



PINNACLE TELECOM GROUP, LLC

Professional and Technical Services

www.pinnacletelecomgroup.com

February 2, 2026

Honorable Supervisor Lachterman and Members of the Town Board
Town Of Yorktown
363 Underhill Avenue
Yorktown Heights, NY 10598

RE: Homeland Towers, LLC
62 Granite Springs Road
Town of Yorktown, NY

Dear Honorable Supervisor Lachterman and Members of the Town Board:

In connection with the above-referenced cellular monopole site proposed by Homeland Towers LLC, Pinnacle Telecom Group (PTG) provided an "Antenna Site FCC RF Compliance Assessment and Report" dated November 16, 2021, along with a separate letter dated January 9, 2026.

That material was reviewed by the town's RF consultant, who has subsequently made several requests in connection with the FCC compliance analysis, as follows:

- The technical parameters for the operation of the anchor operator, Verizon Wireless, need to be confirmed with Verizon Wireless, and the transmission parameters for all three carriers need to include the frequency bands used for 5G service. (We will include T-Mobile in that modification even though the RF consultant only mentioned Verizon Wireless and AT&T as 5G operators.)
- The antenna heights in the original analysis need to be changed by one foot for consistency with the site drawings.
- And finally, the RF consultant noted that the original analysis did not include any assumed antenna downtilt, and recommended the revised analysis apply two degrees of downtilt. (In our analyses we applied the maximum available electrical downtilts for each antenna, which was a maximum of 12 degrees).

PTG has incorporated all those modifications in a revised FCC compliance analysis and report (which is provided separately).

We mentioned at the outset of this letter and throughout the compliance report that our exposure analysis was very conservative, which is the approach recommended by the FCC, so that there can be great confidence about conclusions about MPE compliance.

Despite the considerable additional conservatism in the revised mathematical analysis, the worst-case calculated RF level is only 12.9647 percent of the FCC limit for safe,

continuous exposure of the general public – in other words, still *more than seven times below* the FCC limit. This provides a clear demonstration of FCC compliance, regardless of what configuration of up to three wireless operators might ultimately exist at this proposed site.

Note that FCC regulations require that any future antenna operator here is required to assess and assure continuing MPE compliance based on the overall combined RF effects from the combination of proposed and then-existing antennas at this site.



Daniel J. Collins
Chief Technical Officer



Pinnacle Telecom Group

Professional and Technical Services

ANTENNA SITE FCC RF COMPLIANCE ASSESSMENT AND REPORT

HOMELAND TOWERS, LLC

**SITE "NY578 – GRANITE SPRINGS"
GRANITE SPRINGS ROAD
YORKTOWN HEIGHTS, NY**

FEBRUARY 2, 2026

14 RIDGEDALE AVENUE, SUITE 260 • CEDAR KNOLLS, NJ 07927 • 973-451-1630

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INTRODUCTION AND SUMMARY

At the request of Homeland Towers, LLC, Pinnacle Telecom Group has performed an independent expert assessment of radiofrequency (RF) levels and related FCC compliance for proposed wireless antenna operations on a new 130-foot monopine to be located on Granite Springs in Yorktown Heights, NY.

Homeland Towers refers to the prospective site as “NY578 – Granite Springs”, and the proposed monopine will accommodate the directional panel antennas of up to three wireless carriers.

The FCC requires wireless antenna operators to perform an assessment of the RF levels from all the transmitting antennas at a site whenever antenna operations are added or modified, and ensure compliance with the FCC Maximum Permissible Exposure (MPE) limit in areas of unrestricted public access, i.e., at street level around the site.

In this case, the compliance assessment will include the RF effects of a worst-case hypothetical collocation of three wireless carriers’ antennas. By worst case, we mean that the carriers whose maximum capacity relates to higher emitted power levels will be hypothetically assumed to occupy the lower mounting positions on the monopine, thus matching higher power and smaller distances to ground-level around the site.

The analysis will conservatively assume all the wireless carriers are operating at maximum capacity and maximum power in each of their FCC-licensed frequency bands. With that extreme degree of conservatism incorporated in the analysis, we can have great confidence that the actual RF effects from any combination of wireless operators, however they might actually be positioned on the monopine, would be in compliance with the FCC’s MPE limit.

This assessment of antenna site compliance is based on the FCC limit for general population “maximum permissible exposure” (MPE), a limit established as safe for continuous exposure to RF fields by humans of either sex, all ages and sizes, and under all conditions.

The result of an FCC compliance assessment can be described in layman's terms by expressing the calculated RF levels as simple percentages of the FCC MPE limit. In that way, the figure 100 percent serves as the reference for compliance, and calculated RF levels below 100 percent indicate compliance with the MPE limit. An equivalent way to describe the calculated results is to relate them to a "times-below-the-limit" factor. Here, we will apply both descriptions.

The result of the FCC compliance assessment in this case is as follows:

- At street level around the site, the conservatively calculated maximum RF level caused by the combination of antenna operations is 12.9647 percent of the FCC general population MPE limit, well below the 100-percent reference for compliance. In other words, even with calculations designed to significantly overstate the RF levels versus those that could actually occur at the site, the worst-case calculated RF level in this case is still more than seven times below the limit defined by the federal government as safe for continuous exposure of the general public.
- The results of the calculations provide a clear demonstration that the RF levels from as many as three wireless carriers, even under worst-case collocation circumstances, would satisfy the FCC requirement for controlling potential human exposure to RF fields. Moreover, because of the conservative methodology and assumptions applied in this analysis, RF levels actually caused by any combination of wireless operators' antenna operations at this site will be even less significant than the calculation results here indicate.

The remainder of this report provides the following:

- relevant technical data on the parameters for the three wireless carriers;
- a description of the applicable FCC mathematical model for assessing compliance with the MPE limit, and application of the relevant technical data to that model; and
- analysis of the results of the calculations, and the compliance conclusion for the proposed site.

In addition, two Appendices are included. Appendix A provides background on the FCC MPE limit, along with a list of key FCC references on MPE compliance, and Appendix B provides a summary of the qualifications of the expert certifying the FCC compliance for the subject antenna operations.

