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EM-VER-057-040624

June 24, 2004

*Via Hand Delivery*



S. Derek Phelps
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Antenna Swap**
**Roof-top Wireless Telecommunications Facility**
**1111 East Putnam Avenue, Greenwich, Connecticut**

Dear Mr. Phelps:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains a roof-top wireless telecommunications facility at 1111 East Putnam Avenue in Greenwich. This facility consists of twelve (12) panel-type cellular antennas attached to an existing roof-top mechanical penthouse on the roof of the building. Equipment associated with the antenna is located in an existing roof-top mechanical penthouse.

The Connecticut Siting Council ("the Council") approved shared use of the West Main Street roof-top tower facility on February 26, 1990 and, as such, maintains continuing jurisdiction over the facility. Attached behind Tab 1 is a copy of the Council's decision authorizing the shared use of this roof-top tower. Cellco now intends to modify its East Putnam Avenue facility by replacing six (6) of the cellular antennas with six (6) PCS antennas. Attached behind Tab 2 are specifications for the existing cellular and proposed PCS antennas for the East Putnam Avenue site.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Greenwich First Selectman, James Lash

As the Council knows, on May 23, 2003, Cellco acquired, from Northcoast Communications, a license to provide PCS service throughout Connecticut. The proposed modifications to the East Putnam Avenue facility will allow Cellco to

provide its customers in the Greenwich area with enhanced wireless voice and data services.

The planned modifications to the East Putnam Avenue facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modifications will not result in any increase in the overall height of the existing structure. Cellco's replacement antennas will be mounted at the same level as its existing antennas.

2. The proposed modifications will not affect associated equipment areas and will not require the extension of the site boundaries.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more.

4. The proposed modifications will not result in radio frequency (RF) power density levels at the facility that exceed the Federal Communications Commission (FCC) adopted safety standard. Attached behind Tab 3 is a Report on Site RF Compliance prepared by Pinnacle Telecom Group. This report includes actual RF measurements around the East Putnam Avenue facility and estimated RF emissions levels anticipated from the proposed addition of Cellco's PCS antennas.

For the foregoing reasons, Cellco respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitute an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Kenneth C. Baldwin

Enclosures
cc: James Lash, Mayor, Town of Greenwich
Sandy M. Carter

ORIGINAL

4145E

DOCKET NO. 120 - An application of Metro Mobile CTS of Fairfield County, Inc., for a Certificate of Environmental Compatibility and Public Need for the construction, operation, and maintenance of cellular telephone antennas and associated equipment located in the Town of Greenwich, Connecticut.

CONNECTICUT

SITING

COUNCIL

FEBRUARY 26, 1990

## DECISION AND ORDER

Pursuant to the foregoing Findings of Fact and Opinion, the Connecticut Siting Council finds that the effects associated with the construction, operation, and maintenance of a cellular telecommunications facility at the proposed site in Greenwich, Connecticut, including effects on the natural environment; ecological balance; public health and safety; scenic, historic, and recreational values; forests and parks; air and water purity; and fish and wildlife are not significant either alone or cumulatively with other effects, are not in conflict with the policies of the State concerning such effects, and are not sufficient reason to deny the proposed Greenwich (East) site in this application, and therefore directs that a Certificate of Environmental Compatibility and Public Need, as provided by Section 16-50k of the Connecticut General Statutes (CGS), be issued to Metro Mobile CTS of Fairfield County, Inc., for the construction, operation, and maintenance of a cellular telephone facility at the proposed site on 1111 East Putnam Avenue, Greenwich, Connecticut.

The Facility shall be constructed, operated, and maintained substantially as specified in the Council's record on this matter, and subject to the following conditions:

1. The facility shall be constructed in accordance with applicable sections of the State of Connecticut Basic Building Code.

2. The Certificate holder shall notify the Council if and when any equipment other than that listed in this application is added to this facility.

3. The Certificate Holder shall prepare a Development and Management Plan (D&M Plan) for this site which shall include detailed plans for the attachment of the antenna structures to the roof top facade showing mounting brackets, modifications to the facade and building structure, cable pathway from antennas to the equipment room, and the location of emergency power generation. The Certificate Holder shall consult with the building's owner in the preparation of the D&M Plan.

