189599

AGENDA ITEM 526 **TESTIMONY** **REGULAR AGENDA**

Grant a franchise to XO Communications Services, LLC for telecommunications services and facilities, for a period of 10 years

If you wish to speak to Council, please print your name, address and email

	Name (PRINT)	Address and Zip Code (*Optional*)	Email (*Optional*)
✓ 1	Roberta Phillip-Robbins		roberta@digitalcommonwealth.global
2	michelle bexelius		
✓ 3	~~Anne-Marie Oliver~~ Barry Sanders		
✓ 4	~~Barry Sanders~~ Anne-Marie Oliver		
✓ 5	David Morrison		
left 6	Maggie		
✓ 7	Coleman Gariety		
8			
9			
10			

Date 6-5-19

189599

Moore-Love, Karla

From: Daphnie <xandri.w@gmail.com>
Sent: Friday, June 7, 2019 10:58 AM
To: Council Clerk – Testimony
Subject: Agenda 526 and 537

To whom it may concern,

I am writing to ask that agenda 526 and 537 not be allowed to pass. Our bodies and the health of our people are too important to take such an unknown risk, of which the damage from we will likely only see until well after it is too late.

Please choose to be heroic and protect us, and put our livelihood and health first! We have seen studies of the impacts of 5G on other life forms, and we DO NOT have enough information to prove its safety yet. This is potentially one of the most important decisions that could be made on our behalf. I urge you to make the right choice, and prevent potential public outrage and protest. Thank you for hearing this message, and thank you for choosing the welfare of people over profit.

Be well,
Daphnie Alexandria

189599

PETER A. DEFAZIO
4TH DISTRICT, OREGON

TRANSPORTATION AND
INFRASTRUCTURE
CHAIRMAN

Congress of the United States
House of Representatives

PLEASE RESPOND TO:

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WASHINGTON, DC 20515-3704
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☐ 405 EAST 8TH AVENUE, #2030
EUGENE, OR 97401
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April 15, 2019

Chairman Ajit Pai
Federal Communications Commission
445 12th Street SW
Washington, DC 20554

Dear Chairman Pai and Acting Commissioner Sharpless:

I write to inquire about the status of the federal government's research into the potential health effects of radiofrequency (RF) radiation and its relation to the Federal Communications Commission's (FCC) current guidelines for what it considers to be safe RF exposure levels for humans.

As you know, the impending rollout of 5G technology will require the installation of hundreds of thousands of "small cell" sites in neighborhoods and communities throughout the country, and these installations will emit higher-frequency radio waves than previous generations of cellular technology. This means that Americans will be exposed to more non-ionizing RF radiation than ever before.

The FCC's current guidelines for RF safety were adopted in 1996, a time when our society's relationship with and understanding of wireless technology was much different than it is today. In fact, in August 2012 – almost seven years ago – the Government Accountability Office (GAO) released a report recommending that the FCC "should formally reassess and, if appropriate, change its current RF energy exposure limit and mobile phone tested requirements..."[1] The report continued:

> The [FCC's] RF energy exposure limit may not reflect the latest research, and testing requirements may not identify maximum exposure in all possible usage conditions...By not formally reassessing its current limit, FCC cannot ensure it is using a limit that reflects the latest research on RF energy exposure. FCC has also not reassessed its testing requirements to ensure that they identify the maximum RF energy exposure a user could experience.

While I was pleased to see the FCC seek comments in 2013 on whether its RF safety guidelines should be reassessed,[2] it is unacceptable that six years later the FCC still has not conducted a reassessment of its 1996 guidelines.

Meanwhile, concern about exposure to RF radiation has been increasing. My constituents in southwest Oregon have expressed their concerns regarding possible health effects from increased RF exposure, particularly in light of upcoming 5G technology. They are not alone – Americans across the country are expressing similar worries about possible adverse health effects from this technology, and they are understandably demanding answers from the federal government.

Moreover, states and municipalities across the country, including in my congressional district, are hearing from citizens who are concerned about this technology being installed in their communities. Yet

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[1] Government Accountability Office, "Exposure and Testing Requirements for Mobile Phones Should Be Reassessed," GAO-12-771, July 2012, https://www.gao.gov/assets/600/592901.pdf.

[2] Federal Communications Commission, "Reassessment of Federal Communications Commission Radiofrequency Exposure Limits and Policies: Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields," FCC 13-39, 29 March 2013, https://docs.fcc.gov/public/attachments/FCC-13-39A1.pdf.

because Section 704(a) of the Telecommunications Act of 1996 – legislation which I opposed – expressly prohibits state and local governments from regulating wireless infrastructure based on RF emissions, and because the FCC's onerous new clarifying rules[3] usurp local control over 5G small cell installations, states and municipalities are forced to depend on the federal government for information about the safety of 5G technology.

It is clear that the federal government has not been transparent enough about the current status of 5G RF radiation research and its guidelines on RF exposure limits. As Senator Richard Blumenthal noted in a February 2019 Senate hearing,[4] the FCC's and FDA's responses to congressional inquiries on this issue have been less than satisfactory, merely reiterating general statements that 5G technology is safe without citing specific research or studies.

Even though the FDA states that it "believes the weight of scientific evidence does not show an association between exposure to radiofrequency from cell phones and adverse health outcomes," it also states that "there is consensus that additional research is warranted to address gaps in knowledge…"[5]

I request the FCC and FDA provide answers to the following questions:

1. What scientific literature or research has the FCC and FDA used to determine that 5G technology will not cause any adverse health effects in humans? Please cite specific studies and research conducted.

2. What gaps exist in our current understanding of possible health effects from 5G technology, as well as the possible health effects of RF radiation writ large?

3. What efforts has the federal government taken to educate the public, as well as state and local governments, about its research on RF radiation and safety guidelines as it relates to 5G technology?

I strongly urge the FCC, FDA, and relevant agencies to be open and transparent about the research and methods used for determining RF safety guidelines, as well as any outstanding questions your agencies may have about this new technology. Full transparency is needed, and the American people expect and deserve no less from their government.

I look forward to your reply.

Sincerely,

PETER A. DEFAZIO
Member of Congress

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[3] Federal Communications Commission, "Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment," FCC 18-111, 2 August 2018; https://docs.fcc.gov/public/attachments/FCC-18-111A1.pdf; and FCC 18-133, 26 September 2018, https://docs.fcc.gov/public/attachments/FCC-18-133A1.pdf.

[4] Senate Committee on Commerce, Science, and Transportation; Hearing: "Winning the Race to 5G and the Next Era of Technology Innovation in the United States," 02:03:59 – 2:08:50, 6 February 2019, https://www.commerce.senate.gov/public/index.cfm/hearings?ID=06336057-CC60-45DF-A361-32D7401EE6CB.

[5] U.S. Food and Drug Administration, "Radiation-Emitting Products: Current Research Results," https://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/HomeBusinessandEntertainment/CellPhones/ucm116335.htm

Human Exposure to RF Fields in 5G Downlink

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***Abstract*—While cellular communications in millimeter wave (mmW) bands have been attracting significant research interest, their potential harmful impacts on human health are not as significantly studied. Prior research on human exposure to radio frequency (RF) fields in a cellular communications system has been focused on uplink only due to the closer physical contact of a transmitter to a human body. However, this paper claims the necessity of thorough investigation on human exposure to downlink RF fields, as cellular systems deployed in mmW bands will entail (i) deployment of more transmitters due to smaller cell size and (ii) higher concentration of RF energy using a highly directional antenna. In this paper, we present human RF exposure levels in downlink of a Fifth Generation Wireless Systems (5G). Our results show that 5G downlink RF fields generate significantly higher power density (PD) and specific absorption rate (SAR) than a current cellular system. This paper also shows that SAR should also be taken into account for determining human RF exposure in the mmW downlink.**

***Index Terms*—5G; mmW; Downlink; Human RF exposure; PD; SAR.**

I. Introduction

It is acknowledged that exposure to RF has negative impacts on human body. The rapid proliferation of mobile telecommunications has occurred amidst controversy over whether the technology poses a risk to human health [1]. At mmW frequencies where future mobile telecommunications systems will likely operate, two changes that will likely occur have the potential to increase the concern on exposure of human users to RF fields. First, *larger numbers of transmitters* will operate. More base stations (BSs) will be deployed due to proliferation of small cells [2]-[4] and mobile devices accordingly. This will increase chance of human exposure to RF fields. Second, *narrower beams* will be used as a solution for the higher attenuation in higher frequency bands [3]-[7]. Very small wavelengths of mmW signals combined with advances in RF circuits enable very large numbers of miniaturized antennas. These multiple antenna systems can be used to form very high gains. Such higher concentration of RF energy will increase the potential to more deeply penetrate into a human body.

A. Related Work

This paper is motivated from the fact that prior work is not enough to address such potential increase in threats.

