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Use Permit Application Packet  
Eagle Vines – Sprint Facility

SF 25XC335

FILE # P19-00337



A Tradition of Stewardship  
A Commitment to Service

NAPA COUNTY  
PLANNING, BUILDING, AND ENVIRONMENTAL SERVICES  
1195 Third Street, Suite 210, Napa, California, 94559 • (707) 253-4417

APPLICATION FOR TELECOM SITE PLAN APPROVAL

**FOR OFFICE USE ONLY**

ZONING DISTRICT: \_\_\_\_\_ Date Submitted: \_\_\_\_\_

TYPE OF APPLICATION: \_\_\_\_\_ Date Published: \_\_\_\_\_

REQUEST: \_\_\_\_\_ Date Complete: \_\_\_\_\_

**TO BE COMPLETED BY APPLICANT**

(Please type or print legibly)

PROJECT NAME: Napa Airport Hwy 12 + 29 Relo

Assessor's Parcel #: 057-060-007 Existing Parcel Size: \_\_\_\_\_

Site Address/Location: 580 South Kelly Rd, American Canyon Ca 94503  
No. Street City State Zip

Property Owner's Name: Napa Sanitation (Jeff Tucker)

Mailing Address: 1515 Soscol Ferry Rd, Napa, Ca 94558  
No. Street City State Zip

Telephone #: (707) 258-6012 Fax #: ( ) - \_\_\_\_\_ E-Mail: jtucker@napasan.com

Applicant's Name: Jeremy Jordan (Precision SD)

Mailing Address: 5098 Foothills Blvd. 3-119 Roseville, Ca 95747  
No. Street City State Zip

Telephone #: 916 918 - 9322 Fax #: ( ) - \_\_\_\_\_ E-Mail: jeremy@precisionSD.com

Status of Applicant's Interest in Property: Representative of Sprint

Representative Name: Jeremy Jordan on behalf of Sprint

Mailing Address: 5098 Foothills Blvd. 3-119 Roseville, Ca 95747  
No. Street City State Zip

Telephone #: 916 918 - 9322 Fax #: ( ) - \_\_\_\_\_ E-Mail: jeremy@precisionSD.com

I certify that all the information contained in this application, including but not limited to the information sheet, water supply/waste disposal information sheet, site plan, floor plan, building elevations, water supply/waste disposal system site plan and toxic materials list, is complete and accurate to the best of my knowledge. I hereby authorize such investigations including access to County Assessor's Records as are deemed necessary by the County Planning Division for preparation of reports related to this application, including the right of access to the property involved.

[Signature] Jeff A. Tucker District 7/8/2019  
Signature of Property Owner Print Name

[Signature] Jeremy Jordan 7/26/19  
Signature of Applicant Print Name Date

**TO BE COMPLETED BY PLANNING, BUILDING, AND ENVIRONMENTAL SERVICES**

Application Fee Deposit: \$ \_\_\_\_\_ Receipt No. \_\_\_\_\_ Received by \_\_\_\_\_ Date: \_\_\_\_\_

# BASIC INFORMATION SHEET

## - Telecommunications Facilities -

**I. GENERAL**

- A. Type of service(s) provided:  cellular telephone  cellular radio  pcs  paging  tv  
 broadcast radio  other (please specify) \_\_\_\_\_
- B. Service(s) offered to:  
 general public  private business  police/fire/emergency medical aid  other government
- C. Project phases:  one  two  three  more (please specify number) \_\_\_\_\_
- D. Estimated completion year for each phase: phase 1: 2019 phase 2: \_\_\_\_\_ phase 3: \_\_\_\_\_
- E. Actual time to construct each phase:  less than 3 months  more than 3 months
- F. Construction days:  Monday - Friday  other (please specify) \_\_\_\_\_
- G. Construction hours:  7:30 am - 5:30 pm  other (please specify) \_\_\_\_\_ am to \_\_\_\_\_ pm
- H. Additional licenses/approvals required: District: \_\_\_\_\_ Regional: \_\_\_\_\_ State: \_\_\_\_\_  
 Federal \_\_\_\_\_
- I. Proposed facility complies with all FCC rules, regulations & standards?  yes  no
- J. Open space easements or other similar use restrictions on the property?  yes  no
- K. Property contains other telecommunications facilities or Public Or Quasi-Public Uses?  yes  no
- L. Facilities shared with other telecommunication facilities:  
 parking areas  access roads  utilities  building(s)/enclosure(s)