4. The antenna bases shall be mounted no higher than 49 feet above ground level, or 144 feet above mean sea level.

5. The Certificate Holder shall provide a final report to the Council upon completion of construction, including the final construction costs and date of commercial operation.

6. If this facility does not initially provide, or permanently ceases to provide, cellular service following the completion of construction, this Decision and Order shall be void, and the antennas and all associated equipment in this application shall be dismantled and removed or reapplication for any new use shall be made to the Council and a Certificate granted before any such new use is made.

7. The Certificate Holder shall comply with any future radio frequency (RF) standard promulgated by State or federal regulatory agencies. Upon the establishment of any new governmental RF standards, the facility granted in this Decision and Order shall be brought into compliance with such standards.

8. The Certificate Holder or its successor shall provide the Council with a report of recalculated power density if and when additional channels over the proposed 90 channels, higher wattage over the proposed 100 watts per channel, or if other circumstances in operation cause change in power density above the levels originally calculated in the application.

9. Unless otherwise approved by the Council, this Decision and Order shall be void if all construction authorized herein is not completed within three years of the issuance of this Decision and Order, or within three years of the completion of any appeal taken to this Decision and Order.

Pursuant to Section 16-50p, we hereby direct that a copy of the Findings of Fact, Opinion, and Decision and Order be served on each person listed below. A notice of issuance shall be published in the The Advocate and Greenwich Time. By this Decision and Order, the Council disposes of the legal rights, duties, and privileges of each party named or admitted to the proceeding in accordance with Section 16-50j-17 of the Regulations of State Agencies.

The parties or intervenors to this proceeding are:

| (Applicant) | (Its Representatives) |
|---|---|
| Metro Mobile CTS of<br>Fairfield County, Inc.<br>50 Rockland Road<br>South Norwalk, CT 06854<br>Attn: Phillip Mayberry<br>Vice President<br>and General Manager | Robinson & Cole<br>One Commercial Plaza<br>Hartford, CT 0613-3597<br>Attn: Earl W. Phillips, Esq. |

(Party)

Patrick J. Pellegrino
Mary G. Pellegrino
268 Milbank Avenue
Greenwich, CT 06830

(Intervenor)

SNET Cellular, Inc.
227 Church Street
New Haven, CT 06506

Peter H. Tyrrell, Esq.
Senior Attorney
SNET Cellular, Inc.
227 Church Street
New Haven, CT 06506

TEF/cp

CERTIFICATION

The undersigned members of the Connecticut Siting Council hereby certify that they have heard this case in Docket No. 120 or read the record thereof, and that we voted as follows:

Dated at New Britain, Connecticut the 26 day of February, 1990.

| Council Members | Vote Cast |
|---|---|
| Gloria Dibble Pond<br>Chairperson | Yes |
| Commissioner Peter Boucher<br>Designee: Robert A. Pulito | Yes |
| Commissioner Leslie Carothers<br>Designee: Brian Emerick | Yes |
| Harry E. Covey | Yes |
| Mortimer A. Gelston | Yes |
| Daniel P. Lynch, Jr. | Yes |
| Paulann H. Sheets | Abstain |
| William H. Smith | Yes |
| Colin C. Tait | Yes |