1) Measurement of Human RF Exposure: Being aware of the health hazards due to electromagnetic (EM) emissions in mmW spectrum, international agencies such as the Federal Communications Commission (FCC) [8] or the International Commission on Non-Ionizing Radiation Protection (ICNIRP) [9] set the maximum radiation allowed to be introduced in the human body without causing any health concern. Possibilities of skin cancer due to RF emissions at higher frequency spectrum are reported [10]. Heating due to EM exposure in mmW is absorbed within the first few millimeters (mm) within the human skin; for instance, the heat is absorbed within 0.41 mm for 42.5 GHz [11]. The mmW induced burns are more likely to be conventional burns as like as a person touching a hot object as reported in [1]. The normal temperature for the skin outer surface is typically around 30 to 35°C. The pain detection threshold temperature for human skin is approximately 43°C as reported and any temperature over that limit can produce long-term injuries.

One problem is that the literature on the impact of cellular communications on human health is not mature enough. The three major quantities used to measure the intensity and effects of RF exposure are SAR, PD, and the steady state or transient temperature [12][13]. However, selection of an appropriate metric evaluating the human RF exposure still remains controversial. The FCC suggests PD as a metric measuring the human exposure to RF fields generated by devices operating at frequencies higher than 6 GHz [8], whereas a recent study suggested that the PD standard is not efficient to determine the health issues especially when devices are operating very close to human body in mmW [14]. Therefore, this paper examines the human RF exposure by using both PD and SAR.

2) Reduction of Human RF Exposure: Very few prior studies in the literature paid attention to human RF exposure in communications systems [1][14]-[17]. Propagation characteristics at different mmW bands and their thermal effects were investigated for discussion on health effects of RF exposure in mmW radiation [14]. Emission reduction scheme and models for SAR exposure constraints are studied in recent work [15][16].

However, health impacts of mmW RF emissions in *downlink* of a cellular communications system have not been studied so far, which this paper targets to discuss.

B. Contributions

Three contributions of this paper can be highlighted and distinguished from the prior art.

Firstly, this paper analyzes the human RF exposure in the *downlink*. All the prior work studied an uplink only, while paid almost no attention to suppression of RF fields generated by access points (APs) and BSs in a 5G nor Release 9 network,

TABLE I
PARAMETERS FOR 5G AND RELEASE 9

Parameter	Value	
	5G	Release 9
Carrier frequency	28 GHz	1.9 GHz
System layout	RMa, UMa, UMi [18]	SMa, UMa, UMi [21]
Inter-site distance (ISD)	200 m	1,000 m
Cell sectorization	3 sectors/site	6 sectors/site
Bandwidth	850 MHz	20 MHz
Max antenna gain	5 dBi per element	17 dBi
Transmit power	21 dBm per element	43 dBm
AP's number of antennas ($\lambda/2$ array)	8×8 and 16×16	4×4
AP antenna height	10 m	32 m
Duplexing	Time-division duplexing (TDD)	
Transmission scheme	Singler-user (SU)-MIMO	
UE noise figure	7 dB	
Temperature	290 K	

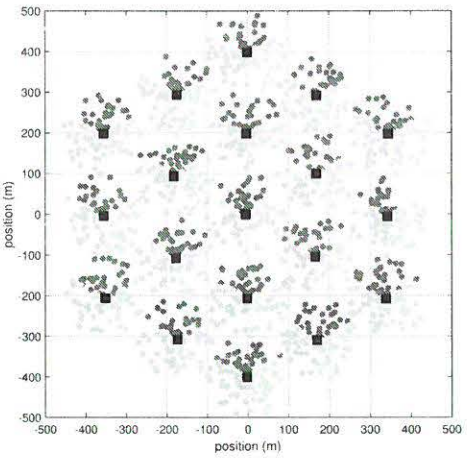

Fig. 1. A snapshot of one "drop" of 5G topology (19 sites, 3 sectors per site, and 30 UEs per sector)

respectively. In fact, APs generate even stronger RF fields compared to the concurrent systems, due to (i) higher transmit power and (ii) larger antenna array size leading to higher concentration of RF energy. Moreover, one important feature of the future cellular networks is small cell networks. The consequences of this change will be two-fold: (i) APs/BSs will serve smaller geographic areas and thus are located closer to human users; (ii) larger numbers of APs/BSs will be deployed, which will lead to higher chances of human exposure to the RF fields generated by downlinks.

Secondly, this paper finds that *SAR should also be considered* in determination of human RF exposure in mmW downlinks. Our simulations are performed for a 5G system based on the 3GPP Release 14 [18], one of the promising technical specifications for 5G. The results show that even considering a shallow penetration into a human body due to high frequencies, a downlink RF emission causes significantly higher SAR in mmW. This effectively highlights the elevation in potential harmful impact in human health, which can ignite higher interest in further research on design of future cellular communications systems considering the impacts on human RF exposure.

Thirdly, it explicitly *compares the human RF exposure in downlinks between 5G and Release 9*, highlighting the difference in the size of a cell. This will lead to clear understanding on how the technical evolution to 5G affects the human RF exposure. This paper calculates PD and SAR of a 5G [18] and a Release 9 [21] to highlight the change in human RF exposure according to the technical evolution.

II. SYSTEM MODEL

This section describes the system setting for a cellular communications network that forms the basis for the analysis of human RF exposure. Considering the frequency spectrum of 28 GHz as a potential candidate for 5G, we use a corresponding technical report [18] that was released by the 3GPP. Also, this paper compares the human RF exposure level in a 5G system to a legacy cellular communications system. For highlighting how much a SAR level can be increased compared to the current wireless services, this paper chose to compare the 5G to the Release 9 [21]. The parameters of both systems are summarized in Table I.

A. 5G

1) Path Loss: Our model for a 5G system is illustrated in Fig. 1. It consists of 19 sites each having 3 sectors. The inter-site distance (ISD) is 200 meters (m) and each sector is assumed to have 30 active user equipments (UEs). Also, as identified in Table I, for the terrestrial propagation between an AP and a UE, the following three path loss models are assumed: Rural Macro (RMa), Urban Macro (UMa), and Urban Micro (UMi) [18].

2) Antenna Beam Pattern: For a 5G AP, the attenuation patterns of an antenna element on the elevation and azimuth plane are given by [18]

$$A_a(\phi) = \min\left\{12\left(\frac{\phi}{\phi_{3db}}\right)^2, A_m\right\} \text{ [dB]} \quad (1)$$

$$A_e(\theta) = \min\left\{12\left(\frac{\theta - 90^\circ}{\theta_{3db}}\right)^2, A_m\right\} \text{ [dB]} \quad (2)$$

where ϕ and θ are angles of a beam on the azimuth and elevation plane, respectively; $(\cdot)_{3db}$ denotes an angle at which a 3-dB loss occurs. Then the antenna element pattern that is combined in the two planes is given by

$$A(\theta, \phi) = \min\left(A_a(\phi) + A_e(\theta), A_m\right) \text{ [dB]} \quad (3)$$

where A_m is a maximum attenuation (front-to-back ratio). It is defined $A_m = 30$ dB in [18], but it can be higher in practice. Finally, an antenna gain that is formulated as

$$G(\phi, \theta) = G_{max} - A(\phi, \theta) \text{ [dB]} \quad (4)$$

where G_{max} is a maximum antenna gain.

B. Release 9

1) Path Loss: A cellular network operating on Release 9 is designed to form a cell radius of 500 m, which results in an ISD of 1,000 m. This paper calculates the received power in a downlink, following the path loss models provided in [21]–Suburban Macro (SMa), UMa, and UMi.

2) Antenna Beam Pattern: The antenna radiation pattern for a Release 9 BS is also given as (1) and (2). However, unlike at a 5G AP, θ_{3db} and A_m for a Release 9 BS are given as 35° and 23 dB, respectively.

III. Performance Analysis

In this section, we present an analysis on the human RF exposure in a 5G communications and a Release 9 system. Though we chose 28 GHz frequency spectrum for 5G performance analysis, performance for any other frequency spectrum can be demonstrated following the same methodology. It is obvious that the higher number of elements used in the antenna give better signal power, the outcome also increases the cost and complication of the antenna design. The present technology has a large cell size where a single BS can provide coverage to more than thousands of meters, but the cell size of 5G is relatively small. In a model like Release 9, there may be one BS used to provide coverage to a wide area for providing service to UEs, but in 5G scenario, the same area is covered by a number of scattered APs to provide a better reliable service.

A. Data Rate

The downlink performance of a system is calculated from the Shannon's formula, which is given by

$$R = B\log(1 + \mathrm{SNR}) \tag{5}$$

where R and B denotes a data rate and bandwidth, respectively. Signal-to-noise power ratio (SNR) is used to determine a data rate. Note that the inter-cell interference is not considered for simplicity in calculation as the focus of this paper is analysis of human exposure level, which is not influenced by the interference. In this paper, we calculate a SNR for the UEs considering all the possible locations in a sector that is formed by an AP in a 5G system and a BS in a Release 9 system. However, an accurate *three-dimensional distance* is considered with the exact heights of an AP, BS, and UE which are taken into account referred from [18]. In other words, although the horizontal axes of the results provided in Section IV present all the possible locations in a cellular system, they in fact demonstrate three-dimensional distances with the exact vertical distances accounted.