ANTENNA AND TRANSMISSION DATA

As described, the proposed 130-foot monopine will be able to accommodate as many as three wireless carriers' antennas. This analysis will include an assumption of "worst-case" collocation by three wireless carriers – Verizon Wireless, AT&T, and T-Mobile.

The table that follows summarizes the relevant data for the proposed Verizon Wireless antenna operations.

General Data – Verizon Wireless	
Frequency Bands	700 MHz, 850 MHz, 1900 MHz, 2100 MHz and 3700 MHz
Service Coverage Type	Sectorized
Antenna Type	Directional Panel
Antenna Centerline Height AGL	126 ft.
Antenna Azimuths (°)	110 / 230 / 350 / 40
Antenna Line Loss	Conservatively ignored (assumed 0 dB)
700 MHz Antenna Data	
Antenna Model (Max. Gain)	Commscope NHH-65C-HG-R2B (17.4 dBi)
Input Power per Sector	160 watts
850 MHz Antenna Data	
Antenna Model (Max. Gain)	Commscope NHH-65C-HG-R2B (17.4 dBi)
Input Power per Sector	160 watts
1900 MHz Antenna Data	
Antenna Model (Max. Gain)	Commscope NHH-65C-HG-R2B (19.5 dBi)
Input Power per Sector	160 watts
2100 MHz Antenna Data	
Antenna Model (Max. Gain)	Commscope NHH-65C-HG-R2B (20.1 dBi)
Input Power per Sector	160 watts

3700 MHz Antenna Data	
Antenna Model (Max. Gain)	Samsung MT6413-77A (25.5 dBi)
Input Power per Sector	320 watts

Note that in the analysis the maximum electrical downtilt for all antennas was applied, which was 12 degrees..

AT&T is licensed to operate in the 700 MHz, 850 MHz, 1900 MHz, 2100 MHz, 2300 MHz and 3800 MHz frequency bands. In the 700 MHz band, AT&T uses 370 watts of input power per sector. In the 850 MHz band, AT&T uses 160 watts of input power per sector. In the 1900 MHz band, AT&T uses 160 watts of input power per sector. In the 2100 MHz band, AT&T uses 160 watts of input power per sector. In the 2300 MHz band, AT&T uses 100 watts of input power per sector. Lastly, In the 3800 MHz band, AT&T uses 320 watts of input power per sector.

T-Mobile is licensed to operate in the 600 MHz, 700 MHz, 1900 MHz, 2100 MHz and 2500 MHz frequency bands. In the 600 MHz band, T-Mobile uses 120 watts per sector. In the 700 MHz band, T-Mobile uses 40 watts per sector. In the 1900 MHz band, T-Mobile uses 240 watts per sector. In the 2100 MHz band, T-Mobile uses 160 watts per sector. Lastly, In the 2500 MHz band, T-Mobile uses 300 watts per sector.

The assigned mounting heights (to the centerline of the antennas) are as follows:

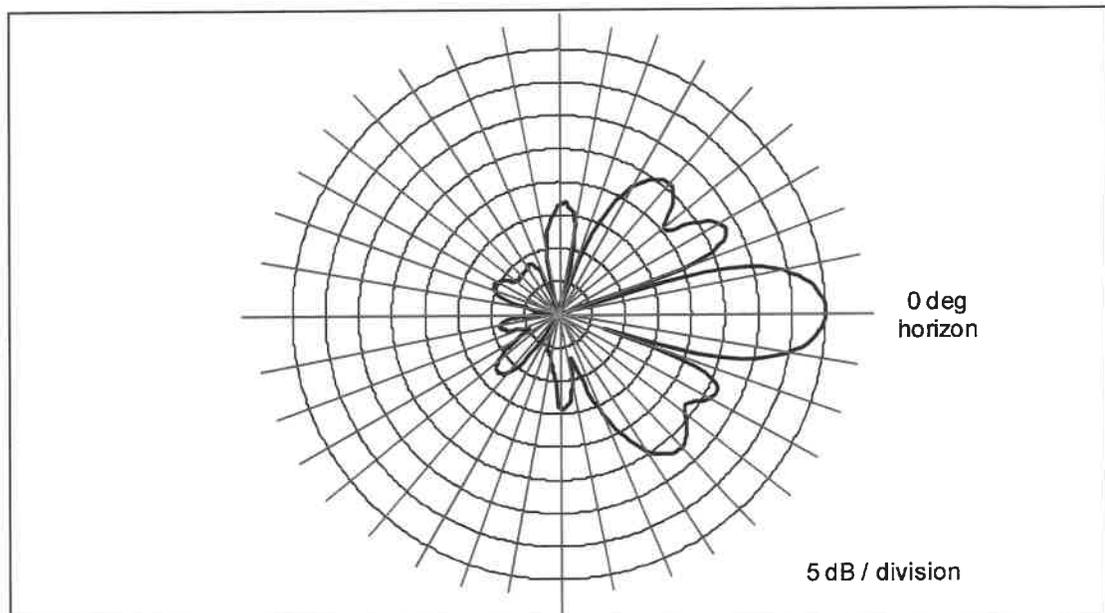
- Verizon Wireless: 126 feet
- T-Mobile: 116 feet
- AT&T: 106 feet

The area below the antennas, at street level, is of interest in terms of potential “uncontrolled” exposure of the general public, so the antenna’s vertical-plane emission characteristic is used in the calculations, as it is a key determinant in the relative level of RF emissions in the “downward” direction.

By way of illustration, Figure 1, below, shows the vertical-plane pattern of a typical 1900 MHz panel antenna. The antenna is effectively pointed at the three o'clock position (the horizon) and the pattern at different angles is described using decibel units. The use of a decibel scale incidentally visually understates the relative directionality characteristic of the antenna in the vertical plane. Where the antenna pattern reads 20 dB, the relative RF energy emitted at the corresponding downward angle is 1/100th of the maximum that occurs in the main beam (at 0 degrees); at 30 dB, the energy is 1/1000th of the maximum.

Note that the automatic pattern-scaling feature of our internal software may skew side-by-side visual comparisons of different antenna models, or even different parties' depictions of the same antenna model.