**II. TYPICAL OPERATION**

	Existing	Proposed
A. Days of operation:	<u>24/7</u>	<u>24/7</u>
B. Expected hours of operation:	<u>24/7</u>	<u>24/7</u>
C. Anticipated average number of visits to site		
• during construction:	<u>1</u> trips/day	<u>1</u> trips/day
• after fully operational:	<u>2</u> trips/month	<u>2</u> trips/month
D. Transmitting frequency(ies):	<u>800, 1900, 2500</u>	<u>800, 1900, 2500</u>
E. Transmitting direction(s) (e.g., SW 120°, 360°, etc):	<u>330°, 75°, 145°</u>	<u>330°, 75°, 145°</u>
F. Effective radiated power:	_____ watts	<u>7830</u> watts
G. Backup generator testing		
• days: <input type="checkbox"/> Monday - Friday <input type="checkbox"/> other (please specify) _____		
• hours: <input type="checkbox"/> 8:30 am - 4:30 pm <input type="checkbox"/> other (please specify) _____ am to _____ pm		

**III. BASIC INSTALLATION**

- A. Number of antennas proposed: 4 (initial configuration) 7 (ultimate configuration)
- B. Type of antennas proposed (e.g., whip, panel, etc): 3 panel / 1 mw (initial configuration)  
1 panel / 1 mw (ultimate configuration)

- C. Size of antennas proposed (dimensions): 73.8" x 11.8" x 5.9" (initial configuration)  
72" x 21" x 8" (ultimate configuration)
- D. Distance between back of wall-mounted antenna & surface of wall \_\_\_\_\_ inches
- E. Type of dish construction:  mesh  solid
- F. Number, height & diameter of tower(s) or mast(s): \_\_\_\_\_ feet
- G. Height of telecommunication facility: 55 ft (ultimate configuration) (measured from natural grade below center of tower to highest point on the tower or the highest antenna, whichever is higher)  
55 ft (initial configuration)
- H. Capacity of tower:
  - Number of antennas it will support: \_\_\_\_\_
  - Weight of antennas & equipment it will support: \_\_\_\_\_ lbs
- I. Gross cross-sectional area (silhouette): \_\_\_\_\_ ft<sup>2</sup>
- J. Material: tower: Steel antenna: Fiberglass
- K. Color: tower: Brown/Green antenna: Green
- L. Special painting/lighting required under FAA regulations:  yes  no
- M. Width of fire protection zone installed: Graveled area: \_\_\_\_\_ ft Fuel modification zone: \_\_\_\_\_ ft
- N. Domestic/emergency water supply available:  yes  no
- O. Bathroom(s) to be installed at facility:  yes  no
- P. Hazardous/toxic materials present at facility:  yes  no

IV. BUILDING(S)/ENCLOSURE(S)

- A. Size: \_\_\_\_\_ ft<sup>2</sup>  new construction  existing facility
- B. Height at highest point: 6 feet
- C. Type of construction (e.g., wood-frame): Chain linked Fence
- D. Exterior materials: walls: NA roof: NA
- E. Exterior color: walls: NA roof: NA
- F. Type of emergency rapid entry system to be installed: NA
- G. Fire rating of interior surfaces: NA
- H. Type of interior fire extinguishing system to be installed: NA
- I. Method used to protect openings against penetration by fire or wind-blow embers: NA
- J. Width of fire protection zone installed: Graveled area: NA ft fuel modification zone: NA ft

