Phillips Lytle LLP

Via Overnight Delivery
Village of Old Brookville
Village Hall
201 McCouns Lane
Old Brookville, NY 11545
Attn: Hon. Bernie Ryba

April 6, 2012

Re: Supplemental Submittal
NY CLEC LLC Right of Way Agreement Supplemental Submittal

Dear Mayor Ryba and Board of Trustees:

We represent NY CLEC LLC, ("Crown" or "Applicant") a subsidiary of Crown Castle International Corporation and we are writing to provide the Village of Old Brookville ("Village") with additional information in support of Crown's proposed Right of Way ("ROW") Agreement for access to the utility corridor in the public right of way located in the Village. This submittal is provided in furtherance of our application dated October 3, 2011, our correspondence of February 28, 2012, and our appearances at the September 19, 2012, November 21, 2011 and March 26, 2012 Board of Trustees ("Board") meetings.

As you are aware, Crown has proposed the installation of a distributed antenna system telecommunications network ("DAS") within the Village ("Project"). The network will consist of fiber optic cable and other telecommunications facilities to be installed within the existing utility corridor along the public right of way within the Village.

The following exhibits are attached hereto and made part of this supplemental submittal.

Exhibit A Federal Communications Commission ("FCC") *Local Government Official's Guide to Transmitting Antenna RF [Radio Frequency] Emission Safety: Rules, Procedures, and Practical Guidance*
Exhibit B RF Radiation Comparison Report
Exhibit C Long Island Triangle Site Compliance Report

ATTORNEYS AT LAW

DAVID E. BRONSTON, SPECIAL COUNSEL DIRECT 212 508 0470 DBRONSTON@PHILLIPSLYTLE.COM

437 MADISON AVENUE 34TH FLOOR NEW YORK, NY 10022 PHONE 212 759 4888 FAX 212 308 9079

BUFFALO ALBANY CHAUTAUQUA GARDEN CITY NEW YORK ROCHESTER WWW.PHILLIPSLYTLE.COM

Exhibit D Technical Specifications

RADIOFREQUENCY ANALYSIS

At the Board meeting on March 26, 2012 there was a discussion regarding health effects from RF emissions related to the proposed Project. In order to help the Village understand RF safety and provide assurance of the Applicant's compliance with all applicable safety standards, we have attached as Exhibit A the FCC's *Local Government Official's Guide to Transmitting Antenna RF Emission Safety: Rules, Procedures, and Practical Guidance* ("Guide"). The Guide provides a summary of the FCC's RF exposure guidelines along with helpful background information. As described in the Guide, the FCC has extensively analyzed the issues surrounding the RF exposure limits and guidelines. RF emissions are regulated by FCC standards with which all FCC licensed entities, and infrastructure installers like the Applicant, must comply. As the Guide explains, the FCC limits are based on exposure criteria recommended by the National Council on Radiation Protection and Measurements. See Exhibit A, P. 4. The maximum RF exposure limits established by the FCC are designed to protect the public health with a very large margin of safety. In fact, pursuant to Federal Law, local governments are prohibited from regulating wireless carriers on the basis of RF emissions as long as the wireless service facility is operated within the FCC standards. Nonetheless, the Applicant is sensitive to the public's concern.

It should also be noted that these limits have been endorsed by Federal health and safety agencies such as the Environmental Protection Agency and the Food and Drug Administration. The FCC's maximum exposure standards have also been upheld by a Federal Court of Appeals and New York State courts. In Cellular Phone Taskforce v. Federal Communications Commission, 205 F.3d 82 (2nd Cir. 2000) and in Stanley v. Amalithone Realty, Inc. 2012 NY Slip Op. 01788 (1st Dep't, March 13, 2012) both courts upheld the FCC's preemption of State and local governments from regulating, based on RF emissions, the operation of wireless service facilities that are in compliance with FCC regulations concerning such emissions. Also, the Federal Court of Appeals for the

2nd Circuit found the FCC's RF emission guidelines reasonable in the context of protecting human health. Id. at 93. With this in mind, we respectfully suggest that the proposed Project will not present any safety concerns with regard to RF emissions.

Also for your reference and for comparison purposes the Applicant commissioned a report that describes RF emissions associated with common household and personal devices. See Exhibit B. On Page 1 of Exhibit B there is a graphical comparison of the power density of a typical DAS node as compared to various household devices and cellular phones. As shown in the diagrams on page 1 of Exhibit B, not only are the proposed DAS nodes in compliance with FCC requirements, a typical DAS node emits RF energy at a significantly lower power density than many common household electronic devices, such as handheld cordless phones, cellular telephones or microwave ovens. For your reference, the Applicant has also included a copy of a RF compliance report which was commissioned to demonstrate that the proposed DAS nodes comply with all applicable FCC requirements. Exhibit C. The Mayor recently requested similar information with respect to the nodes in the Village. While the report attached as Exhibit C is specific to nodes in Muttontown, the information is generic for other nodes throughout the Project. The Applicant would be willing, subsequent to approval of the ROW Agreement but prior to commencement of any construction, to prepare a similar report for the Village as a matter of ROW Agreement compliance.

On March 27, 2012, following the Board meeting, a resident of the Village sent additional questions to the Board and the Applicant. We appreciate the opportunity to respond and offer the following additional information. The individual questions and the Applicant's RF expert's responses to each question are as follows:

Question 1. Power output of each utility pole installation (including multiple antennas).

Response: The DAS equipment configuration is relatively low power ranging from 20W to 40W watts from the amplified signal standpoint going into the antenna. The ERP for each utility pole installation will vary depending on the total number of

antennas and the subscriber traffic channels utilized to address capacity, however the maximum for any installation in the system will be 252W (not transmitted in a single direction but dispersed across various antenna azimuths as designed).

Question 2. Frequency(ies):

Response: The DAS system is designed to be compatible with 698-940 MHz and 1710-2155 MHz equipment.

Question 3. Signal strength @ 100' (or any other distance) from one of your antenna installations in the direction of maximum radiation.

Response: Initially it is important to note that the DAS system is designed such that all handoffs are based on the line of sight to the farthest point along the road based on the morphology or topography or obstructions to the signal. If it is assumed that there were no obstructions (i.e. vegetation, topography, no elevation changes, or structures) based on a clear sight line of 100 ft between the transmitting and receiving point the signal strength is estimated to be between -55 dBm to -65 dBm. The specific strength in the range would depend upon the transmitting frequency, which would yield a stronger signal on the 850 MHz band and lower signal strength on the PCS and AWS band. If there are obstructions, such as vegetation, the signal strength will be significantly lower.

Question 4. The radiation pattern of the antennas (vertical and horizontal).

Response: Illustrated radiation patterns (both vertical and horizontal) for the proposed antennas are found on page 2 of Exhibit D, which includes the technical specifications for the Amphenol antenna model that Crown will install.

Question 5. The power output of one distributed antenna installation in comparison to a typical cell tower output.

Response: As described above, the Applicant commissioned a study to analyze three typical DAS nodes. See Exhibit C. In this study, the DAS nodes were compared to a generic cell site. A complete description of this analysis can be found on page 10 of Exhibit C. As mentioned previously, the Applicant is willing to provide a similar report for the Village regarding the specific nodes in the Village as a condition subsequent to the approval of the ROW Agreement.

Question 6. The maximum signal strength expected in any area of coverage, and also compared to a typical cell tower output.

Response: As described above, please refer to Exhibit C.

Question 7. The maximum radiation exposure allowed for distributed wireless transponders by the FCC in any area of coverage.

Response: As explained in the FCC Guide, the FCC has set limits for occupational/controlled exposure and general population/uncontrolled exposure, which are explained in the Guide. Exhibit A, P. 6. The limits are uniform across the various technologies, irrespective of the communications system employed (e.g. telecommunications facility such as a cellular tower or a DAS system).

Question 8. If known by your company, the (maximum FCC allowed) signal strength exposure to humans from a mobile phone held up to an ear.

Response: The FCC website states:

> The FCC requires cell phone manufacturers to ensure that their phones comply with these [Specific Absorption Rates or SAR] objective limits for safe exposure. Any cell phone at or below these SAR levels (that is, any phone legally sold in the U.S.) is a "safe" phone, as measured by these standards. The FCC limit for

public exposure from cellular telephones is an SAR level of 1.6 watts per kilogram (1.6 W/kg).

See, the FCC Encyclopedia, *available at:* http://www.fcc.gov/encyclopedia/specific-absorption-rate-sar-cellular-telephones, last accessed April 5, 2012.

CONCLUSION

In summary we look forward to receiving approval of the ROW Agreement as soon as possible. Thank you for your consideration of this request.

Very truly yours,

Phillips Lytle LLP

By DAVID E. BRONSTON /JD

David E. Bronston
DEB/J-D
Attachments

cc: Bob Ritter, Crown Castle (via e-mail) (w/attachments)
John Chase, Esq. (via overnight delivery) (w/attachments)
Rick Shaper (via e-mail) (w/attachments)

Doc # 01-2567795.3

EXHIBIT A

Federal
Communications
Commission

Local and State
Government
Advisory
Committee

A Local Government Official's Guide to Transmitting Antenna RF Emission Safety: Rules, Procedures, and Practical Guidance

June 2, 2000

A Local Government Official's Guide to Transmitting Antenna RF Emission Safety: Rules, Procedures, and Practical Guidance

Over the past two years, the Federal Communications Commission (FCC) and its Local and State Government Advisory Committee (LSGAC) have been working together to prepare a voluntary guide to assist state and local governments in devising efficient procedures for ensuring that the antenna facilities located in their communities comply with the FCC's limits for human exposure to radiofrequency (RF) electromagnetic fields. The attached guide is the product of this joint effort.

We encourage state and local government officials to consult this guide when addressing issues of facilities siting within their communities. This guide contains basic information, in a form accessible to officials and citizens alike, that will alleviate misunderstandings in the complex area of RF emissions safety. This guide is not intended to replace OET Bulletin 65, which contains detailed technical information regarding RF issues, and should continue to be used and consulted for complex sites. The guide contains information, tables, and a model checklist to assist state and local officials in identifying sites that do not raise concerns regarding compliance with the Commission's RF exposure limits. In many cases, the model checklist offers a quick and effective way for state and local officials to establish that particular RF facilities are unlikely to exceed specific federal guidelines that protect the public from the environmental effects of RF emissions. Thus, we believe this guide will facilitate federal, state, and local governments working together to protect the public while bringing advanced and innovative communications services to consumers as rapidly as possible. We hope and expect that use of this guide will benefit state and local governments, service providers, and, most importantly, the American public.

We wish all of you good luck in your facilities siting endeavors.

William E. Kennard, Chairman
Federal Communications Commission

Kenneth S. Fellman, Chair
Local and State Government
Advisory Committee

A LOCAL GOVERNMENT OFFICIAL'S GUIDE TO TRANSMITTING ANTENNA RF EMISSION SAFETY: RULES, PROCEDURES, AND PRACTICAL GUIDANCE

A common question raised in discussions about the siting of wireless telecommunications and broadcast antennas is, "Will this tower create any health concerns for our citizens?" We have designed this guide to provide you with information and guidance in devising efficient procedures for assuring that the antenna facilities located in your community comply with the Federal Communication Commission's (FCC's) limits for human exposure to radiofrequency (RF) electromagnetic fields.[1]

We have included a checklist and tables to help you quickly identify siting applications that do not raise RF exposure concerns. Appendix A to this guide contains a checklist that you may use to identify "categorically excluded" facilities that are unlikely to cause RF exposures in excess of the FCC's guidelines. Appendix B contains tables and figures that set forth, for some of the most common types of facilities, "worst case" distances beyond which there is no realistic possibility that exposure could exceed the FCC's guidelines.

As discussed below, FCC rules require transmitting facilities to comply with RF exposure guidelines. The limits established in the guidelines are designed to protect the public health with a very large margin of safety. These limits have been endorsed by federal health and safety agencies such as the Environmental Protection Agency and the Food and Drug Administration. The FCC's rules have been upheld by a Federal Court of Appeals.[2] As discussed below, most facilities create maximum exposures that are only a small fraction of the limits. Moreover, the limits themselves are many times below levels that are generally accepted as having the potential to cause adverse health effects. Nonetheless, it is recognized that any instance of noncompliance with the guidelines is potentially very serious, and the FCC has therefore implemented procedures to enforce compliance with its rules. At the same time, state and local governments may wish to verify compliance with the FCC's exposure limits in order to protect their own citizens. As a state or local government official, you can play an important role in ensuring that innovative and beneficial communications services are provided in a manner that is consistent with public health and safety.

This document addresses only the issue of compliance with RF exposure limits established by the FCC. It does not address other issues such as construction, siting, permits, inspection, zoning, environmental review, and placement of antenna facilities within communities. Such issues fall generally under the jurisdiction of states and local governments, within the limits imposed for personal wireless service facilities by Section 332(c)(7) of the Communications Act.[3]

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[1] This guide is intended to complement, but not to replace, the FCC's OET Bulletin 65, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields," August 1997. Bulletin 65 can be obtained from the FCC's Office of Engineering and Technology (phone: 202-418-2464 or e-mail: rfsafety@fcc.gov). Bulletin 65 can also be accessed and downloaded from the FCC's "RF Safety" website: http://www.fcc.gov/oet/rfsafety.

[2] See *Cellular Phone Taskforce v. FCC*, 205 F.3d 82 (2d Cir. 2000).

This document is not intended to provide legal guidance regarding the scope of state or local government authority under Section 332(c)(7) or any other provision of law. Section 332(c)(7)[4] generally preserves state and local authority over decisions regarding the placement, construction, and modification of personal wireless service facilities,[5] subject to specific limitations set forth in Section 332(c)(7). Among other things, Section 332(c)(7) provides that "[n]o State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the [FCC's] regulations concerning such emissions." The full text of Section 332(c)(7) is set forth in Appendix C.

State and local governments and the FCC may differ regarding the extent of state and local legal authority under Section 332(c)(7) and other provisions of law. To the extent questions arise regarding such authority, they are being addressed by the courts. Rather than address these legal questions, this document recognizes that, as a practical matter, state and local governments have a role to play in ensuring compliance with the FCC's limits, and it provides guidance to assist you in effectively fulfilling that role. The twin goals of this document are: (1) to define and promote locally-adaptable procedures that will provide you, as a local official concerned about transmitting antenna emissions, with adequate assurance of compliance, while (2), at the same time, avoiding the imposition of unnecessary burdens on either the local government process or the FCC's licensees.

First, we'll start with a summary of the FCC's RF exposure guidelines and some background information that you'll find helpful. Next, we'll review the FCC's procedures for verifying compliance with the guidelines and enforcing its rules. Finally, we'll offer you some practical guidance to help you determine if personal wireless service facilities may raise compliance concerns. Note, however, that this guide is only intended to help you distinguish sites that are unlikely to raise compliance concerns from those that may raise compliance concerns, not to identify sites that are out of compliance. Detailed technical information necessary to determine compliance for individual sites is contained in the FCC's OET Bulletin 65 (see footnote 1, above).

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[3] 47 U.S.C. § 332(c)(7). Under limited circumstances, the FCC also plays a role in the siting of wireless facilities. Specifically, the FCC reviews applications for facilities that fall within certain environmental categories under the National Environmental Policy Act of 1969 (NEPA), *see* 47 C.F.R. § 1.1307(a). Antenna structures that are over 200 feet in height or located near airport runways must be marked or lighted as specified by the Federal Aviation Administration and must be registered with the FCC, *see* 47 C.F.R. Part 17.

[4] Section 332(c)(7) of the Communications Act is identical to Section 704(a) of the Telecommunications Act of 1996.

[5] "Personal wireless services" generally includes wireless telecommunications services that are interconnected with the public telephone network and are offered commercially to the public. Examples include cellular and similar services (such as Personal Communications Service or "PCS"), paging and similar services, certain dispatch services, and services that use wireless technology to provide telephone service to a fixed location such as a home or office.

Before we start, however, let's take a short tour of the radiofrequency spectrum. RF signals may be transmitted over a wide range of frequencies. The frequency of an RF signal is expressed in terms of cycles per second or "Hertz," abbreviated "Hz." One kilohertz (kHz) equals one thousand Hz, one megahertz (MHz) equals one million Hz, and one gigahertz (GHz) equals one billion Hz. In the figure below, you'll see that AM radio signals are at the lower end of the RF spectrum, while other radio services, such as analog and digital TV (DTV), cellular and PCS telephony, and point-to-point microwave services are much higher in frequency.

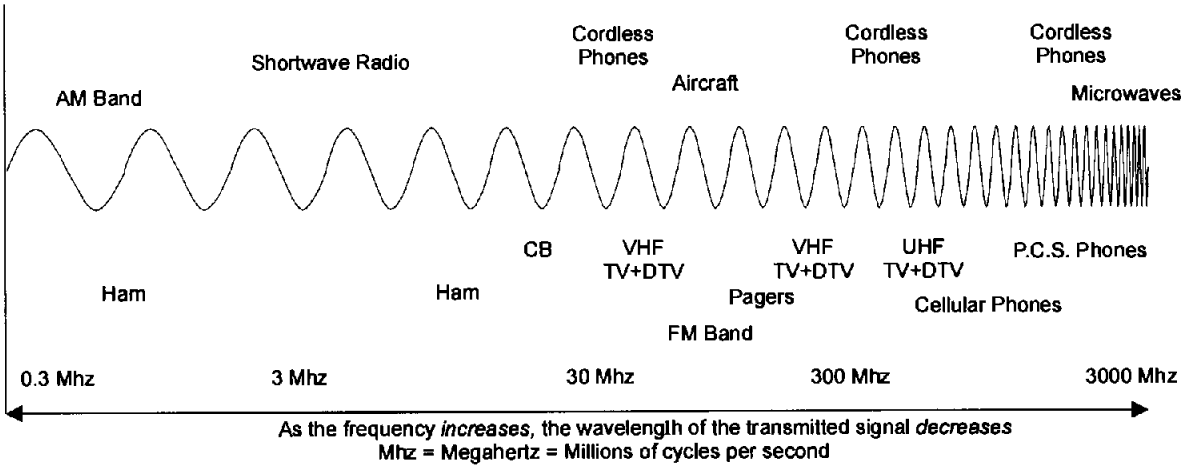


Illustration 1

The FCC's limits for maximum permissible exposure (MPE) to RF emissions depend on the frequency or frequencies that a person is exposed to. Different frequencies may have different MPE levels. Later in this document we'll show you how this relationship of frequency to MPE limit works.

I. The FCC's RF Exposure Guidelines and Rules.

Part 1 of the FCC's Rules and Regulations contains provisions implementing the National Environmental Policy Act of 1969 (NEPA). NEPA requires all federal agencies to evaluate the potential environmental significance of an agency action. Exposure to RF energy has been identified by the FCC as a potential environmental factor that must be considered before a facility, operation or transmitter can be authorized or licensed. The FCC's requirements dealing with RF exposure can be found in Part 1 of its rules at 47 C.F.R. § 1.1307(b). The exposure limits themselves are specified in 47 C.F.R. § 1.1310 in terms of frequency, field strength, power density and averaging time. Facilities and transmitters licensed and authorized by the FCC must either comply with these guidelines or else an applicant must file an Environmental Assessment (EA) with the FCC as specified in 47 C.F.R. § 1.1301 *et seq.* An EA is an official document required by the FCC's rules whenever an action may have a significant environmental impact (see discussion below). In practice, however, a potential environmental RF exposure problem is typically resolved before an EA would become necessary. Therefore, compliance with the FCC's RF guidelines constitutes a *de facto* threshold for obtaining FCC approval to construct or operate a station or transmitter. The FCC guidelines are based on exposure criteria

recommended in 1986 by the National Council on Radiation Protection and Measurements (NCRP) and on the 1991 standard developed by the Institute of Electrical and Electronics Engineers (IEEE) and later adopted as a standard by the American National Standards Institute (ANSI/IEEE C95.1-1992).

The FCC's guidelines establish separate MPE limits for "general population/uncontrolled exposure" and for "occupational/controlled exposure." The general population/uncontrolled limits set the maximum exposure to which most people may be subjected. People in this group include the general public not associated with the installation and maintenance of the transmitting equipment. Higher exposure limits are permitted under the "occupational/controlled exposure" category, but only for persons who are exposed as a consequence of their employment (*e.g.*, wireless radio engineers, technicians). To qualify for the occupational/controlled exposure category, exposed persons must be made fully aware of the potential for exposure (*e.g.*, through training), and they must be able to exercise control over their exposure. In addition, people passing through a location, who are made aware of the potential for exposure, may be exposed under the occupational/controlled criteria. The MPE limits adopted by the FCC for occupational/controlled and general population/uncontrolled exposure incorporate a substantial margin of safety and have been established to be well below levels generally accepted as having the potential to cause adverse health effects.

Determining whether a potential health hazard could exist with respect to a given transmitting antenna is not always a simple matter. Several important factors must be considered in making that determination. They include the following: (1) What is the frequency of the RF signal being transmitted? (2) What is the operating power of the transmitting station and what is the actual power radiated from the antenna? [6] (3) How long will someone be exposed to the RF signal at a given distance from the antenna? (4) What other antennas are located in the area, and what is the exposure from those antennas? We'll explore each of these issues in greater detail below.

For all frequency ranges at which FCC licensees operate, Section 1.1310 of the FCC's rules establishes maximum permissible exposure (MPE) limits to which people may be exposed. The MPE limits vary by frequency because of the different absorptive properties of the human body at different frequencies when exposed to whole-body RF fields. Section 1.1310 establishes MPE limits in terms of "electric field strength," "magnetic field strength," and "far-field equivalent power density" (power density). For most frequencies used by the wireless services, the most relevant measurement is power density. The MPE limits for power density are given in terms of "milliwatts per square centimeter" or mW/cm^2. One milliwatt equals one thousandth of one watt (1/1000 of a watt).[7] In terms of power density, for a given frequency the FCC MPE limits can be interpreted as specifying the maximum rate that energy can be transferred (*i.e.*, the power) to a square centimeter of a person's body over a period of time (either 6 or 30 minutes, as explained

[6] Power travels from a transmitter through cable or other connecting device to the radiating antenna. "Operating power of the transmitting station" refers to the power that is fed from the transmitter (transmitter output power) into the cable or connecting device. "Actual power radiated from the antenna" is the transmitter output power minus the power lost (power losses) in the connecting device plus an apparent increase in power (if any) due to the design of the antenna. Radiated power is often specified in terms of "effective radiated power" or "ERP" or "effective isotropic radiated power" or "EIRP" (see footnote 14).

