	7	0
- early wake-up	1	1	0
<b>Depression tendency</b>	2	8	0
<b>Sucidal ideation</b>	0	0	0
<b>Cardiovascular abnormalities</b>			
- transitory high pulse	0	10	0
- irregular pulse	0	10	0
- slow pulse	0	0	0
<b>Blood pressure high/low</b>	0	3	0
<b>Ocular deficiency</b>	0	4	0
<b>Light sensitivity</b>	0	0	0
<b>Anxiety/Panic</b>	0	2	0
<b>Emotive</b>	2	4	0
<b>Irritability</b>	3	7	0
<b>Global body dysthermia</b>	0	5	0
<b>Dyspnoea</b>	0	5	0
<b>Chest squeeze</b>	0	0	0
<b>Chest pain</b>	0	10	0
<b>Cough</b>	0	0	0
<b>Nausea</b>	0	3	0
<b>Diarrehea (involuntary)</b>	0	2	0
<b>Abdominal pain</b>	0	0	0
<b>Urinary system -urgency</b>	0	0	0
<b>Skin (face, arms, legs)</b>	0	4	2
-burning, lancinating skin on hands and arms	0	10	3
-bruises, hemorrhages	1	3	0
<b>Nose bleeding</b>	0	0	0
<b>Hair loss</b>	0	1	0

**Table 3:** Clinical symptoms grades 0-10. Grade 0 = no symptoms, 10 = unbearable pain and/or discomfort in a man aged 49 years.

The most severe symptoms, graded to be 10 on the 10-grade severity scale, were headache, dysesthesia (abnormal sensation), loss of immediate memory, transitory high pulse, irregular pulse, chest pain, burning and lancinating skin on hands and arms. Other symptoms graded between 7 and 8 on the severity scale were fatigue, sleeping problems, concentration/attention deficiency, depression tendency and irritability.

As can be seen in Table 3, the man had since before much less self-estimated health problems. However he had e.g., headache, fatigue, sleeping difficulties, irritability and loss of immediate memory, grades 1-3, before the 5G exposure. After living in the new dwelling with considerably lower exposure to RF radiation, nearly all these health issues had disappeared by May 2023, apart from some skin problems, but now graded lower between 2 and 3.

Measurements made with the Safe and Sound Pro II meter on October 11, 2023 showed low levels of RF radiation in the new dwelling. Levels between 20 and 45  $\mu\text{W}/\text{m}^2$  were obtained at the pillow in the bed and between 20 and 50  $\mu\text{W}/\text{m}^2$  in the sofa in the living room (not in Table).

## Discussion

During the week from the deployment of the 5G base station until the man and his daughter left the apartment the man experienced worsening symptoms that started shortly after the 5G exposure started. He got headache that he described as “extreme”, a sense of tingling in his body and dry eyes. The slightest effort, such as doing the dishes or lifting up something, caused pain in his chest. His body swelled and he got bruises all over the body. Due to the swelling of the feet, his shoes did not fit anymore. During this first week, after leaving the apartment for work, the symptoms disappeared after some hours. However, they recurred and worsened each time he returned to the apartment.

The man and his daughter left the apartment already one week after the start of the 5G base station due to the man’s increasingly unbearable symptoms. During that week, the daughter complained of headache and had sleeping problems.

During the winter and until May 2023 the man returned repeatedly to the apartment to pick up his personal belongings. He estimates that over time his sensitivity to exposure to RF radiation has increased as the symptoms develop rather immediately when he returns. After each such exposure, it also takes longer time before they disappear once he returns to the new low-level radiation dwelling.

The symptoms experienced by the man are typical for the microwave syndrome or the microwave illness. Headache, sleeping problems and effects on the heart are well documented and reported repeatedly in studies on health effects due to exposure

to microwave/RF radiation.

The levels of RF radiation measured in the man’s apartment are among the highest measured so far in our case studies on health effects from exposure to 5G base stations. In our first case study also very high peak levels were measured with the Safe and Sound Pro II meter,  $>2\,500\,000\ \mu\text{W}/\text{m}^2$  (bedroom), the maximum measurable value for the used meter at that time [14]. This time a meter with maximum  $>3\,180\,000\ \mu\text{W}/\text{m}^2$  was used and the maximum level was reached within 10-15 seconds for each measurement in the living room. These levels are extremely much higher than levels of measured RF radiation exposure that had previously been reported to be linked to similar symptoms among people living near mobile phone masts and base stations for previous generations of mobile phone technology. However the measured levels are far below the recommended ICNIRP 2020 limits for the 5G frequency [3]. For these frequencies ICNIRP recommends maximum  $10\,000\,000\ \mu\text{W}/\text{m}^2$  averaged over 30 minutes.