Figure 1. 1900 MHz Directional Panel Antenna – Vertical-plane Pattern



COMPLIANCE ANALYSIS

FCC Office of Engineering and Technology Bulletin 65 (“OET Bulletin 65”) provides guidelines for mathematical models to calculate potential RF exposure levels at various points around transmitting antennas.

Around an antenna site at ground level (in what is called the “far field” of the antennas), the RF levels are directly proportional to the total antenna input power and the relative antenna gain (focusing effect) in the downward direction of interest – and the levels are otherwise inversely proportional to the square of the straight-line distance to the antenna. Conservative calculations also assume the potential RF exposure is enhanced by reflection of the RF energy from the intervening ground. Our calculations will assume a 100% “perfect”, mirror-like reflection, which is the absolute worst-case approach.

The formula for ground-level MPE compliance assessment of any given wireless antenna operation is as follows:

$$\text{MPE}\% = (100 * \text{TxPower} * 10^{(\text{Gmax-Vdisc})/10} * 4) / (\text{MPE} * 4\pi * \text{R}^2)$$

where

- MPE% = RF level, expressed as a percentage of the FCC MPE limit applicable to continuous exposure of the general public
- 100 = factor to convert the raw result to a percentage
- TxPower = maximum net power into antenna sector, in milliwatts, a function of the number of channels per sector, the transmitter power per channel, and line loss
- $10^{(\text{Gmax-Vdisc})/10}$ = numeric equivalent of the relative antenna gain in the direction of interest downward toward ground level
- 4 = factor to account for a 100-percent-efficient energy reflection from the ground, and the squared relationship between RF field strength and power density ($2^2 = 4$)
- MPE = FCC general population MPE limit
- R = straight-line distance from the RF source to the point of interest, centimeters

The MPE% calculations are normally performed out to a distance of 500 feet from the facility to points 6.5 feet (approximately two meters, the FCC-recommended standing height) off the ground, as illustrated in Figure 2 on the next page.

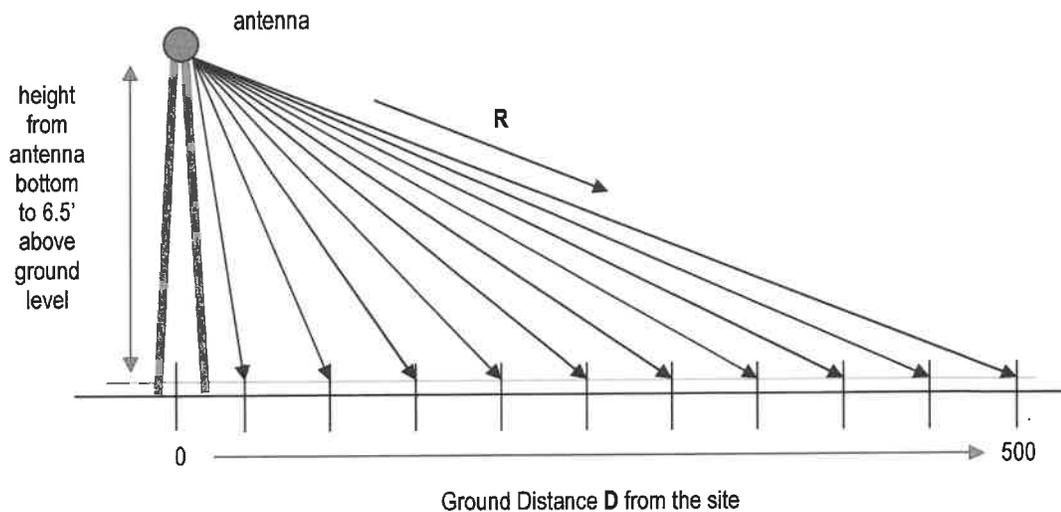


Figure 2. Street-level MPE% Calculation Geometry

It is popularly thought that the farther away one is from an antenna, the lower the RF level – which is generally but not universally correct. The results of MPE% calculations fairly close to the site will reflect the variations in the vertical-plane antenna pattern as well as the variation in straight-line distance to the antennas. Therefore, RF levels may actually increase slightly with increasing distance within the range of zero to 500 feet from the site. As the distance approaches 500 feet and beyond, though, the antenna pattern factor becomes less significant, the RF levels become primarily distance-controlled and, as a result, the RF levels generally decrease with increasing distance. In any case, the RF levels more than 500 feet from a wireless antenna site are well understood to be sufficiently low and always in compliance.

FCC compliance for a collocated antenna site is assessed in the following manner. At each distance point away from the site, an MPE% calculation is made for each antenna operation, including the individual components of dual-band operations. Then, at each point, the sum of the individual MPE% contributions is compared to 100 percent, where the latter figure serves as a normalized reference for compliance with the MPE limit. We refer to the sum of the individual MPE% contributions as “total MPE%”, and any calculated total MPE% result exceeding

100 percent is, by definition, higher than the limit and represent non-compliance and a need to take action to mitigate the RF levels. If all results are below 100 percent, that indicates compliance with the federal regulations on controlling exposure.