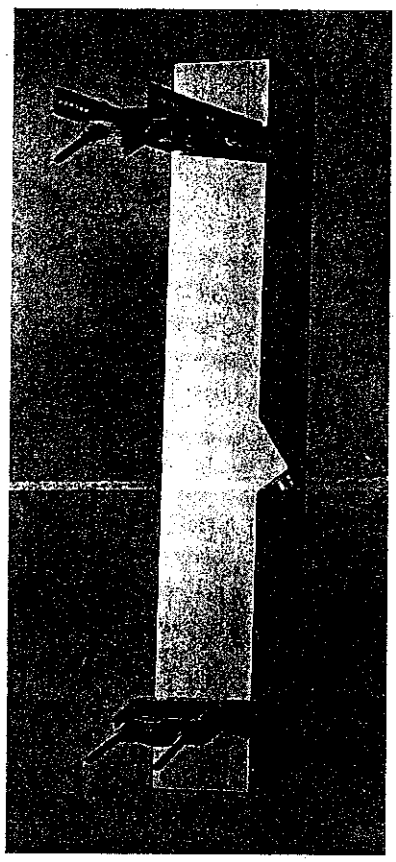
Swedcom

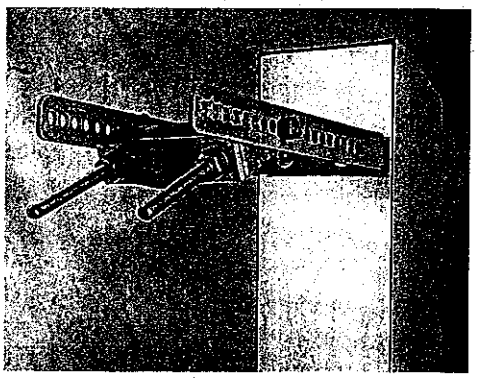
# ALP-E 9011-Din

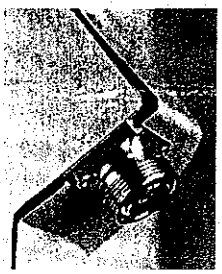
*Enhanced Log-Periodic Antenna*

## Features:

- ❑ **Small Size**
- ❑ **Aesthetically Pleasing**
- ❑ **Suitable For TDMA/CDMA**
- ❑ **High Return Loss**
- ❑ **Low Intermodulation**
- ❑ **High FTB**
- ❑ **Broadbanded**
- ❑ **Side-lobe Suppression**
- ❑ **Sturdy Design**
- ❑ **Down-Tilt Brackets Incl.**








The distance between the center of the bolts (on the back of the antenna) are shown in the drawing above.

Bolt diameter is: **3/8-16** [comes with lock nut].

| | |
|---|---|
| Frequency Range: | **800-900 MHz** |
| Impedance: | **50 ohm** |
| Connector Type: | **7/16 Din** |
| Return Loss: | **20 dB** |
| Polarization: | **Vertical** |
| Gain: | **> 11 dBd** |
| Front To Back Ratio: | **> 30 dB** |
| Side-Lobe Suppression: | **18 dB** |
| Intermodulation (2x25W): | **IM3 > 146 dB** |
| | **IM5 > 153 dB** |
| | **IM7/9 > 163 dB** |
| Power Rating: | **500 W** |
| H-Plane (-3 dB point): | **85 - 92°** |
| V-Plane (-3 dB point): | **16 - 18°** |
| Lightning Protection: | **DC Grounded** |

| | | |
|---|---|---|
| Overall Height: | **43 in** | **[1092 mm]** |
| Width: | **6.5 in** | **[165 mm]** |
| Depth: | **8 in** | **[203 mm]** |
| Weight Including Tilt-Brackets: | **20 lbs** | **[9.1 Kg]** |
| Rated Wind Velocity: | **113 mph** | **[180 Km/h]** |
| Wind Area (CxA/Side): | **2.3 sq. ft.** | **[0.22 sq.m]** |
| Lateral Thrust At Rated Wind Worst Case: | **112 lbs** | **[500 N]** |

| | |
|---|---|
| Radiating Elements: | **Aluminum** |
| Extrusion: | **Aluminum** |
| Radome: | **Grey PVC** |
| Tilt-Bracket: | **Hot Dip Galvanized Steel** |
| Antenna Bolts: | **Stainless Steel** |

***The ALP-E 9011-Din is made in U.S.A.***

**DECIBEL**
*Base Station Antennas*

# 948F85T2E-M

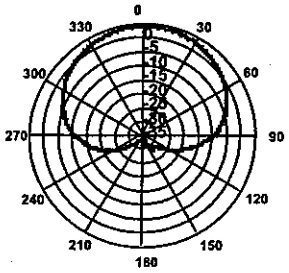
16.1 dBi, Directed Dipole Antenna
1850-1990 MHz

**1850-1990 MHz**

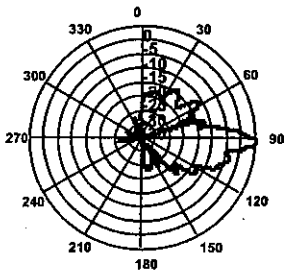
**dB Director®**
**MaxFill™**

- Exceptional azimuth roll-off reducing soft hand-offs and improving capacity
- Excellent upper side lobe suppression
- Deep null filling below the horizon assures improved signal intensity
- Low profile appearance and low wind loading profile for easier zoning approvals

