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George Burylo
Director
Engineering Services

January 29, 2003

Mr. Scott T. Penner
Hurwittz & Sagarin LLC
147 North Broad Street
Milford, CT 06460

Subject: RF Exposure Compliance Analysis – Guilford, CT (CT03XC172)

Dear Mr. Penner:

At your request, Edwards and Kelcey, Inc. has performed a RF exposure compliance analysis of Sprint Sites USA's existing wireless communications facility at 1919 Boston Post Road, Guilford, CT. The updated report of site compliance is attached.

The calculations presented in the attached report demonstrate that the worst-case, maximum potential exposure level in publicly accessible ground level areas around the monopole from all antennas is only 36.43% of the FCC limit for continuous exposure of the general population.

Based on the RF analysis performed, the Sprint Sites USA wireless facility will be in full compliance with the FCC regulations concerning RF exposure control, and poses no RF health hazard to the surrounding community.

If you have any questions or require any additional information, please call me at 973-267-8830, extension 1250.

Regards,

George Burylo
Director – Engineering Services

Attachments

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RF Emissions Experts
AN EDWARDS AND KELCEY SERVICE

***Analysis and Report
of RF Exposure Levels
and Compliance with
FCC Regulations***

***Guilford Site
1919 Boston Post Road
Guilford, CT
CT03XC172***

***Prepared for
Sprint Sites USA***

January 29, 2003

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PROPRIETARY – SPRINT SITES USA AND EDWARDS AND KELCEY

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FCC RF COMPLIANCE ANALYSIS FOR

Sprint Sites USA

Guilford, CT Monopole

This site compliance report is organized as follows:

- Site Technical Data (supplied by client)
- Analysis Method and Assumptions
- The FCC RF Radiation Exposure Regulations
- Applicable Formulas
- Analysis Results
- Conclusion

SITE TECHNICAL DATA (For AT&T Wireless antenna type and mounting height change only. All other emission levels previously calculated and summarized.)

Facility type	150 ft. Monopole
Frequency band (transmit)	1900 MHz
Antenna types	Allgon 7250
Antenna major dimension (length)	5.1 ft
Maximum antenna gain	18.5 dBi
Antenna mounting height (above ground level)	102.6 ft.
Total number of antennas	6 (2 per sector)
Other transmitting facilities on monopole	Sprint PCS, Verizon, Nextel, Cingular and T-Mobile

ANALYSIS METHOD AND ASSUMPTIONS

Type of analysis	Maximum / ground at base
Area analyzed	0' to 500' from monopole
Classification of area	Uncontrolled (gen. pop.)
FCC Maximum Permissible Exposure (MPE) limit	See Report
Mathematical model	Point source, far field
Assumed ground reflection factor	100%
Assumed human height	6'0"
Vertical antenna discrimination	(not used in CT)

THE FCC RF RADIATION EXPOSURE REGULATIONS

This RF exposure analysis is based on the current FCC guidelines for human exposure to RF fields, which represent the consensus of federal agencies responsible for RF safety matters. Those agencies include the National Council on Radiation Protection and Measurements (NCRP), the Occupational Health and Safety Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), the American National Standards Institute (ANSI), the Environmental Protection Agency (EPA), and the Food and Drug Administration (FDA). In formulating its guidelines, the FCC also considered input from the public and technical community – notably the Institute of Electrical and Electronics Engineers (IEEE).

The FCC's RF exposure guidelines are incorporated in Section 1.1301 *et seq* of its Rules and Regulations. Those guidelines specify maximum permissible exposure (MPE) levels for both occupational and general population exposure on a continuous basis, as well as averaging times for each of those categories when and if exposure exceeds the specified continuous exposure limits. (The concept of averaging time will be ignored in this analysis, as the results show the potential exposure levels are far below those permitted even for continuous exposure.)