[7] Thus, by way of illustration, it takes 100,000 milliwatts of power to fully illuminate a 100 watt light bulb.

below). In practice, however, since it is unrealistic to measure separately the exposure of each square centimeter of the body, actual compliance with the FCC limits on RF emissions should be determined by "spatially averaging" a person's exposure over the projected area of an adult human body (this concept is discussed in the FCC's OET Bulletin 65).

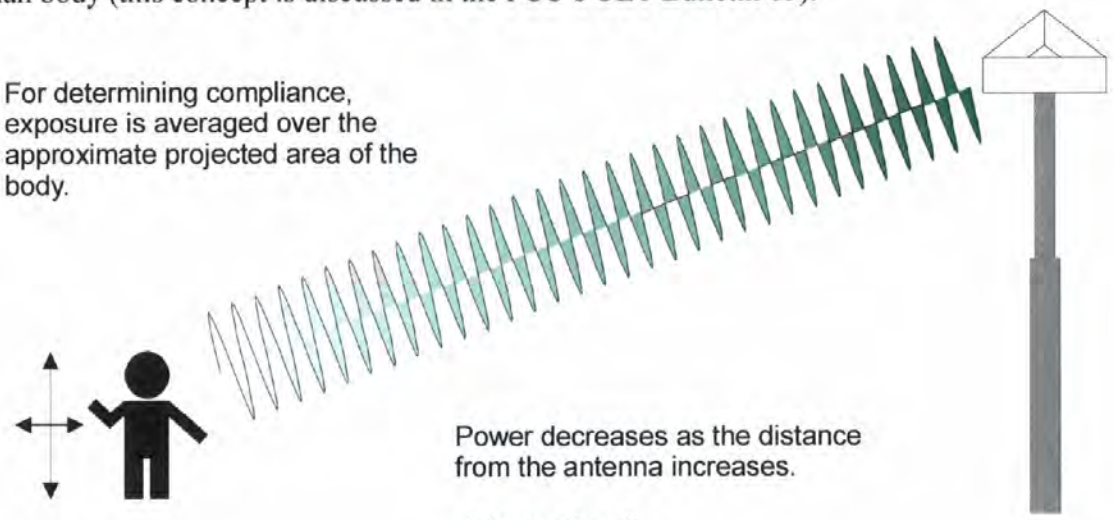


Illustration 2

Electric field strength and magnetic field strength are used to measure "near field" exposure. At frequencies below 300 MHz, these are typically the more relevant measures of exposure, and power density values are given primarily for reference purposes. However, evaluation of far-field equivalent power density exposure may still be appropriate for evaluating exposure in some such cases. For frequencies above 300 MHz, only one field component need be evaluated, and exposure is usually more easily characterized in terms of power density. Transmitters and antennas that operate at 300 MHz or lower include radio broadcast stations, some television broadcast stations, and certain personal wireless service facilities (*e.g.*, some paging stations). Most personal wireless services, including all cellular and PCS, as well as some television broadcast stations, operate at frequencies above 300 MHz. (See Illustration 1.)

As noted above, the MPE limits are specified as time-averaged exposure limits. This means that exposure can be averaged over the identified time interval (30 minutes for general population/uncontrolled exposure or 6 minutes for occupational/controlled exposure). However, for the case of exposure of the general public, time averaging is usually not applied because of uncertainties over exact exposure conditions and difficulty in controlling time of exposure. Therefore, the typical conservative approach is to assume that any RF exposure to the general public will be continuous. The FCC's limits for exposure at different frequencies are shown in Illustration 3, below:

Illustration 3. ***FCC Limits for Maximum Permissible Exposure (MPE)***

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

(B) Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz *Plane-wave equivalent power density

NOTE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

Finally, it is important to understand that the FCC's limits apply cumulatively to all sources of RF emissions affecting a given area. A common example is where two or more wireless operators have agreed to share the cost of building and maintaining a tower, and to place their antennas on that joint structure. In such a case, the total exposure from the two facilities taken together must be within the FCC guidelines, or else an EA will be required.

A. Categorically Excluded Facilities

The Commission has determined through calculations and technical analysis that due to their low power or height above ground level, many facilities by their very nature are highly unlikely to

cause human exposures in excess of the guideline limits, and operators of those facilities are exempt from routinely having to determine compliance. Facilities with these characteristics are considered "categorically excluded" from the requirement for routine environmental processing for RF exposure.

Section 1.1307(b)(1) of the Commission's rules sets forth which facilities are categorically excluded.[8] If a facility is categorically excluded, an applicant or licensee may ordinarily assume compliance with the guideline limits for exposure. However, an applicant or licensee must evaluate and determine compliance for a facility that is otherwise categorically excluded if specifically requested to do so by the FCC.[9] If potential environmental significance is found as a result, an EA must be filed with the FCC.

No radio or television broadcast facilities are categorically excluded. Thus, broadcast applicants and licensees must affirmatively determine their facility's compliance with the guidelines before construction, and upon every facility modification or license renewal application. With respect to personal wireless services, a cellular facility is categorically excluded if the total effective radiated power (ERP) of all channels operated by the licensee at a site is 1000 watts or less. If the facility uses sectorized antennas, only the total effective radiated power in each direction is considered. Examples of a 3 sector and a single sector antenna array are shown below:

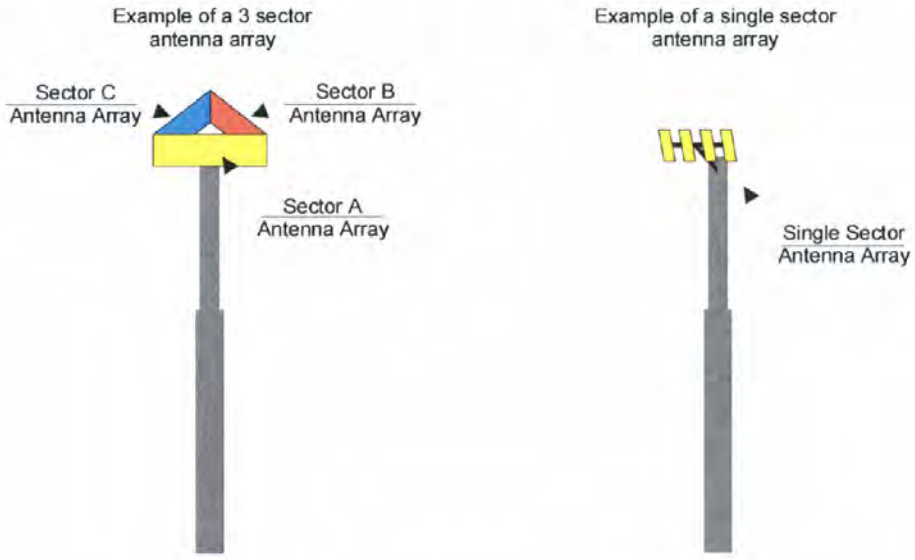


Illustration 4

[8] "The appropriate exposure limits . . . are generally applicable to all facilities, operations and transmitters regulated by the Commission. However, a determination of compliance with the exposure limits . . . (routine environmental evaluation), and preparation of an EA if the limits are exceeded, is necessary only for facilities, operations and transmitters that fall into the categories listed in table 1 [of §1.1307], or those specified in paragraph (b)(2) of this section. All other facilities, operations and transmitters are categorically excluded from making studies or preparing an EA . . ."

[9] See 47 C.F.R §1.1307(c) and (d).

In addition, a cellular facility is categorically excluded, regardless of its power, if it is not mounted on a building and the lowest point of the antenna is at least 10 meters (about 33 feet) above ground level. A broadband PCS antenna array is categorically excluded if the total effective radiated power of all channels operated by the licensee at a site (or all channels in any one direction, in the case of sectorized antennas) is 2000 watts or less. Like cellular, another way for a broadband PCS facility to be categorically excluded is if it is not mounted on a building and the lowest point of the antenna is at least 10 meters (about 33 feet) above ground level. The power threshold for categorical exclusion is higher for broadband PCS than for cellular because broadband PCS operates at a higher frequency where exposure limits are less restrictive. For categorical exclusion thresholds for other personal wireless services, consult Table 1 of Section 1.1307(b)(1).[10]

For your convenience, we have developed the checklist in Appendix A that may be used to streamline the process of determining whether a proposed facility is categorically excluded. You are encouraged to adopt the use of this checklist in your jurisdiction, although such use is not mandatory.

B. What If An Applicant Or Licensee Wants To Exceed The Limits Shown In Illustration 3?

Any FCC applicant or licensee who wishes to construct or operate a facility that, by itself or in combination with other sources of emissions (*i.e.*, other transmitting antennas), may cause human exposures in excess of the guideline limits must file an Environmental Assessment (EA) with the FCC. Where more than one antenna is collocated (for example, on a single tower or rooftop or at a hilltop site), the applicant must take into consideration all of the RF power transmitted by all of the antennas when determining maximum exposure levels. Compliance at an existing site is the shared responsibility of all licensees whose transmitters produce exposure levels in excess of 5% of the applicable exposure limit. A new applicant is responsible for compliance (or submitting an EA) at a multiple-use site if the proposed transmitter would cause non-compliance and if it would produce exposure levels in excess of 5% of the applicable limit.[11]

An applicant or licensee is not permitted to construct or operate a facility that would result in exposure in excess of the guideline limits until the FCC has reviewed the EA and either found no significant environmental impact, or pursued further environmental processing including the preparation of a formal Environmental Impact Statement. As a practical matter, however, this process is almost never invoked for RF exposure issues because applicants and licensees normally undertake corrective actions to ensure compliance with the guidelines before submitting an application to the FCC.

Unless a facility is categorically excluded (explained above), the FCC's rules require a licensee to evaluate a proposed or existing facility's compliance with the RF exposure guidelines and to

[10] Table 1 of §1.1307(b)(1) is reproduced in Appendix A to this guide.

[11] For more information, see OET Bulletin 65, or see 47 CFR §1.1307(b)(3).

determine whether an EA is required. In the case of broadcast licensees, who are required to obtain a construction permit from the FCC, this evaluation is required before the application for a construction permit is filed, or the facility is constructed. In addition, if a facility requires the filing of an EA for any reason other than RF emissions, the RF evaluation must be performed before the EA is filed. Factors other than RF emissions that may require the filing of an EA are set out in 47 C.F.R. § 1.1307(a). Otherwise, new facilities that do not require FCC-issued construction permits should be evaluated before they are placed in operation. The FCC also requires its licensees to evaluate existing facilities and operations that are not categorically excluded if the licensee seeks to modify its facilities or renew its license. These requirements are intended to enhance public safety by requiring periodic site compliance reviews.

All facilities that were placed in service before October 15, 1997 (when the current RF exposure guidelines became effective) are expected to comply with the current guidelines no later than September 1, 2000, or the date of a license renewal, whichever is earlier.[12] If a facility cannot meet the September 1, 2000, date, the licensee of that facility must file an EA by that date. Section 1.1307(b) of the FCC's rules requires the licensee to provide the FCC with technical information showing the basis for its determination of compliance upon request.

II. How the FCC Verifies Compliance with and Enforces Its Rules.

A. Procedures Upon Initial Construction, Modification, and Renewal.

The FCC's procedures for verifying that a new facility, or a facility that is the subject of a facility modification or license renewal application, will comply with the RF exposure rules vary depending upon the service involved. Applications for broadcast services (for example, AM and FM stations, and television stations) are reviewed by the FCC's Mass Media Bureau (MMB). As part of every relevant application, the MMB requires an applicant to submit an explanation of what steps will be taken to limit RF exposure and comply with FCC guidelines. The applicant must certify that RF exposure procedures will be coordinated with all collocated entities (usually other stations at a common transmitter site or hill or mountain peak). If the submitted explanation does not adequately demonstrate a facility's compliance with the guidelines, the MMB will require additional supporting data before granting the application.

The Wireless Telecommunications Bureau (WTB) reviews personal wireless service applications (for cellular, PCS, SMR, etc.). For those services that operate under blanket area licenses, including cellular and PCS, the license application and renewal form require the applicant to certify whether grant of the application would have a significant environmental impact so as to require submission of an EA. The applicant's answer to this question covers all of the facilities sites included within the area of the license.

For those services that continue to be licensed by site (*e.g.*, certain paging renewals), the WTB requires a similar certification on the application form for each site. To comply with the FCC's rules, an applicant must determine its own compliance before completing this certification for

[12] Prior to October 15, 1997, the Commission applied a different set of substantive guidelines.

every site that is not categorically excluded. The WTB does not, however, routinely require the submission of any information supporting the determination of compliance.

B. Procedures For Responding To Complaints About Existing Facilities.

The FCC frequently receives inquiries from members of the public as to whether a particular site complies with the RF exposure guidelines. Upon receiving these inquiries, FCC staff may ask the inquiring party to describe the site at issue. In many instances, the information provided by the inquiring party does not raise any concern that the site could exceed the limits in the guidelines. FCC staff will then inform the inquiring party of this determination.

In some cases, the information provided by the inquiring party does not preclude the possibility that the limits could be exceeded. Under these circumstances, FCC staff may ask the licensee who operates the facility to supply information demonstrating its compliance. FCC staff may also inspect the site to determine whether it is accessible to the public, and examine other relevant physical attributes. Usually, the information obtained in this manner is sufficient to establish compliance. If compliance is established in this way, FCC staff will inform the inquiring party of this determination.

In some instances, a licensee may be unable to provide information sufficient to establish compliance with the guideline limits. In these cases, FCC staff may test the output levels of individual facilities and evaluate the physical installation. Keep in mind, however, that instances in which physical testing is necessary to verify compliance are relatively rare.

If a site is found to be out of compliance with the RF guidelines, the FCC will require the licensees at the site to remedy the situation. Depending on the service and the nature and extent of the violation, these remedies can include, for example, an immediate reduction in power, a modification of safety barriers, or a modification of the equipment or its installation. Actions necessary to bring a site into compliance are the shared responsibility of all licensees whose facilities cause exposures in that area that exceed 5% of the applicable MPE limit. In addition, licensees may be subject to sanctions for violating the FCC's rules and/or for misrepresentation.

The FCC is committed to responding fully, promptly, and accurately to all inquiries regarding compliance with the RF exposure guidelines, and to taking swift and appropriate action whenever the evidence suggests potential noncompliance. To perform this function effectively, however, the FCC needs accurate information about potentially problematic situations. By applying the principles discussed in this guide about RF emissions, exposure and the FCC's guidelines, state and local officials can fulfill a vital role in identifying and winnowing out situations that merit further attention.

III. Practical Guidance Regarding Compliance.

This section is intended to provide some general guidelines that can be used to identify sites that should not raise serious questions about compliance with FCC RF exposure guidelines. Sites that don't fall into the categories described here may still meet the guidelines, but the determination

of compliance will not be as straightforward. In such cases, a detailed review may be required. The tables and graphs shown in Appendix B are intended only to assist in distinguishing sites that should not raise serious issues from sites that may require further inquiry. They are not intended for use in identifying sites that are out of compliance. As noted above, the factors that can affect exposure at any individual site, particularly a site containing multiple facilities, are too numerous and subtle to be practically encompassed within this framework.

Applying the basic principles discussed in this guide should allow you to eliminate a large number of sites from further consideration with respect to health concerns. You may find it useful to contact a qualified radio engineer to assist you in your inquiry. Many larger cities and counties, and most states, have radio engineers on staff or under contract. In smaller jurisdictions, we recommend you seek initial assistance from other jurisdictions, universities that have RF engineering programs, or perhaps the engineer in charge of your local broadcast station(s).

We'll exclude any discussion of broadcast sites. As explained before, broadcast licensees are required to submit site-specific information on each facility to the FCC for review, and that information is publicly available at the station as long as the application is pending. The focus in this section is on personal wireless services, particularly cellular and broadband PCS, the services that currently require the largest numbers of new and modified facilities. Many other personal wireless services, however, such as paging services, operate in approximately the same frequency ranges as cellular and broadband PCS.[13] Much of the information here is broadly applicable to those services as well, and specific information is provided in Appendix B for paging and narrowband PCS operations over frequency bands between 901 and 940 MHz.

Finally, this section only addresses the general population/uncontrolled exposure guidelines, since compliance with these guidelines generally causes the most concern to state and local governments. Compliance with occupational/controlled exposure limits should be examined independently.

A. Categorically Excluded Facilities.

As a first step in evaluating a siting application for compliance with the FCC's guidelines, you will probably want to consider whether the facility is categorically excluded under the FCC's rules from routine evaluation for compliance. The checklist in Appendix A will guide you in making this determination. Because categorically excluded facilities are unlikely to cause any exposure in excess of the FCC's guidelines, determination that a facility is categorically excluded should generally suffice to end the inquiry.

B. Single Facility Sites.

If a wireless telecommunications facility is not categorically excluded, you may want to evaluate potential exposure using the methods discussed below and the tables and figures in Appendix B.

[13] The major exception is fixed wireless services, which often operate at much higher frequencies. In addition, some paging and other licensees operate at lower frequencies

If you "run the numbers" using the conservative approaches promoted in this paper and the site in question does not exceed these values, then you generally need look no further. Alternately, if the "numbers" don't pass muster, you may have a genuine concern. But remember, there may be other factors (*i.e.*, power level, height, blockages, etc.) that contribute to whether the site complies with FCC guidelines.

Where a site contains only one antenna array, the maximum exposure at any point in the horizontal plane can be predicted by calculations. The tables and graphs in Appendix B show the maximum distances in the horizontal plane from an antenna at which a person could possibly be exposed in excess of the guidelines at various levels of effective radiated power (ERP).[14] Thus, if people are not able to come closer to an antenna than the applicable distance shown in Appendix B, there should be no cause for concern about exposure exceeding the FCC guidelines. The tables and graphs apply to the following wireless antennas: (1) cellular omni-directional antennas (Table B1-1 and Figure B1-1); (2) cellular sectorized antennas (Table B1-2 and Figure B1-2); (3) broadband PCS sectorized antennas (Table B1-3 and Figure B1-3);[15] and (4) high-power (900 MHz-band) paging antennas (Table B1-4 and Figure B1-4). Table B1-4 and Figure B1-4 can also be used for omni-directional, narrowband (900 MHz) PCS antennas. Note that both tables and figures in Appendix B have been provided. In some cases it may be easier to use a table to estimate exposure distances, but figures may also be used when a more precise value is needed that may not be listed in a table.

It's important to note that the predicted distances set forth in Appendix B are based on a very conservative, "worst case" scenario. In other words, Appendix B identifies the furthest distance from the antenna that presents even a remote realistic possibility of RF exposure that could exceed the FCC guidelines. The power levels are based on the approximate maximum number of channels that an operator is likely to operate at one site. It is further assumed that each channel operates with the maximum power permitted under the FCC's rules and that all of these channels are "on" simultaneously, an unlikely scenario. This is a very conservative assumption. In reality, most sites operate at a fraction of the maximum permissible power and many sites use fewer than the maximum number of channels. Therefore, actual exposure levels would be expected to be well below the predicted values. Another mitigating factor could be the presence of intervening structures, such as walls, that will reduce RF exposure by variable amounts. For all these reasons, the values given in these tables and graphs are considered to be quite conservative and should over-predict actual exposure levels.

[14] ERP is the apparent effective amount of power leaving the transmit antenna. The ERP is determined by factors including but not limited to transmitter output power, coaxial line loss between the transmitter and the antenna, and the "gain" (focusing effect) of the antenna. In some cases, power may also be expressed in terms of EIRP (effective isotropically radiated power). Therefore, for convenience, the tables in Appendix B also include a column for EIRP. ERP and EIRP are related by the mathematical expression: (1.64) X ERP = EIRP.

[15] Because broadband PCS antennas are virtually always sectorized, no information is provided for omni-directional PCS antennas.

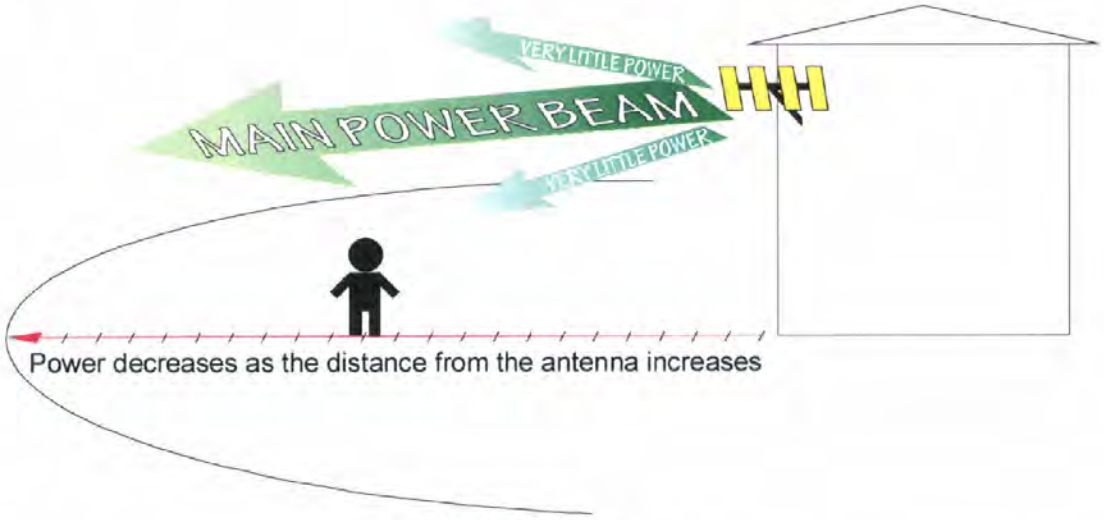


Illustration 5

Personal wireless service antennas typically do not emit high levels of RF energy directed above or below the horizontal plane of the antenna. Although the precise amount of energy transmitted outside the horizontal plane will depend upon the type of antenna used, we are aware of no wireless antennas that produce significant non-horizontal transmissions. Thus, exposures even a small distance below the horizontal plane of these antennas would be significantly less than in the horizontal plane. As discussed above, the tables and figures in Appendix B show distances in the horizontal plane from typical antennas at which exposures could potentially exceed the guidelines, assuming "worst case" operating conditions at maximum possible power levels. In any direction other than horizontal, including diagonal or straight down, these "worst case" distances would be significantly less.