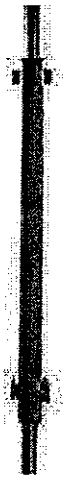
85°

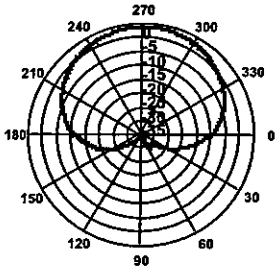



Azimuth 1850 MHz (Tilt=2)




Vertical 1850 MHz (Tilt=2)






Horizontal 1850 MHz (Tilt=2)

| ELECTRICAL | | MECHANICAL | |
|---|---|---|---|
| **Frequency (MHz):** | 1850-1990 | **Weight:** | 8.5 lbs (3.9 kg) |
| **Polarization:** | Vertical | **Dimensions (LxWxD):** | 48 X 3.5 X 7 in (1219 X 89 X 178 mm) |
| **Gain (dBd/dBi):** | 14/16.1 | **Max. Wind Area:** | 2.3 ft² (0.21 m²) |
| **Azimuth BW:** | 85° | **Max. Wind Load (@ 100mph):** | 92 lbf (409 N) |
| **Elevation BW:** | 8° | **Max. Wind Speed:** | 125 mph (201 km/h) |
| **Beam Tilt:** | 2° | **Radiator Material:** | Low Loss Circuit Board |
| **USLS* (dB):** | >18 | **Reflector Material:** | Passivated Aluminum |
| **Null Fill* (dB):** | 15 | **Radome Material:** | ABS, UV Resistant |
| **Front-to-Back Ratio* (dB):** | 40 | **Mounting Hardware Material:** | Galvanized Steel |
| **VSWR:** | <1.33:1 | **Connector Type:** | 7-16 DIN - Female (Bottom) |
| **IM Suppression - Two 20 Watt Carriers:** | -150 | **Color:** | Light Gray |
| **Impedance:** | 50 Ohms | **Standard Mounting Hardware:** | DB390 Pipe Mount Kit, included |
| **Max Input Power:** | 250 Watts | **Downtilt Mounting Hardware:** | DB5098, optional |
| **Lightning Protection:** | DC Ground | **Opt. Mounting Hardware:** | DB5094-AZ Azimuth Wall Mount |
| **Opt Electrical Tilt:** | 0°,4°,6° | | |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Date: 1/23/2004
* - Indicates Typical Values


PINNACLE TELECOM GROUP
*Consulting and Engineering Services*

# REPORT ON SITE RF COMPLIANCE

## VERIZON WIRELESS

## RIVERSIDE

JUNE 11, 2004

14 RIDGEDALE AVENUE, SUITE 262 • CEDAR KNOLLS, NJ 07927 • 973-451-1630

# Contents

## Introduction and Summary

At the request of Verizon Wireless, Pinnacle Telecom Group has prepared an independent assessment of potential radiofrequency (RF) exposure and FCC compliance related to an existing wireless base station antenna facility on a building rooftop located at 1111 East Putnam Avenue in Riverside, CT. Verizon Wireless identifies the site as Riverside. On-site measurements were previously performed by Pinnacle Telecom Group on August 7, 2003.

Verizon Wireless is licensed by the FCC to provide cellular radio service, using the 800 MHz frequency band and currently operates 12 panel antennas mounted on the subject rooftop. Verizon is proposing to now provide PCS service using the 1900 MHz frequency band and to add two more channels to the existing cellular service.

FCC regulations require an assessment and assurance of compliance with specified maximum permissible exposure (MPE) limits whenever technical modifications are made to a site, which includes the addition or modification of antennas. The assessment of compliance may involve on-site measurements, an office-based mathematical analysis, or a combination of the two. The latter was used in this case.

The results of the analysis of RF compliance for Verizon's proposed antenna operation are as follows:

- RF measurements performed at street level around the site indicated the highest existing RF level is 2.5 percent of the FCC limit for continuous exposure of the general population. A mathematical analysis of the effects of Verizon's proposed antenna operation indicates a worst-case incremental contribution of approximately 0.8479 percent of the same exposure limit.
- Taking the most conservative approach, if the worst-case incremental contribution associated with the antenna modification is added to the worst-case measurement result (even if they do not occur at the same

point), the new worst-case exposure level at street level would be 3.3479 percent – still more than 29 times below the limit.