V. ACCESS ROAD

- A. Relocation/extension required:  yes  no
- B. Length of new road required: NA feet
- C. Width including shoulders: existing: 18 feet proposed: NA feet
- D. Road surface: existing: Asphalt proposed: NA
- E. Number of turnouts: existing: 2 proposed: NA
- F. Width of pavement at turnouts: existing: 18 feet proposed: NA feet
- G. Distance between turnouts: existing: 350 feet proposed: NA feet

**VI. OTHER ANCILLARY FACILITIES**

- A. Type of self-contained power supply to be installed:  None  Batteries  Generator  
 Other (please specify) \_\_\_\_\_
- B. Number of hours self-contained power supply will operate facility: \_\_\_\_\_ hours
- C. Type of exterior night lighting proposed  
• Tower: \_\_\_\_\_  
• Buildings: \_\_\_\_\_  
• Other (please specify): \_\_\_\_\_
- D. Nature of light shields to be installed:  none  other (please specify): \_\_\_\_\_
- E. Type of signage proposed:  none  address  facility identification  
 other (please specify) \_\_\_\_\_
- F. Size of parking area planned:  
• existing: 100 ft<sup>2</sup> • proposed: NA ft<sup>2</sup>
- G. Utility line extensions required:  
• Power lines: \_\_\_\_\_ feet • telecom lines: \_\_\_\_\_ feet  
• Other (specify): \_\_\_\_\_ feet

**VII. WATER SUPPLY (IF ANY) NA**

- A. Drinking  
• Proposed source of water (e.g., spring, well, mutual water co, city, district, etc.): \_\_\_\_\_  
• Name of proposed water supplier (if water co, city, district, c): \_\_\_\_\_  
• Annexation needed:  yes  no
- B. Emergency (Fire)  
• Proposed source of water (e.g., spring, well, mutual water co, city, district, etc.): \_\_\_\_\_  
• Name of proposed water supplier (if water co, city, district, c): \_\_\_\_\_  
• Annexation needed:  yes  no  
• Capacity of water storage system: \_\_\_\_\_ gallons  
• Nature of storage facility (e.g., tank, reservoir, swimming pool, etc): \_\_\_\_\_

**VIII. WASTE DISPOSAL NA**

- A. Sewage  
• Disposal method (e.g., septic system, ponds, community system, district, etc): \_\_\_\_\_  
• Name of disposal agent (if district, city, community system, etc used): \_\_\_\_\_
- B. Operational solid waste  
• Disposal location (e.g., on-site, landfill, garbage co, etc): \_\_\_\_\_
- C. Grading spoils/construction debris  
• Disposal location (e.g., on-site, landfill, construction, etc): \_\_\_\_\_
- D. Hazardous/toxic materials  
• Disposal method (on-site, landfill, garbage co, waste hauler, etc.): \_\_\_\_\_  
• Name of disposal agent (if landfill, garbage co, private hauler, etc): \_\_\_\_\_



**IX. SETBACKS**

- A. Radial distance of tower/antenna from nearest
- Property line: 58 feet
  - Other telecommunication tower: \_\_\_\_\_ feet
  - Other type of telecommunication facility: \_\_\_\_\_ feet
  - Readily visible uncamouflaged/unscrewed telecommunication facility: NA feet
  - Dwelling: \_\_\_\_\_ feet
    - Occupied by property owner or his family:  yes  no
  - Non-residential structure regularly occupied by people: 235 feet
  - Outdoor area regularly occupied by people: 28 feet
  - Trail, park or other outdoor recreation area: 28 feet
- B. Distance of guy wire anchors from nearest property line: NA feet