The core part in calculation of a SNR is a received power that is directly determined by a path loss model provided in the specifications [18][21]. Here we provide an analysis framework for the signal power that is received by a UE from either an AP or a BS in a single downlink, denoted by $P_{R,ue}$. It is noteworthy that with straightforward modifications, this framework can easily be extended to an uplink received signal power also. A received signal strength in a downlink transmission of a single sector is computed by averaging over all possible downlink directions according to position of the UE, which is given by

$$P_{R,ue}\left(\mathbf{x}_{ue}\right) = \frac{1}{\left|\mathcal{R}_k^2\right|}\int_{\mathbf{x}_{ue}^{(k)}\in\mathcal{R}_k^2}\frac{P_{T,ap}G_{ap}\left(\mathbf{x}_{ue}\right)G_{ue}\left(\mathbf{x}_{ue}\right)}{PL_{ap\to ue}}d\mathbf{x}_{ue} \tag{6}$$

where $\mathcal{R}_k^2$ is region of a sector and thus $\left|\mathcal{R}_k^2\right|$ is the area of a sector; $\mathbf{x}_{ue}$ is position of a UE in an $\mathcal{R}_k^2$; $P_{T,ap}$ is transmit power of an AP; G_{ap} and G_{ue} are the antenna beamforming gains of an AP and a UE, respectively, in a downlink transmission based on (4); $PL_{ap\to ss}$ is the path loss between the AP and the UE.

B. Human RF Exposure

To determine the deleterious impacts of RF emissions to the human body in mmW spectrum, SAR and PD are the most commonly used evaluation criteria so far. As there remains a controversy which method is more accurate one to be considered, whether it is a far-field or near-field case, we show both the analysis for SAR and PD for future technology.

The SAR is a quantitative measure that represents the power dissipated per body mass. It is one of the International System of Units (SI), which is measured in watts (W) per kilogram (kg) and is given by

$$\mathrm{SAR} = \frac{P_{diss}}{m} = \frac{\sigma\left|E\right|^2}{\rho} \tag{7}$$

where P_{diss} represents dissipated power in tissue in the unit of W, m represents the exposed tissue mass in the unit of kg, ρ is the tissue mass density (kg/m^3), σ is the conductivity in siemens per meter (S/m) and E is a root mean square (rms) value of the electric-field strength which is given in the unit of voltage per meter (V/m). The SAR for a particular tissue in human body is different from the SAR for a tissue at different location. Also, SAR at the surface of the exposed tissue is different from the SAR deep within that exposed tissue.

The PD of a transmitting antenna for the far-field can be expressed as [1]

$$\mathrm{PD} = \frac{\left|E_i\right|^2}{\eta} = \frac{\eta}{\left|H_i\right|^2} \tag{8}$$

where E_i (V/m) and H_i (A/m) are rms values of the electric and magnetic field strengths, respectively, incident on the tissue surface and η is the wave impedance in the unit of ohm (Ω). The SI unit of a PD is W/m^2, which indicates that a PD is a measurement of the power dissipated per area of the exposed tissue.

Our paper focuses on the downlink behaviors when performing the analysis and comparison of the two communications system. Incident PD for far-field communications is expressed as

$$S_i = \frac{P_T G_T}{4\pi d^2} \tag{9}$$

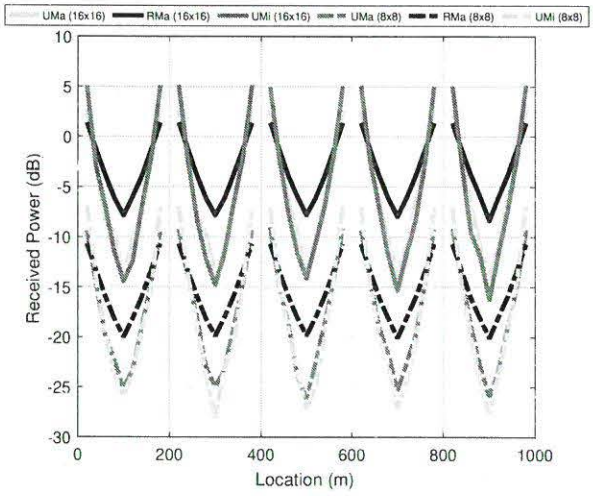

Fig. 2. Received signal power (6) versus UE location in a 5G system (APs are located at 0, 200, 400, 600, 800, and 1,000 m)

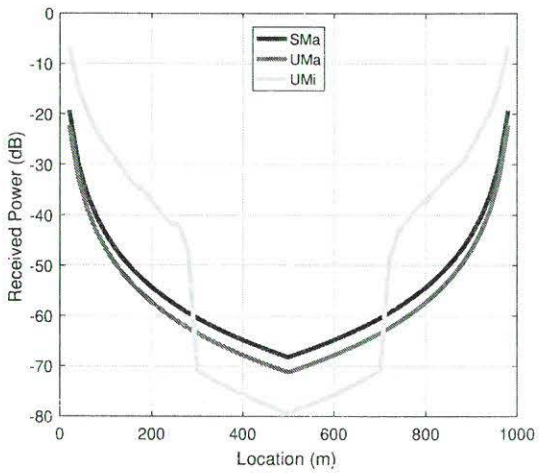

Fig. 3. Received signal power (6) versus UE location in a Release 9 system (BSs are located at 0 and 1,000 m)

where P_T is a transmit power; G_T is a transmit antenna gain; d is the AP-UE distance (m) as in (6).

Now, we can rewrite an SAR given in (7) in terms of d for calculation in a cellular communications system, which is also a function of ϕ [19][17], as

$$\mathrm{SAR}(d) = \mathrm{SAR}(\phi) = \frac{2S_i(\phi)\,T(\phi)\,m(\phi)}{\delta\rho} \qquad (10)$$

where T is the power transmission coefficient [16] and δ is the skin penetration depth (m) at 28 GHz [14]. The function $m(\phi)$ [16] is dependent on the tissue properties of dielectric constant (ϵ^*).

In order to accurately study a mmW signal propagation and absorption in a human body, investigation on the parameters related to dielectric measurements on human skin are necessary. Specifically the values of the parameters, ρ, ϵ^*, δ, T, and $m(\phi)$ are obtained from prior related work [13][14][18][20].

IV. Evaluation of Human RF Exposure

In this section, we analyze the results for the performance of 5G technology and make a comprehensive comparison of the model with present Release 9. First we show the performance for 5G in terms of service quality and then make a deeper interest in the health impacts due to exposure to EM emissions at mmW radiation.

A. Data Rate

We consider two antenna array sizes: 8×8 and 16×16 for 5G analysis. As we consider 3 sectors under each AP, it is adequate for each antenna to have the coverage of 120° capability to cover an entire 360° range of the cell.

Figs. 2 and 3 show the signal power received at a UE, $P_{R,ue}(\mathtt{x}_{ue})$, at different locations in 5G and Release 9 scenarios, respectively. The most significant factor that determines a received signal power is path loss that is in turn dominated by the LoS probability provided differently in each path loss model [18]. The received power decreases sharply with increasing distance in both systems, but as the APs are located at much closer positions for 5G, the received power bounces back to increase again while it keeps on decreasing with increasing distance in a Release 9 system. Also, it can be seen from Figs. 2 and 3 that even at the cell edges (at 100, 300, 500, 700, and 900 m), the received power is still remarkably higher for all 5G scenarios than the respective scenarios of the Release 9. One key rationale behind this outperformance can obviously be found as the higher antenna gain that an AP can form by adopting the larger phased arrays.

Figs. 4 and 5 show data rates that can be achieved in a 5G and a Release 9 system, respectively, to represent the downlink performances. One can obviously find that a higher received power directly leads to a higher data rate (as observed from comparison to Figs. 2 and 3), considering the data rate that is calculated from (5). Fig. 4 illustrates a comparison of data rates achieved in a 5G downlink system between different AP's phased array size–16×16 and 8×8. It can be seen that a UE in all 5G scenarios yields a downlink data rate above 13 Gbps even at a cell edge. Fig. 5 presents downlink data rates in a Release 9 system.

It should be emphasized from Figs. 4 and 5 that in spite of the disadvantage in the propagation due to the higher carrier frequency, a 5G system presents approximately 20-times higher downlink rates compared to a Release 9 system regardless of (i) the path loss model and (ii) an AP's phased array size. The main rationale behind such a significant outperformance is the smaller ISD in a 5G system. It is thus evident that the 5G mmW technology provides significantly better performance to the consumer as it provides better signal strength with higher data transmission capabilities at the user end.