- A further analysis of potential exposure on the main roof indicates that the worst-case incremental RF level on the roof will be 170.7455 percent of the applicable FCC limit for occupational exposure.
- Again taking the conservative approach, if the worst-case incremental contribution associated with the antenna modification is added to the worst-case measurement result on the rooftop, the new worst-case exposure level would be 470.7455 percent.

The calculations on the rooftop indicate the FCC occupational MPE limit is exceeded. Note that the calculations are overly conservative and over estimate the actual RF exposure.

It is Verizon Wireless safety policy to post RF alert signs at each site and appropriate RF alert signs have been posted at each Verizon antenna sector. In addition, OSHA safety guidelines state that a minimum distance of three feet should be maintained from all antennas. Therefore, based on the analysis of RF exposure levels at ground level around the site, the FCC regulations regarding signage, and OSHA safety guidelines, the site is in compliance with FCC regulations regarding RF compliance.

In addition, Appendix A provides a site map, photographs taken the day of the measurements and antenna data, Appendix B provides a description of the measurement equipment and procedures, Appendix C provides background on the FCC limits for RF exposure and Appendix D provides a list of key FCC references on RF exposure and site compliance.

The remainder of this report provides technical data on the proposed antenna operation, a brief description of the measurements performed, a mathematical analysis of Verizon's proposed operation using standard engineering formulas provided by the FCC, an analysis of those results with respect to RF compliance, and a certification of site compliance.

## Technical Data

Relevant data for the proposed Verizon antenna operation at the site is summarized in the tables below.

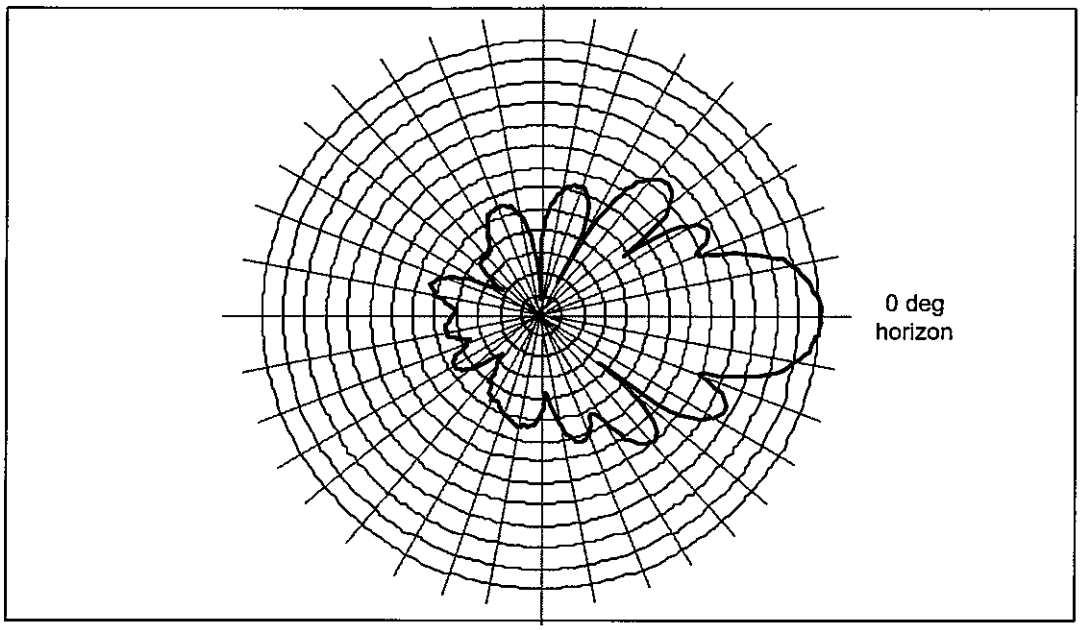
| ***Verizon Wireless – 800 MHz System*** | |
|---|---|
| Transmitting Frequency Band | 800 MHz |
| Antenna Height (AGL) | 45 ft. (centerline) |
| Antenna Type | panel |
| Antenna Manufacturer | Swedcom |
| Antenna Model | ALP9011 |
| Antenna Major Dimension | 43 in. |
| Antenna Gain (max.) | 12 dBd |
| Beam Tilt | 0° |
| Antenna Line Loss | 1.2 dB |
| Transmitter Power per RF Channel per Tx | 32 watts |
| RF Channels per Tx | 2 |
| Antenna Mounting Height Above Roof | 4.3 ft. |