**X. GROUND/VEGETATION DISTURBANCE**

- A. Slope of area(s) to be disturbed: maximum: 0 % average: 4 %
- B. Height of highest
- New cut or existing cut to be modified: \_\_\_\_\_ feet
  - New fill or existing fill to be modified: \_\_\_\_\_ feet
  - New combination cut and fill or existing combination cut and fill to be modified: 1 feet
- C. Number, species, diameter and height of trees to be removed: NA
- |       |       |              |     |       |           |
|-------|-------|--------------|-----|-------|-----------|
| _____ | _____ | _____ inches | BDH | _____ | feet tall |
| _____ | _____ | _____ inches | BDH | _____ | feet tall |
| _____ | _____ | _____ inches | BDH | _____ | feet tall |
- D. Trees overhang or extend to within 10 feet of edges of access road.  yes  no
- E. Trees present within 100 feet of any area to be disturbed:  yes  no
- F. Ground/vegetation disturbance or storage/parking of equipment/vehicles may occur within the drip Line of any trees:  yes  no
- G. Vegetation replanting program proposed:  yes  no (if yes please provide replanting plans)

*Handwritten signature and date: 11.01.2009*


## INDEMNIFICATION AGREEMENT

Pursuant to Chapter 1.30 of the Napa County Code, as part of the application for a discretionary land use project approval for the project identified below, Applicant agrees to defend, indemnify, release and hold harmless Napa County, its agents, officers, attorneys, employees, departments, boards and commissions (hereafter collectively "County") from any claim, action or proceeding (hereafter collectively "proceeding") brought against County, the purpose of which is to attack, set aside, void or annul the discretionary project approval of the County, or an action relating to this project required by any such proceeding to be taken to comply with the California Environmental Quality Act by County, or both. This indemnification shall include, but not be limited to damages awarded against the County, if any, and cost of suit, attorneys' fees, and other liabilities and expenses incurred in connection with such proceeding that relate to this discretionary approval or an action related to this project taken to comply with CEQA whether incurred by the Applicant, the County, and/or the parties initiating or bringing such proceeding. Applicant further agrees to indemnify the County for all of County's costs, attorneys' fees, and damages, which the County incurs in enforcing this indemnification agreement.

Applicant further agrees, as a condition of project approval, to defend, indemnify and hold harmless the County for all costs incurred in additional investigation of or study of, or for supplementing, redrafting, revising, or amending any document (such as an EIR, negative declaration, specific plan, or general plan amendment) if made necessary by said proceeding and if the Applicant desires to pursue securing approvals which are conditioned on the approval of such documents.

In the event any such proceeding is brought, County shall promptly notify the Applicant of the proceeding, and County shall cooperate fully in the defense. If County fails to promptly notify the Applicant of the proceeding, or if County fails to cooperate fully in the defense, the Applicant shall not thereafter be responsible to defend, indemnify, or hold harmless the County. The County shall retain the right to participate in the defense of the proceeding if it bears its own attorneys' fees and costs, and defends the action in good faith. The Applicant shall not be required to pay or perform any settlement unless the settlement is approved by the Applicant.

  
\_\_\_\_\_  
Applicant

 For Napa Solicitor District  
\_\_\_\_\_  
Property Owner (if other than Applicant)

7/26/19  
\_\_\_\_\_  
Date

Sprint SF 25XC335  
\_\_\_\_\_  
Project Identification

## HAZARDOUS MATERIALS INFORMATION SHEET

List all acutely/extremely hazardous materials that will be used or store at the site:

<u>C.A.S.#</u>	<u>Chemical Name</u>	<u>Physical State</u>	<u>Largest Amount</u>
<u>7439-92-1</u>	<u>Lead (Pb)</u>	<u>Solid</u>	<u>2660 lbs</u>
<u>7664-93-9</u>	<u>Electrolyte: Sulfuric Acid</u>	<u>Liquid</u>	<u>49.8 Gal</u>
<u>68334-30-5</u>	<u>Diesel</u>	<u>Liquid</u>	<u>132 Gal</u>
_____	_____	_____	_____
_____	_____	_____	_____

List the hazardous materials that are stored or handled at any one time, equal to or greater than any one of the following amounts: 500 pounds of solids, 55 gallons of liquids, 200 cubic feet of compressed gasses (s.t.p.). Aggregate amounts of the same hazard class are considered one type of hazardous material and must be listed individually below.