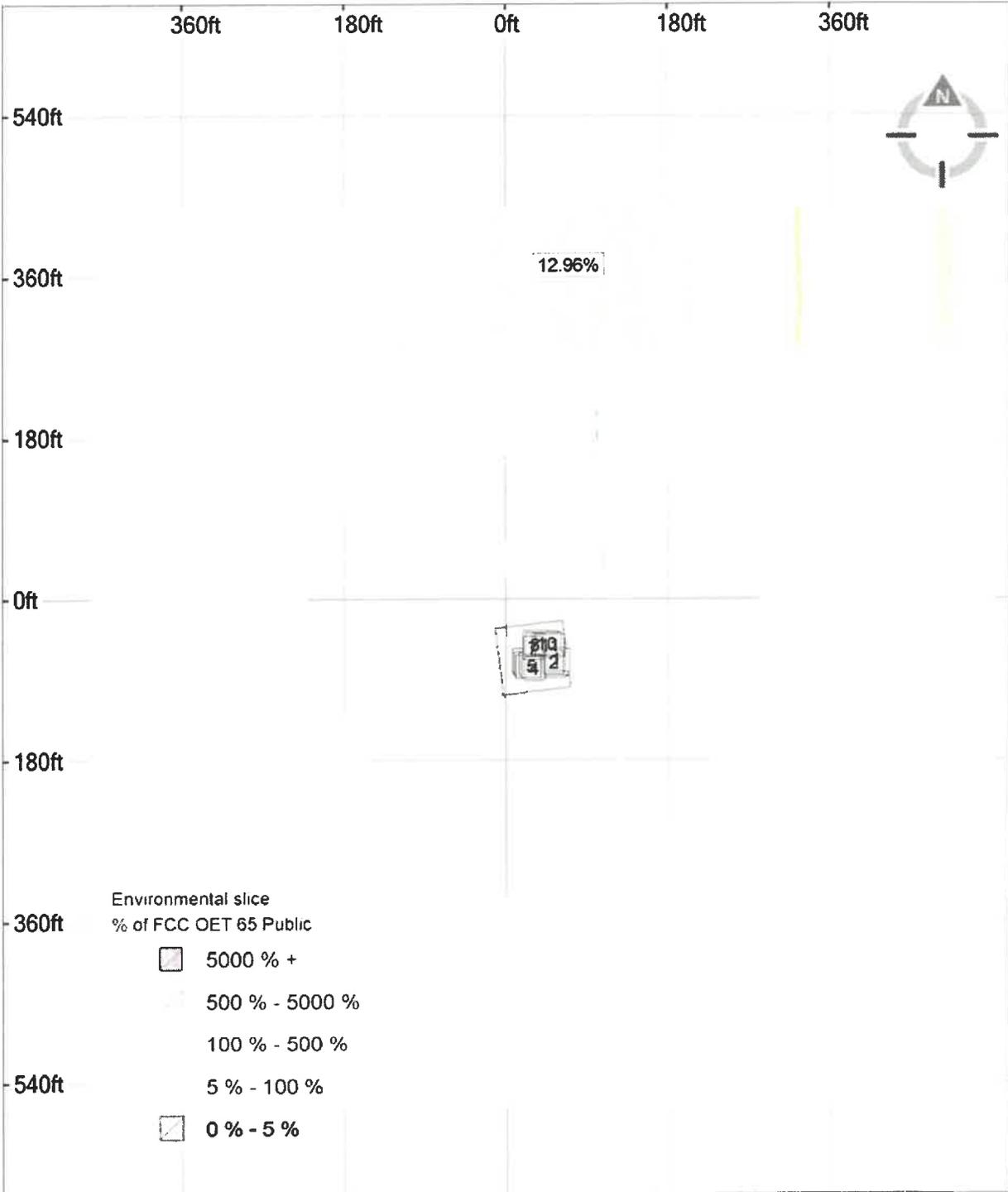
Note that the following conservative methodology and assumptions are incorporated into the MPE% calculations on a general basis:

1. The antennas are assumed to be operating continuously at maximum RF power – i.e., with the maximum number of channels and the maximum transmitter power per channel.
2. The power-attenuation effects of any shadowing or visual obstruction to a line-of-sight path from the antennas to the points of interest at ground level are ignored.
3. The calculations intentionally minimize the distance factor (R) by assuming a 6'6" human and performing the calculations from the bottom (rather than the centerline) of the antenna.
4. The potential RF exposure at ground level is assumed to be 100-percent enhanced (increased) via a "perfect" field reflection from the intervening ground.

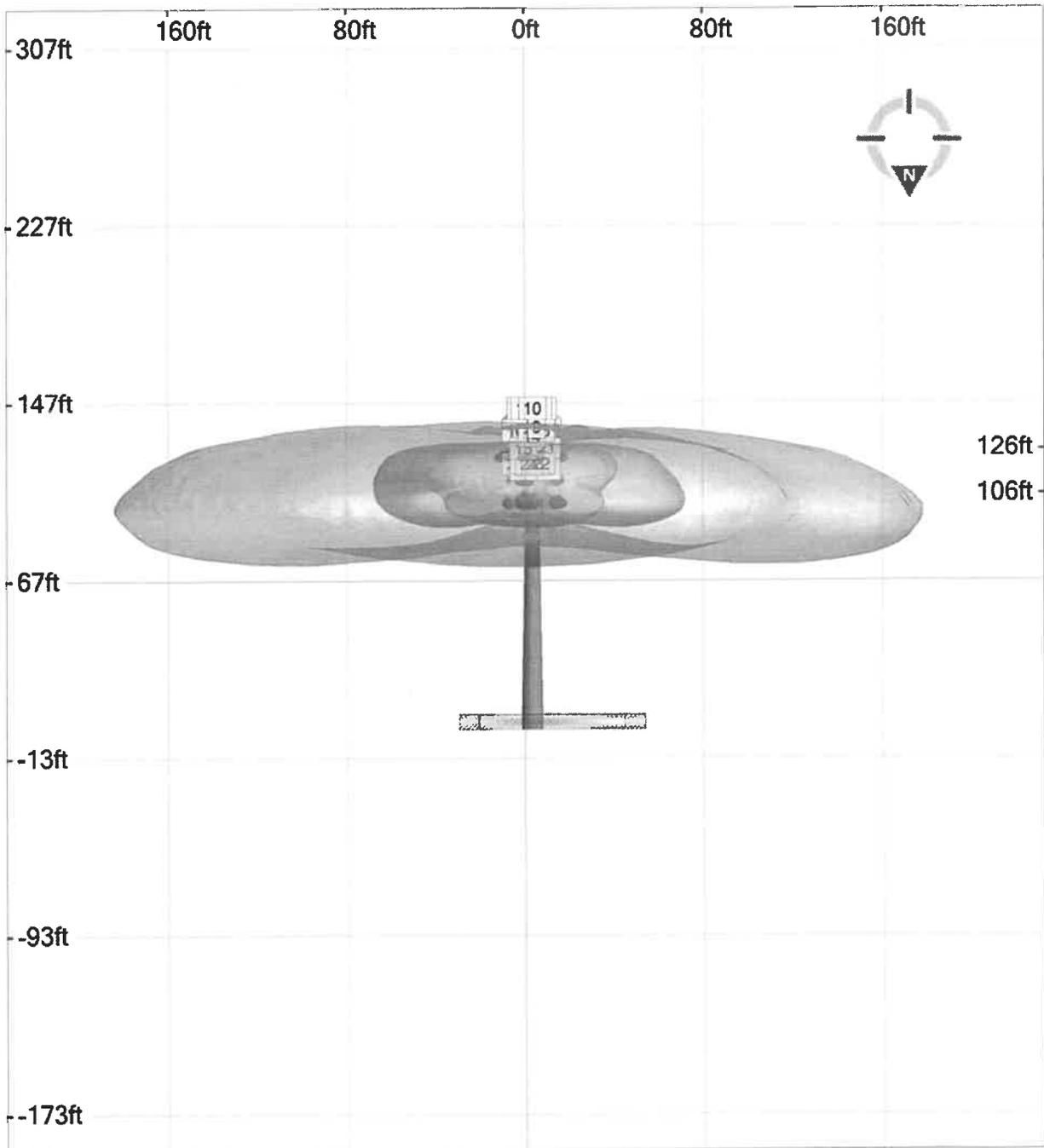
The net result of these assumptions is to intentionally and significantly overstate the calculated RF levels relative to the RF levels that will actually occur – and the purpose of this conservatism is to allow "safe-side" conclusions about compliance with the MPE limit.