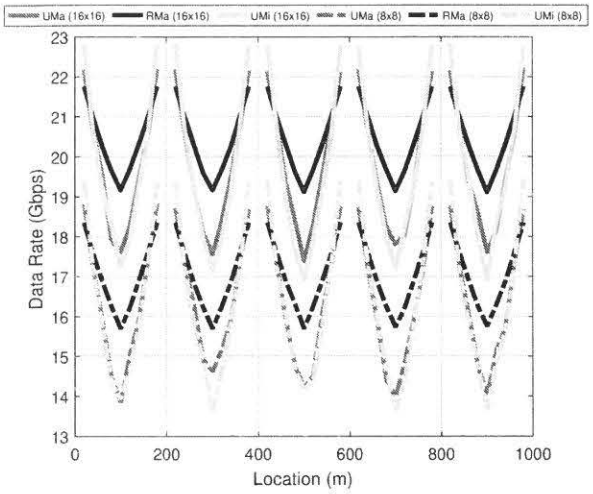

Fig. 4. Data rate (5) versus UE location in a 5G system (APs are located at 0, 200, 400, 600, 800, and 1,000 m)

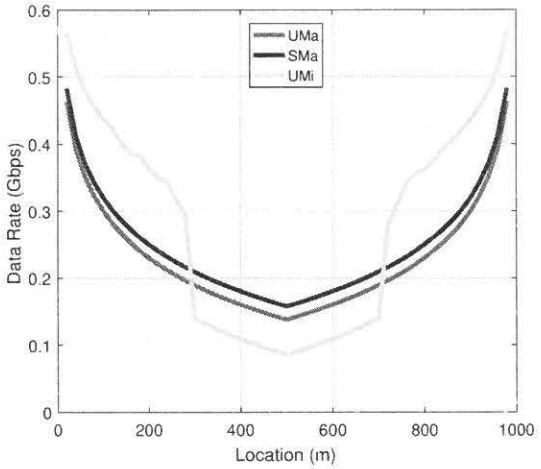

Fig. 5. Data rate (5) versus UE location in a Release 9 system (BSs are located at 0 and 1,000 m)

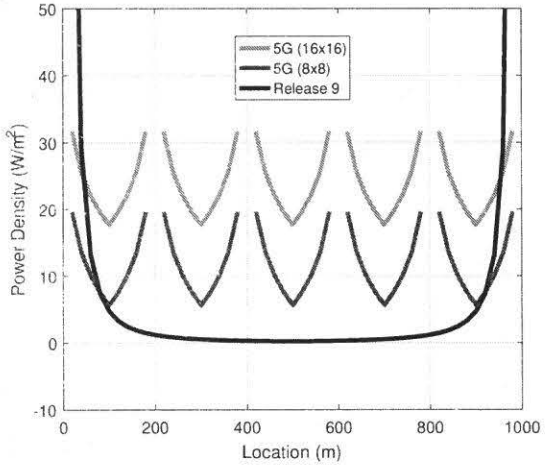

Fig. 6. Power density (8) versus UE location in a 5G and Release 9 system

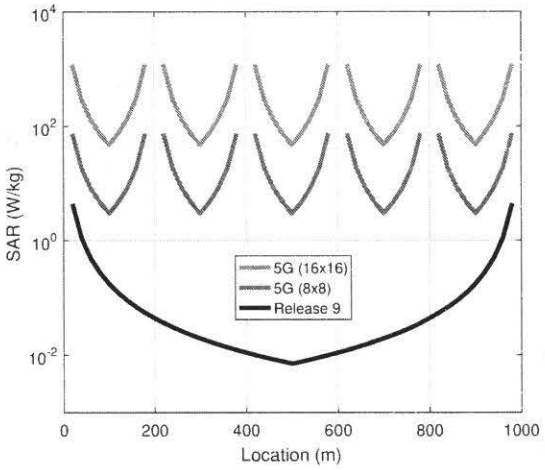

Fig. 7. SAR (7) versus UE location in a 5G and Release 9 system

B. Human RF Exposure

Now we show that even considering such shallow penetration depth due to high frequencies, a downlink RF emission causes significantly higher SAR in mmW. In this section, the PD and SAR are compared between a 5G and a Release 9 system. It still remains not concluded in the literature which of PD and SAR is more appropriate to represent the human RF exposure level in far-field RF propagations. We claim that *SAR should not be excluded* in measurement of human RF exposure in mmW downlinks. The rationale is that in spite of shallower penetration into a human body compared to lower frequencies, a mmW RF field causes a higher SAR due to (i) smaller cell radius and (ii) higher concentration of RF energy per beam via adoption of larger phased array.

Fig. 6 compares the PD between the downlinks of 5G and Release 9. One can find far higher PDs in 5G downlinks compared to those of a Release 9 system. The same rationale yields this higher PD in 5G downlinks: the PD in a 5G system bounces back up at a shorter distance compared to a Release 9 system due to the smaller ISD. In other words, the denser deployment of cell sites in 5G keeps PDs higher in more areas in a network than in a Release 9 network. At a distance about 50 m from the nearest AP for 5G, the user is exposed to a significant PD value when a 16 $\times$ 16 array is used. Thus, when a larger phased antenna is used or when a user moves closer to the AP, the PD value becomes a major health concern which inevitably requires more research about health effects of 5G before it is deployed successfully by strictly following the RF emission standards.

We show the comparison of SAR also between 5G and present existing scenario in Fig. 7 for far-field to have a better

understanding about the health impacts of RF emissions into human body. The SAR requirements for near-field is stated in [1], but to the best of our knowledge, there is no standard provided for SAR in far-field scenario so far as it is expected that SAR does not have a significant effect on human body in far-field. Our result in Fig. 7 presents that a 5G downlink does not allow a sufficient far-field propagation due to the small-cell topology. This yields a much higher SAR level than Release 9 that adopts a larger ISD that consequently yields a longer propagation that is sufficient fall down to a low enough SAR. This is resulted from the mmW radiations, antenna beam steering effects and smart antenna characteristics of 5G architecture.

The result provided in Fig. 7 has a significant implication. According to the ICNIRP guidelines [9], the maximum allowable SAR level for head and trunk is 2 W/kg and for limbs it is 4 W/kg for 10 g tissue over 6 minutes of exposure for frequencies up to 10 GHz for general public (ICNIRP and FCC [8] do not have SAR guidelines for mmW like 28 GHz far-field scenario yet, as it is expected to be less dangerous). But our result presented in Fig. 7 shows a significant increase in SAR in 5G downlinks compared to the Release 9, even in such far-field propagations. Considering the significance of a regulatory guideline in the societal endeavor to prevent injuries from over-exposure, this paper hereby strongly urges that it is not safe enough with the PD solely being considered as a basic restriction in human RF exposure in mmW operations. Our result suggests that the SAR should also be considered as a measuring parameter even for far-field, particularly in mmW communications due to its received signal strength remaining strong at an end user.

V. Conclusions

This paper has highlighted the significance of human RF exposure issue in downlink of a cellular communications system. This paper measured the exposure level in terms of PD and SAR, and compared them to those calculated in the Release 9 as a representative of the current mobile communications technology. Distinguished from the prior art that studied uplinks only, this paper has found that the downlinks of a 5G also yield significantly higher levels of PD and SAR compared to a Release 9. Our results emphasized that the increase stems from two technical changes that will likely occur in 5G: (i) more APs due to deployment of smaller cells and (ii) more highly concentrated RF energy per downlink RF beam due to use of larger phased arrays.

As such, unlike the prior work, this paper claims that RF fields generated in downlinks of 5G can also be dangerous in spite of far-field propagations. Therefore, we here urge design of cellular communications and networking schemes that force an AP to avoid generation of RF fields if pointed at a human user with an angle yielding a dangerous level of PD and SAR. To this end, this paper identifies as the future work proposition of techniques that reduces human exposure to RF fields in 5G downlinks.

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Hello Everyone,
Please take the time to read this; you'll be glad you did.

We must all stop perpetuating the misconception that the FCC can "order" a state of the Union, a county or a city to do anything, including mandating the installation of 5G cells in American cities. By perpetuating this myth we become part of the problem. The federal government is not usurping cities rights, they are simply exercising their authority to make rules for cities in the District of Columbia, the Territories and possessions, as they are allowed to do under the U.S. Constitution. Here is how the game is played.

When we see or hear the word "state", we are conditioned to assume that it always means one of the 50 states of the Union. This is what creates a lot of the confusion about whether the federal government actually has jurisdiction over, for instance, a state like Oregon. The government defines the word "state" in each of its laws, so that everyone knows where that law applies. In the FCC Telecommunications Act, "State" is defined as the District of Columbia and the Territories and possessions. The federal government only has jurisdiction over this category of places, and even that jurisdiction is somewhat limited.

Below is Supreme Court evidence that none of the 50 states, their subsidiaries or officers are required to comply with any Federal Government agency's programs, instructions, rules or regulations. This is simply a convenient myth encouraged by the federal government itself. The solution is for cities not to comply.

Abraham

States Don't Have to Comply: The Anti-Commandeering Doctrine

By: Mike Maharrey Published on: Dec 28, 2013-excerpted, emphasis added

This is known as the anti-commandeering doctrine, and it is well established in constitutional jurisprudence.