<u>C.A.S.#</u>	<u>Chemical Name</u>	<u>Physical State</u>	<u>Largest Amount</u>
<u>7432-92-1</u>	<u>Lead (Pb)</u>	<u>Solid</u>	<u>2660 lbs</u>
<u>68334-30-5</u>	<u>Diesel</u>	<u>Liquid</u>	<u>132 Gal</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

If you are unsure about the C.A.S.#, etc., your distributor or supplier should be able to provide you with a M.S.D.S. (Material Safety Data Sheet) which will contain that information. Your Workman's Compensation Insurer and the local libraries may also have access to this information.

If you are a tenant, you are responsible for proper notification to the property owner.



**Sprint & AT&T Mobility • Proposed Base Stations (Site Nos. SF35xc335 & CVL03781)  
580 South Kelly Road • American Canyon, California**

**Statement of Hammett & Edison, Inc., Consulting Engineers**

The firm of Hammett & Edison, Inc., Consulting Engineers, has been retained by Sprint and AT&T Mobility, personal wireless telecommunications carriers, to evaluate the base stations (Site Nos. SF35xc335 and CVL03781, respectively) proposed to be located at 580 South Kelly Road in American Canyon, California, for compliance with appropriate guidelines limiting human exposure to radio frequency (“RF”) electromagnetic fields.

**Executive Summary**

Sprint and AT&T propose to upgrade their base stations at Eagle Vines Golf Club, located at 580 South Kelly Road near American Canyon. The proposed operations will comply with the FCC guidelines limiting public exposure to RF energy.

**Prevailing Exposure Standards**

The U.S. Congress requires that the Federal Communications Commission (“FCC”) evaluate its actions for possible significant impact on the environment. A summary of the FCC’s exposure limits is shown in Figure 1. These limits apply for continuous exposures and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health. The most restrictive limit for exposures of unlimited duration at several wireless service bands are as follows:

Wireless Service Band	Transmit Frequency	“Uncontrolled” Public Limit	Occupational Limit (5 times Public)
Microwave (point-to-point)	1–80 GHz	1.0 mW/cm <sup>2</sup>	5.0 mW/cm <sup>2</sup>
Millimeter-wave	24–47	1.0	5.0
Part 15 (WiFi & other unlicensed)	2–6	1.0	5.0
CBRS (Citizens Broadband Radio)	3,550 MHz	1.0	5.0
BRS (Broadband Radio)	2,490	1.0	5.0
WCS (Wireless Communication)	2,305	1.0	5.0
AWS (Advanced Wireless)	2,110	1.0	5.0
PCS (Personal Communication)	1,930	1.0	5.0
Cellular	869	0.58	2.9
SMR (Specialized Mobile Radio)	854	0.57	2.85
700 MHz	716	0.48	2.4
600 MHz	617	0.41	2.05
[most restrictive frequency range]	30–300	0.20	1.0

**General Facility Requirements**

Base stations typically consist of two distinct parts: the electronic transceivers (also called “radios” or “channels”) that are connected to the traditional wired telephone lines, and the passive antennas that send the wireless signals created by the radios out to be received by individual subscriber units. The

**Sprint & AT&T Mobility • Proposed Base Stations (Site Nos. SF35xc335 & CVL03781)  
580 South Kelly Road • American Canyon, California**

transceivers are often located at ground level and are connected to the antennas by coaxial cables. A small antenna for reception of GPS signals is also required, mounted with a clear view of the sky. Because of the short wavelength of the frequencies assigned by the FCC for wireless services, the antennas require line-of-sight paths for their signals to propagate well and so are installed at some height above ground. The antennas are designed to concentrate their energy toward the horizon, with very little energy wasted toward the sky or the ground. This means that it is generally not possible for exposure conditions to approach the maximum permissible exposure limits without being physically very near the antennas.