The compliance analysis is performed using the IXUS EME Compliance Management Software.

The IXUS graphic outputs for the areas surrounding the Verizon antenna sectors are reproduced on the pages that follow.



IXUS – Street Level



IXUS – Elevation

As indicated, the overall worst-case calculated result is 12.9647 percent of the FCC general population MPE limit – well below the 100-percent reference for compliance, particularly given the significant conservatism incorporated in the analysis.

COMPLIANCE CONCLUSION

The FCC MPE limit has been constructed in such a manner that continuous human exposure to RF fields up to and including 100 percent of the MPE limit is acceptable and completely safe.

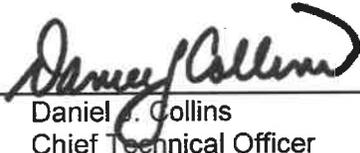
The conservatively calculated maximum RF effect at street level from the assumed collocation of as many as three wireless carriers is 12.9647 percent of the FCC general population MPE limit. In other words, even with an extremely conservative analysis intended to dramatically overstate the RF effects of any wireless collocation scenario at the site, the calculated worst-case RF level is still more than seven times below the FCC MPE limit.

The results of the calculations indicate clear compliance with the FCC regulations and the related MPE limit, even for a worst-case collocation scenario. Because of the conservative calculation methodology and operational assumptions applied in this analysis, the RF levels actually caused by any more realistic collocation of antennas at this site would be even less significant than the calculation results here indicate, and compliance would be achieved by an even larger margin.

CERTIFICATION

It is the policy of Pinnacle Telecom Group that all FCC RF compliance assessments are reviewed, approved, and signed by the firm's Chief Technical Officer who certifies as follows:

1. I have read and fully understand the FCC regulations concerning RF safety and the control of human exposure to RF fields (47 CFR 1.1301 *et seq*).
2. To the best of my knowledge, the statements and information disclosed in this report are true, complete and accurate.
3. The analysis of site RF compliance provided herein is consistent with the applicable FCC regulations, additional guidelines issued by the FCC, and industry practice.
4. The results of the analysis indicate that the subject antenna operations will be in compliance with the FCC regulations concerning the control of potential human exposure to the RF emissions from antennas.



Daniel J. Collins
Chief Technical Officer
Pinnacle Telecom Group, LLC

2/2/26

Date

Appendix A. Background on the FCC MPE Limit

As directed by the Telecommunications Act of 1996, the FCC has established limits for maximum continuous human exposure to RF fields.

The FCC maximum permissible exposure (MPE) limits represent the consensus of federal agencies and independent experts responsible for RF safety matters. Those agencies include the National Council on Radiation Protection and Measurements (NCRP), the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), the American National Standards Institute (ANSI), the Environmental Protection Agency (EPA), and the Food and Drug Administration (FDA). In formulating its guidelines, the FCC also considered input from the public and technical community – notably the Institute of Electrical and Electronics Engineers (IEEE).

The FCC's RF exposure guidelines are incorporated in Section 1.301 *et seq* of its Rules and Regulations (47 CFR 1.1301-1.1310). Those guidelines specify MPE limits for both occupational and general population exposure.

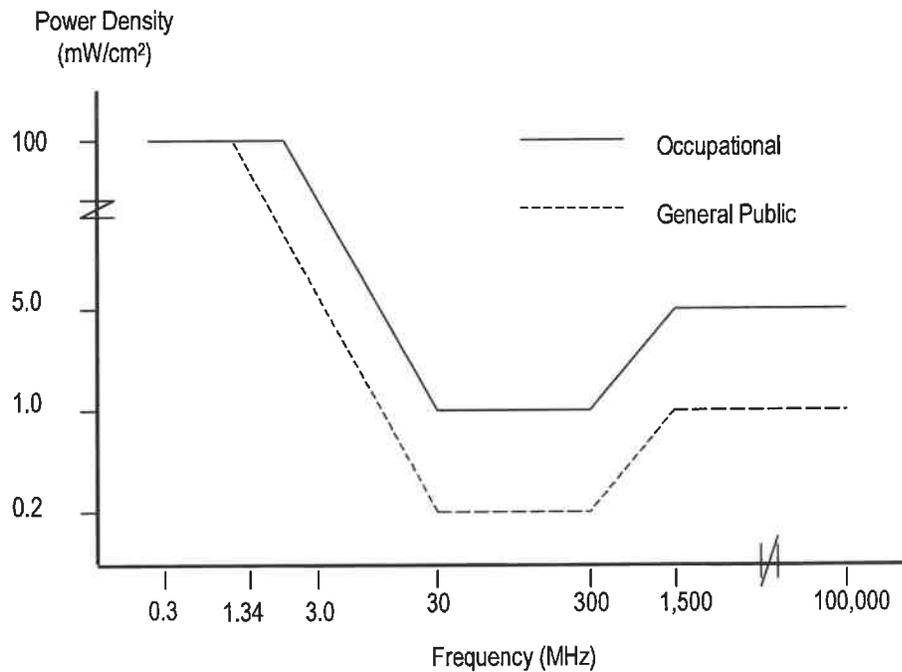
The specified continuous exposure MPE limits are based on known variation of human body susceptibility in different frequency ranges, and a Specific Absorption Rate (SAR) of 4 watts per kilogram, which is universally considered to accurately represent human capacity to dissipate incident RF energy (in the form of heat). The occupational MPE guidelines incorporate a safety factor of 10 or greater with respect to RF levels known to represent a health hazard, and an additional safety factor of five is applied to the MPE limits for general population exposure. Thus, the general population MPE limit has a built-in safety factor of more than 50. The limits were constructed to appropriately protect humans of both sexes and all ages and sizes and under all conditions – and continuous exposure at levels equal to or below the applicable MPE limits is considered to result in no adverse health effects or even health risk.