Sandra Day O'Connor wrote for the majority in the 6-3 decision in New York v. United States (1992)

As an initial matter, Congress may not simply "commandee[r] the legislative processes of the States by directly compelling them to enact and enforce a federal regulatory program."
"....the Constitution has never been understood to confer upon Congress the ability to require the States to govern according to Congress' instructions."

Citing the New York case, the court majority declared this provision of the Brady Gun Bill unconstitutional, expanding the reach of the anti-commandeering doctrine.

Justice Antonin Scalia in Printz v. United States:

"We held in New York v United States that Congress cannot compel the States to enact or enforce a federal regulatory program. Today we hold that Congress cannot circumvent that prohibition by conscripting the States' officers directly. The Federal Government may neither issue directives requiring the States to address particular problems, nor command the States' officers, or those of their political subdivisions, to administer or enforce a federal regulatory program. It matters not whether policymaking is involved, and no case-by-case weighing of the burdens or benefits is necessary; such commands are fundamentally incompatible with our constitutional system of dual sovereignty."

The Court ruled that the federal government cannot force the states to act against their will by withholding funds in a coercive manner. In Independent Business v. Sebelius (2012), the Court held that the federal government can not compel states to expand Medicaid by threatening to withhold funding for Medicaid programs already in place. Justice Roberts argued that allowing Congress to essentially punish states that refused to go along violates constitutional separation of powers.

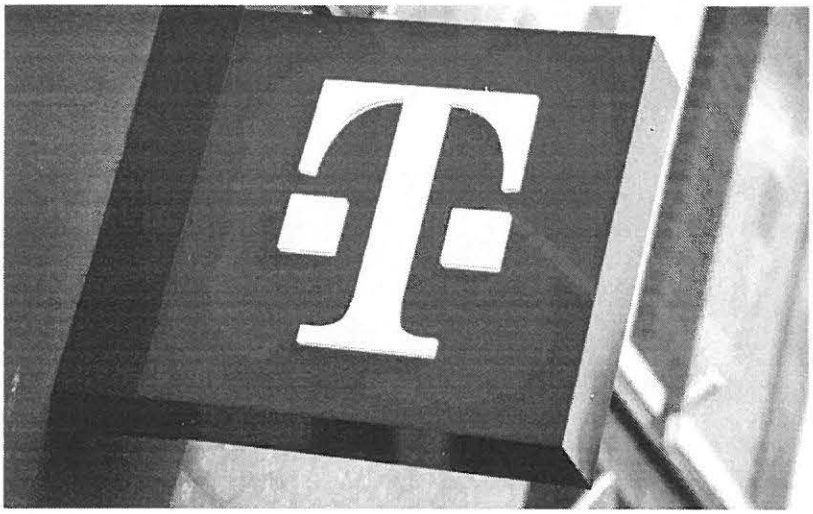
The legitimacy of Congress's exercise of the spending power "thus rests on whether the State voluntarily and knowingly accepts the terms of the 'contract.' " Pennhurst, supra, at 17. Respecting this limitation is critical to ensuring that Spending Clause legislation does not undermine the status of the States as independent sovereigns in our federal system. That system "rests on what might at first seem a counterintuitive insight, that 'freedom is enhanced by the creation of two governments, not one.' " Bond, 564 U. S., at ___ (slip op., at 8) (quoting Alden v. Maine, 527 U. S. 706, 758 (1999)). For this reason, "the Constitution has never been understood to confer upon Congress the ability to require the States to govern according to Congress' instructions." New York, supra, at 162. Otherwise the two-government system established by the Framers would give way to a system that vests power in one central government, and individual liberty would suffer."

Taken together, these cases firmly establish a legal doctrine holding that the federal government has no authority to force states to cooperate in implementing or enforcing its acts. Even lawyers cannot dispute the legitimacy of nullification through noncooperation.

The anti-commandeering doctrine, provides a powerful tool that states can use to stop unconstitutional federal acts in their tracks.

MANY FEDERAL LAWS HAVE BEEN SHOWN NOT TO APPLY TO STATES OF THE UNION

Meredith v. United States, 330 F.2d 9, 11 (9th Cir. 1964) (holding the Federal Torts Claims Act as territorial);
United States v. Cotroni, 527 F.2d 708, 711 (2nd Cir. 1975) (holding federal wiretap laws as territorial);
Stowe v. Devoy, 588 F.2d 336, 341 (2nd Cir. 1978); Cleary v. United States Lines, Inc., 728 F.2d 607, 609 (3rd Cir. 1984); Thomas v. Brown & Root, Inc., 745 F.2d 279, 281 (4th Cir. 1984); Pfeiffer v. William Wrigley, Jr., Co., 755 F.2d 554, 557 (7th Cir. 1985); Zahourek v. Arthur Young and Co., 750 F.2d 827, 829 (10th Cir.1984) (holding federal age discrimination laws as territorial);
United States v. Mitchell, 553 F.2d 996, 1002 (5th Cir. 1977) (holding marine mammals protection act as territorial);
Airline Stewards & Stewardesses Assn. v. Northwest Airlines, Inc., 267 F.2d 170, 175 (8th Cir.1959) (holding Railway Labor Act as territorial);
Commodities Futures Trading Comm. v. Nahas, 738 F.2d 487,493 (D.C.Cir. 1984) (holding commission's subpoena power under federal law as territorial);
Reyes v. Secretary of H.E.W., 476 F.2d 910, 915 (D.C.Cir. 1973) (holding administration of Social Security Act as territorial);
Schoenbaum v. Firstbrook, 268 F.Supp. 385, 392 (S.D.N.Y. 1967) (holding securities act as territorial).



MOBILE

T-Mobile says Verizon's mmWave 5G won't really benefit most Americans

Yoni Heisler @yonibleapple
April 23rd, 2019 at 2:06 PM

If we're being honest, it's been a while since we've seen a revolutionary new smartphone feature or technology hit the market. While that's not to say that recent smartphone releases from the likes of Apple and Samsung have been boring, they haven't exactly engendered waves of excitement either.

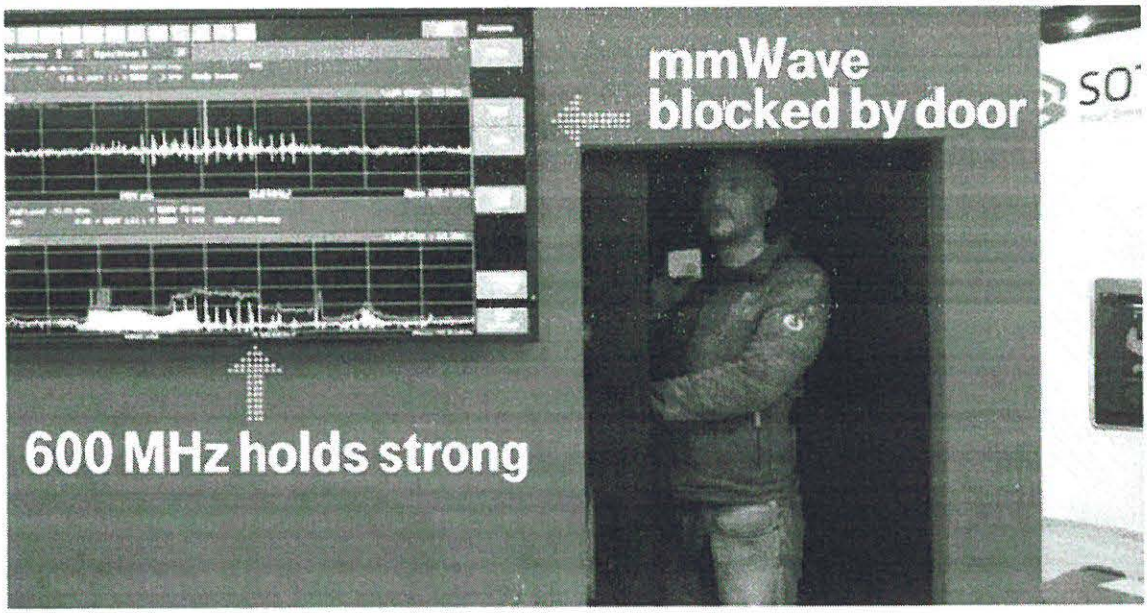
Which brings us to 5G. In recent months there has been a tremendous amount of hype surrounding the blazing fast speeds 5G will provide smartphone users. And though broad 5G coverage is still a long ways away, the reality is that 5G may prove to be more of an evolutionary upgrade as opposed to the revolutionary breakthrough we've been led to believe. Now this isn't to say that 5G won't offer discernible speed improvements, but rather that the actual speeds 5G will enable for most users won't be as impressive as you might think.

Touching on this very topic, T-Mobile CTO Neville Ray recently penned an informative blog post detailing some of the logistical limitations of 5G that some other carriers have conveniently ignored in the interest of drumming up hype and excitement for 5G.