| ***Verizon Wireless – 1900 MHz System*** | |
|---|---|
| Transmitting Frequency Band | 1900 MHz |
| Antenna Height (AGL) | 45 ft. (centerline) |
| Antenna Type | panel |
| Antenna Manufacturer | Decibel |
| Antenna Model | DB948F85T2E-M |
| Antenna Major Dimension | 48 in. |
| Antenna Gain (max.) | 14 dBd |
| Beam Tilt | 0° |
| Antenna Line Loss | 3 dB |
| Transmitter Power per RF Channel per Tx | 16 watts |
| RF Channels per Tx | 3 |
| Antenna Mounting Height Above Roof | 4.3 ft. |

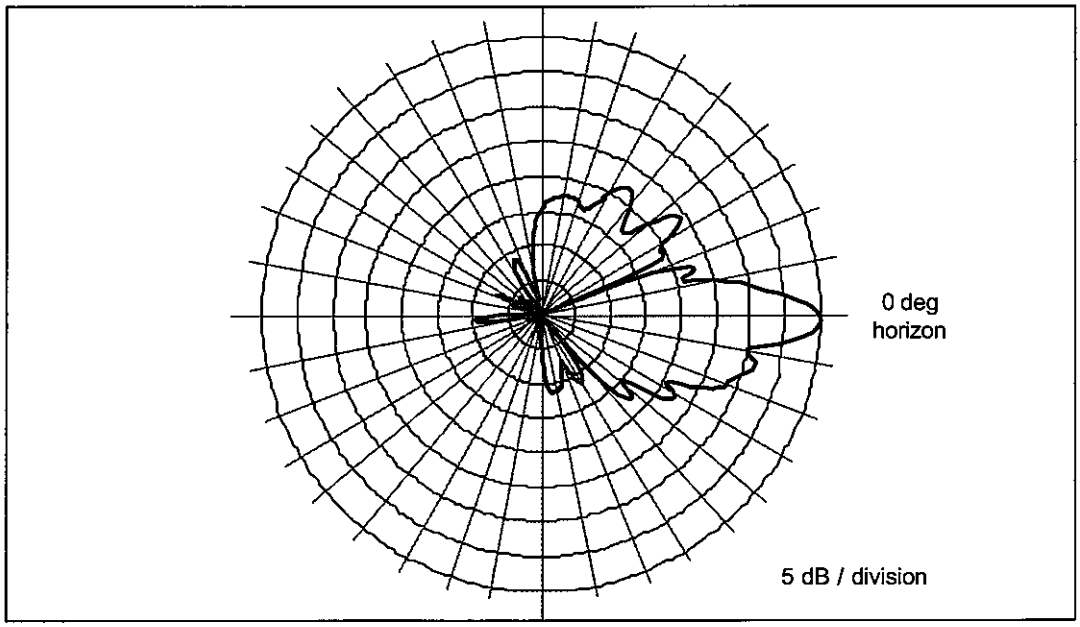
Directional panel antennas, such as are proposed here, are designed to radiate RF energy primarily in one sector of the horizon, and most of the RF energy is emitted in the horizontal plane. A small fraction of the RF energy is radiated below that plane and toward the ground around the facility in question, and the particulars of that characteristic are used in calculating the relative strength of potential exposure levels at street level around an antenna operation.

Diagrams illustrating the vertical-plane radiation pattern of the antennas to be used by Verizon are shown below and on the following page. Note that in these types of antenna radiation pattern diagrams, the antenna is effectively pointed at the three o'clock position, and where the antenna pattern reads 20 dB the relative RF energy emitted at the corresponding downward angle is 1/100$^{th}$ of the maximum that occurs at 0 degrees; at the 30 dB point, it is 1/1000$^{th}$ of the maximum.