Where unidirectional antennas are used, exposure levels within or outside the horizontal plane in directions other than those where the antennas are aimed will typically be insignificant. In addition, many new antennas are being designed with shielding capabilities to minimize emissions in undesired directions.

C. Multiple Facility Sites.

Where multiple facilities are located at a single site, the FCC's rules require the total exposure from all facilities to fall within the guideline limits, unless an EA is filed and approved. In such cases, however, calculations of predicted exposure levels and overall evaluation of the site may become much more complicated. For example, different transmitters at a site may operate different numbers of channels, or the operating power per channel may vary from transmitter to transmitter. Transmitters may also operate on different frequencies (for example, one antenna array may belong to a PCS operator, while the other belongs to a cellular operator). A large number of variables such as these make the calculations more time consuming, and make it difficult to apply a simple rule-of-thumb test. See the following illustration.

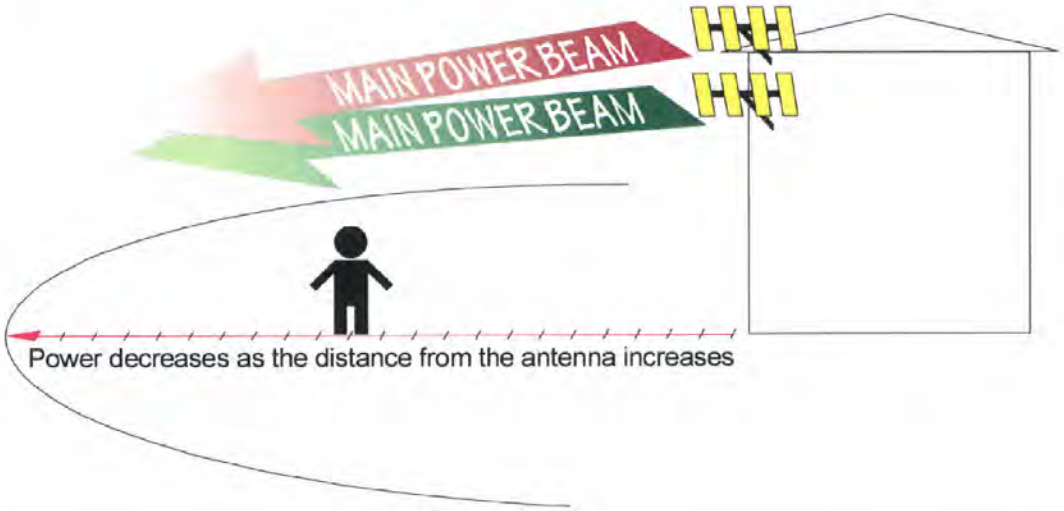


Illustration 6

However, we can be overly conservative and estimate a "worst case" exposure distance for compliance by assuming that the total power (e.g., ERP) of all transmitting antennas at the site is concentrated in the antenna that is closest to the area in question. (In the illustration above, this would be the antenna that is mounted lower on the building.) Then the values in the tables and graphs in Appendix B may be used as if this were the only antenna at the site, with radiated power equal to the sum of the actual radiated power of all antennas at the site. Actual RF exposure at any point will always be less than the exposure calculated using these assumptions. Thus, if people are not able to come closer to a group of antennas than the applicable distance shown in Appendix B using these assumptions, there should be no cause for concern about exposure exceeding the FCC guidelines. This is admittedly an extremely conservative procedure, but it may be of assistance in making a "first cut" at eliminating sites from further consideration.

IV. Conclusion.

We've highlighted many of the most common concerns and questions raised by the siting of wireless telecommunications and broadcast antennas. Applying the principles outlined in this guide will allow you to make initial conservative judgments about whether RF emissions are or should be of concern, consistent with the FCC's rules.

As we have explained, when first evaluating a siting application for compliance with the FCC's guidelines, you will probably want to consider whether the facility is categorically excluded under the FCC's rules from routine evaluation for compliance. The checklist in Appendix A will guide you in making this determination. Because categorically excluded facilities are unlikely to cause any exposure in excess of the FCC's guidelines, determination that a facility is categorically excluded should generally suffice to end the inquiry.

If a wireless telecommunications facility is not categorically excluded, you may want to evaluate potential exposure using the methods discussed in Part III of this paper and the tables and figures in Appendix B. If the site in question does not exceed the values, then you generally need look no further. Alternately, if the values don't pass muster, you may have a genuine concern. But

remember, there may be other factors (*i.e.*, power level, height, blockages, etc.) that contribute to whether the site complies with FCC guidelines.

If you have questions about compliance, your initial point of exploration should be with the facilities operator in question. That operator is required to understand the FCC's rules and to know how to apply them in specific cases at specific sites. If, after diligently pursuing answers from the operator, you still have genuine questions regarding compliance, you should contact the FCC at one of the numbers listed below. Provision of the information identified in the checklist in Appendix A may assist the FCC in evaluating your inquiry.

General Information: Compliance and Information Bureau, (888) CALL-FCC

> Concerns About RF Emissions Exposure at a Particular Site: Office of Engineering and Technology, RF Safety Program, phone (202) 418-2464, FAX (202) 418-1918, e-mail rfsafety@fcc.gov
>
> Licensing and Site Information Regarding Wireless Telecommunications Services: Wireless Telecommunications Bureau, Commercial Wireless Division, (202) 418-0620
>
> Licensing and Site Information Regarding Broadcast Radio Services: Mass Media Bureau, Audio Services Division, (202) 418-2700
>
> Licensing and Site Information Regarding Television Service (Including DTV): Mass Media Bureau, Video Services Division, (202) 418-1600

Also, note that the RF Safety Program Web site is a valuable source of general information on the topic of potential biological effects and hazards of RF energy. For example, OET recently updated its OET Bulletin 56 ("Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields"). This latest version is available from the program and can be accessed and downloaded from the FCC's web site at:

http://www.fcc.gov/oet/rfsafety/

APPENDIX A

Optional Checklist for Determination

Of Whether a Facility is Categorically Excluded

Optional Checklist for Local Government To Determine Whether a Facility is Categorically Excluded

Purpose: The FCC has determined that many wireless facilities are unlikely to cause human exposures in excess of RF exposure guidelines. Operators of those facilities are exempt from routinely having to determine their compliance. These facilities are termed "categorically excluded." Section 1.1307(b)(1) of the Commission's rules defines those categorically excluded facilities. This checklist will assist state and local government agencies in identifying those wireless facilities that are categorically excluded, and thus are highly unlikely to cause exposure in excess of the FCC's guidelines. Provision of the information identified on this checklist may also assist FCC staff in evaluating any inquiry regarding a facility's compliance with the RF exposure guidelines.

BACKGROUND INFORMATION

1. Facility Operator's Legal Name: _____
2. Facility Operator's Mailing Address: _____
3. Facility Operator's Contact Name/Title: _____
4. Facility Operator's Office Telephone: _____
5. Facility Operator's Fax: _____
6. Facility Name: _____
7. Facility Address: _____
8. Facility City/Community: _____
9. Facility State and Zip Code: _____
10. Latitude: _____
11. Longitude: _____

continue →

Optional Local Government Checklist (page 2)

EVALUATION OF CATEGORICAL EXCLUSION

12. Licensed Radio Service (see attached Table 1): _____
13. Structure Type (free-standing or building/roof-mounted): _____
14. Antenna Type [omnidirectional or directional (includes sectored)]: _____
15. Height above ground of the lowest point of the antenna (in meters): _____
16. ☐ Check if all of the following are true:
    (a) This facility will be operated in the Multipoint Distribution Service, Paging and Radiotelephone Service, Cellular Radiotelephone Service, Narrowband or Broadband Personal Communications Service, Private Land Mobile Radio Services Paging Operations, Private Land Mobile Radio Service Specialized Mobile Radio, Local Multipoint Distribution Service, or service regulated under Part 74, Subpart I (see question 12).
    (b) This facility will not be mounted on a building (see question 13).
    (c) The lowest point of the antenna will be at least 10 meters above the ground (see question 15).

If box 16 is checked, this facility is categorically excluded and is unlikely to cause exposure in excess of the FCC's guidelines. The remainder of the checklist need not be completed. If box 16 is not checked, continue to question 17.

17. Enter the power threshold for categorical exclusion for this service from the attached Table 1 in watts ERP or EIRP* (note: EIRP = (1.64) X ERP): _____
18. Enter the total number of channels if this will be an omnidirectional antenna, or the maximum number of channels in any sector if this will be a sectored antenna:
19. Enter the ERP or EIRP per channel (using the same units as in question 17): _____
20. Multiply answer 18 by answer 19: _____
21. Is the answer to question 20 less than or equal to the value from question 17 (yes or no)?

If the answer to question 21 is YES, this facility is categorically excluded. It is unlikely to cause exposure in excess of the FCC's guidelines.

If the answer to question 21 is NO, this facility is not categorically excluded. Further investigation may be appropriate to verify whether the facility may cause exposure in excess of the FCC's guidelines.

*"ERP" means "effective radiated power" and "EIRP" means "effective isotropic radiated power

TABLE 1: TRANSMITTERS, FACILITIES AND OPERATIONS SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

SERVICE (TITLE 47 CFR RULE PART)	EVALUATION REQUIRED IF:
Experimental Radio Services (part 5)	power > 100 W ERP (164 W EIRP)
Multipoint Distribution Service (subpart K of part 21)	non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and power > 1640 W EIRP building-mounted antennas: power > 1640 W EIRP
Paging and Radiotelephone Service (subpart E of part 22)	non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and power > 1000 W ERP (1640 W EIRP) building-mounted antennas: power > 1000 W ERP (1640 W EIRP)
Cellular Radiotelephone Service (subpart H of part 22)	non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and total power of all channels > 1000 W ERP (1640 W EIRP) building-mounted antennas: total power of all channels > 1000 W ERP (1640 W EIRP)

TABLE 1 (cont.)

SERVICE (TITLE 47 CFR RULE PART)	EVALUATION REQUIRED IF:
Personal Communications Services (part 24)	(1) Narrowband PCS (subpart D): non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and total power of all channels > 1000 W ERP (1640 W EIRP) building-mounted antennas: total power of all channels > 1000 W ERP (1640 W EIRP) (2) Broadband PCS (subpart E): non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and total power of all channels > 2000 W ERP (3280 W EIRP) building-mounted antennas: total power of all channels > 2000 W ERP (3280 W EIRP)
Satellite Communications (part 25)	all included
General Wireless Communications Service (part 26)	total power of all channels > 1640 W EIRP
Wireless Communications Service (part 27)	total power of all channels > 1640 W EIRP
Radio Broadcast Services (part 73)	all included

TABLE 1 (cont.)

SERVICE (TITLE 47 CFR RULE PART)	EVALUATION REQUIRED IF:
Experimental, auxiliary, and special broadcast and other program distributional services (part 74)	subparts A, G, L: power > 100 W ERP subpart I: non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and power > 1640 W EIRP building-mounted antennas: power > 1640 W EIRP
Stations in the Maritime Services (part 80)	ship earth stations only
Private Land Mobile Radio Services Paging Operations (part 90)	non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and power > 1000 W ERP (1640 W EIRP) building-mounted antennas: power > 1000 W ERP (1640 W EIRP)
Private Land Mobile Radio Services Specialized Mobile Radio (part 90)	non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and total power of all channels > 1000 W ERP (1640 W EIRP) building-mounted antennas: total power of all channels > 1000 W ERP (1640 W EIRP)

TABLE 1 (cont.)

SERVICE (TITLE 47 CFR RULE PART)	EVALUATION REQUIRED IF:
Amateur Radio Service (part 97)	transmitter output power > levels specified in § 97.13(c)(1) of this chapter
Local Multipoint Distribution Service (subpart L of part 101)	non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and power > 1640 W EIRP building-mounted antennas: power > 1640 W EIRP LMDS licensees are required to attach a label to subscriber transceiver antennas that: (1) provides adequate notice regarding potential radiofrequency safety hazards, *e.g.*, information regarding the safe minimum separation distance required between users and transceiver antennas; and (2) references the applicable FCC-adopted limits for radiofrequency exposure specified in § 1.1310 of this chapter.

APPENDIX B

Estimated "Worst Case" Distances that Should be Maintained from Single Cellular, PCS, and Paging Base Station Antennas

Table B1-1. Estimated "worst case" horizontal* distances that should be maintained from a single, omni-directional, **cellular base-station** antenna to meet FCC RF exposure guidelines

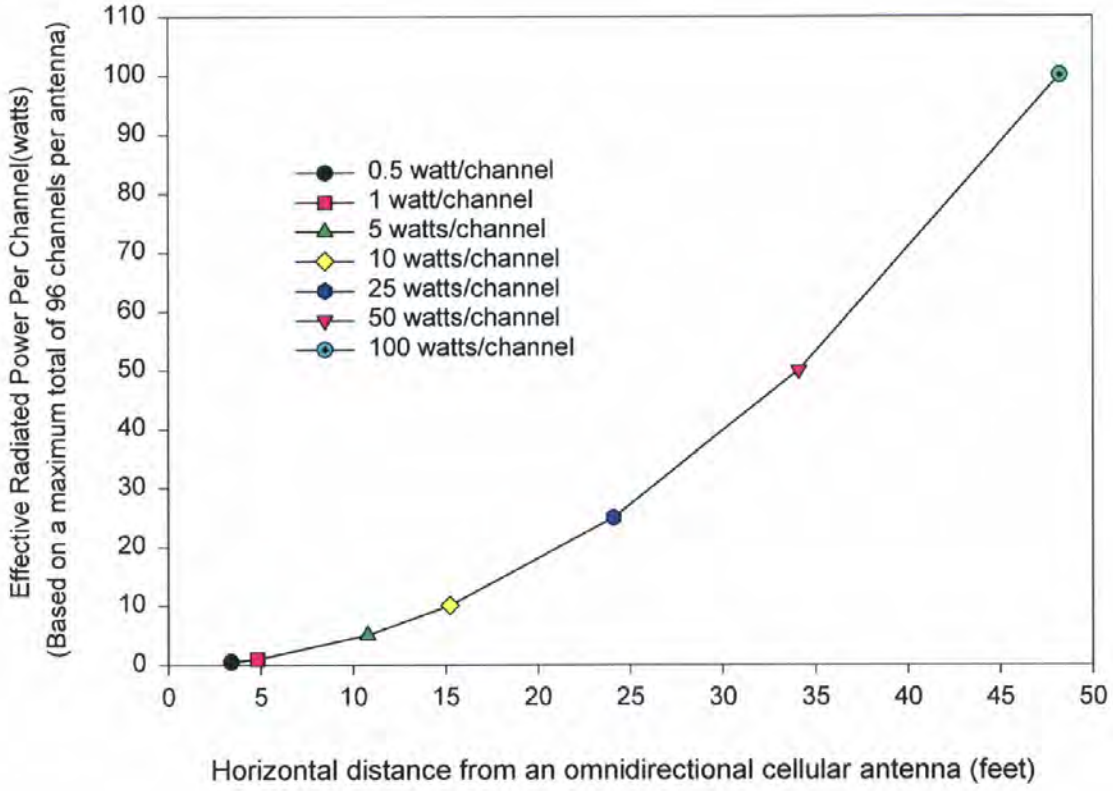
Effective Radiated Power (watts) per channel based on maximum total of 96 channels per antenna	Effective Isotropic Radiated Power (watts) per channel based on a maximum total of 96 channels per antenna	Horizontal* distance (feet) that should be maintained from a single omni-directional cellular antenna
0.5	0.82	3.4
1	1.6	4.8
5	8.2	10.8
10	16.4	15.2
25	41	24.1
50	82	34.1
100	164	48.2

For intermediate values not shown on this table, please refer to the Figure B1-1

*These distances are based on exposure at same level as the antenna, for example, on a rooftop or in a building directly across from and at the same height as the antenna.

Note: These estimates are worst case, assuming an omnidirectional antenna using 96 channels. If the systems are using fewer channels, the actual horizontal distances that must be maintained will be less. Cellular omnidirectional antennas transmit more or less equally from the antenna in all horizontal directions and transmit relatively little energy directly toward the ground. Therefore, these distances are even more conservative for "non-horizontal" distances, for example, distances directly below an antenna.

Figure B1-1. Estimated "worst case" horizontal* distances that should be maintained from a single omni-directional **cellular base station** antenna to meet FCC RF exposure guidelines



* These distances are based on exposure at same level as antenna, for example, on a rooftop or in a building directly across from and at the same height as the antenna.

Note: These estimates are worst case, assuming an omnidirectional antenna using 96 channels. If the systems are using fewer channels, the actual horizontal distances that must be maintained will be less. Cellular omnidirectional antennas transmit more or less equally from the antenna in all horizontal directions and transmit relatively little energy directly toward the ground.

Table B1-2. Estimated "worst case" horizontal* distances that should be maintained from a single, sectorized, **cellular base-station** antenna to meet FCC RF exposure guidelines

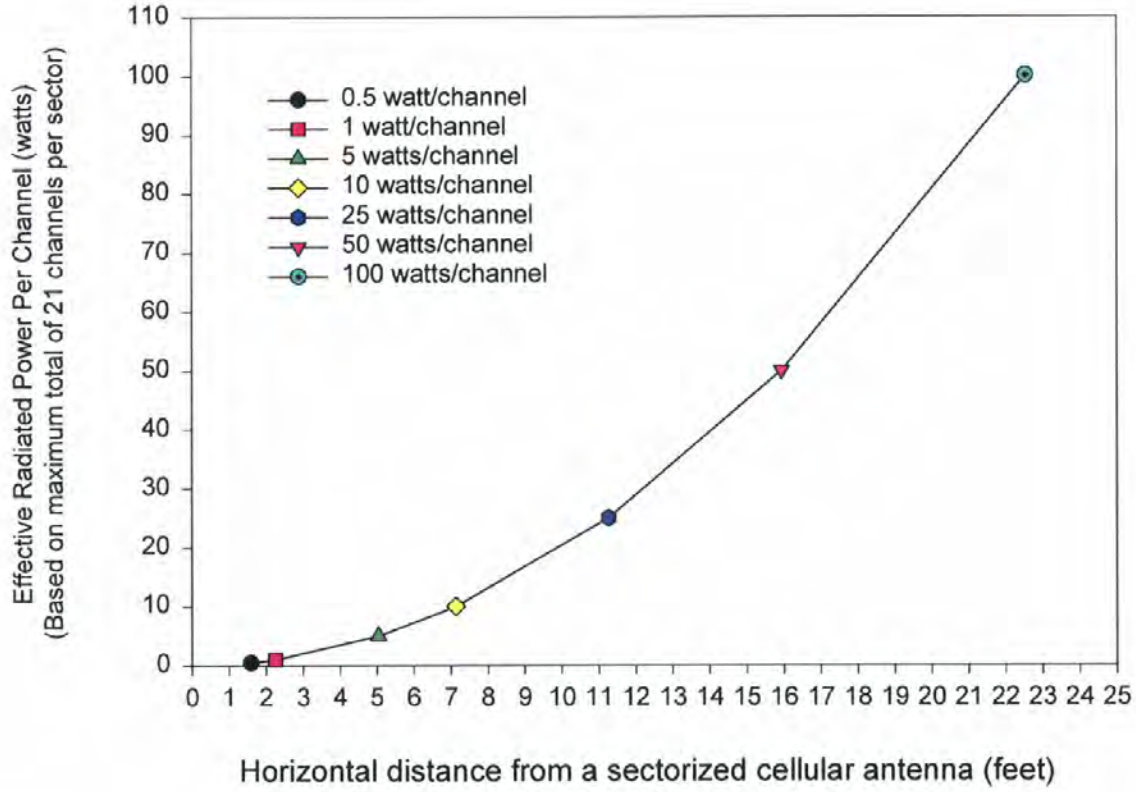
Effective Radiated Power (watts) per channel based on maximum total of 21 channels per sector	Effective Isotropic Radiated Power (watts) per channel based on maximum total of 21 channels per sector	Horizontal* distance (feet) that should be maintained from a single sectorized cellular antenna
0.5	0.82	1.6
1	1.6	2.3
5	8.2	5
10	16.4	7.1
25	41	11.3
50	82	16
100	164	22.6

For intermediate values not shown on this table, please refer to the Figure B1-2

*These distances are based on exposure at same level as the antenna, for example, on a rooftop or in a building directly across from and at the same height as the antenna.

Note: These estimates are "worst case," assuming a sectorized antenna using 21 channels. If the systems are using fewer channels, the actual horizontal distances that must be maintained will be less. Cellular sectorized antennas transmit more or less in one direction from the antenna in a horizontal direction and transmit relatively little energy directly toward the ground. Therefore, these distances are even more conservative for "non-horizontal" distances, for example, distances directly below an antenna.

Figure B1-2. Estimated "worst case" horizontal* distances that should be maintained from a single sectorized, **cellular base station** antenna to meet FCC RF exposure guidelines



* These distances are based on exposure at same level as antenna, for example, on a rooftop or in a building directly across from and at the same height as the antenna.

Note: These estimates are "worst case", assuming a sectorized antenna using 21 channels. If the systems are using fewer channels, the actual horizontal distances that must be maintained will be less. Cellular sectorized antennas transmit more or less in one direction from the antenna in a horizontal direction and transmit relatively little energy directly toward the ground.