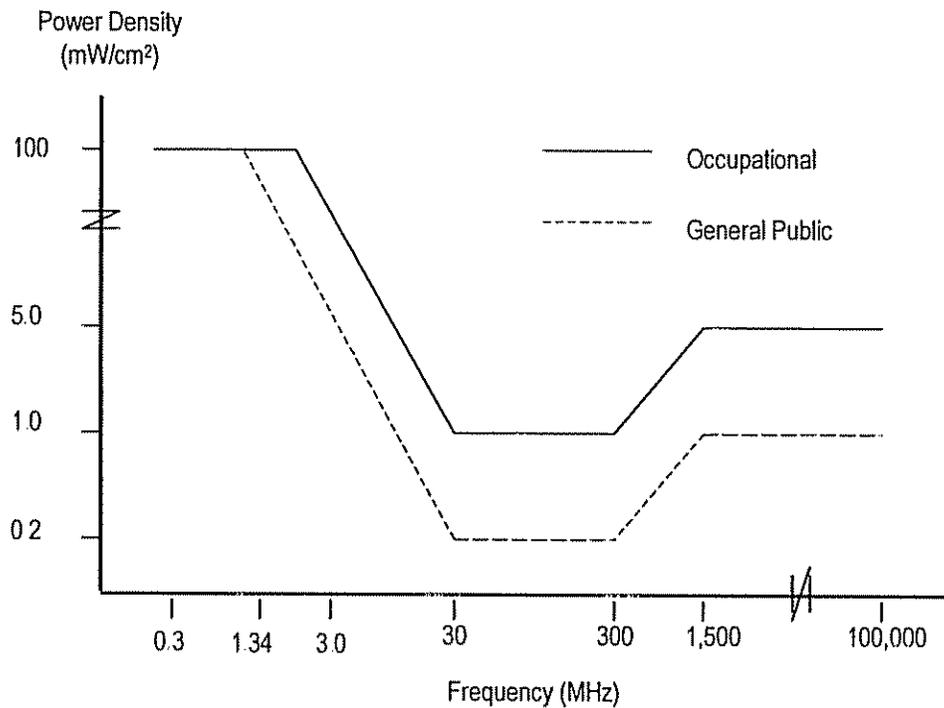
The specified continuous exposure MPE limits are based on known variation of human body susceptibility in different frequency ranges, and a Specific Absorption Rate (SAR) of 4 watts per kilogram, which is universally considered to accurately represent human capacity to dissipate incident RF energy (in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

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

The FCC's RF exposure limits are expressed in two equivalent forms, using alternative units of field strength (expressed in volts per meter, or V/m), and power density (expressed in milliwatts per square centimeter, or mW/cm²). The more popularly used reference unit is power density, as it is more easily understood. One milliwatt per square centimeter is approximately the energy impinging on an area roughly one-fourth the size of a dime from a light bulb emitting ten thousand times less than the energy of a common 100-watt bulb. The table below lists the FCC limits for both occupational and general population exposure to different radio frequencies.

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

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



FCC MPE limits – graphical representation

The FCC makes it clear that the MPE limits apply only in accessible areas. Fundamentally, in areas that are considered normally inaccessible, the exposure issue is moot.

APPLICABLE FORMULAS

According to FCC Bulletin OET65, different mathematical models apply to different distances around an antenna. At the height of the antenna, the breakpoint is the "far-field distance", calculated as the ratio of the square of the major dimension of the antenna divided by the signal wavelength. Beyond the far-field distance at the height of the antenna, as well as at ground-level underneath the antenna, a "far-field point source" model applies; within that distance, a "near-field" cylindrical model applies. The subsections below provide background on the two applicable models in the 1900 MHz band.

Far-Field Point Source Model

$$(1) \quad S \text{ [mW/cm}^2\text{]} = (4 * \text{EIRP}_{\text{max}} * \text{VertAntDisc}(\phi)) / (4 * \pi * R^2_{\text{cm}})$$

$$(2) \quad \text{FCC MPE limit} = 1.000 \text{ mW/cm}^2$$

$$(3) \quad \text{MPE}\% = 100 * (S / 1.000)$$

where:

S	=	Calculated power density
4 (in numerator)	=	100% field ground reflection effect (has $[1 + 1]^2 = 4$ effect on power density)
EIRP_{max}	=	Maximum effective isotropically radiated power (Note: EIRP is 64% higher than ERP, which is referenced to a half-wave dipole)
$\text{VertAntDisc}(\phi)$	=	Numeric factor for antenna discrimination (EIRP reduction) in the vertical plane, applicable at downward angle ϕ to a 6' human standing on ground, calculated at distances from 0' to 500' away from the antenna (not used in Connecticut sites – as requested by the Connecticut Siting Council)
R	=	Straight-line distance from antenna to 6' human
MPE%	=	Calculated exposure level, as a percentage of the FCC MPE limit for continuous exposure of the general population