**Computer Modeling Method**

The FCC provides direction for determining compliance in its Office of Engineering and Technology Bulletin No. 65, “Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radio Frequency Radiation,” dated August 1997. Figure 2 describes the calculation methodologies, reflecting the facts that a directional antenna’s radiation pattern is not fully formed at locations very close by (the “near-field” effect) and that at greater distances the power level from an energy source decreases with the square of the distance from it (the “inverse square law”). The conservative nature of this method for evaluating exposure conditions has been verified by numerous field tests.

**Site and Facility Description**

Based upon information provided by Sprint and AT&T, including zoning drawings by Borges Architectural Group, dated July 26 and May 21, 2019, respectively, the carriers presently each have three directional panel antennas installed on separate guyed poles temporarily sited on the north side of the entrance to Eagle Vines Golf Club, located at 580 South Kelly Road in unincorporated Napa County, about a mile north of American Canyon.

Sprint proposes to remove its installation and to install antennas on a 55-foot steel pole,\* configured to resemble a pine tree, to be sited about 650 feet north of the existing pole, along the western edge of the driving range. Sprint proposes to install six CommScope directional panel antennas – three each Models TTTT65AP-1XR and NNVV-65B – at an effective height of about 48½ feet above ground. The antennas would employ up to 4° downtilt and would be oriented in identical pairs toward 75°T, 165°T, and 300°T. The maximum effective radiated power in any direction would be 7,830 watts, representing simultaneous operation at 4,310 watts for BRS, 2,850 watts for PCS, and 670 watts for SMR. Also proposed to be located on the pole is a microwave “dish” antenna, for interconnection of this site with others in the Sprint network.

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\* Foliage atop the pole puts the overall height at about 60 feet.

**Sprint & AT&T Mobility • Proposed Base Stations (Site Nos. SF35xc335 & CVL03781)  
580 South Kelly Road • American Canyon, California**

AT&T proposes to remove its installation and to install antennas on a 50-foot pole,<sup>†</sup> configured to resemble a pine tree, to be sited about 150 feet further north of the proposed Sprint pole, along the northern edge of the driving range. AT&T proposes to install nine directional panel antennas – three Quintel Model QS46512-2, three CommScope Model NNHH-65A, and three CommScope Model SBNHH-1D65A – in identical groups of three at an effective height of about 47 feet above ground, employing up to 3° downtilt and oriented toward 100°T, 220°T, and 330°T, to provide service in all directions. The maximum effective radiated power in any direction would be 15,000 watts, representing simultaneous operation at 3,600 watts for WCS, 5,110 watts for AWS, 2,910 watts for PCS, 1,580 watts for cellular, and 1,800 watts for 700 MHz service.

### **Study Results**

For a person anywhere at ground, including golfers on the golf course, the maximum RF exposure level due to the proposed Sprint and AT&T operations together, including the contribution of the microwave antenna, is calculated to be 0.049 mW/cm<sup>2</sup>, which is 7.1% of the applicable public exposure limit. The maximum calculated cumulative level at the second-floor elevation of any nearby building<sup>‡</sup> is 5.6% of the public limit. It should be noted that these results include several “worst-case” assumptions and therefore are expected to overstate actual power density levels.

### **No Recommended Compliance Measures**

Due to their mounting locations and height, the Sprint and AT&T antennas would not be accessible to unauthorized persons, and so no measures are necessary to comply with the FCC public exposure guidelines. It is presumed that the carriers will, as FCC licensees, take adequate steps to ensure that their employees or contractors receive appropriate training and comply with FCC occupational exposure guidelines whenever work is required near the antennas themselves.