Table B1-3. Estimated "worst case" horizontal* distances that should be maintained from a single sectorized **Broadband PCS base station** antenna to meet FCC RF exposure guidelines

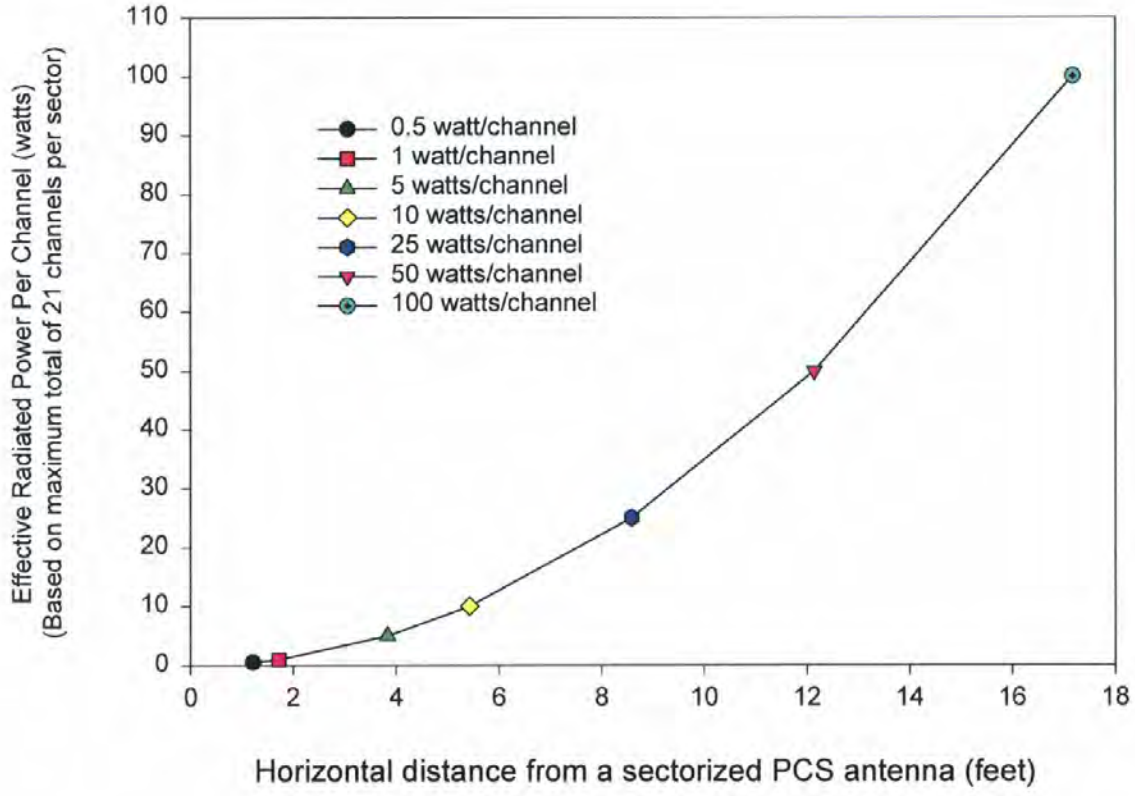
Effective Radiated Power (watts) per channel based on maximum total of 21 channels per sector	Effective Isotropic Radiated Power (watts) per channel based on maximum total of 21 channels per sector	Horizontal* distance (feet) that should be maintained from a single sectorized Broadband PCS antenna
0.5	0.82	1.2
1	1.6	1.7
5	8.2	3.8
10	16.4	5.4
25	41	8.6
50	82	12.1
100	164	17.2

For intermediate values not shown on this table, please refer to the Figure B1-3

*These distances are based on exposure at same level as the antenna, for example, on a rooftop or in a building directly across from and at the same height as the antenna.

Note: These estimates are "worst case," assuming a sectorized antenna using 21 channels. If the system is using fewer than 21 channels, the actual horizontal distances that must be maintained will be less. PCS sectorized antennas transmit more or less in one direction from the antenna in a horizontal direction and transmit relatively little energy directly toward the ground. Therefore, these distances are even more conservative for "non-horizontal" distances, for example, distances directly below an antenna.

Figure B1-3. Estimated "worst case" horizontal* distances that should be maintained from a single sectorized, **PCS base station** antenna to meet FCC RF exposure guidelines



* These distances are based on exposure at same level as antenna, for example, on a rooftop or in a building directly across from and at the same height as the antenna.

Note: These estimates are "worst case", assuming a sectorized antenna using 21 channels. If the systems are using fewer channels, the actual horizontal distances that must be maintained will be less. PCS sectorized antennas transmit more or less in one direction from the antenna in a horizontal direction and transmit relatively little energy directly toward the ground.

Table B1-4. Estimated "worst case" horizontal* distances that should be maintained from a single omnidirectional **paging** or **narrowband PCS** antenna to meet FCC RF exposure guidelines. Note: this table and the associated figure only apply to the 900-940 MHz band; paging antennas at other frequencies are subject to different values.

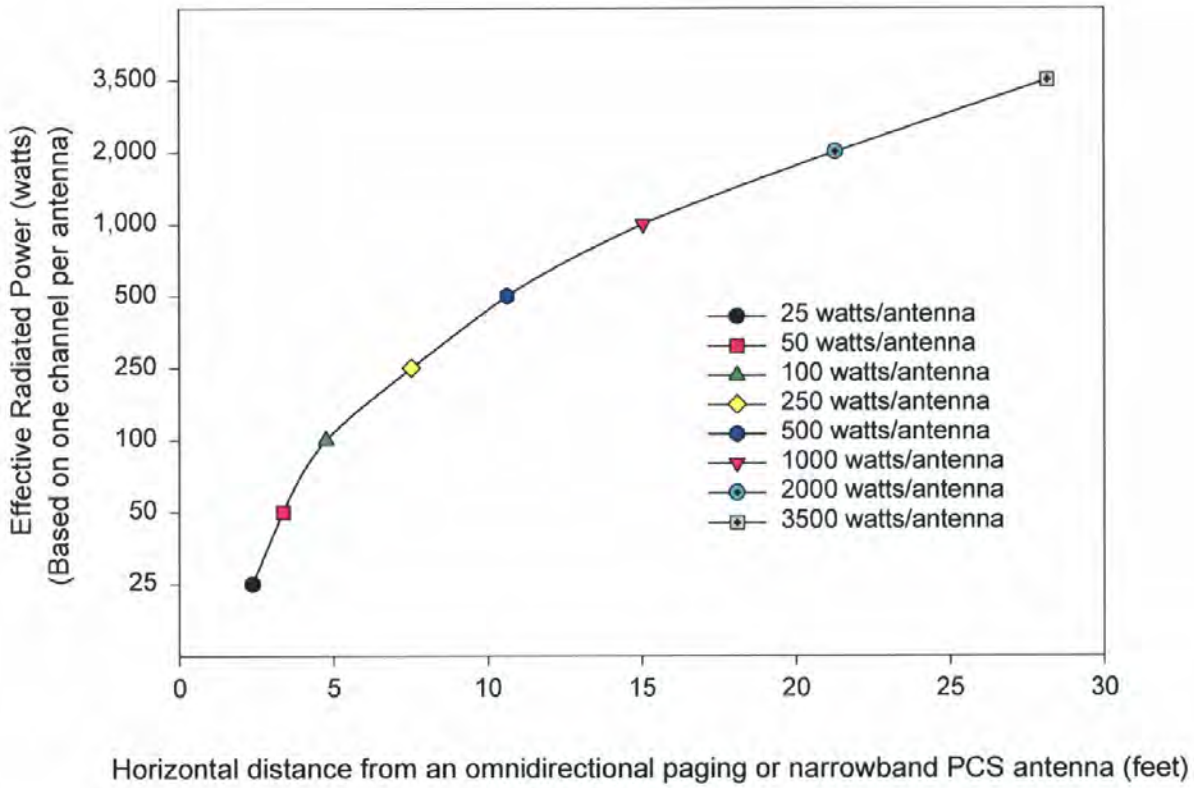
Effective Radiated Power (watts) based on one channel per antenna	Effective Isotropic Radiated Power (watts)	Horizontal* distance (feet) that should be maintained from a single omnidirectional paging or narrowband PCS antenna
50	82	3.4
100	164	4.8
250	410	7.5
500	820	10.6
1,000	1,640	15.1
2,000	3,280	21.3
3,500	5,740	28. 2

For intermediate values not shown on this table, please refer to the Figure B1-4

*These distances are based on exposure at same level as the antenna, for example, on a rooftop or in a building directly across from and at the same height as the antenna.

Note: These distances assume only one frequency (channel) per antenna. Distances would be greater if more than one channel is used per antenna. Omnidirectional paging and narrowband PCS antennas transmit more or less equally from the antenna in all horizontal directions and transmit relatively little energy toward the ground. Therefore, these distances are even more conservative for "non-horizontal" distances, for example, distances directly below an antenna.

Figure B1-4. Estimated "worst case" horizontal* distances that should be maintained from a single omnidirectional **paging** or **narrowband PCS** antenna to meet FCC RF exposure guidelines. Note: this figure and the associated table only apply to the 900-940 MHz band; paging antennas at other frequencies are subject to different values



* These distances are based on exposure at the same level as the antenna, for example, on a rooftop or building directly across from and at the same height as the antenna.

Note: These distances assume only one frequency (channel) per antenna. Distances would be greater if more than one channel is used per antenna. Omnidirectional paging and narrowband PCS antennas transmit more or less equally from the antenna in all horizontal directions and transmit relatively little energy towards the ground.

APPENDIX C

Text of 47 U.S.C. § 332(c)(7)

(7) PRESERVATION OF LOCAL ZONING AUTHORITY.

(A) GENERAL AUTHORITY. Except as provided in this paragraph, nothing in this Act shall limit or affect the authority of a State or local government or instrumentality thereof over decisions regarding the placement, construction, and modification of personal wireless service facilities.

(B) LIMITATIONS.

(i) The regulation of the placement, construction, and modification of personal wireless service facilities by and State or local government or instrumentality thereof (I) shall not unreasonably discriminate among providers of functionally equivalent services; and (II) shall not prohibit or have the effect of prohibiting the provision of personal wireless services.

(ii) A State or local government or instrumentality thereof shall act on any request for authorization to place, construct, or modify personal wireless service facilities within a reasonable period of time after the request is duly filed with such government or instrumentality, taking into account the nature and scope of such request.

(iii) Any decision by a State or local government or instrumentality thereof to deny a request to place, construct, or modify personal wireless service facilities shall be in writing and supported by substantial evidence contained in a written record.

(iv) No State or local government or instrumentality thereof may regulate the placement, construction, or modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission's regulations concerning such emissions.

(v) Any person adversely affected by any final action or failure to act by a State or local government or any instrumentality thereof that is inconsistent with this subparagraph may, within 30 days after such action or failure to act, commence an action in any court of competent jurisdiction. The court shall hear and decide such action on an expedited basis. Any person adversely affected by an act or failure to act by a State or local government or any instrumentality thereof that is inconsistent with clause (iv) may petition the Commission for relief.

(C) DEFINITIONS. For purposes of this paragraph

(i) the term "personal wireless services" means commercial mobile services, unlicensed wireless services, and common carrier wireless exchange access services;

(ii) the term "personal wireless service facilities" means facilities for the provision of personal wireless services; and

(iii) the term "unlicensed wireless service" means the offering of telecommunications service using duly authorized devices which do not require individual licenses, but does not mean the provision of direct-to-home satellite services (as defined in section 303(v)).

EXHIBIT B

RF Radiation Comparison

Between a Typical DAS Node and Typical Household Appliances

February 6, 2012

Prepared by: Crown Castle USA

Table of Contents

I. Executive Summary

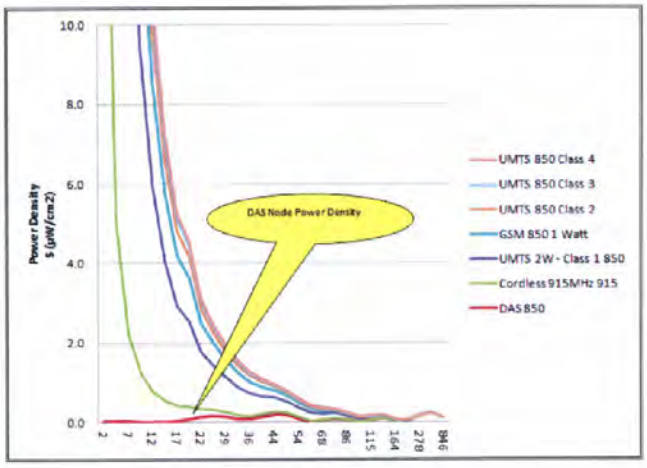
The power density calculations for DAS nodes as calculated in this report represent the absolute maximum power. In the real world, the power density produced by DAS node are substantially lower than the levels show in Exhibits 3.2 and 3.3. The reason for lower levels is that other factors, such as foliage, other manmade or natural obstacles attenuate RF energy and therefore lower the power density level; however for sake of simplicity they were not considered in the power density calculations Notwithstanding that as demonstrated in the preceding sections, the RF energy emitted by a DAS node:

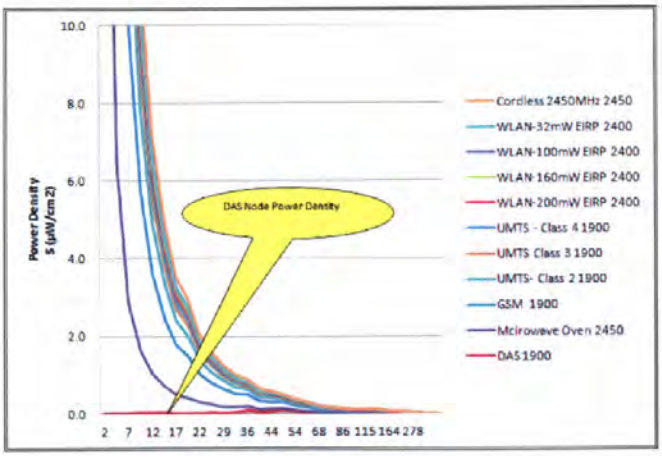
(a) meets the FCC's maximum permissible exposure,

(b) is substantially below the maximum power density levels indicated in FCC Bulletin 65; and

(c) is substantially lower than the RF energy found in the home from common household appliances.

Exhibit I.1 Power Density Comparison between DAS Node and Other Home Appliances Operating in Bands 4 and 5 as a Function of Distance





1. Introduction

In recent years there has been considerable discussion and concern about the possible hazards of electromagnetic radiation (EMR)[1], including both radio frequency (RF)[2] energy and power frequency (50-60 Hz) electromagnetic fields.

The electromagnetic spectrum includes all the various forms of electromagnetic energy from low frequency energy (non-ionizing)[3] to X-rays and gamma rays, which have very high frequencies and correspondingly short wavelengths (ionizing[4]). In between these extremes are radio waves, microwaves, infrared radiation, visible light, and ultraviolet radiation, in that order. The RF part of the electromagnetic spectrum is generally defined as that part of the spectrum where electromagnetic waves have frequencies in the range of about 3 KHz to 300 GHz.

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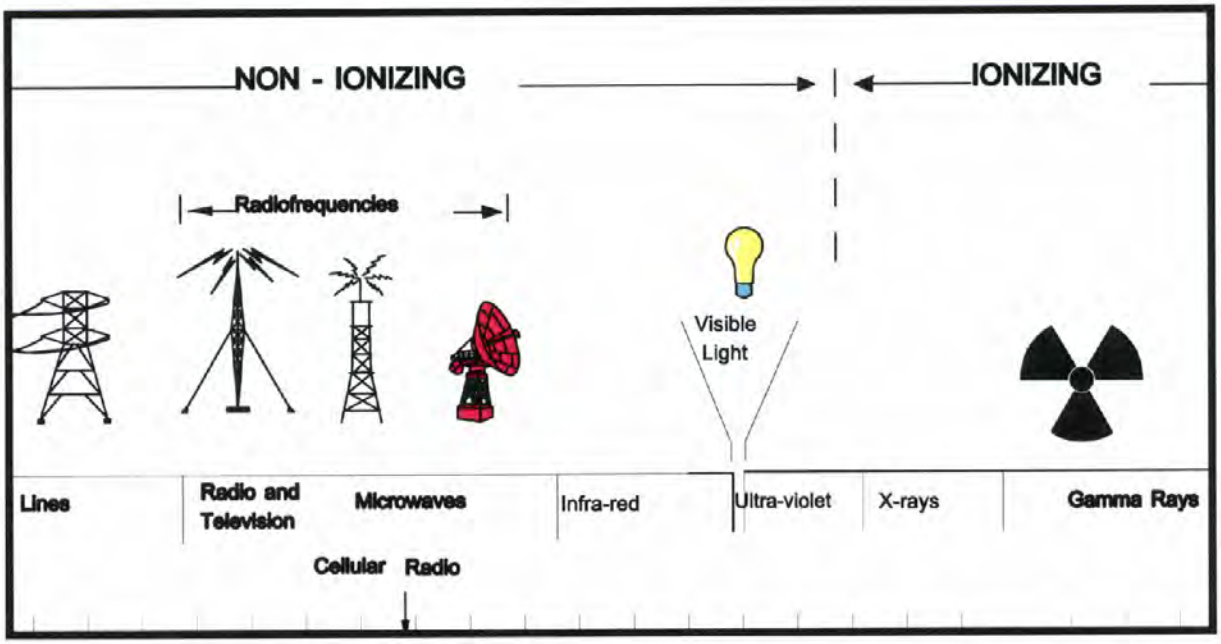
1 - Electromagnetic Radiation (EMR) is defined as the propagation of energy through space in the form of waves or particles.

2 - Radio waves and microwaves are forms of electromagnetic energy that are collectively described by the term "radiofrequency" or "RF."

3 - Non-ionizing radiation ranges from extremely low frequency radiation, through the audible, microwave and visible portions of the spectrum into the ultraviolet range.

4 - Ionizing radiation is higher frequency ultraviolet radiation, which begins to have enough energy to break chemical bonds.

Exhibit 1.1 - The Electromagnetic Spectrum



As can be seen from Exhibit 1.1, the RF field is classified as non-ionizing radiation because the frequency is too low for there to be enough photon energy to ionize atoms. However, at sufficiently high power densities[5], EMR poses certain health hazards.

The intent of this report is to compare the EMR from RF sources in a typical house with the RF levels produced and/or caused by a distributed antenna system (DAS) node located in the close proximity of the closest house. As stated above, EMR produced by an RF source can be expressed in terms of power density; therefore, the basis for comparing the EMR levels produced by different household appliances (such as wireless LANs, cordless phones, cellular mobile phones, etc.) and DAS node will be the power density level.

2. Background

In 1985, the Federal Communications Commission (FCC) adopted the 1982 American National Standards Institute (ANSI) guidelines for purposes of evaluating exposure due to RF

[5] - Power density is the amount of power (time rate of energy transfer) per unit volume.

transmitters licensed and authorized by the FCC. In 1992, ANSI adopted the 1991 Institute of Electrical and Electronics Engineers (IEEE) standard as an ANSI (a revision of its 1982 standard) and designated it ANSI/IEEE C95.1-1992. In 1996, the FCC adopted a modified version of its original proposal. The FCC's action also fulfilled requirements of the Telecommunications Act of 1996 for adopting new RF exposure guidelines. The FCC considered comments submitted by the Environmental Protection Agency (EPA), Food and Drug Administration (FDA), National Institute for Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA), the regulating agencies that have primary responsibility for consumer health and safety within the Federal government.

The FCC's guidelines are based on the recommended exposure criteria issued by the National Council on Radiation Protection & Measurements (NCRP) and ANSI/IEEE and are similar to the ANSI/IEEE 1992 guidelines except for differences in recommended exposure levels at lower frequencies and higher frequencies, and for occupational (controlled)[6] and general population (uncontrolled)[7]access areas. Over a broad range of frequencies, the NCRP exposure limits for the public are generally one-fifth that for workers in terms of power density.

The NCRP and ANSI/IEEE exposure criteria are frequency dependent since the whole-body human absorption of RF energy varies with the frequency of the RF signal. The most restrictive limits on exposure are in the frequency range of 30-300 MHz where the human body absorbs RF energy most efficiently when exposed in the far field of an RF transmitting source (The most common use of this band includes FM radio and the VHF television channels 2-13). The Maximum Permissible Exposure (MPE)[8] limits adopted by the FCC in 1996[9] are shown in Exhibits 2.1 and 2.2.

---

[6] - Occupational/Controlled Exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure.

[7] - General Population/Uncontrolled Exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure.

[8] - MPE is defined by the plane-wave equivalent power density to which a person may be exposed without harmful effect and with an acceptable safety factor

[9] - FCC Bulletin 65 has had several revised editions; the New Edition 01-01 of Supplement C supersedes the previous Edition 97-01.

Exhibit 2.1 - FCC Limits for Maximum Permissible Exposure (MPE) Limits for Occupational (Controlled) Exposure

Band	Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time |E|, |H| or S (minutes)
1	0.3-3.0	614	1.63	(100)*	6
2	3.0-30	1842/f	4.89/f	($900/f^2$)*	6
3	30-300	61.4	0.163	1	6
4	300-1500	--	--	f/300	6
5	1500-100,000	--	--	5	6

f = frequency in MHz **Plane-wave equivalent power density*

Exhibit 2.2 - FCC Limits for Maximum Permissible Exposure (MPE) Limits for General Population (Uncontrolled) Exposure

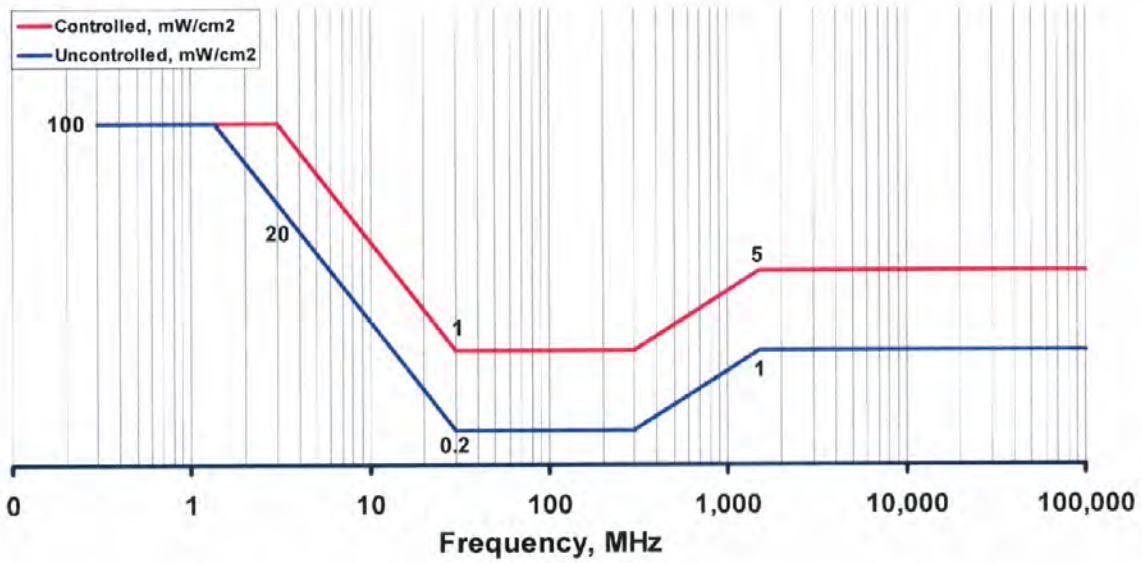
Band	Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time |E|, |H| or S (minutes)
1	0.3-1.34	614	1.63	(100)*	30
2	1.34-30	824/f	2.19/f	($180/f^2$)*	30
3	30-300	27.5	0.073	0.2	30
4	300-1500	--	--	f/1500	30
5	1500-100,000	--	--	1	30

f = frequency in MHz **Plane-wave equivalent power density*

The NCRP and ANSI/IEEE exposure criteria and most other standards also specify "time-averaged" MPE limits. This means that it is permissible to exceed the recommended limits for short periods of time as long as the average exposure (over the appropriate period specified) does not exceed the limit. For example, Exhibit 2.2 shows that for a frequency of 100 MHz, the recommended power density limit is 0.2 mW/cm^2 with an averaging time of thirty (30) minutes (any thirty-minute period) for general public (uncontrolled) exposure.