The reason for *two* tiers of MPE limits is based on an understanding and assumption that members of the general public are unlikely to have had appropriate RF safety training and may not be aware of the exposures they receive; occupational exposure in controlled environments, on the other hand, is assumed to involve individuals who have had such training, are aware of the exposures, and know how to maintain a safe personal work environment.

The FCC's RF exposure limits are expressed in two equivalent forms, using alternative units of field strength (expressed in volts per meter, or V/m), and power density (expressed in milliwatts per square centimeter, or mW/cm²). The table on the next page lists the FCC limits for both occupational and general population exposures, using the mW/cm² reference, for the different radio frequency ranges.

Frequency Range (F) (MHz)	Occupational Exposure (mW/cm ²)	General Public Exposure (mW/cm ²)
0.3 - 1.34	100	100
1.34 - 3.0	100	$180 / F^2$
3.0 - 30	$900 / F^2$	$180 / F^2$
30 - 300	1.0	0.2
300 - 1,500	$F / 300$	$F / 1500$
1,500 - 100,000	5.0	1.0

The diagram below provides a graphical illustration of both the FCC's occupational and general population MPE limits.



Because the FCC's RF exposure limits are frequency-shaped, the exact MPE limits applicable to the instant situation depend on the frequency range used by the systems of interest.

The most appropriate method of determining RF compliance is to calculate the RF power density attributable to a particular system and compare that to the MPE limit applicable to the operating frequency in question. The result is usually expressed as a percentage of the MPE limit.

For potential exposure from multiple systems, the respective percentages of the MPE limits are added, and the total percentage compared to 100 (percent of the limit). If the result is less than 100, the total exposure is in compliance; if it is more than 100, exposure mitigation measures are necessary to achieve compliance.

Note that the FCC “categorically excludes” all “non-building-mounted” wireless antenna operations whose mounting heights are more than 10 meters (32.8 feet) from the routine requirement to demonstrate compliance with the MPE limit, because such operations “are deemed, individually and cumulatively, to have no significant effect on the human environment”. The categorical exclusion also applies to *all* point-to-point antenna operations, regardless of the type of structure they’re mounted on. Note that the FCC considers any facility qualifying for the categorical exclusion to be automatically in compliance.

FCC References on RF Compliance

47 CFR, FCC Rules and Regulations, Part 1 (Practice and Procedure), Section 1.1310 (Radiofrequency radiation exposure limits).

FCC Second Memorandum Opinion and Order and Notice of Proposed Rulemaking (FCC 97-303), *In the Matter of Procedures for Reviewing Requests for Relief From State and Local Regulations Pursuant to Section 332(c)(7)(B)(v) of the Communications Act of 1934 (WT Docket 97-192), Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation (ET Docket 93-62), and Petition for Rulemaking of the Cellular Telecommunications Industry Association Concerning Amendment of the Commission's Rules to Preempt State and Local Regulation of Commercial Mobile Radio Service Transmitting Facilities*, released August 25, 1997.

FCC First Memorandum Opinion and Order, ET Docket 93-62, *In the Matter of Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, released December 24, 1996.

FCC Report and Order, ET Docket 93-62, *In the Matter of Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, released August 1, 1996.

FCC Office of Engineering and Technology (OET) Bulletin 65, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields”, Edition 97-01, August 1997.

FCC Office of Engineering and Technology (OET) Bulletin 56, “Questions and Answers About Biological Effects and Potential Hazards of RF Radiation”, edition 4, August 1999.

Appendix B. SUMMARY of EXPERT QUALIFICATIONS

Daniel J. Collins, Chief Technical Officer, Pinnacle Telecom Group, LLC

<p>Synopsis:</p>	<ul style="list-style-type: none"> • 40+ years of experience in all aspects of wireless system engineering, related regulation, and RF exposure • Has performed or led RF exposure compliance assessments on more than 20,000 antenna sites since the latest FCC regulations went into effect in 1997 • Has provided testimony as an RF compliance expert more than 1,500 times since 1997 • Have been accepted as an FCC compliance expert in New York, New Jersey, Connecticut, Pennsylvania and more than 40 other states, as well as by the FCC
<p>Education:</p>	<ul style="list-style-type: none"> • B.E.E., City College of New York (Sch. Of Eng.), 1971 • M.B.A., 1982, Fairleigh Dickinson University, 1982 • Bronx High School of Science, 1966
<p>Current Responsibilities:</p>	<ul style="list-style-type: none"> • Leads all PTG staff work involving RF safety and FCC compliance, microwave and satellite system engineering, and consulting on wireless technology and regulation
<p>Prior Experience:</p>	<ul style="list-style-type: none"> • Edwards & Kelcey, VP – RF Engineering and Chief Information Technology Officer, 1996-99 • Bellcore (a Bell Labs offshoot after AT&T's 1984 divestiture), Executive Director – Regulation and Public Policy, 1983-96 • AT&T (Corp. HQ), Division Manager – RF Engineering, and Director – Radio Spectrum Management, 1977-83 • AT&T Long Lines, Group Supervisor – Microwave Radio System Design, 1972-77
<p>Specific RF Safety / Compliance Experience:</p>	<ul style="list-style-type: none"> • Involved in RF exposure matters since 1972 • Have had lead corporate responsibility for RF safety and compliance at AT&T, Bellcore, Edwards & Kelcey, and PTG • While at AT&T, helped develop the mathematical models for calculating RF exposure levels • Have been relied on for compliance by all major wireless carriers, as well as by the federal government, several state and local governments, equipment manufacturers, system integrators, and other consulting / engineering firms
<p>Other Background:</p>	<ul style="list-style-type: none"> • Author, <i>Microwave System Engineering</i> (AT&T, 1974) • Co-author and executive editor, <i>A Guide to New Technologies and Services</i> (Bellcore, 1993) • National Spectrum Management Association (NSMA) – former three-term President and Chairman of the Board of Directors; was founding member, twice-elected Vice President, long-time member of the Board, and was named an NSMA Fellow in 1991 • Have published more than 35 articles in industry magazines