In a nutshell, Ray articulates that hyper fast speeds provided by mmWave 5G — which is what Verizon is using currently — will simply not be available outside of small areas within densely populated urban cities. The reason? mmWave 5G, on account of it having a high frequency and small wavelength, simply can't travel far and, more importantly, can't penetrate buildings with ease.

"Some of this is physics," Ray writes, "millimeter wave (mmWave) spectrum has great potential in terms of speed and capacity, but it doesn't travel far from the cell site and doesn't penetrate materials at all. It will never materially scale beyond small pockets of 5G hotspots in dense urban environments."

To illustrate this point, Ray released the GIF below:



Ray's comments here aren't all that surprising, especially in light of reports that early testing of Verizon's 5G network in Chicago resulted in a number of issues relating to connectivity and speed.

To this point, *CNET's* own 5G experience in Chicago was far from compelling:

> At times, the 5G speeds recorded by the Speedtest.net benchmarking test got us the 600-plus megabits per second download speeds Verizon has promised (my peak speed was 634Mbps). Other times it was closer to 200Mbps, and still other times, the phone professed to be on 5G, but acted a lot like 4G. I had a battalion of upload and download tests I was going to try Thursday in downtown Chicago, but it was so hard to keep a 5G connection long enough to run the most basic tests, I had to throw those plans out the window.

Not surprisingly, Ray took some time to throw a few jabs at Verizon:

> But some of the pain and frustration people are experiencing is because Verizon rolled out technology that is nowhere near ready for primetime. Verizon basically launched a science experiment using customers as test subjects. I have the exact same 5G mmWave network equipment and software that AT&T and Verizon do, and there's no way we would launch this for customers right now.

In turn, Ray also explained why T-Mobile's approach to 5G is superior to what we're seeing from rival carriers:

> Is mmWave spectrum important? Absolutely. But real, game-changing, innovation driving 5G requires broad and deep nationwide coverage. And *that* can only be achieved by using ALL SPECTRUM BANDS.
>
> That's why only the New T-Mobile will bring #5GForAll.
>
> T-Mobile has a strong portfolio of low band spectrum, which provides the wide area coverage necessary to reach every American. T-Mobile also has mmWave spectrum that provides massive capacity over a very small footprint. It holds big promise for speed and capacity in dense urban areas and venues where large numbers of people gather. And Sprint has the critical middle layer of 2.5 GHz mid-band spectrum, which provides the balance of coverage and capacity that enables a seamless and meaningful 5G experience. Mid-band spectrum is key to providing an ideal mix of coverage and capacity for 5G networks.

Ray also made a point of re-emphasizing that T-Mobile will not charge subscribers more money for 5G access, a point Ray initially made a few months back.

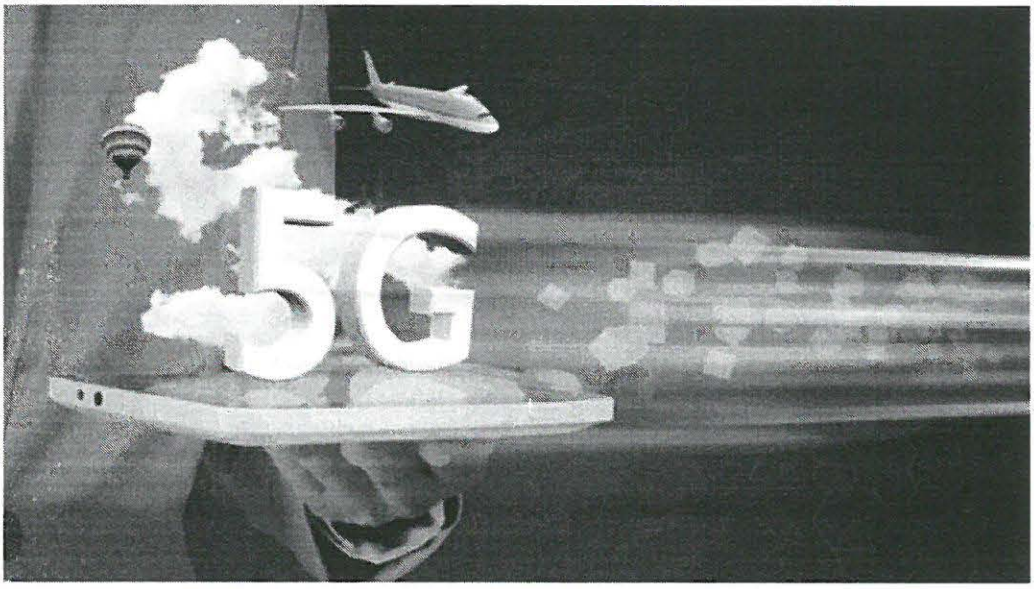
Image Source: Utrecht Robin/action press/REX/Shutterstock

Tags: 5G, T-Mobile, Verizon

189599

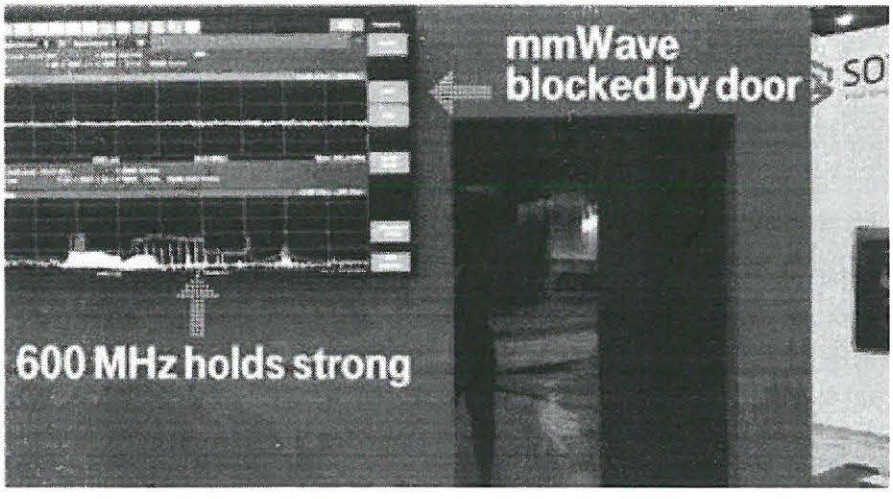
T-Mobile: Millimeter-Wave 5G Will 'Never Materially Scale' Outside Dense Urban Areas

By Joel Hruska on April 23, 2019 at 3:30 pm



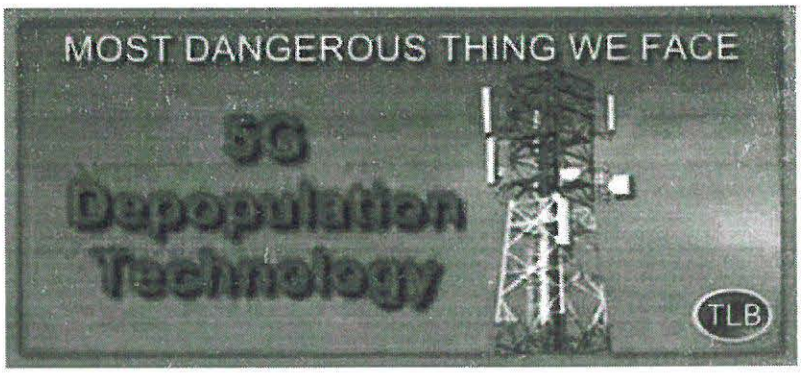
The 5G hype-cycle is spinning so fast these days, you can barely see the spokes. None of the cellular providers are blameless when it comes to spinning it, but T-Mobile seems more willing than the others to admit the truth around 5G: Namely, it's never going to scale very well outside dense urban environments.

Neville Ray, T-Mobile's CTO, has written a blog post arguing that the current state of 5G "is clearly not good enough." Ray points out that the 5G launches we've seen from Verizon and AT&T are spotty and that performance is highly variable. He posted a GIF of what happens to mmWave signals when a sliding glass door is closed. A frame from the image, shown below, illustrates the problem — the top signal strength line goes flat when the door is even halfway shut.



These problems are going to be diffcult for carriers to solve because they're intrinsic to the EM wavelengths being used for 5G in the frst place.

One of the reason it's so funny to see the conspiracy theories around the supposed danger of 5G signals is because 5G signals are so easily blocked. Pretty sure it isn't.



Water vapor in the atmosphere causes 5G range to attenuate. Glass — a substance generally regarded as superior for EM transmission compared with other solids — is still difficult for mmWave signals. Early 5G reviews have noted that services generally only work outside or close to an exterior wall, even in a heavily glassed environment. Beamforming and MIMO may improve these results somewhat, but 5G is starting from a very different point on the field compared with LTE.

Ray's decision to attack the networks Verizon and AT&T are deploying is, of course, partly driven by the fact that T-Mobile is lagging its rivals in 5G rollouts. The fact that the man is self-interested doesn't make him *wrong*, though. The fact is, 5G is barely in its infancy. There are no supported 5G devices with native 5G modems right now. The technology really isn't ready for customers.