Near-Field Cylindrical Model

(1) $S \text{ [mW/cm}^2\text{]} = (P_i * ACF / (2 \pi R h))$

(2) FCC MPE limit = 1.000 mW/cm²

(3) MPE% = 100 * (S / 1.000)

where:

S	=	Calculated power density
P _i	=	Total power input to the antenna, in mW
ACF	=	Antenna correction factor (adjustment to near-field power density calculation to compensate for the antenna mounting height above ground level and resulting partial-body exposure; see Richard Tell article listed in the References)
R	=	Straight-line distance from antenna to 6' human
h	=	Subtended height of the antenna, in cm
MPE%	=	Calculated exposure level, as a percentage of the FCC MPE limit for continuous exposure of the general population

ANALYSIS RESULTS – GROUND-LEVEL

The table on the following page summarizes the ground level results of the calculations using the site data, method and models described above. The information on the vertical antenna discrimination has been taken from the antenna manufacturer's specification sheets. Please note that while the tabular distances are listed in feet, the calculations translate these units into centimeters, to match the FCC specification of MPE units. Also note that the G dist value represents the distance in feet from the monopole at ground level.

1900 MHz Antenna Array (Ground Level – AT&T Wireless)					
G dist	R dist	V angle	V disc	mW/cm ²	GPMPE%
0	91.0	90.0	1.000	0.0485	4.850
20	93.2	77.6	1.000	0.0463	4.626
40	99.4	66.3	1.000	0.0406	4.064
60	109.0	56.6	1.000	0.0338	3.380
80	121.2	48.7	1.000	0.0274	2.735
100	135.2	42.3	1.000	0.0220	2.197
120	150.6	37.2	1.000	0.0177	1.771
140	167.0	33.0	1.000	0.0144	1.440
160	184.1	29.6	1.000	0.0119	1.185
180	201.7	26.8	1.000	0.0099	0.987
200	219.7	24.5	1.000	0.0083	0.832
220	238.1	22.5	1.000	0.0071	0.709
240	256.7	20.8	1.000	0.0061	0.610
260	275.5	19.3	1.000	0.0053	0.529
280	294.4	18.0	1.000	0.0046	0.463
300	313.5	16.9	1.000	0.0041	0.409
320	332.7	15.9	1.000	0.0036	0.363
340	352.0	15.0	1.000	0.0032	0.324
360	371.3	14.2	1.000	0.0029	0.291
380	390.7	13.5	1.000	0.0026	0.263
400	410.2	12.8	1.000	0.0024	0.239
420	429.7	12.2	1.000	0.0022	0.217
440	449.3	11.7	1.000	0.0020	0.199
460	468.9	11.2	1.000	0.0018	0.183
480	488.5	10.7	1.000	0.0017	0.168
500	508.2	10.3	1.000	0.0016	0.155

Table 1. 1900 MHz Ground level RF power density and percent-of-MPE calculations.

The **ground level** areas around the monopole were rated using the Far-Field Point Source Model described above. In these areas, the worst case calculations are 0.0485 mW/cm², or 4.850% of the maximum recommended exposure for the general population.

CONCLUSION

The calculations demonstrate that the maximum potential exposure to radio frequency emissions is well below the FCC recommended levels for safety. The total ground level around the monopole from all antennas is 36.43% of the maximum permissible exposure (MPE) level, and is safe for continuous exposure of the general population based on FCC requirements.