The absolute MPE limits for different frequencies for occupational (controlled) and general public (uncontrolled) is graphically illustrated in Exhibit 2.3

Exhibit 2.3 - Absolute MPE Limits for Different Frequencies



RF waves and RF fields have both electrical and magnetic components. It is often convenient to express the strength of the RF field in terms of each component. For example, the unit "volts per meter" (V/m) is used to measure the electric field strength, and the unit "amperes per meter" (A/m) is used to express the magnetic field strength. Another common way to characterize an RF field is by means of the power density. Power density is defined as power per unit area. For example, power density can be expressed in terms of milliwatts (one thousandth of a watt) per square centimeter (mW/cm^2) or microwatts (one millionth of a watt) per square centimeter ($\mu W/cm^2$).

3. Theoretical RF Field Calculations for DAS Node

The calculations are based on "worst-case" estimates. That is the estimates assume 100% use of all transmitters simultaneously, and aimed in the same direction. Additionally, the calculations make the assumptions that the surrounding area is a flat plain. The resultant values are conservative in that they over predict actual power densities.

The calculations are based on the following information:

i. Effective Radiated Power (ERP) in Watts

ii. Antenna height above ground level (AGL) in meters

iii. Antenna vertical radiation pattern[10] (G) in dBs

As stated before, power density (S) calculations are used to determine the magnitude of the RF field. The procedure to calculate the power density has been described in FCC Bulletin 65 (referenced above). Based on FCC Bulletin 65, the power density of an RF source is calculated by using equation 9:

$$S = \frac{33.4\ ERP}{R^2}$$

Where: S = Power Density in $\mu W/cm^2$
ERP = Power in Watts
R = Distance in Meters

The theoretical power density calculations for DAS node are listed in Exhibit 3.1 and 3.2 for each three degree increment of depression angle (90° being straight down at the base of the DAS node and 0° being straight out from the antenna). All values have been calculated from the height of six feet above ground level (typical human height).

To calculate the percent MPE (%MPE), the following formula is used:

$$\%\mathrm{MPE} = \frac{\mathrm{S}}{\mathrm{MPE}}\ \mathbf{100}$$

[10] - Directional antennas are designed to focus the RF signal, resulting in "patterns" of signal loss and gain. Antenna vertical radiation patterns display the loss of signal relative to the direction of propagation due to elevation angle change.

Exhibit 3.1 - Theoretical RF Field Calculations for DAS Node Operating in Cellular Frequency Band

ERP = 200 Watts (max./Sector) @ F = 860 - 890 MHz Decibel HDB856DG65EXY Antenna (typical), DAS Node Height 50 feet AGL General Population MPE = 590 μW/cm^2				
Depression Angle (Degree)	**Gain (dB)**	**Horizontal Distance (ft)**	**Power Density S (μW/cm^2)**	**% MPE @ 6' AGL**
-90	-28.85	0	0.048	0.82%
-87	-29.77	2	0.039	0.66%
-84	-31.03	5	0.029	0.49%
-81	-33.03	7	0.018	0.31%
-78	-36.84	9	0.007	0.12%
-75	-40.00	12	0.003	0.06%
-72	-36.11	14	0.008	0.14%
-69	-29.95	17	0.033	0.55%
-66	-26.03	18	0.079	1.34%
-63	-23.70	22	0.126	2.13%
-60	-22.81	25	0.146	2.47%
-57	-23.26	29	0.123	2.09%
-54	-24.57	32	0.085	1.44%
-51	-24.46	36	0.080	1.36%
-48	-21.86	40	0.134	2.26%
-45	-19.79	44	0.195	3.30%
-42	-19.59	49	0.182	3.09%
-39	-22.41	54	0.084	1.43%
-36	-30.88	61	0.010	0.18%
-33	-24.26	68	0.041	0.70%
-30	-20.31	76	0.086	1.46%
-27	-22.34	86	0.045	0.75%
-24	-40.00	99	0.001	0.01%
-21	-19.23	115	0.057	0.96%
-18	-15.31	135	0.104	1.77%
-15	-18.57	164	0.035	0.59%
-12	-18.83	207	0.021	0.36%
-9	-7.51	278	0.160	2.72%
-6	-2.53	419	0.226	3.83%
-3	-0.25	846	0.094	1.60%
0	0.00	oo	<0.001	<0.001%

Exhibit 3.3- Theoretical RF Field Calculations for DAS Node Operating in PCS Frequency Band

ERP = 200 Watts (max./Sector) @ F = 1920 - 1970 MHz Decibel HBV-6517DS-T0M Antenna (typical), DAS Node Height 50 feet AGL General Population MPE = 1000 μW/cm^2				
Depression Angle (Degree)	**Gain (dB)**	**Horizontal Distance (ft)**	**Power Density S (μW/cm^2)**	**% MPE @ 6' AGL**
-90	-36.06	0	0.009	0.09%
-87	-36.24	2	0.009	0.09%
-84	-35.20	5	0.011	0.11%
-81	-34.47	7	0.013	0.13%
-78	-32.84	9	0.018	0.18%
-75	-31.05	12	0.027	0.27%
-72	-30.89	14	0.027	0.27%
-69	-33.46	17	0.015	0.15%
-66	-46.29	18	0.001	0.01%
-63	-33.81	22	0.012	0.12%
-60	-30.27	25	0.026	0.26%
-57	-35.84	29	0.007	0.07%
-54	-29.20	32	0.029	0.29%
-51	-24.08	36	0.088	0.88%
-48	-30.61	40	0.018	0.18%
-45	-25.04	44	0.058	0.58%
-42	-22.70	49	0.089	0.89%
-39	-25.13	54	0.045	0.45%
-36	-26.67	61	0.028	0.28%
-33	-35.42	68	0.003	0.03%
-30	-34.40	76	0.003	0.03%
-27	-30.09	86	0.007	0.07%
-24	-28.47	99	0.009	0.09%
-21	-21.79	115	0.032	0.32%
-18	-17.92	135	0.057	0.57%
-15	-23.64	164	0.011	0.11%
-12	-18.06	207	0.025	0.25%
-9	-18.59	278	0.012	0.12%
-6	-23.52	419	0.002	0.02%
-3	-3.49	846	0.045	0.45%
0	0.00	oo	<.001	<.001%

The theoretical percent MPE calculations for DAS node are listed in Exhibit 3.1 and 3.2 for the same angle and height conditions. The theoretical cumulative % MPE calculations for a DAS node are shown in Exhibit 3.3.

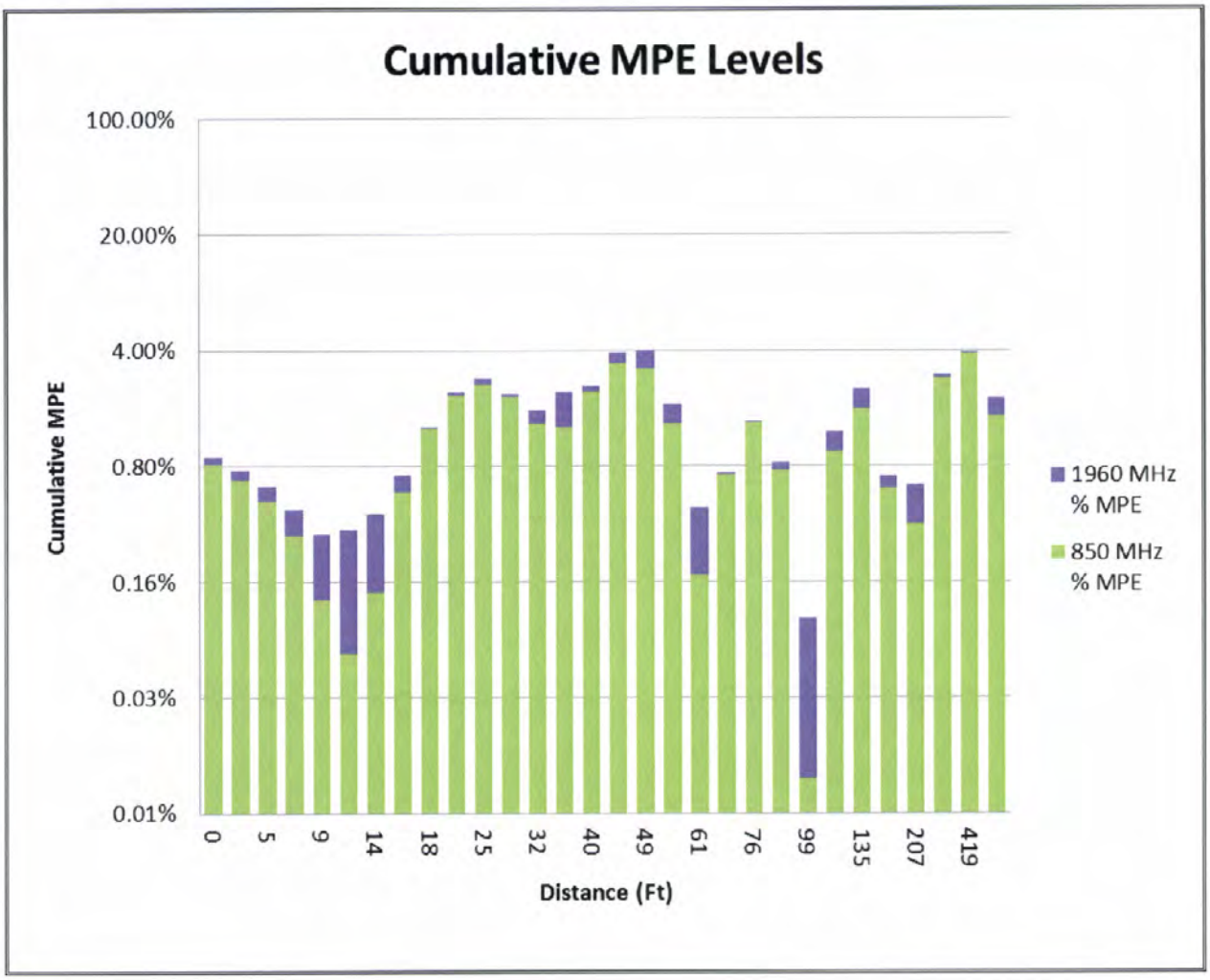
Exhibit 3.3 - Theoretical Cumulative %MPE Calculation for a DAS Node

Horizontal Distance (ft)	850 MHz % MPE	1960 MHz % MPE	Cumulative MPE 850 + 1960
0	0.82%	0.09%	0.91%
2	0.66%	0.09%	0.75%
5	0.49%	0.11%	0.60%
7	0.31%	0.13%	0.43%
9	0.12%	0.18%	0.31%
12	0.06%	0.27%	0.33%
14	0.14%	0.27%	0.41%
17	0.55%	0.15%	0.70%
18	1.34%	0.01%	1.34%
22	2.13%	0.12%	2.25%
25	2.47%	0.26%	2.73%
29	2.09%	0.07%	2.16%
32	1.44%	0.29%	1.73%
36	1.36%	0.88%	2.24%
40	2.26%	0.18%	2.44%
44	3.30%	0.58%	3.88%
49	3.09%	0.89%	3.98%
54	1.43%	0.45%	1.88%
61	0.18%	0.28%	0.45%
68	0.70%	0.03%	0.73%
76	1.46%	0.03%	1.50%
86	0.75%	0.07%	0.83%
99	0.01%	0.09%	0.10%
115	0.96%	0.32%	1.28%
135	1.77%	0.57%	2.34%
164	0.59%	0.11%	0.69%
207	0.36%	0.25%	0.61%
278	2.72%	0.12%	2.84%
419	3.83%	0.02%	3.85%
846	1.60%	0.45%	2.05%

Exhibit 3.4 is a graph showing the worst case %MPE generated by the DAS node against linear distance from the base of the DAS node. Note that a logarithmic scale is used to plot the

calculated theoretical %MPE values in order to compare with the MPE of 100%, which is so much larger that it would be off the page in a linear plot. This means that someone 846 feet away from the DAS node would be exposed to RF energy equal to 2.05% of the maximum permissible limits.

Exhibit 3.4 - Cumulative % MPE Graph



4. Theoretical RF Field Calculations for Typical Household Appliances

Typical households contain many devices that emit RF waves. Some of the devices found in almost all households are:

- Microwave Ovens,
- Cellular Phones,
- Wireless LAN
- Laptop Wi-Fi, and
- Cordless Phones.

The following sections provide a brief description about each device along with the typical power emitted by each one.

4.1 Microwave Oven

A microwave oven passes (non-ionizing) microwave radiation (at a frequency near 2.45 GHz) through food, causing dielectric heating primarily by absorption of the energy in water. Microwave ovens became common kitchen appliances in Western countries in the late 1970s, following the development of inexpensive cavity magnetrons.

For the safe exposure limits for microwave ovens, the Occupational Safety & Health Administration (OSHA) refers to the Canadian Centre for Occupational Health and Safety (CCOCS) limits, described as Safety Code 6 and are as follows:

Part III (Microwave Ovens) of the Radiation Emitting Devices Regulation (C.R.C., C. 1370) specifies the following limits for the leakage radiation at 5 cm from the surface of the microwave oven:

- 1.0 mW/cm^2 with test load, and
- 5.0 mW/cm^2 without test load.

Moreover, the U.S. Food and Drug Administration (FDA)[11] states that a Federal standard limits the amount of microwaves that can leak from an oven throughout its lifetime to 5 milliwatts of microwave radiation per square centimeter (mW/cm^2) at approximately 2 inches from the oven surface. This limit is far below the level known to harm people. Microwave energy also decreases dramatically as you move away from the source of radiation. A measurement made 20 inches from an oven would be approximately one one-hundredth of the value measured at 2 inches. Exhibit 4.1.1 provides the typical power for RF radiated from a microwave oven.

Exhibit 4.1.1 - Typical RF Radiated from Microwave Oven

Household Appliance	Power	dBm Level
Typical combined radiated RF power of microwave oven elements	1000 W	60 dBm
Typical RF Leakage based on FDA approved 5.0 mW/cm^2	0.39	25.9 dBm

The US Food and Drug Administration (FDA) also has a regulation on microwave oven leakage. In Title 21 it states that the power density limit from an operating microwave oven "shall not exceed 1 milliwatt per square centimeter at any point 5 centimeters or more from the external surface of the oven, measured prior to acquisition by a purchaser, and, thereafter, 5 milliwatts per square centimeter at any such point."

The power leakage from the microwave oven will be even lower once an individual is a foot (12 inches) or more away from the oven, since the power is inversely proportional to the square of distance.

Using the power density calculations referenced in Section 3, the power density for microwave ovens is found in Exhibits 4.1.2 below.

Exhibit 4.1.2 - Power Density Calculations for Microwave Ovens

[11] - By authority of the Radiation Control for Health and Safety Act of 1968, the Center for Devices and Radiological Health (CDRH) of the FDA develops performance standards for the emission of radiation from electronic products including X-ray equipment, other medical devices, television sets, microwave ovens, laser products and sunlamps.

ERP = 0.39 Watts @ Frequency = 2450 MHz	
Horizontal Distance (ft)	**Power Density S ($\mu W/cm^2$)**
0	13870.680
2	26.085
5	6.485
7	2.855
9	1.585
12	0.998
14	0.679
17	0.486
18	0.415
22	0.276
25	0.215
29	0.170
32	0.136
36	0.109
40	0.088
44	0.072
49	0.058
54	0.047
61	0.038
68	0.030
76	0.024
86	0.019
99	0.014
115	0.011
135	0.008
164	0.005
207	0.003
278	0.002
419	0.001
846	0.000

4.2 Cellular Phones

Cellular (cell) phones first became widely available in the United States in the early 1980s but their use has increased dramatically since then. The CTIA – The Cellular Telecommunications & Internet Association (CTIA) has released survey data that shows in 2011, the number of wireless subscriber connections now outnumbers the U.S. population, adding up to a wireless penetration rate of 103.9%. Other highlights from the survey, monitoring wireless industry activity from January through June, indicate that wireless subscriber connections were at 327.6 million, up 9% from mid-year 2010.

Cell phones give off RF waves and based on the large and still growing number of cell phone users (both adults and children), it is therefore safe to assume that there are at least a minimum of two cell phones within each household. Exhibit 4.2.1 provides the listing of the maximum output power for cell phones typically used by subscribers.

Exhibit 4.2.1 - Typical Cell Phone Type and RF Output Power

Cell Phone Type	Power	dBm level
Max. output from a GSM, UMTS/3G cell phone (Power class 1 mobiles)	2 W	33 dBm
Max. output power from GSM 1900 MHz cell phone	1 W	30 dBm
Max. output from a UMTS/3G cell phone (Power class 2 mobiles)	500 mW	27 dBm
Max. output from a UMTS/3G cell phone (Power class 3 mobiles)	250 mW	24 dBm
Max. output from a UMTS/3G cell phone (Power class 4 mobiles)	125 mW	21 dBm

Using the power density calculations referenced in Section 3, the power density for each handset type is found in Exhibits 4.2.2 to 4.2.7.

Exhibit 4.2.2 - Power Density Calculations for GSM/UMTS Class 1 Cell Phones

ERP = 2 Watts @ Frequency = 850 & 1900 MHz	
Horizontal Distance (ft)	**Power Density S ($\mu W/cm^2$)**
0	71808.654
2	135.044
5	33.574
7	14.782
9	8.207
12	5.166
14	3.514
17	2.517
18	2.147
22	1.429
25	1.113
29	0.880
32	0.702
36	0.566
40	0.458
44	0.371
49	0.300
54	0.243
61	0.195
68	0.156
76	0.123
86	0.096
99	0.073
115	0.055
135	0.039
164	0.027
207	0.017
278	0.009
419	0.004
846	0.001

Exhibit 4.2.3 - Power Density Calculations for GSM/UMTS Class 1 Cell Phones

ERP = 2 Watts @ Frequency = 850 & 1900 MHz	
Horizontal Distance (ft)	**Power Density S ($\mu W/cm^2$)**
0	71808.654
2	135.044
5	33.574
7	14.782
9	8.207
12	5.166
14	3.514
17	2.517
18	2.147
22	1.429
25	1.113
29	0.880
32	0.702
36	0.566
40	0.458
44	0.371
49	0.300
54	0.243
61	0.195
68	0.156
76	0.123
86	0.096
99	0.073
115	0.055
135	0.039
164	0.027
207	0.017
278	0.009
419	0.004
846	0.001

Exhibit 4.2.4 - Power Density Calculations for GSM 1 Watt Cell Phones

ERP = 1 Watts @ Frequency = 850 & 1900 MHz	
Horizontal Distance (ft)	**Power Density S ($\mu W/cm^2$)**
0	35904.327
2	67.522
5	16.787
7	7.391
9	4.104
12	2.583
14	1.757
17	1.259
18	1.074
22	0.715
25	0.556
29	0.440
32	0.351
36	0.283
40	0.229
44	0.185
49	0.150
54	0.122
61	0.098
68	0.078
76	0.062
86	0.048
99	0.037
115	0.027
135	0.020
164	0.013
207	0.008
278	0.005
419	0.002
846	0.001

Exhibit 4.2.5 - Power Density Calculations for UMTS Class 2 Cell Phones

ERP = 0.50 Watts @ Frequency = 850 & 1900 MHz	
Horizontal Distance (ft)	**Power Density S ($\mu W/cm^2$)**
0	17952.163
2	33.761
5	8.393
7	3.696
9	2.052
12	1.292
14	0.879
17	0.629
18	0.537
22	0.357
25	0.278
29	0.220
32	0.176
36	0.141
40	0.114
44	0.093
49	0.075
54	0.061
61	0.049
68	0.039
76	0.031
86	0.024
99	0.018
115	0.014
135	0.010
164	0.007
207	0.004
278	0.002
419	0.001
846	0.000

Exhibit 4.2.6 - Power Density Calculations for UMTS Class 3 Cell Phones

ERP = 0.250 Watts @ Frequency = 850 & 1900 MHz	
Horizontal Distance (ft)	**Power Density S ($\mu W/cm^2$)**
0	8976.082
2	16.880
5	4.197
7	1.848
9	1.026
12	0.646
14	0.439
17	0.315
18	0.268
22	0.179
25	0.139
29	0.110
32	0.088
36	0.071
40	0.057
44	0.046
49	0.038
54	0.030
61	0.024
68	0.020
76	0.015
86	0.012
99	0.009
115	0.007
135	0.005
164	0.003
207	0.002
278	0.001
419	0.001
846	0.000

Exhibit 4.2.7 - Power Density Calculations for UMTS Class 4 Cell Phones

ERP = 1/8 Watts @ Frequency = 850 & 1900 MHz	
Horizontal Distance (ft)	**Power Density S ($\mu W/cm^2$)**
0	4488.041
2	8.440
5	2.098
7	0.924
9	0.513
12	0.323
14	0.220
17	0.157
18	0.134
22	0.089
25	0.070
29	0.055
32	0.044
36	0.035
40	0.029
44	0.023
49	0.019
54	0.015
61	0.012
68	0.010
76	0.008
86	0.006
99	0.005
115	0.003
135	0.002
164	0.002
207	0.001
278	0.001
419	0.000
846	0.000

4.3 Wireless LAN

A wireless local area network (WLAN) links two or more devices using some wireless distribution method (typically spread-spectrum or OFDM radio), and usually provides a connection through an access point to the wider internet. This gives users the mobility to move around within a local coverage area and still be connected to the network. Most modern WLANs are based on IEEE 802.11 standards, marketed under the Wi-Fi brand name.