The Narda-550 average RMS values for the highest exposed rooms in this study were between 101 306 (living room table) and 332 732  $\mu\text{W}/\text{m}^2$  (entrance to the daughter’s room) averaged over 2 minutes. There are no available studies showing that these measured levels, or maximum levels that are recommended by ICNIRP, are not harmful to human health when humans are full-body exposed to RF radiation from different generations of base stations for wireless communication. Nevertheless, in spite of this, ICNIRP’s chairman has argued that the ICNIRP limits will protect the public from any harmful effects from 5G (<https://www.techspot.com/news/84370-international-watchdog-study-finds-5g-safe.html>).

However, this case study shows that 5G at levels far below the ICNIRP limits may cause severe health effects in short time.

Previously a study has found that exposure from a base station for previous generations of telecommunications was associated with increased prevalence of fatigue, irritability, headaches, nausea, loss of appetite, sleeping disorder, depressive tendency, feeling of discomfort, difficulty in concentration, loss of memory, visual disorder, dizziness and cardiovascular problems. The highest exposure group was exposed to between 165 and 4 400  $\mu\text{W}/\text{m}^2$  in the bedroom [28].

Another earlier study reported headaches, cold hands or feet, difficulties in concentrating, tremor, loss of appetite, and feeling of exhaustion in the highest exposure group exposed to between 500 and 4 100  $\mu\text{W}/\text{m}^2$  in the bedroom [29].

Further, a significant correlation between measured RF radiation from mobile phone base stations and insomnia, depression, cerebral symptoms, joint illnesses, infections, skin changes, heart and circulation disorders, and disorders of the optical and acoustic



sensory systems, and the gastro-intestinal tract were reported in a study where the most exposed group was exposed on average to 3 631  $\mu\text{W}/\text{m}^2$  (1.17 V/m) in the bedroom [30].

A recent review on health risks from the wireless technology concluded that “there are numerous non-thermal effects from wireless radiation on reproduction, development, and chronic illness” [31]. Further, in an Essay it was stated that “Based on the precautionary principle, the author echoes the calls of others for a moratorium on the further roll-out of 5G systems globally, pending more conclusive research on their safety.” [32].

Since 2017 seven appeals, today endorsed by 434 scientists and medical doctors, have been sent to EU requesting a moratorium on the deployment of 5G until health risks have been investigated (<http://www.5gappeal.eu>). These calls have not had any effect on the progress of this technology. On the contrary the EU Commission has proposed a regulation called the Gigabit Infrastructure Act (GIA) for deployment of 5G millimeter technology ([http://www.5gappeal.eu/wp-content/uploads/2023/10/critical\\_comments\\_gia\\_nyberg\\_hardell\\_annex.pdf](http://www.5gappeal.eu/wp-content/uploads/2023/10/critical_comments_gia_nyberg_hardell_annex.pdf)). If accepted, GIA will pave the way for much denser 5G infrastructure technology, mainly millimeter wave technology in the frequency range 26 GHz and higher.

Our new case report and our previous ones show an urgent need for a moratorium on deployment of 5G at 3.5 GHz, and also the 5G millimeter wave technology and above, i.e., 6G that is now discussed to be implemented. There are at present, according to our knowledge, no other studies on health effects on humans from real 5G exposure.

## Conclusion

This case study showed that a man living in an apartment at a distance of 20 meters from a 5G base station quickly developed severe symptoms of the microwave syndrome. The study confirmed previous case studies that 5G entails very high RF radiation exposure that causes illness in people living in the vicinity, and that the exposure levels that caused this illness are very much below the ICNIRP limits. There are no studies showing that 5G is safe for human health.

**Funding:** Support for this report was received from Agarth AB

**Availability of data and materials:** The information generated and analyzed during the current study is available from the corresponding author on reasonable request.

**Author’s contributions:** Both authors participated in the conception, design and writing of the manuscript, and have read and approved the final version.

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