Will Rural Areas See 5G?

Rural areas are definitely going to see some form of 5G, but it may not be the millimeter wave technology that's being deployed right now in urban areas. US Cellular, for example, has announced that it will use older LTE spectrum and 600MHz bands for rural 5G. T-Mobile is planning something similar, with different spectrum bands. Here's Ray:

T-Mobile has a strong portfolio of low band spectrum, which provides the wide area coverage necessary to reach every American. T-Mobile also has mmWave spectrum that provides massive capacity over a very small footprint. It holds big promise for speed and capacity in dense urban areas and venues where large numbers of people gather. And Sprint has the critical middle layer of 2.5 GHz mid-band spectrum, which provides the balance of coverage and capacity that enables a seamless and meaningful 5G experience. Mid-band spectrum is key to providing an ideal mix of coverage and capacity for 5G networks.

This suggests that the 5G experience is likely to be far more variable, depending on where you live, than LTE may have been. Customers in dense urban areas could see the gigabit speeds 5G promises, while customers in rural areas will make do with much slower connections. It is not clear how much improvement, if any, is gained by adopting 5G standards using LTE spectrum. It's also not clear which company will provide the strongest overall service from its spectrum allocations right now. But it's entirely possible that, outside of major cities and towns, 5G service in rural or semi-rural areas may not exceed LTE speeds. 5G service will come to rural areas, but mmWave service, specifcally, may not. That will depend on the individual carriers and the decisions they make around small cell allocations.

MOBILE

Report: Verizon 5G Home Service Too Expensive To Scale, Attracts Few Users

REMY HORWITZ @HORWITZ MARCH 22, 2019 11:40 AM

Verizon launched its 5G Home broadband service in October 2018, and is readying its mobile 5G network now. Image Credit: Verizon

Verizon may have been the world's first major carrier to launch a commercial 5G network, but a new report suggests that its 5G Home service isn't practically scalable — its short-range 5G

"small cells" are expensive to install, reach too few customers, and might not be economically feasible for a nationwide rollout.

That's the harsh conclusion of research analysts at MoffettNathanson (via MultiChannel), whose "Peek Behind the Curtain of Verizon's 5G Rollout" report and followup conference call today questioned whether the carrier will be able to scale and make money on its fxed 5G network. The researchers focused on fndings in Sacramento, one of the frst 5G cities, roughly six months after Verizon launched 5G Home there.

According to the report, only 6 percent of homes in tested areas had access to Verizon's 5G, and under 3 percent of residences in those areas actually subscribed to the 5G service. Moreover, the report said that the millimeter wave-based "cell radii appear much smaller" than expected, which is to say that even more 5G "small cell" broadcasting units might be needed on towers than was previously thought.

"To us, the most interesting statistic isn't so much the low take rate as it is the relatively low coverage," the frm said, "as it illustrates the enormity of the challenge of scaling a small cell network, in neighborhood after neighborhood, across the United States."

There's no question that building a millimeter wave-based small cell network is challenging — in equal parts due to the cost of new 5G radio hardware and to zoning considerations. Sensing the potential for local and state approval delays, the FCC voted to cut regulatory red tape and limit local fees that could impede the installation of new 5G small cells. Even with federal support, however, carriers still have to get permission from hundreds of cities and towns. Verizon set up a mini-site to ask citizens to lobby local officials to speed up the necessary approvals.

Verizon has paused its 5G Home expansion well short of full coverage in its initial four cities, explaining at the end of January 2019 that standards-based 5G hardware wouldn't be ready until later this year. Two weeks later, a Sacramento TV station reported that Verizon had only installed 200 5G radios there, covering under 10 percent of the city, and suggested that a full rollout could take years.

MoffettNathanson suggests that Verizon's small cell installation costs in Sacramento — a mid-market city ranked 35th in size — are lower than they will be in bigger, denser cities such as New York. The analysts aren't convinced that Verizon will be able to reach 30 million customers who are already served by fber cable broadband, as the costs won't be matched or exceeded by "second player" service revenues.

Verizon's competitors have differed in their approaches to 5G home broadband service. T-Mobile and Sprint have touted a combined plan to launch 5G broadband services using devices that do not require millimeter wave small cells. AT&T has focused largely on mobile 5G but expects customers to use personal hotspots for some of their broadband needs.

We've reached out to Verizon for comment and will update this article if and when we hear back. The carrier previously said that it will commence mobile 5G service on April 11 in Chicago and Minneapolis, two cities not involved in the 5G Home rollout, with a 30-city mobile 5G deployment this year. Based on Verizon's prior statements, it's highly likely that the initial four 5G Home cities will be converted to combined mobile and home 5G service later this year under the "5G Ultra Wideband Network" name, as more standards-based 5G hardware becomes available.

Millimeter-wave 5G Isn't For Widespread Coverage, Verizon Admits

Verizon and T-Mobile confirm 5G's highest speeds will only be for select areas.

JON BRODKIN - APR 23, 2019 10:12 PM UTC

Verizon's early rollout of millimeter-wave 5G is producing high speeds and throughput, but the high-frequency spectrum isn't suitable for widespread coverage, Verizon CEO Hans Vestberg said today.

A Verizon booth at Mobile World Congress Americas in Los Angeles in September 2018.

One day after T-Mobile CTO Neville Ray wrote that millimeter-wave spectrum "will never materially scale beyond small pockets of 5G hotspots in dense urban environments," wireless industry analyst Craig Moffett asked Vestberg about Ray's statement during a Verizon earnings call.

Vestberg responded that millimeter-wave spectrum "has lived up to our expectation on performance" and will get better as Verizon improves the software for managing the spectrum. But he added a significant caveat.

"We will need to remind ourselves, this is not a coverage spectrum," Vestberg said.

Verizon will use millimeter waves "as far as [they're] economically sustainable, of course," Vestberg continued. "But still, it's very good ranges we can come up with and, of course, the throughput and speeds are enormous."

Later in the earnings call, analyst Walter Piecyk pressed Vestberg on his millimeter-wave statement, saying it seemed like a change from Verizon's optimism about the frequency ranges.

In September 2018, Verizon said that "millimeter-wave spectrum is the cornerstone in enabling our 5G Ultra Wideband network" and that this spectrum is like "a superhighway that's capable of moving massive amounts of traffic, at super-high speeds, on thousands of lanes lined up side by side."

"Hans, you mentioned that millimeter wave is not your coverage spectrum," Piecyk said to Vestberg during today's earnings call. "I think that's a little different than what you guys talked about before."

"I don't think we've changed anything about what we thought about millimeter wave, how we're going to deploy that—and we're deploying massively at the moment," Vestberg responded.

He further said that "the majority of all the traffic is in dense urban areas, where we now initially are focusing."

Vestberg also said that Verizon 5G will be boosted by the rollout of dynamic spectrum sharing technology next year, but that will be used on all mobile frequencies from low bands to high bands.

Separately today, Moffett told CNBC that he thinks there is "zero chance" 5G becomes a ubiquitous technology by 2021.

5G's top speeds not for rural areas

Taken together, the T-Mobile and Verizon statements this week indicate that 5G's fastest speeds won't come to rural America and will be limited to certain areas even within big cities.

5G networks will use both low and high frequencies, but they're expected to offer their highest speeds on millimeter waves. These high frequencies generally haven't been used in cellular networks because they don't travel far and are easily blocked by walls and other obstacles.

T-Mobile and Verizon both have high-frequency spectrum licenses in the 28GHz and 39GHz ranges, which they can use for high speeds in densely populated urban areas. Both carriers used sub-1GHz spectrum to provide nationwide coverage with 4G, and they can use that same low-band spectrum with 5G.

For 5G in rural areas, then, the carriers seem likely to focus on making better use of lower-frequency spectrum instead of deploying millimeter-wave networks to any significant extent.

T-Mobile says it will launch 5G coverage in 30 cities during the second half of 2019. This is later than originally planned, and the reason is a lack of 5G-enabled phones. The delay is due to "the lack of phones that can tap into the critical low-band 600MHz spectrum that will power much of [T-Mobile's] early 5G coverage," CNET wrote in February, based on an interview with Ray.

"Ray had pushed the industry to move faster with compatible devices but noted much of the industry was working on devices that supported bands with higher frequencies, which offer better speeds, but less range," the CNET article said.

Verizon launched 5G on the 28GHz band in parts of Chicago and Minneapolis this month, but it's only usable on one Motorola phone. Reviewers found that finding a signal is difficult even within Verizon's narrow launch areas.

Ray made his comments about millimeter-wave spectrum yesterday as part of a blog post criticizing AT&T and Verizon for hyping small 5G rollouts that are "meaningless for consumers." Ray noted that millimeter-wave spectrum "has great potential in terms of speed and capacity, but it doesn't travel far from the cell site and doesn't penetrate materials at all."