Wireless LANs have become popular in the home due to ease of installation, The survey, by research firm Parks Associates, found that 52 percent of U.S. households with a home network were using wireless technology, compared with 50 percent for Ethernet and about 5 percent for power line networking via electrical wires. (This does not add up to 100 due to some homes usage of a combination of technologies.)

Exhibit 4.3.1 provides the listing of the maximum output power for WLAN typically used in households in the US.

Exhibit 4.3.1 - Typical WLAN Output RF Power

Household Wireless Electronics	Power	dBm Level
EIRP for IEEE 802.11n Wireless LAN 40MHz-wide (5mW per MHz) channels in 5GHz sub-band 4 (5735-5835 MHz).	200 mW 160 mW	23 dBm 22 dBm
EIRP for IEEE 802.11b/g Wireless LAN 20 MHz-wide channels in the 2.4 GHz ISM band (5mW per MHz)	100 mW	20 dBm
Typical Wireless LAN transmission power in laptops.	32.0 mW 10.0 mW 4.0 mW 3.2 mW	15 dBm 10 dBm 6 dBm 5 dBm

Using the power density calculations referenced in Section 3, the power density for each handset type is found in Exhibits 4.3.2 to 4.2.5.

Exhibit 4.3.2 - Power Density Calculations for WLAN with 200 mW EIRP

ERP = 125 mWatts @ Frequency = 2400, 3700, 5000 MHz	
Horizontal Distance (ft)	**Power Density S ($\mu W/cm^2$)**
0	4488.041
2	8.440
5	2.098
7	0.924
9	0.513
12	0.323
14	0.220
17	0.157
18	0.134
22	0.089
25	0.070
29	0.055
32	0.044
36	0.035
40	0.029
44	0.023
49	0.019
54	0.015
61	0.012
68	0.010
76	0.008
86	0.006
99	0.005
115	0.003
135	0.002
164	0.002
207	0.001
278	0.001
419	0.000
846	0.000

Exhibit 4.3.3 - Power Density Calculations for WLAN with 160 mW EIRP

ERP = 100 mWatts @ Frequency = 2400, 3700, 5000 MHz	
Horizontal Distance (ft)	**Power Density S ($\mu W/cm^2$)**
0	3590.433
2	6.752
5	1.679
7	0.739
9	0.410
12	0.258
14	0.176
17	0.126
18	0.107
22	0.071
25	0.056
29	0.044
32	0.035
36	0.028
40	0.023
44	0.019
49	0.015
54	0.012
61	0.010
68	0.008
76	0.006
86	0.005
99	0.004
115	0.003
135	0.002
164	0.001
207	0.001
278	0.000
419	0.000
846	0.000

Exhibit 4.3.4- Power Density Calculations for WLAN with 100 mW EIRP

ERP = 62.5 mWatts @ Frequency = 2400, 3700, 5000 MHz	
Horizontal Distance (ft)	**Power Density S ($\mu W/cm^2$)**
0	2244.020
2	4.220
5	1.049
7	0.462
9	0.256
12	0.161
14	0.110
17	0.079
18	0.067
22	0.045
25	0.035
29	0.027
32	0.022
36	0.018
40	0.014
44	0.012
49	0.009
54	0.008
61	0.006
68	0.005
76	0.004
86	0.003
99	0.002
115	0.002
135	0.001
164	0.001
207	0.001
278	0.000
419	0.000
846	0.000

Exhibit 4.3.4- Power Density Calculations for Typical Wireless LAN Transmission Power in Laptops

ERP = 20 mWatts @ Frequency = 2400, 3700, 5000 MHz	
Horizontal Distance (ft)	**Power Density S ($\mu W/cm^2$)**
0	718.087
2	1.350
5	0.336
7	0.148
9	0.082
12	0.052
14	0.035
17	0.025
18	0.021
22	0.014
25	0.011
29	0.009
32	0.007
36	0.006
40	0.005
44	0.004
49	0.003
54	0.002
61	0.002
68	0.002
76	0.001
86	0.001
99	0.001
115	0.001
135	0.000
164	0.000
207	0.000
278	0.000
419	0.000
846	0.000

4.4 Cordless Phones

Virtually all telephones sold in the U.S. today use the 900 MHz, 1.9 GHz, 2.4-GHz, or 5.8 GHz bands, though legacy phones may remain in use on the older bands. There is no specific requirement for any particular transmission mode on 900, 1.9, 2.4, and 5.8, but in practice, virtually all newer 900 MHz phones are inexpensive analog models with digital features generally available only on the higher frequencies. Exhibit 4.4.1 provides the typical power authorized by the FCC for cordless phones.

Exhibit 4.4.1 provides the listing of the maximum output power for cordless phones typically used in households in the U.S.

Exhibit 4.4.1 - Typical Output Power for Cordless Phones

Device Type	Power	Level dBm
Cordless Phone	> 0.3 W at 915 MHz	>24.8 dBm
	> 0.2 W at 2450 MHz	>23.0 dBm

Using the power density calculations referenced in Section 3, the power density for each handset type is found in Exhibits 4.4.2 to 4.2.3.

Exhibit 4.4.2- Power Density Calculations for Typical 900 MHz Cordless Phones

ERP = 0.3 Watts Frequency = 915 MHz	
Horizontal Distance (ft)	**Power Density S ($\mu W/cm^2$)**
0	10771.298
2	20.257
5	5.036
7	2.217
9	1.231
12	0.775
14	0.527
17	0.378
18	0.322
22	0.214
25	0.167
29	0.132
32	0.105
36	0.085
40	0.069
44	0.056
49	0.045
54	0.037
61	0.029
68	0.023
76	0.019
86	0.014
99	0.011
115	0.008
135	0.006
164	0.004
207	0.003
278	0.001
419	0.001
846	0.000

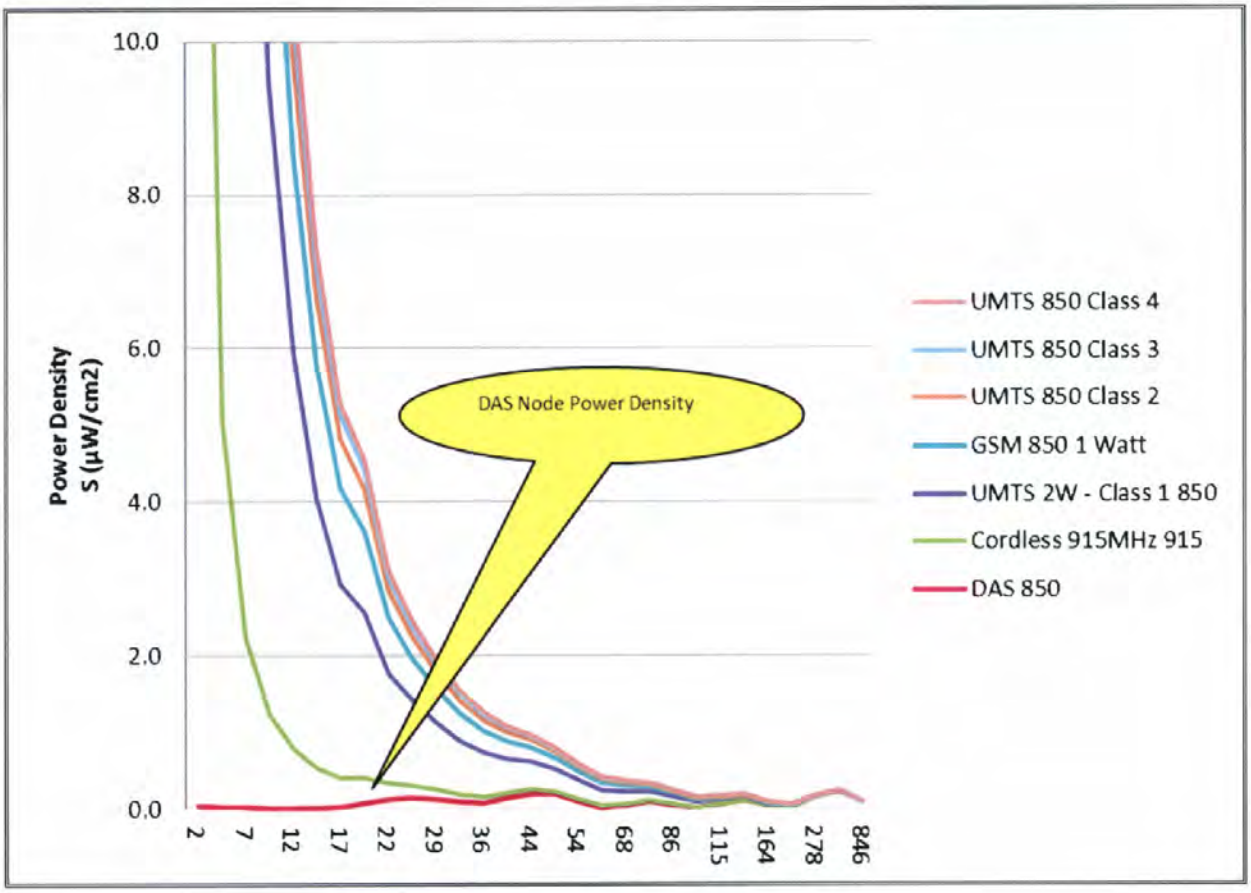
Exhibit 4.4.3- Power Density Calculations for Typical 2100 MHz Cordless Phones

ERP = 0.2 Watts @ F = 2459 MHz	
Horizontal Distance (ft)	**Power Density S (μW/cm²)**
0	7180.865
2	13.504
5	3.357
7	1.478
9	0.821
12	0.517
14	0.351
17	0.252
18	0.215
22	0.143
25	0.111
29	0.088
32	0.070
36	0.057
40	0.046
44	0.037
49	0.030
54	0.024
61	0.020
68	0.016
76	0.012
86	0.010
99	0.007
115	0.005
135	0.004
164	0.003
207	0.002
278	0.001
419	0.000
846	0.000

5. Power Density Comparison between a DAS Node and Typical Household Electronics

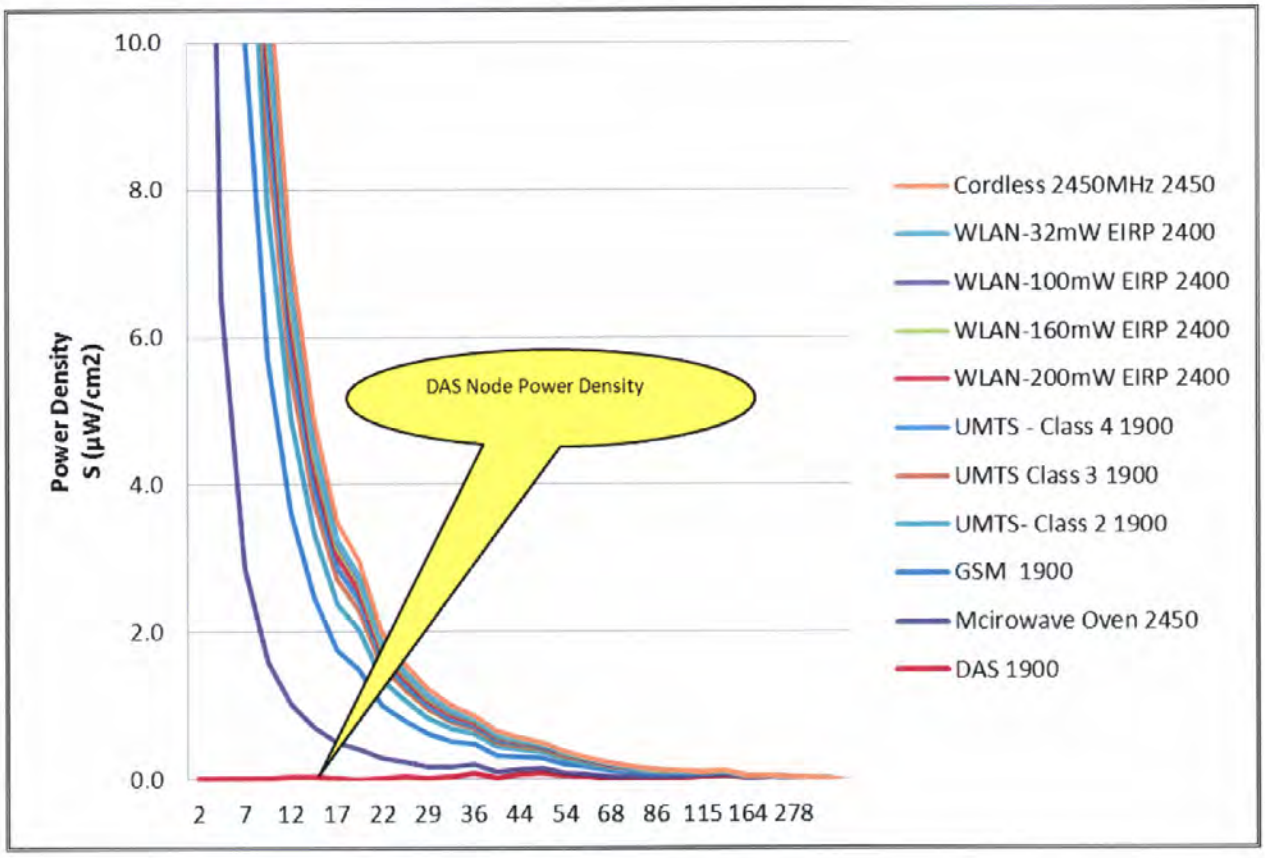
DAS node and typical household electronics emitting RF energy operate in two distant frequency bands, 300-1500 MHz and 1500-100000 MHz[12] . The power density comparison between each of the household devices and the DAS node is shown in Exhibits 5.1 and 5.2

Exhibit 5.1 Power Density Comparison between DAS Node and Other Home Appliances Operating in Band 4 as a Function of Distance



[12] - Refer to Exhibit 2.2 for specific frequencies within each band.

Exhibit 5.2 Power Density Comparison between DAS Node and Other Home Appliances Operating in Band 5 as a Function of Distance



As can be seen from Exhibits 5.1 & 5.2, in comparison with other household appliances that emit RF waves, DAS node has substantially lower power density than that of typical household appliances.

Attachment A - Writer's Bio

Mehran Nazari

Mr. Nazari is the founder and managing director of AdGen Telecom Group, Inc. Mr. Nazari has a wealth of domestic and international wireless telecommunications experience encompassing radio frequency (RF) and network design, technical planning, strategic planning/management and operationally focused consulting organizations. He has more than 25 years of experience in the design, build-out and operations of large to medium wireless networks. He has designed varying technologies from GSM, CDMA, UMTS and LTE to WiFi/WiMax - as a result, he has been involved in strategic planning and implementation of many different generations of telecommunications technologies and infrastructure vendors. In addition to defining technology roadmaps for start-up operations, he has assisted incumbent operators review and refine existing product and service portfolios and well as enabling platform landscapes. He has extensive background and expertise in topology, signaling and interconnect plans between fixed networks in domestic US and international markets. He has served as the lead consultant and acting chief technical officer for several wireless carriers using all air interface technologies and negotiated several large wireless infrastructure contracts with Lucent, Nortel, Ericsson, Siemens, Alcatel and Motorola as well as interconnect agreements with a number of local exchange carriers. Mr. Nazari has extensive knowledge and background in FCC licensing, regulatory compliance and has developed several software programs for automating interference calculations, microwave link reliability and database analysis/manipulation. Mehran received his Bachelor of Science degree from George Washington University in electrical engineering, and is pursuing a master's degree in telecommunications and computer science.

EXHIBIT C

sitesafe
rf compliance experts

200 North Glebe Road, Suite 1000, Arlington, VA 22203-3728
703.276.1100 ● 703.276.1169 fax
info@sitesafe.com ● www.sitesafe.com

Crown Castle
Site Name – Long Island Triangle
Site Compliance Report

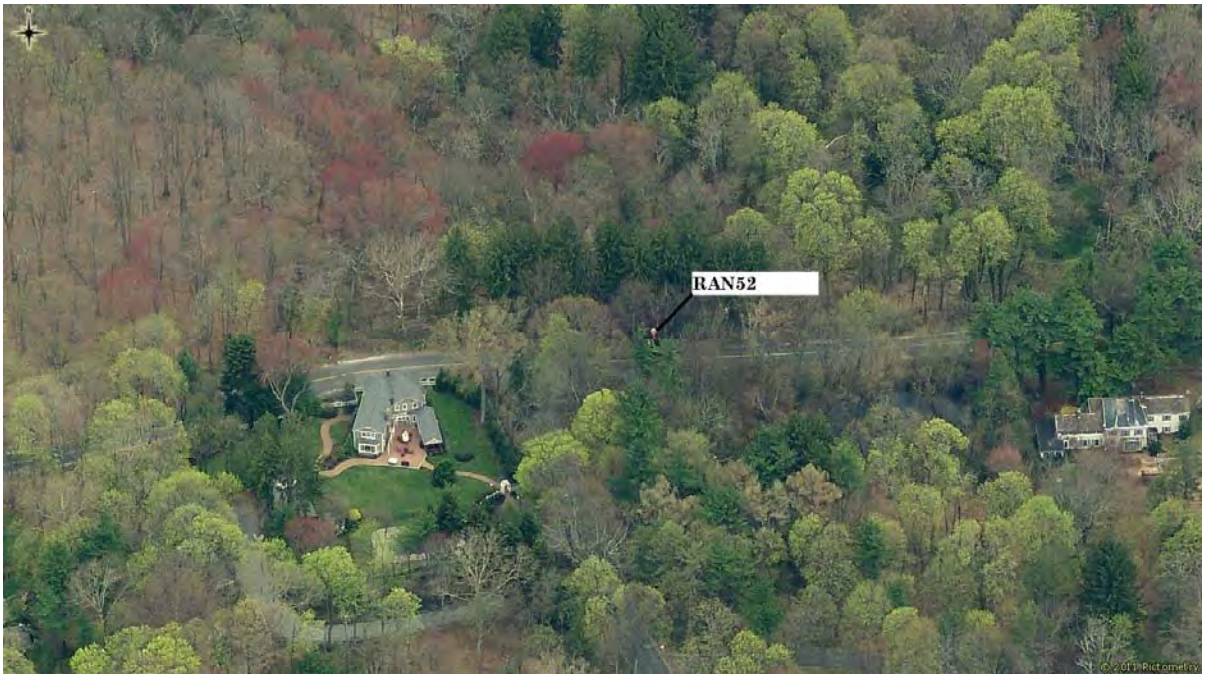
Muttontown Road
Syosset, NY 11791
Nassau County

Latitude: N40-49-25.90
Longitude: W73-32-41.40
Structure Type: Light Pole/ Monopole

Report generated date: February 10, 2012
Report by: Kobina Thompson
Customer Contact: Rick Soto

Proposed DAS sites will be Compliant based on FCC Rules and Regulations.

Crown Castle
Long Island Triangle - RAN51 and RAN 52
Radio Frequency (RF) Site Compliance Report



200 N. Glebe Road • Suite 1000 • Arlington, VA 22203-3728
703.276.1100 • info@sitesafe.com

Muttontown Road, Syosset, NY 11791

Table of Contents

1 Executive Summary

Crown Castle has contracted with Sitesafe, Inc. (Sitesafe), an independent Radio Frequency (RF) regulatory and engineering consulting firm, to determine whether the proposed multi-carrier DAS communications site, Long Island Triangle, located on Muttontown Road, Syosset, NY, is in compliance with Federal Communication Commission (FCC) Rules and Regulations for RF emissions. A comparison of the Crown Castle multi-carrier DAS system configuration has been reviewed against a generic large monopole facility and a typical consumer WiFi installation.

This report addresses exposure to radio frequency electromagnetic fields in accordance with the FCC Rules and Regulations for all individuals, classified as the "General Public." This **site will be compliant** with the FCC rules and regulations, as described in OET Bulletin 65.

This document and the conclusions herein are based on the information provided by Crown Castle.

If you have any questions regarding RF safety and regulatory compliance, please do not hesitate to contact Sitesafe's Customer Support Department at (703) 276-1100.

2 Regulatory Basis

2.1 FCC Rules and Regulations

In 1996, the Federal Communication Commission (FCC) adopted regulations for the evaluating of the effects of RF emissions in 47 CFR § 1.1307 and 1.1310. The guideline from the FCC Office of Engineering and Technology is Bulletin 65 ("OET Bulletin 65"), *Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields*, Edition 97-01, published August 1997. Since 1996 the FCC periodically reviews these rules and regulations as per their congressional mandate.

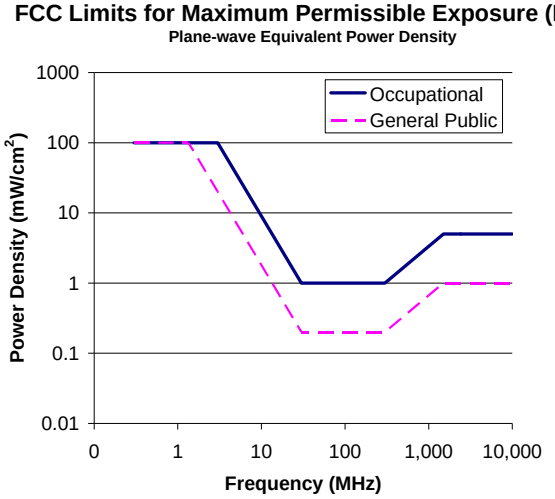
FCC regulations define two separate tiers of exposure limits: Occupational or "Controlled environment" and General Public or "Uncontrolled environment". The General Public limits are generally five times more conservative or restrictive than the Occupational limit. These limits apply to *accessible* areas where workers or the general public may be exposed to Radio Frequency (RF) electromagnetic fields.

Occupational or Controlled limits apply in situations in which persons are exposed as a consequence of their employment and where those persons exposed have been made fully aware of the potential for exposure and can exercise control over their exposure.

An area is considered a Controlled environment when access is limited to these aware personnel. Typical criteria are restricted access (i.e. locked or alarmed doors, barriers, etc.) to the areas where antennas are located coupled with proper RF warning signage. A site with Controlled environments is evaluated with Occupational limits.

All other areas are considered Uncontrolled environments. If a site has no access controls or no RF warning signage it is evaluated with General Public limits.