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January 9, 2026

Honorable Supervisor Lachterman and Members of the Town Board
Town Of Yorktown
363 Underhill Avenue
Yorktown Heights, NY 10598

RE: Homeland Towers, LLC
62 Granite Springs Road
Town of Yorktown, NY

Dear Honorable Supervisor Lachterman and Members of the Town Board:

In connection with the above-referenced cellular monopole site proposed by Homeland Towers LLC, Pinnacle Telecom Group (PTG) provided an "Antenna Site FCC RF Compliance Assessment and Report" dated November 16, 2021. The FCC requires all wireless antenna operators to assess and assure compliance with the FCC Maximum Permissible Exposure (MPE) limit for safe, continuous exposure of the general public in areas of unrestricted access around an antenna site. In this case, with a proposed monopole, that means at ground level. Given that the monopole is being proposed to accommodate colocation by as many as three wireless carriers, our report provided a conservative mathematical analysis demonstrating that cellular antenna operations by three national carriers would clearly satisfy the FCC's MPE limit.

The MPE limit, described in Part 2 of the FCC's Rules and Regulations", was created as a result of a Congressional directive in the Telecommunications Act of 1996 that the FCC create a single, national standard for controlling potential RF exposure. The FCC proceeded to gather information from scientific, medical and technical experts inside and outside the Federal government, a partial listing of which is offered in Appendix A attached hereto. In addition, as is typically the case in FCC rulemaking procedures, the Commission included in its analysis inputs and comments from the general public, as well as by national and international standards bodies involved in RF safety matters.

The MPE limit that was adopted and still applies to the general public represented the consensus of experts in the field and **incorporates a safety factor of 50** (not the more usual 10) relative to RF levels understood to represent a threshold for potential harm to humans of **either sex, all ages, all sizes and under all conditions**. (A slight relaxation in the MPE limit for the general public applies to "occupational" exposure, which acknowledges that individuals with RF safety training can take specific action to mitigate their potential exposure and maintain safety; the safety factor for such exposure is 10).

The MPE limit adopted by the FCC recognized that human bodies basically act as receiving antennas, so that the impacts of exposure from sources at different frequencies can have different effects depending on the major dimension (height). Thus, the MPE limit is frequency-shaped, not flat for all frequencies, as illustrated by the diagram on the second page of Appendix A of our report.

Note that the factors related to potential exposure at ground level around an antenna site include the particular RF transmitter power levels, the focusing effects of antennas, the distance from the antennas to the point of interest, and the frequencies of the signals emitted by the transmitters – but not the particular RF technology or modulation scheme involved. For example, the MPE limit for any operation in any particular frequency band, say the 869 MHz cellular frequency band, is the same whether the particular technology is labeled 3G, 4G, 5G, or anything else. The MPE limit depends alone on the frequency of transmission.

We mentioned at the outset of this letter and throughout the compliance report that our exposure analysis was **conservative**, which is the approach recommended by the FCC, so that there can be great confidence about conclusions about MPE compliance.

The base-level mathematical model for ground-level analysis is described in detail by the FCC in its technical “Bulletin OET65”, and besides the conservatism related to the MPE’s built-in safety factor of 50, there are a number of additional measures that can add to the overall conservatism. As described in part in the “Compliance Analysis” section of our report, we always assume the subject antennas are operating at maximum channel capacity and at maximum transmitter power channel, we ignore the power-attenuation of the cabling connecting the transmitters to the antennas, we assume a clear, unobstructed line-of-sight from the antennas to all points of interest at ground level around the site, we assume in the calculations that the antenna are pointed directly overhead all points around the site (ignoring the effects of horizontal antenna pattern discrimination in the horizontal plane), we minimize the distance factor by performing the calculations from the bottom of the antennas to the top of a 6-foot 6-inch human, and we assume the potential exposure is worst-case enhanced by a perfect, “mirror-like” reflection of the RF energy from the intervening ground (which results in an increase of the calculated results by a factor of four).

In addition, in this case the proposed antenna heights have not been set, but we hypothetically positioned the antenna heights of three cellular operators so that the ones with higher overall RF power levels were lower to the ground, thus conservatively coupling those higher RF sources with the shorter potential exposure distances to the ground around the site.

Despite the considerable conservatism in the mathematical analysis, the worst-case calculated result showed a maximum RF level of no more than **5.2667 percent** of the MPE limit – a clear demonstration of FCC compliance, regardless of what configuration of up to three cellular operators might exist at this proposed site.

Additional information on the MPE limit and compliance is available from the FCC’s website, www.fcc.gov/general/radio-frequency-safety-0.


Daniel J. Collins
Chief Technical Officer

Attachment

Appendix A. Background on the FCC MPE Limit

As directed by the Telecommunications Act of 1996, the FCC has established limits for maximum continuous human exposure to RF fields.

The FCC maximum permissible exposure (MPE) limits represent the consensus of federal agencies and independent experts responsible for RF safety matters. Those agencies include the National Council on Radiation Protection and Measurements (NCRP), the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), the American National Standards Institute (ANSI), the Environmental Protection Agency (EPA), and the Food and Drug Administration (FDA). In formulating its guidelines, the FCC also considered input from the public and technical community – notably the Institute of Electrical and Electronics Engineers (IEEE).

The FCC's RF exposure guidelines are incorporated in Section 1.301 *et seq* of its Rules and Regulations (47 CFR 1.1301-1.1310). Those guidelines specify MPE limits for both occupational and general population exposure.