**Swedcom APL9011 Antenna – Vertical-Plane Radiation Pattern**



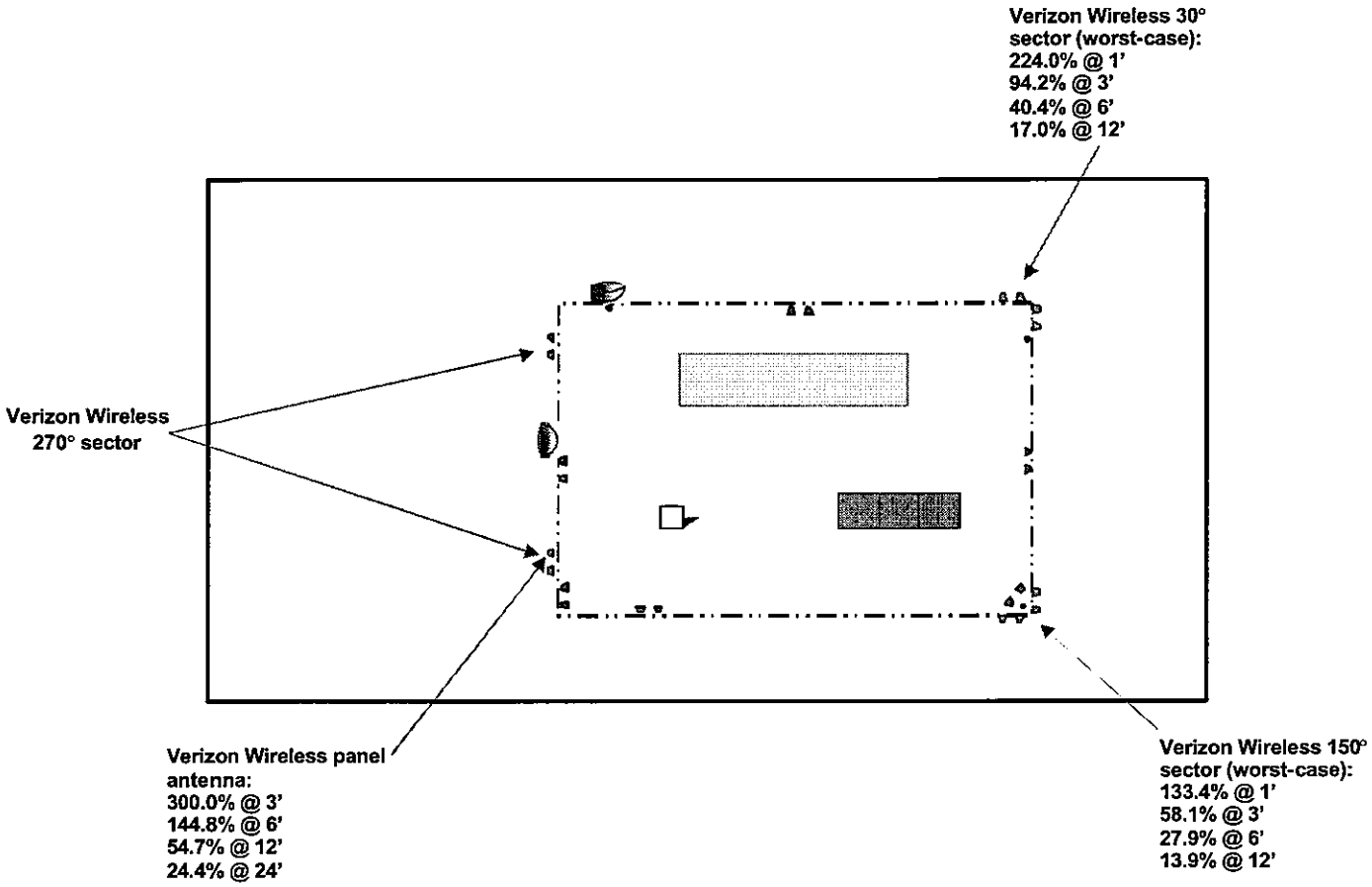
**Decibel DB948F85T2E-M Antenna – Vertical-Plane Radiation Pattern**




## On-Site Measurements

RF measurements were performed on August 2, 2003, in order to determine the pre-existing RF effects on the rooftop and at street level around the building, and to certify site compliance with the FCC regulations concerning human exposure to RF fields.