The theoretical modeling of the RF electromagnetic fields has been performed in accordance with OET Bulletin 65. The Maximum Permissible Exposure (MPE) limits utilized in this analysis are outlined in the following diagram:



Limits for Occupational/Controlled Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $|E|^2$, $|H|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

Limits for General Population/Uncontrolled Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $|E|^2$, $|H|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	($180/f^2$)*	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz *Plane-wave equivalent power density

2.2 Inverse Square Law

The inverse square law is an important part of understanding how RF energy affects the environment. What it means is that as the distance increases from a transmitter, the power density decreases in proportion to the square of the distance. Figure 1 shows how much the power is reduced with distance.

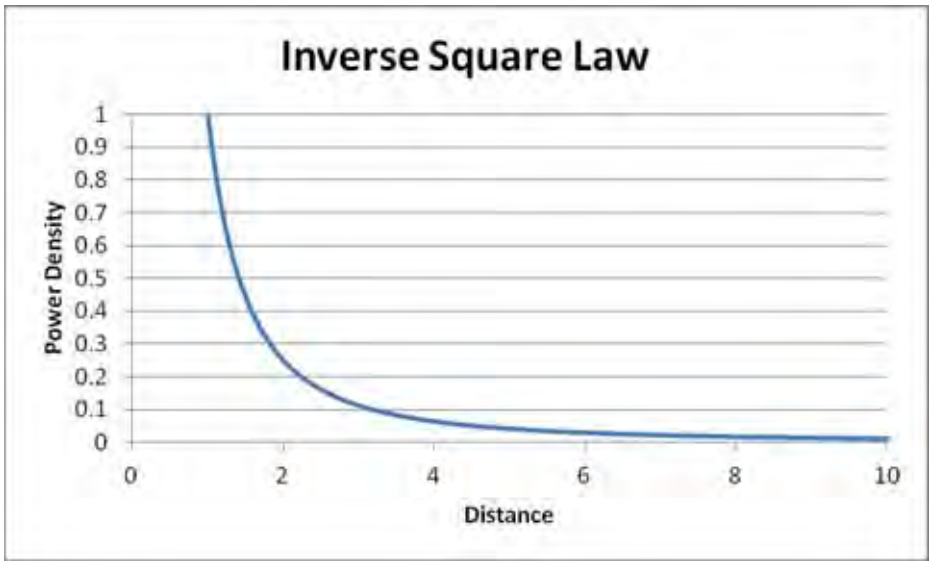


Figure 1 Inverse Square Graph

An example of how the inverse square law works is shown in Figure 2. Light is electromagnetic energy just like RF only higher in frequency. As the lamp is moved further away from the book much less light (power) reaches the book so it is harder to read. Doubling the distance results in ¼ the light, or power density. The effect is the same for RF energy,

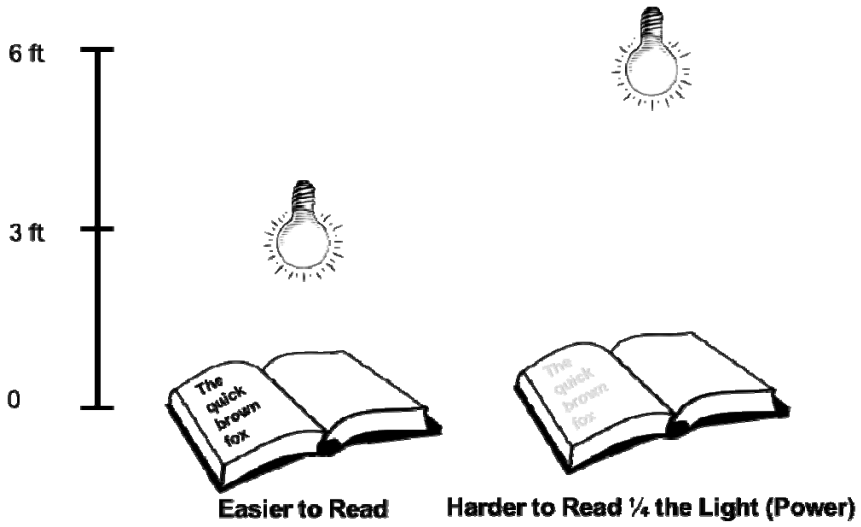


Figure 2 Inverse Square and Light

3 Site Compliance

3.1 Site Compliance Statement

Upon evaluation of the cumulative RF emission levels from the proposed sites, Sitesafe has determined that:

These **sites will be compliant** with the FCC rules and regulations, as described in OET Bulletin 65.

3.2 Actions for Site Compliance

Based on common industry practice and our understanding of FCC and OSHA requirements, this section provides a statement of recommendations for site compliance. RF alert signage recommendations have been proposed based on theoretical analysis of MPE levels.

This site will be compliant with FCC Rules.

Sitesafe recommends that a small Blue Notice sign be placed below the antenna mount on the RAN51, RAN52 and RAN53 poles to alert workers of their presence.

4 Analysis

4.1 RF Emissions Diagram

The RF diagram(s) below display theoretical exposure levels as a percentage of the Maximum Permissible Exposure. These diagrams use modeling as proscribed in OET Bulletin 65 and assumptions detailed in Appendix B.

The key at the bottom of each diagram indicates the levels displayed are referenced to FCC General Public Maximum Permissible Exposure (MPE) limits. Color coding on the diagram is as follows:

- Areas indicated as Gray are below 5% of the MPE limits.
- Green represents areas predicted to be between 5% and 20% of the MPE limits.
- Yellow represents areas predicted to be between 20% and 100% of the MPE limits.
- Red areas indicated predicted levels greater than 100% of the MPE limits.

The diagrams below are:

1. The neighborhood ground level view of RAN51, RAN52 and RAN53.
2. Area elevation view of RAN51
3. Area elevation view of RAN52
4. Detailed elevation view of RAN52
5. Detailed elevation view of RAN53
6. Detailed view of a generic macro Tower.

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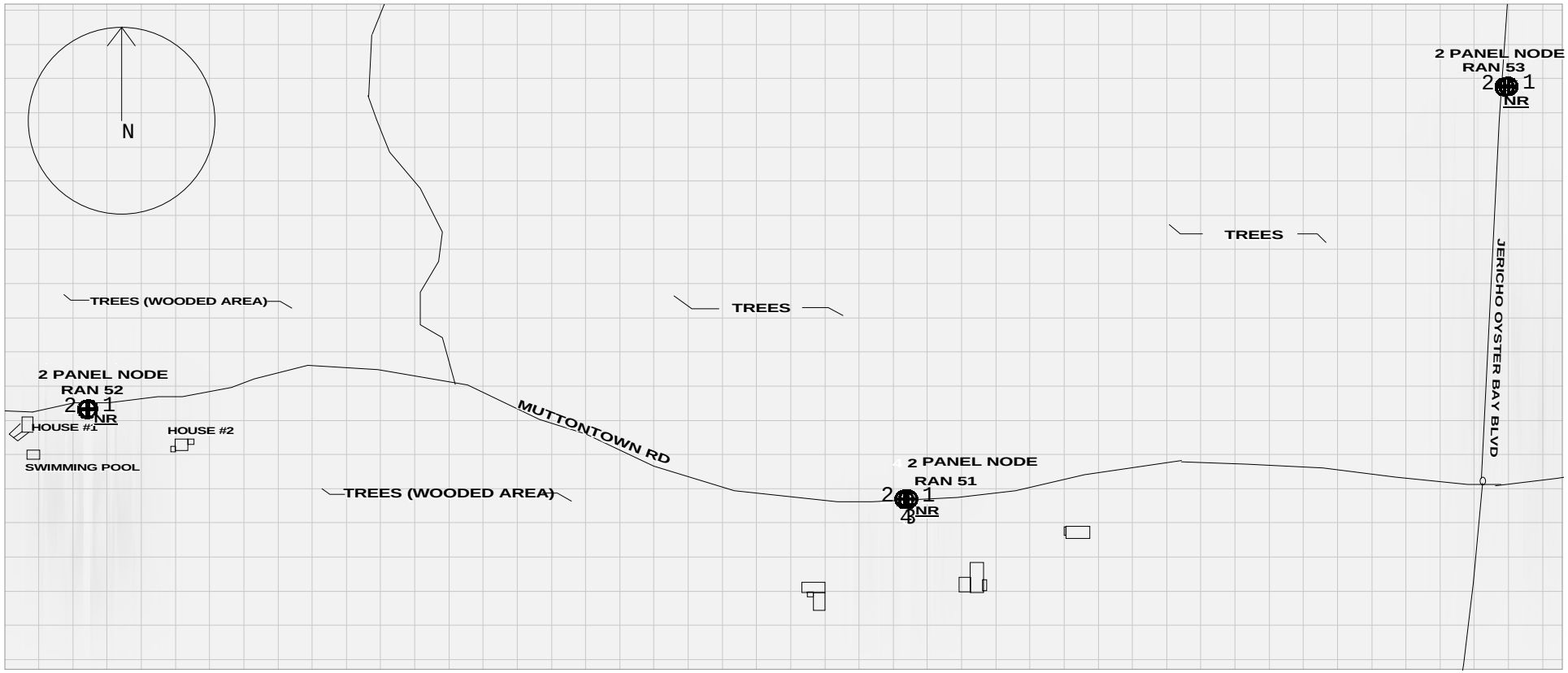
RF Emissions Diagram for: Long Island Triangle
Ground Level



% of FCC Public Exposure Limit
Average from 0 feet above to 6 feet above origin

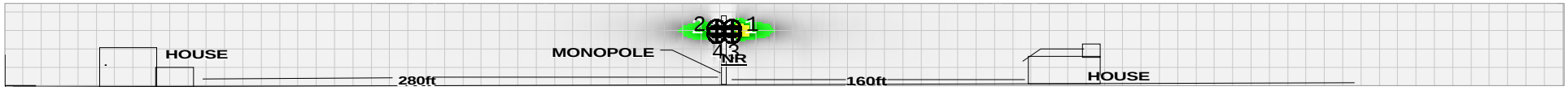
	100 <= X
	20 <= X < 100
	5 <= X < 20
	X <= 5

sitesafe
www.sitesafe.com
Sitesafe ID# 79782
Site Name: Long Island Triangle

SitesafeTC Version 2.81.00
1/7/2012

Feet
200 0 200 400
Grid Size is 100.00

RF Emissions Diagram for: Long Island Triangle
RAN51 Only - Side View



% of FCC Public Exposure Limit

Individual Points

- 100 <= X
- 20 <= X < 100
- 5 <= X < 20
- X <= 5

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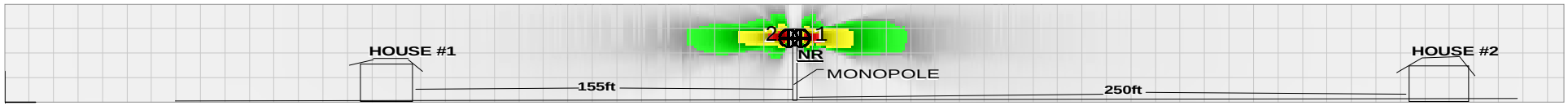
Sitesafe ID# 79782
Site Name: Long Island Triangle

Feet

50 0 50 100

Grid Size is 10.0

RF Emissions Diagram for: Long Island Triangle
RAN52 Only - Side View



% of FCC Public Exposure Limit

Individual Points

- 100 <= X
- 20 <= X < 100
- 5 <= X < 20
- X <= 5

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Site Name: Long Island Triangle

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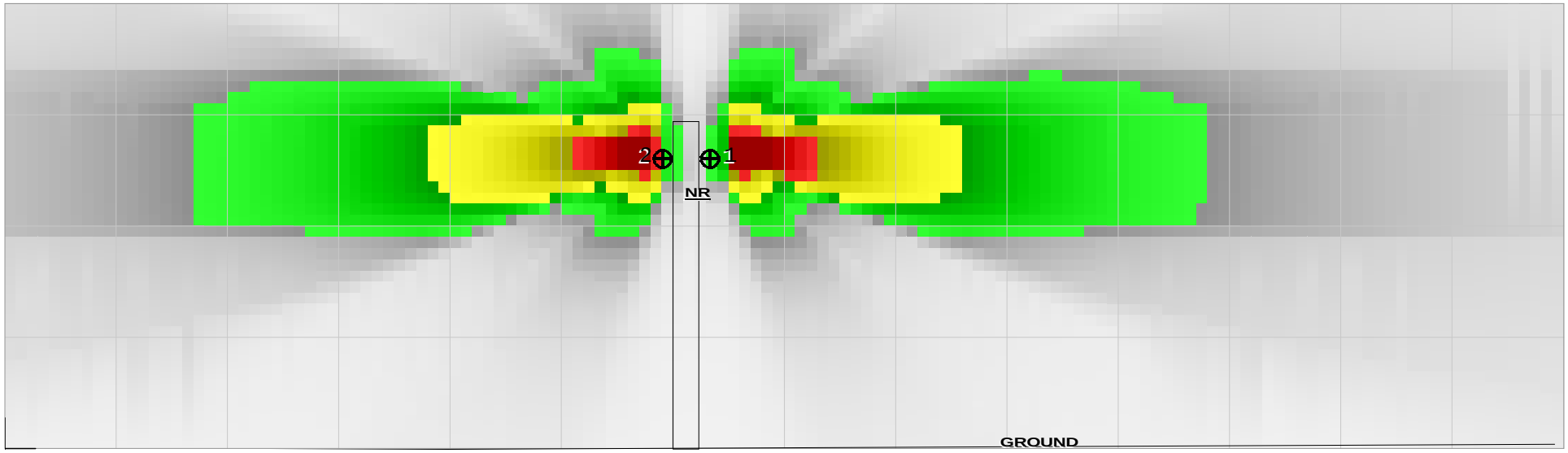
1/10/2012

Feet
40 0 40 80
Grid Size is 10.0

RF Emissions Diagram for: Long Island Triangle
RAN52 Only - Expanded Side View



% of FCC Public Exposure Limit
Individual Points

- 100 <= X
- 20 <= X < 100
- 5 <= X < 20
- X <= 5

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Sitesafe ID# 79782
Site Name: Long Island Triangle

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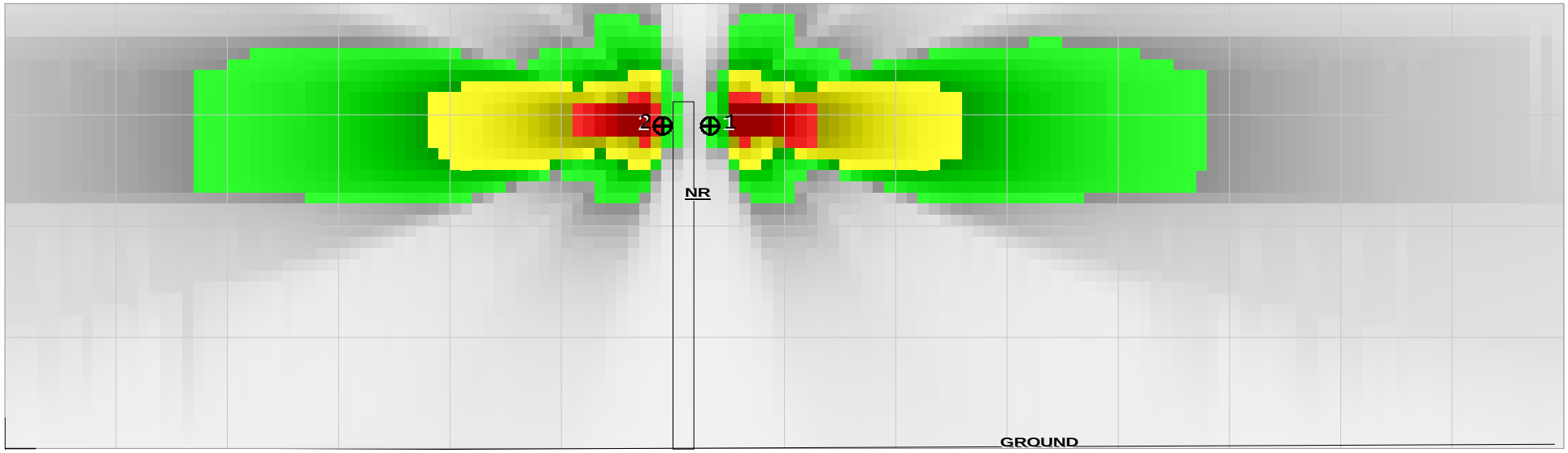
1/10/2012

Feet
5 0 5 10
Grid Size is 10.0

RF Emissions Diagram for: Long Island Triangle
RAN53 Only - Expanded Side View



% of FCC Public Exposure Limit

Individual Points

- 100 <= X
- 20 <= X < 100
- 5 <= X < 20
- X <= 5

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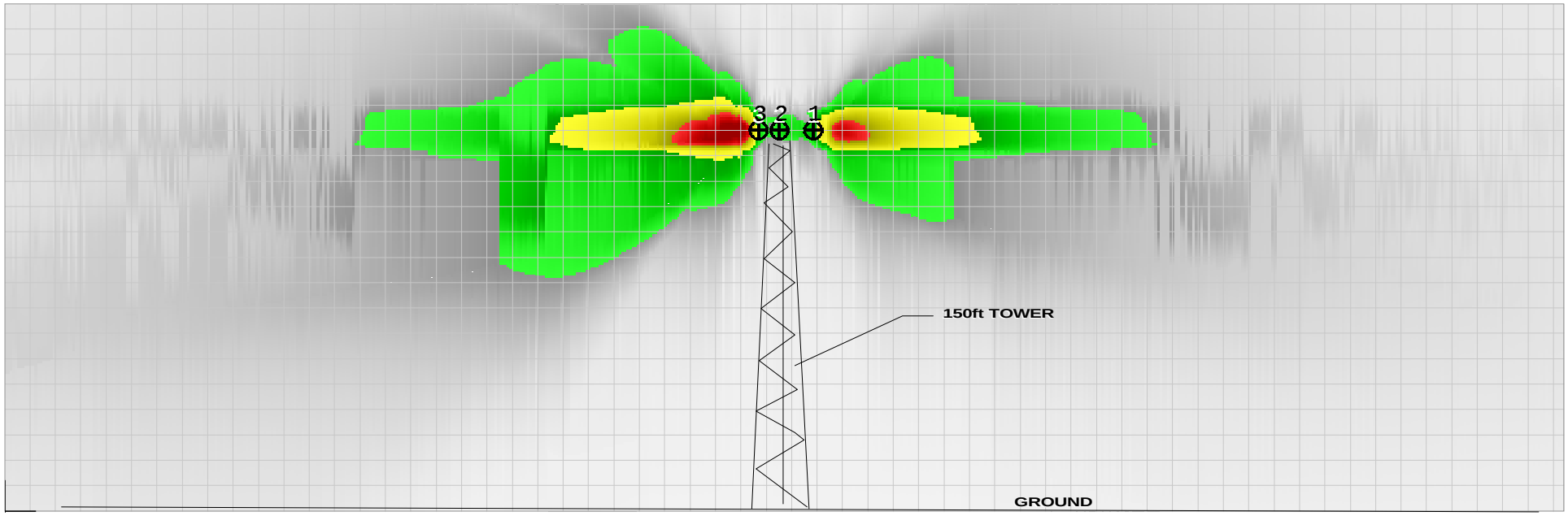
Sitesafe ID# 79782
Site Name: Long Island Triangle

SitesafeTC Version 2.81.00
1/10/2012

Feet
5 0 5 10
Grid Size is 10.0

RF Emissions Diagram for: Long Island Triangle
Macro Tower - Side View



% of FCC Public Exposure Limit

Individual Points

- 100 <= X
- 20 <= X < 100
- 5 <= X < 20
- X <= 5

sitesafe

www.sitesafe.com

Sitesafe ID# 79782

Site Name: Long Island Triangle

SitesafeTC Version 2.81.00
1/10/2012

Feet

30 0 30 60

Grid Size is 10.0

5 Site Information

5.1 Antenna Inventory

The following antenna Inventory identifies three separate antenna configuration:

1) RAN 51 – 2 Panel Node DAS configuration on a utility pole;
2) RAN52 – 2 Panel Node DAS configuration on a utility pole;
3) RAN53 – 2 Panel Node DAS configuration on a utility pole; and
4) A generic cell site with antennas mounted at 150' above ground level.

This inventory is based on information obtained from the customer, and was utilized by Sitesafe to perform theoretical modeling of RF emissions.

Each transmitting configuration has been analyzed against the most stringent FCC Requirements for RF Safety (General Public Maximum Permissible Exposure Levels). The height above ground of the transmitting antennas and the input power to each were used in this analysis.

The DAS configurations are relatively low power (55 – 252 Watts) and installed on light poles approximately 26- 31 feet above ground. The generic cell site utilizes significantly more power (4500 Watts) installed on a tower 150 feet above ground.

A consumer Wi-Fi™ access point installed in a home operates with relatively low power, approximately 1 Watt. Close to the access point the levels will be high compared to external sources. Both the cell sites and the Wi-Fi need to provide similar amounts of power to their mobile components for proper operation. The exposure levels from either technology in the home will be similar, and very low compared to the FCC exposure limits.

Along with each configuration below is a table outlining exposure levels at various distances from the antenna support along the ground.