Despite these limits, Republicans in the federal government have used the 4G-to-5G upgrade to justify regulatory rollbacks. The Federal Communications Commission in September voted to prevent city and town governments from charging wireless carriers about $2 billion worth of fees related to deployment of wireless equipment such as small cells. The FCC claimed this will cause carriers to build 5G networks in rural and sparsely populated areas where it would otherwise be financially unfeasible. But the FCC imposed no requirements on carriers to deploy any more broadband than they otherwise would have.

In Congress, Republicans tried to exempt all 5G wireless services from a bill that would restore net neutrality rules. They argued that net neutrality would limit the full potential of 5G.

189599

McClymont, Keelan

From: Katrina Fairchild Fraijo <onbeingkatrina@yahoo.com>
Sent: Tuesday, June 4, 2019 8:05 PM
To: Council Clerk – Testimony
Subject: 5G networks in Portland

> Dear Mayor Wheeler,
> I'm writing you today because of my great concern about allowing 53 networks to be placed in Southeast Portland by Verizon and XO communications.
>
> My family recently got rid of our wireless network and wired our home with ethernet cable, because of our concerns and experiences with having 5G wireless in our home.
>
> I urge you and the City Council to hit the pause button on this plan and do your own research on what this technology can do to our health.
>
> Sincerely,
> Katrina Fraijo

189599

Moore-Love, Karla

From: patrick prothe <patrickprothe@gmail.com>
Sent: Tuesday, June 4, 2019 2:59 PM
To: Council Clerk – Testimony
Subject: Fwd: URGENT! PORTLAND - HELP STOP 5G FROM INVADING OUR HEALTH, PRIVACY AND ENVIRONMENT -- CITY COUNCIL MEETING JUNE 5TH

Hi Ted and Council -

I am strongly opposed to 5G due to the serious health risks posed and lack of need. This is just business wanting and getting their way. How about listening to the people for a change.

Such actions along with so many issues (chronic homelessness, tent camps and crime) that are degrading a city I used to love make me sad and disenfranchised.

What happened to true leadership - aka people like Mayor Vera Katz.

I urge you to look at the research and reconsider - and think about what you are doing to the city.

Onward,

~ Patrick Prothe

---------- Forwarded message ---------
From: **michelle bexelius** <michelle@designwellstudios.com>
Date: Tue, Jun 4, 2019 at 14:15
Subject: URGENT! PORTLAND - HELP STOP 5G FROM INVADING OUR HEALTH, PRIVACY AND ENVIRONMENT -- CITY COUNCIL MEETING JUNE 5TH
To: michelle bexelius <michelle@designwellstudios.com>

PLEASE PASS THIS ON TO EVERYONE YOU KNOW IN PORTLAND AND HELP US STOP 5G FROM INVADING OUR HEALTH, PRIVACY AND ENVIRONMENT

DEPLOYMENT IS SCHEDULED TO START THIS MONTH IN THE RICHMOND NEIGHBORHOOD IN SE. YOUR VOICE IS NEEDED TO KEEP PORTLAND SAFE.

Hello!
I am not sure how much you know about 5G but on Wednesday, June 5th, the City Council is about to sign a deal with XO Communications ie Verizon (agenda 526) and Cingular (agenda 537) to sign a 10 year agreement and install 5G antennas every 2-10 houses.

Please read the LINKS BELOW which explains exactly what it is and why it is incredibly hazardous to your health and our environment. It will have a negative effect on property values, privacy, and security.

If you feel this is something you don't want to see happen, please show your support by coming to the meeting TOMORROW JUNE 5TH 11-1PM AT 1221 SW 4TH AVE IN COUNCIL CHAMBERS or emailing our Mayor, Ted Wheeler asap to: mayorwheeler@portlandoregon.gov or cctestimony@portlandoregon.gov
or Call: 503.823-4120

Agenda here: https://www.portlandoregon.gov/auditor/index.cfm?c=26997

Impacts of radio-frequency electromagnetic field (RF-EMF) from cell phone towers and wireless devices on biosystem and ecosystem
https://ecfsapi.fcc.gov/file/7520942058.pdf?fbclid=IwAR1PJQ2jvP_-m34qBEIvXqZCo-mbNkNjpvNaVrM54DvfrMVzBClaYtfC9sg

Scientists warn of potential serious health effects of 5G - GLOBALLY
http://emfsafetynetwork.org/wp-content/uploads/2017/11/Scientist-5G-appeal.pdf

There are more than 1,000 scientific studies conducted by independent researchers from around the world concerning the biological effects of RF radiation.
https://www.telecompowergrab.org/science.html

Wireless Radiation: Stop the 5G Network on Earth and in Space, Devastating Impacts on Health and the Environment
https://www.globalresearch.ca/wireless-radiation-stop-the-5g-network-on-earth-and-in-space-devastating-impacts-on-health-and-the-environment/5665066?utm_campaign=magnet&utm_source=article_page&utm_medium=related_articles

Proximity to a cell tower typically lowers property values by more than 20%. See https://ehtrust.org/cell-phone-towers-lower-property-values-documentation-research/ A cell tower could easily take hundreds of thousands- if not millions- in value away from local real estate.

Pushback against superfast 5G wireless spreads to at least 7 Pacific Northwest cities

https://www.klcc.org/post/pushback-against-superfast-5g-wireless-spreads-least-7-pacific-northwest-cities

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If you want to opt out of this email, please reply in the subject line: unsubscribe.
Thank you.

Michelle

Michelle Bexelius
Creative DIrector/Environmental Designer

DESIGN
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studios

EXPERIENTIAL BRANDING FOR HEALTH + WELLNESS COMPANIES
ENVIRONMENTAL + BIOPHILIC DESIGN FOR WELL BEING
HEALTHY INTERIOR + SUSTAINABLE LANDSCAPE DESIGN
ENVIRONMENTAL TESTING (IAQ + EMF/RF)

189599

503.780.5148
michelle@designwellstudios.com
designwellstudios.com

189599

Moore-Love, Karla

From: michelle bexelius <michelle@designwellstudios.com>
Sent: Tuesday, June 4, 2019 3:10 PM
To: Wheeler, Mayor
Cc: Council Clerk – Testimony
Subject: URGENT! PORTLAND - HELP STOP 5G FROM INVADING OUR HEALTH, PRIVACY AND ENVIRONMENT -- CITY COUNCIL MEETING JUNE 5TH

Dear Mayor Wheeler
I love Portland. I am raising my 2 sons here. I came here because Portland is sustainable, conscious, beautiful and supportive. I am an environmental designer who creates healthy spaces for residential and commercial properties. I have helped many people with chronic illnesses clean up their environment due to poor air quality or electromagnetic fields and radio frequencies. There is not a lot you can do when it comes to a large scale deployment of antennas with a constant frequency.

My boyfriend and I just visited friends in Sacramento by the American River. We were walking around the neighborhood and along the river and he said to me, where are all the birds, squirrels, bugs, it's so eerily quiet here. Then I did some research... SACRAMENTO HAS 5G. I don't want this for Portland. We love our parks, riverfront, beautiful neighborhoods.

I am aware of the meeting tomorrow for agenda 537 and 526. The public really has no idea the health and environmental impacts and only thinks that technology will make their life easier. The public has a right to here scientific evidence, testimonies from experts and vote on it properly. This is a huge impact on our health. If this passes, I am certain my family and I will have to look for a new home.

Please stop 5G from coming to Portland and protect your people who LOVE it here.

PLEASE READ THESE ARTICLES.
Impacts of radio-frequency electromagnetic field (RF-EMF) from cell phone towers and wireless devices on biosystem and ecosystem
https://ecfsapi.fcc.gov/file/7520942058.pdf?fbclid=IwAR1PJQ2jvP_-m34qBEIvXqZCo-mbNkNjpvNaVrM54DvfrMVzBClaYtfC9sg

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Thank you.

Michelle

Michelle Bexelius
Creative DIrector/Environmental Designer

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ENVIRONMENTAL + BIOPHILIC DESIGN FOR WELL BEING
HEALTHY INTERIOR + SUSTAINABLE LANDSCAPE DESIGN
ENVIRONMENTAL TESTING (IAQ + EMF/RF)

503.780.5148
michelle@designwellstudios.com
designwellstudios.com

189599

Moore-Love, Karla

From: Briton Fortner <britonfortner@icloud.com>
Sent: Tuesday, June 4, 2019 1:15 PM
To: Council Clerk – Testimony
Subject: [User Approved] 5G

Don't allow 5G in our city!

189599

Moore-Love, Karla

From: Christine DEsposito <stinedespo@gmail.com>
Sent: Tuesday, June 4, 2019 4:06 PM
To: Council Clerk – Testimony
Subject: No 5 G in Portland

I am writing to ask that you please reject the installation of 5 G in Portland. This technology is shown to have negative health consequences as well as lower market value of homes. Please do not take the chance on our health and homes with the proposed addition of 5 G networks in Portland.
Sincerely,
Christine DEsposito

"No matter what your dream in life, no matter what your goal, keep your eye on the donut and not on the hole."