The results are summarized as follows:

Carrier	Height above ground (feet)	Power Density (mW/cm ²)	FCC Maximum (mW/cm ²)	MPE% of Standard
T-Mobile *	150.3	0.0405	1.000	4.05
Nextel **	140.3	0.0185	0.567	2.91
Sprint PCS +	130.3	0.0285	1.000	2.85
Verizon +	122.2	0.0474	0.583	8.13
Cingular ++	112.4	0.0651	0.587	11.10
Cingular ++	112.4	0.0254	1.000	2.54
AT&T Wireless	102.6	0.0485	1.000	4.85
Total	-	-	-	36.43

* calculations submitted by T-Mobile RF Engineer

** calculations submitted by Nextel RF Engineer

+ calculations submitted to Siting Council on 8/31/98 (no changes)

++ calculations submitted by Cingular RF Engineer

Therefore, the upgrades at this Sprint Sites USA facility should not create a significant risk of exposure to cumulative RF emissions to the general population. And, according to the calculations, the Sprint Sites USA wireless facility is in compliance with the FCC regulations concerning the control of potential RF exposure.

CERTIFICATION

This report was prepared by George Burylo, Director – Engineering Services. The undersigned certifies that the analysis provided herein is consistent with the applicable FCC Rules and Regulations and accepted industry practice.



George Burylo
Director – Engineering Services
Edwards and Kelcey, Inc.

January 29, 2003

REFERENCES

47 CFR, FCC Rules and Regulations, Section 1.1301 *et seq.*

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

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

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

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

FCC Office of Engineering and Technology (OET) Bulletin 56, "Questions and Answers About Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields", Fourth Edition, August 1999.

Richard Tell, "CTIA's EME Design and Operation Considerations for Wireless Antenna Sites", November 15, 1996.

Site Data



Tower Loading Form

Site Reference Information:

Cascade #: CT03XC172	<input type="checkbox"/> % of Structural Capacity
Site Address: 1919 Boston Post Rd., Guilford, CT.	Lease Area 2500
Structure Height: 130	Compound Size: 50x50
Tower Manufacturer: Fred Nudd	Structure Type: Monopole
Tower Contact #: 315.524.2531	File #: 00.8094.01
Original Design Load for Structure: <input type="checkbox"/> 1 Carrier <input type="checkbox"/> 2 Carrier <input type="checkbox"/> 3 Carrier <input checked="" type="checkbox"/> 4 Carrier <input type="checkbox"/> ___ Carrier	

Prepared By: Russ Van Oudenaren	Date: 12-20-02
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Sprint Antenna Information:

ACL	# of Ant.	Frequency	Model #	Type	Orientation	Mounting Type	# of Cables	Cable Size
130' 4"	9	* 1990	DB980H90	Panel	30,150,270	Stand-off arm	9	1-5/8"
*	*	*	*	*	*	*	*	*
*	*	*	*	*	*	*	*	*

Co-location Information:

Id	Carrier	ACL	# of Ant	Frequency	TX Output	Model #	Antenna Type	Orientation	Mounting Type	# of Cable			Cable Loc
										Cables	Size	Ins	
1	Pagenet		1	*	*	withdrawn	*		*	*	*	*	<input type="checkbox"/>
*	*		*	*	*	*	*		*	*	*	*	<input type="checkbox"/>
2	Nextel (Relocated)	140' 4"	12	* 860	16 Watts	DB844H90	Panel	0,130, 270	Platform	12	1-5/8"	Ins	<input type="checkbox"/>
3	Verizon	122' 3"	12	* 896	8 Watts	ALLGON 7129	Panel	0,130, 270	Gate Mnt.	12	1-5/8"	Ins	<input checked="" type="checkbox"/>
4	SNET	112' 5"	9	* 896	8 Watts	CSS DU04- 8670	Panel	0,210, 320	Gate Mnt.	9	1-5/8"	Ins	<input checked="" type="checkbox"/>
5	Voicestream	150' 4"	3	* 1900	12 Watts	RR90-1702 DP	Panel		Stand-off arm	6	1-5/8"	Ins	<input type="checkbox"/>
6	ATT	102' 7"	6	* 1900	16 Watts	ALLGON 7250	Panel	0,120, 240	Gate Mnt.	12	1-1/4"	Ins	<input type="checkbox"/>
*	*		*	*	*	*	*		*	*	*	*	<input type="checkbox"/>
4	SNET	112' 5"	6	*	*	ADC MHA's	*		*	*	*	*	<input type="checkbox"/>
*	*		*	*	*	*	*		*	*	*	*	<input type="checkbox"/>

Contact Information:

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6	Michael Austin	203 630 9099	maustin@bechtel.com