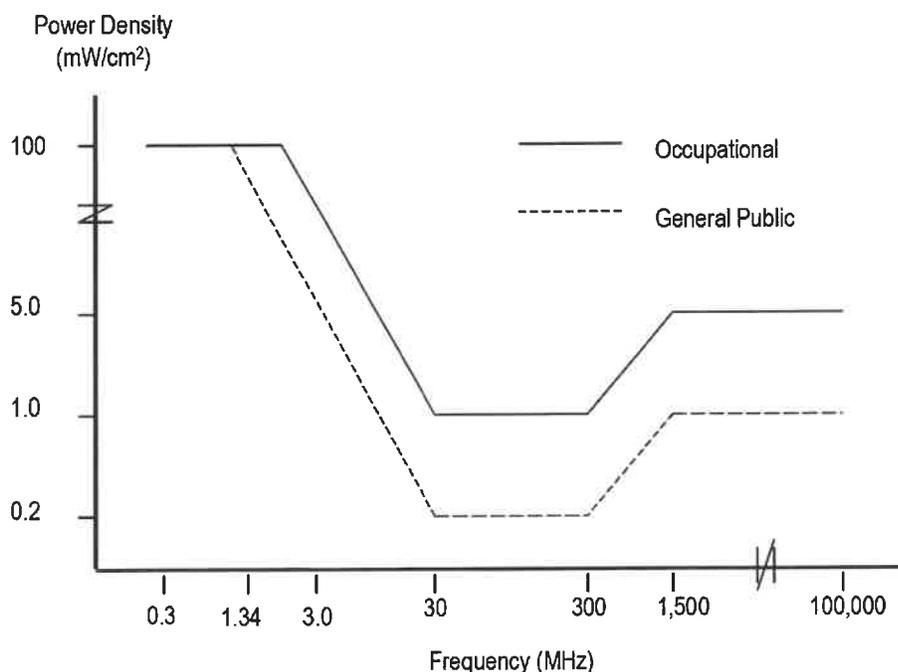
The specified continuous exposure MPE limits are based on known variation of human body susceptibility in different frequency ranges, and a Specific Absorption Rate (SAR) of 4 watts per kilogram, which is universally considered to accurately represent human capacity to dissipate incident RF energy (in the form of heat). The occupational MPE guidelines incorporate a safety factor of 10 or greater with respect to RF levels known to represent a health hazard, and an additional safety factor of five is applied to the MPE limits for general population exposure. Thus, the general population MPE limit has a built-in safety factor of more than 50. The limits were constructed to appropriately protect humans of both sexes and all ages and sizes and under all conditions – and continuous exposure at levels equal to or below the applicable MPE limits is considered to result in no adverse health effects or even health risk.

The reason for *two* tiers of MPE limits is based on an understanding and assumption that members of the general public are unlikely to have had appropriate RF safety training and may not be aware of the exposures they receive; occupational exposure in controlled environments, on the other hand, is assumed to involve individuals who have had such training, are aware of the exposures, and know how to maintain a safe personal work environment.

The FCC's RF exposure limits are expressed in two equivalent forms, using alternative units of field strength (expressed in volts per meter, or V/m), and power density (expressed in milliwatts per square centimeter, or mW/cm²). The table on the next page lists the FCC limits for both occupational and general population exposures, using the mW/cm² reference, for the different radio frequency ranges.

Frequency Range (F) (MHz)	Occupational Exposure (mW/cm ²)	General Public Exposure (mW/cm ²)
0.3 - 1.34	100	100
1.34 - 3.0	100	180 / F ²
3.0 - 30	900 / F ²	180 / F ²
30 - 300	1.0	0.2
300 - 1,500	F / 300	F / 1500
1,500 - 100,000	5.0	1.0

The diagram below provides a graphical illustration of both the FCC's occupational and general population MPE limits.



Because the FCC's RF exposure limits are frequency-shaped, the exact MPE limits applicable to the instant situation depend on the frequency range used by the systems of interest.

The most appropriate method of determining RF compliance is to calculate the RF power density attributable to a particular system and compare that to the MPE limit applicable to the operating frequency in question. The result is usually expressed as a percentage of the MPE limit.

For potential exposure from multiple systems, the respective percentages of the MPE limits are added, and the total percentage compared to 100 (percent of the limit). If the result is less than 100, the total exposure is in compliance; if it is more than 100, exposure mitigation measures are necessary to achieve compliance.

Note that the FCC “categorically excludes” all “non-building-mounted” wireless antenna operations whose mounting heights are more than 10 meters (32.8 feet) from the routine requirement to demonstrate compliance with the MPE limit, because such operations “are deemed, individually and cumulatively, to have no significant effect on the human environment”. The categorical exclusion also applies to *all* point-to-point antenna operations, regardless of the type of structure they’re mounted on. Note that the FCC considers any facility qualifying for the categorical exclusion to be automatically in compliance.

FCC References on RF Compliance

47 CFR, FCC Rules and Regulations, Part 1 (Practice and Procedure), Section 1.1310 (Radiofrequency radiation exposure limits).

FCC Second Memorandum Opinion and Order and Notice of Proposed Rulemaking (FCC 97-303), *In the Matter of Procedures for Reviewing Requests for Relief From State and Local Regulations Pursuant to Section 332(c)(7)(B)(v) of the Communications Act of 1934 (WT Docket 97-192), Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation (ET Docket 93-62), and Petition for Rulemaking of the Cellular Telecommunications Industry Association Concerning Amendment of the Commission's Rules to Preempt State and Local Regulation of Commercial Mobile Radio Service Transmitting Facilities*, released August 25, 1997.

FCC First Memorandum Opinion and Order, ET Docket 93-62, *In the Matter of Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, released December 24, 1996.

FCC Report and Order, ET Docket 93-62, *In the Matter of Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, released August 1, 1996.

FCC Office of Engineering and Technology (OET) Bulletin 65, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields”, Edition 97-01, August 1997.

FCC Office of Engineering and Technology (OET) Bulletin 56, “Questions and Answers About Biological Effects and Potential Hazards of RF Radiation”, edition 4, August 1999.