DAS Site #1: 2-Panel Node (RAN 52)

Centerlines: 26ft AGL. Azimuth: 90º and 270º

Table 3: Antenna Inventory												
Ant #	Operated By	TX Freq (MHz)	ERP (Watts)	Antenna Gain (dBd)	Az (Deg)	Antenna Model	Ant Type	Len (ft)	Horizontal Half Power Beamwidth (Deg)	Location		
										X	Y	Z (AGL)
1	Multi-Carrier	1900	252	11.38	90	Kathrein-Scala 84010525	Panel	2	65	45'	334'	26'
2	Multi-Carrier	1900	252	11.38	270	Kathrein-Scala 84010525	Panel	2	65	41'	331'	26'

Predicted Exposure Levels:

Distance from Monopole	Power Density (mW/cm²)	Public Exposure (% Spatial Average)
Base of monopole	0.007	<1%
50ft	0.006	<1%
100ft	0.004	<1%
150ft	0.004	<1%
200ft	0.006	<1%
250ft	0.005	<1%
300ft	0.004	<1%

DAS Site #2 2-Panel Node (RAN 51)

Centerlines: 31ft AGL. Azimuth: 90º and 270º

Table 4: Antenna Inventory												
Ant #	Operated By	TX Freq (MHz)	ERP (Watts)	Antenna Gain (dBd)	Az (Deg)	Antenna Model	Ant Type	Len (ft)	Horizontal Half Power Beamwidth (Deg)	Location		
										X	Y	Z (AGL)
1	Multi-Carrier	1900	110	11.38	90	Kathrein-Scala 84010525	Panel	2	65	2443'	69'	31'
2	Multi-Carrier	1900	110	11.38	270	Kathrein-Scala 84010525	Panel	2	65	2433'	69'	31'

Measurements:

Distance from Monopole	Power Density (mW/cm2)	Public Exposure (% Spatial Average)
Base of monopole	0.005	<1%
50ft	0.004	<1%
100ft	0.004	<1%
150ft	0.003	<1%
200ft	0.002	<1%
250ft	0.001	<1%
300ft	0.001	<1%

DAS Site #3: 2-Panel Node (RAN 53)

Centerlines: 29ft AGL. Azimuth: 90º and 220º

Table 3: Antenna Inventory												
Ant #	Operated By	TX Freq (MHz)	ERP (Watts)	Antenna Gain (dBd)	Az (Deg)	Antenna Model	Ant Type	Len (ft)	Horizontal Half Power Beamwidth (Deg)	Location		
										X	Y	Z (AGL)
1	Multi-Carrier	1900	252	11.38	90	Kathrein-Scala 84010525	Panel	2	65	45'	334'	29'
2	Multi-Carrier	1900	252	11.38	220	Kathrein-Scala 84010525	Panel	2	65	41'	331'	29'

Predicted Exposure Levels:

Distance from Monopole	Power Density (mW/cm²)	Public Exposure (% Spatial Average)
Base of monopole	0.006	<1%
50ft	0.006	<1%
100ft	0.005	<1%
150ft	0.004	<1%
200ft	0.003	<1%
250ft	0.004	<1%
300ft	0.004	<1%

Generic Cell Tower
Centerlines: 150ft AGL. Azimuth: 0º, 120º and 240º.

Table 5: Antenna Inventory												
Ant #	Operated By	TX Freq (MHz)	ERP (Watts)	Antenna Gain (dBd)	Az (Deg)	Antenna Model	Ant Type	Len (ft)	Horizontal Half Power Beamwidth (Deg)	Location		
										X	Y	Z (AGL)
1	Generic Carrier	751	1000	11.90	0	Powerwave P65-15-XLH-RR	Panel	4	65	1181'	431'	150'
1	Generic Carrier	850	1500	12.60	0	Powerwave P65-15-XLH-RR	Panel	4	65	1181'	431'	150'
1	Generic Carrier	1900	2000	14.90	0	Powerwave P65-15-XLH-RR	Panel	4	65	1181'	431'	150'
2	Generic Carrier	751	1000	11.90	120	Powerwave P65-15-XLH-RR	Panel	4	65	1186'	409'	150'
2	Generic Carrier	850	1500	12.60	120	Powerwave P65-15-XLH-RR	Panel	4	65	1186'	409'	150'
2	Generic Carrier	1900	2000	14.90	120	Powerwave P65-15-XLH-RR	Panel	4	65	1186'	409'	150'
3	Generic Carrier	751	1000	11.90	240	Powerwave P65-15-XLH-RR	Panel	4	65	1164'	418'	150'
3	Generic Carrier	850	1500	12.60	240	Powerwave P65-15-XLH-RR	Panel	4	65	1164'	418'	150'
3	Generic Carrier	1900	2000	14.90	240	Powerwave P65-15-XLH-RR	Panel	4	65	1164'	418'	150'

Measurements

Distance from Monopole	Power Density (mW/cm2)	Public Exposure (% Spatial Average)
Base of monopole	0.008	<1%
50ft away	0.007	<1%
100ft	0.004	<1%
150ft	0.004	<1%
200ft	0.003	<1%
250ft	0.002	<1%
300ft	0.001	<1%

6 Engineer Certification

The professional engineer whose seal appears on the cover of this document hereby certifies and affirms that:

I am registered as a Professional Engineer in the jurisdiction indicated in the professional engineering stamp on the cover of this document; and

That I am an employee of Sitesafe, Inc., in Arlington, Virginia, at which place the staff and I provide RF compliance services to clients in the wireless communications industry; and

That I am thoroughly familiar with the Rules and Regulations of the Federal Communications Commission (FCC) as well as the regulations of the Occupational Safety and Health Administration (OSHA), both in general and specifically as they apply to the FCC Guidelines for Human Exposure to Radio-frequency Radiation; and

That the theoretical analysis of the site identified as Long Island Triangle have been performed in order to determine where there might be electromagnetic energy that is in excess of both the Controlled Environment and Uncontrolled Environment levels; and

That I have thoroughly reviewed this Site Compliance Report and believe it to be true and accurate to the best of my knowledge as assembled by and attested to by Kobina Thompson.

February 10, 2012

Appendix A – Statement of Limiting Conditions

Sitesafe cannot be held accountable or responsible for anomalies or discrepancies due to actual site conditions (i.e., mislabeling of antennas or equipment, inaccessible cable runs, inaccessible antennas or equipment, etc.) or information or data supplied by Crown Castle, the site manager, or their affiliates, subcontractors or assigns.

Sitesafe has provided computer generated model(s) in this Site Compliance Report to show approximate dimensions of the site, and the model is included to assist the reader of the compliance report to visualize the site area, and to provide supporting documentation for Sitesafe's recommendations.

Sitesafe may note in the Site Compliance Report any adverse physical conditions, such as needed repairs, observed during the survey of the subject property or that Sitesafe became aware of during the normal research involved in performing this survey. Sitesafe will not be responsible for any such conditions that do exist or for any engineering or testing that might be required to discover whether such conditions exist. Because Sitesafe is not an expert in the field of mechanical engineering or building maintenance, the Site Compliance Report must not be considered a structural or physical engineering report.

Sitesafe obtained information used in this Site Compliance Report from sources that Sitesafe considers reliable and believes them to be true and correct. Sitesafe does not assume any responsibility for the accuracy of such items that were furnished by other parties. When conflicts in information occur between data provided by a second party and physical data collected by Sitesafe, the physical data will be used.

Appendix B – Assumptions and Definitions

General Model Assumptions

In this site compliance report, it is assumed that all antennas are operating at **full power at all times**. Software modeling was performed for all transmitting antennas located on the site. Sitesafe has further assumed a 100% duty cycle and maximum radiated power.

The site has been modeled with these assumptions to show the maximum RF energy density. Sitesafe believes this to be a *worst-case* analysis, based on best available data. Areas modeled to predict emissions greater than 100% of the applicable MPE level may not actually occur, but are shown as a *worst-case* prediction that could be realized real time. Sitesafe believes these areas to be safe for entry by occupationally trained personnel utilizing appropriate personal protective equipment (in most cases, a personal monitor).

Thus, at any time, if power density measurements were made, we believe the real-time measurements would indicate levels below those depicted in the RF emission diagram(s) in this report. By modeling in this way, Sitesafe has conservatively shown exclusion areas – areas that should not be entered without the use of a personal monitor, carriers reducing power, or performing real-time measurements to indicate real-time exposure levels.

Use of Generic Antennas

For the purposes of this report, the use of "Generic" as an antenna model, or "Unknown" for an operator means the information about a carrier, their FCC license and/or antenna information was not provided and could not be obtained while on site. In the event of unknown information, Sitesafe will use our industry specific knowledge of equipment, antenna models, and transmit power to model the site. If more specific information can be obtained for the unknown measurement criteria, Sitesafe recommends remodeling of the site utilizing the more complete and accurate data. Information about similar facilities is used when the service is identified and associated with a particular antenna. If no information is available regarding the transmitting service associated with an unidentified antenna, using the antenna manufacturer's published data regarding the antenna's physical characteristics makes more conservative assumptions.

Where the frequency is unknown, Sitesafe uses the closest frequency in the antenna's range that corresponds to the highest Maximum Permissible Exposure (MPE), resulting in a conservative analysis.

Definitions

5% Rule – The rules adopted by the FCC specify that, in general, at multiple transmitter sites actions necessary to bring the area into compliance with the guidelines are the shared responsibility of all licensees whose transmitters produce field strengths or power density levels at the area in question in excess of 5% of the exposure limits. In other words, any wireless operator that contributes 5% or greater of the MPE limit in an area that is identified to be greater than 100% of the MPE limit is responsible taking corrective actions to bring the site into compliance.

Compliance – The determination of whether a site is safe or not with regards to Human Exposure to Radio Frequency Radiation from transmitting antennas.

Decibel (dB) – A unit for measuring power or strength of a signal.

Duty Cycle – The percent of pulse duration to the pulse period of a periodic pulse train. Also, may be a measure of the temporal transmission characteristic of an intermittently transmitting RF source such as a paging antenna by dividing average transmission duration by the average period for transmission. A duty cycle of 100% corresponds to continuous operation.

Effective (or Equivalent) Isotropic Radiated Power (EIRP) – The product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna.

Effective Radiated Power (ERP) – In a given direction, the relative gain of a transmitting antenna with respect to the maximum directivity of a half wave dipole multiplied by the net power accepted by the antenna from the connecting transmitter.

Gain (of an antenna) – The ratio of the maximum intensity in a given direction to the maximum radiation in the same direction from an isotropic radiator. Gain is a measure of the relative efficiency of a directional antennas as compared to an omni directional antenna.

General Population/Uncontrolled Environment – Defined by the FCC, as an area where RFR exposure may occur to persons who are **unaware** of the potential for exposure and who have no control of their exposure. General Population is also referenced as General Public.

Generic Antenna – For the purposes of this report, the use of "Generic" as an antenna model means the antenna information was not provided and could not be obtained while on site. In the event of unknown information, Sitesafe will use our industry specific knowledge of antenna models to select a worst case scenario antenna to model the site.

Isotropic Antenna – An antenna that is completely non-directional. In other words, an antenna that radiates energy equally in all directions.

Maximum Measurement – This measurement represents the single largest measurement recorded when performing a spatial average measurement.

Maximum Permissible Exposure (MPE) – The rms and peak electric and magnetic field strength, their squares, or the plane-wave equivalent power densities associated with these fields to which a person may be exposed without harmful effect and with acceptable safety factor.

Occupational/Controlled Environment – Defined by the FCC, as an area where Radio Frequency Radiation (RFR) exposure may occur to persons who are **aware** of the potential for exposure as a condition of employment or specific activity and can exercise control over their exposure.

OET Bulletin 65 – Technical guideline developed by the FCC's Office of Engineering and Technology to determine the impact of Radio Frequency radiation on Humans. The guideline was published in August 1997.

***OSHA* (Occupational Safety and Health Administration)** – Under the Occupational Safety and Health Act of 1970, employers are responsible for providing a safe and healthy workplace for their employees. OSHA's role is to promote the safety and health of America's working men and women by setting and enforcing standards; providing training, outreach and education; establishing partnerships; and encouraging continual process improvement in workplace safety and health. For more information, visit www.osha.gov.

Radio Frequency Radiation – Electromagnetic waves that are propagated from antennas through space.

Spatial Average Measurement – A technique used to average a minimum of ten (10) measurements taken in a ten (10) second interval from zero (0) to six (6) feet. This measurement is intended to model the average energy an average sized human body will absorb while present in an electromagnetic field of energy.

Transmitter Power Output (TPO) – The radio frequency output power of a transmitter's final radio frequency stage as measured at the output terminal while connected to a load.

Appendix C – Rules & Regulations

Explanation of Applicable Rules and Regulations

The FCC has set forth guidelines in OET Bulletin 65 for human exposure to radio frequency electromagnetic fields. Specific regulations regarding this topic are listed in Part 1, Subpart I, of Title 47 in the Code of Federal Regulations. Currently, there are two different levels of MPE - General Public MPE and Occupational MPE. An individual classified as Occupational can be defined as an individual who has received appropriate RF training and meets the conditions outlined below. General Public is defined as anyone who does not meet the conditions of being Occupational. FCC and OSHA Rules and Regulations define compliance in terms of total exposure to total RF energy, regardless of location of or proximity to the sources of energy.

It is the responsibility of all licensees to ensure these guidelines are maintained at all times. It is the ongoing responsibility of all licensees composing the site to maintain ongoing compliance with FCC rules and regulations. Individual licensees that contribute less than 5% MPE to any total area out of compliance are not responsible for corrective actions.

OSHA has adopted and enforces the FCC's exposure guidelines. A building owner or site manager can use this report as part of an overall RF Health and Safety Policy. It is important for building owners/site managers to identify areas in excess of the General Population MPE and ensure that only persons qualified as Occupational are granted access to those areas.

Occupational Environment Explained

The FCC definition of Occupational exposure limits apply to persons who:

- are exposed to RF energy as a consequence of their employment;
- have been made aware of the possibility of exposure; and
- can exercise control over their exposure.

OSHA guidelines go further to state that persons must complete RF Safety Awareness training and must be trained in the use of appropriate personal protective equipment.

In order to consider this site an Occupational Environment, the site must be controlled to prevent access by any individuals classified as the General Public. Compliance is also maintained when any non-occupational individuals (the General Public) are prevented from accessing areas indicated as Red or Yellow in the attached RF Emissions diagram. In addition, a person must be aware of the RF environment into which they are entering. This can be accomplished by an RF Safety Awareness class, and by appropriate written documentation such as this Site Compliance Report.

All Crown Castle employees who require access to this site must complete RF Safety Awareness training and must be trained in the use of appropriate personal protective equipment.

Appendix D – General Safety Recommendations

The following are *general recommendations* appropriate for any site with accessible areas in excess of 100% General Public MPE. These recommendations are not specific to this site. These are safety recommendations appropriate for typical site management, building management, and other tenant operations.

1. All individuals needing access to the main site (or the area indicated to be in excess of General Public MPE) should wear a personal RF Exposure monitor, successfully complete proper RF Safety Awareness training, and have and be trained in the use of appropriate personal protective equipment.

2. All individuals needing access to the main site should be instructed to read and obey all posted placards and signs.

3. The site should be routinely inspected and this or similar report updated with the addition of any antennas or upon any changes to the RF environment including:

- adding new antennas that may have been located on the site
- removing of any existing antennas
- changes in the radiating power or number of RF emitters

4. Post the appropriate **NOTICE**, **CAUTION,** or **WARNING** sign at the main site access point(s) and other locations as required. Note: Please refer to RF Exposure Diagrams in the report above, to inform everyone who has access to this site that beyond posted signs there may be levels in excess of the limits prescribed by the FCC. The signs below are examples of signs meeting FCC guidelines.

5. Ensure that the site door remains locked (or appropriately controlled) to deny access to the general public if deemed as policy by the building/site owner.

6. For a General Public environment the four color levels identified in this analysis can be interpreted in the following manner:

- Areas indicated as Gray are at 5% of the General Public MPE limits or below. This level is safe for a worker to be in at any time.
- Green represents areas predicted to be between 5% and 20% of the General Public MPE limits. This level is safe for a worker to be in at any time.

- Yellow represents areas predicted to be between 20% and 100% of the General Public MPE limits. This level is safe for a worker to be in at any time.
- Red areas indicated predicted levels greater than 100% of the General Public MPE limits. This level is not safe for the General Public to be in.

7. For an Occupational environment the four color levels identified in this analysis can be interpreted in the following manner:

- Areas indicated as Gray are at 5% of the Occupational MPE limits or below. This level is safe for a worker to be in at any time.
- Green represents areas predicted to be between 5% and 20% of the Occupational MPE limits. This level is safe for a worker to be in at any time.
- Yellow represents areas predicted to be between 20% and 100% of the Occupational MPE limits. Only individuals that have been properly trained in RF Health and Safety should be allowed to work in this area. This is not an area that is suitable for the General Public to be in.
- Red areas indicated predicted levels greater than 100% of the Occupational MPE limits. This level is not safe for the Occupational worker to be in for prolonged periods of time. Special procedures must be adhered to such as lock out tag out procedures to minimize the workers exposure to EME.

8. Use of a Personal Protective Monitor: When working around antennas, Sitesafe strong recommends the use of a Personal Protective Monitor (PPM). Wearing a PPM will properly forewarn the individual prior to entering an RF exposure area.

Keep a copy of this report available for all persons who must access the site. They should read this report and be aware of the potential hazards with regards to RF and MPE limits.

Additional Information

Additional RF information is available by visiting both www.Sitesafe.com and www.fcc.gov/oet/rfsafety. OSHA has additional information available at: http://www.osha-slc.gov/SLTC/radiofrequencyradiation.

EXHIBIT D

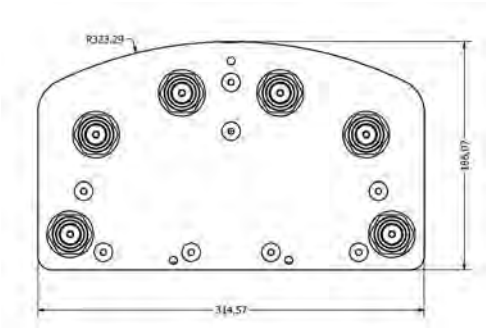
HTXCWW63111414Fx00

XXX-Pol | TriBand VET Panel | 63° | 11.0 / 14.0 / 14.0 dBi

Electrical Characteristics	696-960 MHz		2 x 1710-2170 MHz		
Frequency bands (MHz)	696-806	806-896	1710-1880	1850-1990	1900-2170
Polarization	±45°		±45°		
Horizontal beamwidth	70°	65°	65°	63°	61°
Vertical beamwidth	37°	35°	18°	18°	18°
Gain	10.5 dBi	11.0 dBi	13.5 dBi	14.0 dBi	14.0 dBi
Electrical downtilt	0°		0°		
Impedance	50Ω		50Ω		
VSWR	≤1.5:1		≤1.5:1		
Front-to-back ratio	> 25 dB	> 25 dB	> 25 dB	> 25 dB	> 25 dB
Isolation between ports	25 dB		> 25 dB		
Input power	500 W		300 W		
IM3 (2x20W carriers)	< -153 dBc		< -153 dBc		
Lightning protection	Direct Ground				
Connector(s)	6 Ports / 7/16 DIN / Female / Bottom				
Mechanical Characteristics					
Dimensions Length x Width x Depth	589 x 305 x 180 mm		23.2 x 12.0 x 7.1 in		
Weight without mounting brackets	<9.1 kg		<20 lbs		
Survival wind speed	200 km/hr		125 mph		
Wind area	Front: 0.18 m^2; Side: 0.11 m^2		Front: 1.9 ft^2; Side: 1.1 ft^2		
Wind loads (160 km/hr or 100 mph)	Front: 219 N; Side: 129 N		Front: 49 lbf; Side: 29 lbf		

Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	MKS04P01	40-115 mm 2.0-4.5 in	2.9 kg 6.4 lbs
2-Point Mounting & Downtilt Bracket Kit	MKS04T03	40-115 mm 2.0-4.5 in	4.1 kg 9.0 lbs

Bottom View

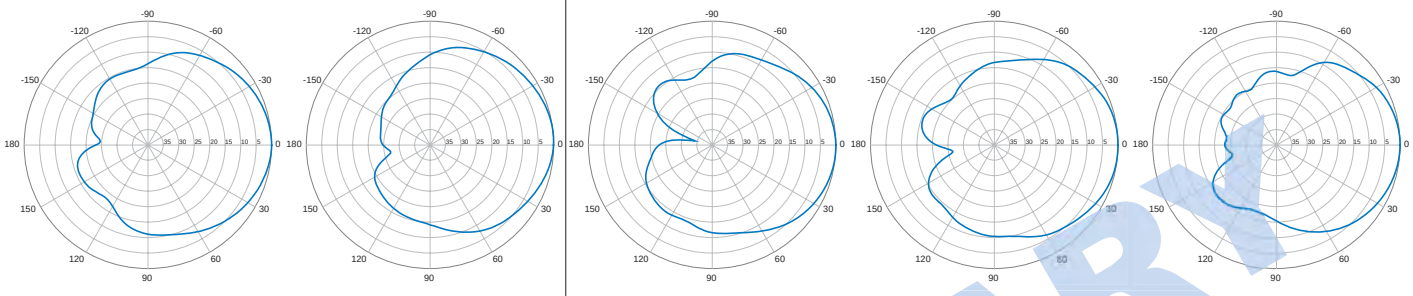


Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

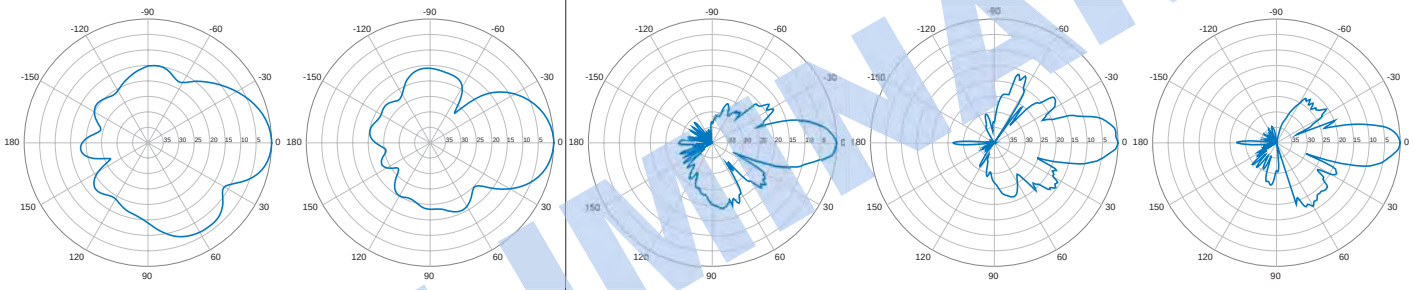
HTXCWW63111414Fx00

XXX-Pol | TriBand VET Panel | 63° | 11.0 / 14.0 / 14.0 dBi

696-896 MHz | **1710-2170 MHz**



Horizontal | 696-806 MHz | Horizontal | 806-896 MHz | Horizontal | 1710-1880 MHz | Horizontal | 1850-1990 MHz | Horizontal | 1900-2170 MHz



0° | Vertical | 696-806 MHz | 0° | Vertical | 806-896 MHz | 0° | Vertical | 1710-1880 MHz | 0° | Vertical | 1850-1990 MHz | 0° | Vertical | 1900-2170 MHz