### **Conclusion**

Based on the information and analysis above, it is the undersigned’s professional opinion that operation of the base stations proposed by Sprint and AT&T Mobility at 580 South Kelly Road near American Canyon, California, will comply with the prevailing standards for limiting public exposure to radio frequency energy and, therefore, will not for this reason cause a significant impact on the environment. The highest calculated level in publicly accessible areas is much less than the prevailing standards allow for exposures of unlimited duration. This finding is consistent with measurements of actual exposure conditions taken at other operating base stations.

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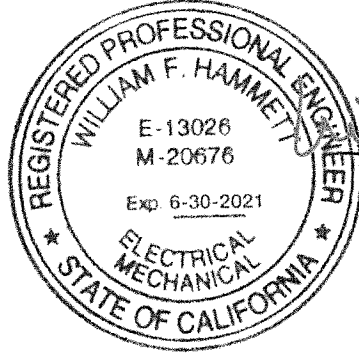
<sup>†</sup> Foliage atop the pole puts the overall height at about 55 feet.

<sup>‡</sup> Including the residence located about 200 feet to the northwest of the Sprint site and about 115 feet to the west of the AT&T site, based on review of aerial photographs from Google Maps.

**Sprint & AT&T Mobility • Proposed Base Stations (Site Nos. SF35xc335 & CVL03781)  
580 South Kelly Road • American Canyon, California**

**Authorship**

The undersigned author of this statement is a qualified Professional Engineer, holding California Registration Nos. E-13026 and M-20676, which expire on June 30, 2021. This work has been carried out under his direction, and all statements are true and correct of his own knowledge except, where noted, when data has been supplied by others, which data he believes to be correct.



William F. Hammett, P.E.  
707/996-5200

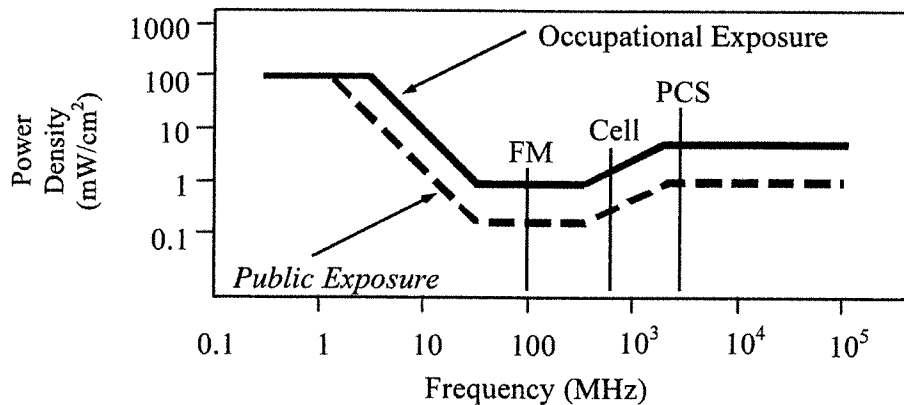
September 19, 2019

## FCC Radio Frequency Protection Guide

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission (“FCC”) to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The FCC adopted the limits from Report No. 86, “Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” published in 1986 by the Congressionally chartered National Council on Radiation Protection and Measurements (“NCRP”). Separate limits apply for occupational and public exposure conditions, with the latter limits generally five times more restrictive. The more recent standard, developed by the Institute of Electrical and Electronics Engineers and approved as American National Standard ANSI/IEEE C95.1-2006, “Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz,” includes similar limits. These limits apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health.

As shown in the table and chart below, separate limits apply for occupational and public exposure conditions, with the latter limits (in *italics* and/or dashed) up to five times more restrictive:

Frequency Applicable Range (MHz)	Electromagnetic Fields (f is frequency of emission in MHz)					
	Electric Field Strength (V/m)		Magnetic Field Strength (A/m)		Equivalent Far-Field Power Density (mW/cm <sup>2</sup> )	
0.3 – 1.34	614	<i>614</i>	1.63	<i>1.63</i>	100	<i>100</i>
1.34 – 3.0	614	<i>823.8/f</i>	1.63	<i>2.19/f</i>	100	<i>180/f<sup>2</sup></i>
3.0 – 30	1842/f	<i>823.8/f</i>	4.89/f	<i>2.19/f</i>	900/f <sup>2</sup>	<i>180/f<sup>2</sup></i>
30 – 300	61.4	<i>27.5</i>	0.163	<i>0.0729</i>	1.0	<i>0.2</i>
300 – 1,500	3.54√f	<i>1.59√f</i>	√f/106	<i>√f/238</i>	f/300	<i>f/1500</i>
1,500 – 100,000	137	<i>61.4</i>	0.364	<i>0.163</i>	5.0	<i>1.0</i>



Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits, and higher levels also are allowed for exposures to small areas, such that the spatially averaged levels do not exceed the limits. However, neither of these allowances is incorporated in the conservative calculation formulas in the FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) for projecting field levels. Hammett & Edison has built those formulas into a proprietary program that calculates, at each location on an arbitrary rectangular grid, the total expected power density from any number of individual radio sources. The program allows for the description of buildings and uneven terrain, if required to obtain more accurate projections.





# RFR.CALC™ Calculation Methodology

## Assessment by Calculation of Compliance with FCC Exposure Guidelines

The U.S. Congress required (1996 Telecom Act) the Federal Communications Commission (“FCC”) to adopt a nationwide human exposure standard to ensure that its licensees do not, cumulatively, have a significant impact on the environment. The maximum permissible exposure limits adopted by the FCC (see Figure 1) apply for continuous exposures from all sources and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health. Higher levels are allowed for short periods of time, such that total exposure levels averaged over six or thirty minutes, for occupational or public settings, respectively, do not exceed the limits.

### Near Field.

Prediction methods have been developed for the near field zone of panel (directional) and whip (omnidirectional) antennas, typical at wireless telecommunications base stations, as well as dish (aperture) antennas, typically used for microwave links. The antenna patterns are not fully formed in the near field at these antennas, and the FCC Office of Engineering and Technology Bulletin No. 65 (August 1997) gives suitable formulas for calculating power density within such zones.

For a panel or whip antenna, power density  $S = \frac{180}{\theta_{BW}} \times \frac{0.1 \times P_{net}}{\pi \times D \times h}$ , in mW/cm<sup>2</sup>,

and for an aperture antenna, maximum power density  $S_{max} = \frac{0.1 \times 16 \times \eta \times P_{net}}{\pi \times h^2}$ , in mW/cm<sup>2</sup>,

- where  $\theta_{BW}$  = half-power beamwidth of antenna, in degrees,
- $P_{net}$  = net power input to antenna, in watts,
- $D$  = distance from antenna, in meters,
- $h$  = aperture height of antenna, in meters, and
- $\eta$  = aperture efficiency (unitless, typically 0.5-0.8).

The factor of 0.1 in the numerators converts to the desired units of power density.

### Far Field.

OET-65 gives this formula for calculating power density in the far field of an individual RF source:

$$\text{power density } S = \frac{2.56 \times 1.64 \times 100 \times RFF^2 \times ERP}{4 \times \pi \times D^2}, \text{ in mW/cm}^2,$$

- where  $ERP$  = total ERP (all polarizations), in kilowatts,
- $RFF$  = three-dimensional relative field factor toward point of calculation, and
- $D$  = distance from antenna effective height to point of calculation, in meters.

The factor of 2.56 accounts for the increase in power density due to ground reflection, assuming a reflection coefficient of 1.6 (1.6 x 1.6 = 2.56). The factor of 1.64 is the gain of a half-wave dipole relative to an isotropic radiator. The factor of 100 in the numerator converts to the desired units of power density. This formula is used in a computer program capable of calculating, at thousands of locations on an arbitrary grid, the total expected power density from any number of individual radio frequency sources. The program also allows for the inclusion of uneven terrain in the vicinity, as well as any number of nearby buildings, to obtain more accurate projections.