The results of the on-site measurements, expressed as a percentage of the FCC occupational MPE limit, are overlaid on the plan view sketch on the next page.




## Technical Analysis

Assessment of RF compliance involves an analysis of potential RF exposure levels in accessible areas, and comparison of those levels with the applicable FCC limits for maximum permissible exposure.

The FCC's regulations describe two tiers of MPE limits, one for "controlled" situations (i.e., where an individual with RF safety training can exercise control of the exposure), and a stricter one for the presumably "uncontrolled" exposure that involves the general public.

In addition, OSHA requires employers to provide appropriate RF safety training for individuals whose work brings them into frequent contact with wireless antenna sites. Access to antenna sites is often restricted to ensure only RF-safety-trained people can get close to antennas.

In this case, the rooftop itself is access-restricted and considered a "controlled" area, and the FCC's occupational MPE limit applies. At street level around the building, the stricter limit for the general population applies.

The subsections that follow will address both areas of interest.

***Street-Level Analysis***

In the far field, the RF levels are directly proportional to the total antenna input power and the relative antenna gain (focusing effect) in the downward direction of interest – and the levels are inversely proportional to the square of the straight-line distance to the antenna.

Conservative calculations also assume the potential RF exposure is enhanced by reflection of the RF energy from the ground. (Our calculations will assume a 100% "perfect" reflection, the absolute worst-case approach.)

According to the FCC, the applicable formula for far-field calculations is as follows:

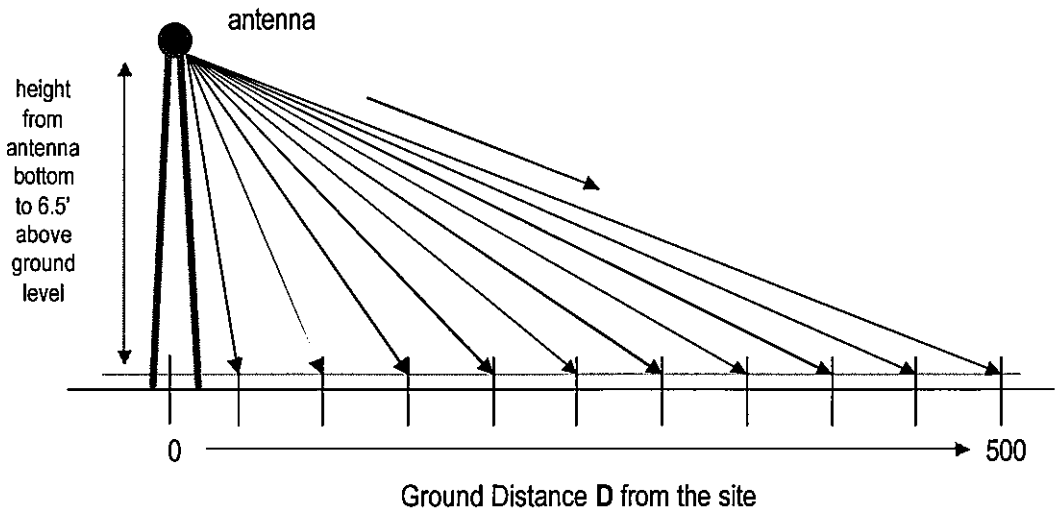
$$MPE\% = (100 * TxPower * 10^{(Gmax-Vdisc/10)} * 4 ) / ( MPE * 4\pi * R2 )$$

where

| | | |
|---|---|---|
| MPE% | = | RF level, expressed as a percentage of the FCC MPE limit |
| 100 | = | factor to convert to a percentage |
| TxPower | = | maximum power into antenna, watts |

| | | |
|---|---|---|
| $10^{(Gmax-Vdisc/10)}$ | = | numeric equivalent of the relative antenna gain in the downward direction of interest, with Gmax (maximum gain)and Vdisc (vertical-plane discrimination) values, in decibels, taken from the antenna manufacturer's specifications; the reference point for the angular calculations is either 0 degrees (the horizon), or the mechanical downtilt angle of the antennas |
| 4 | = | the factor to account for a 100-percent-efficient energy reflection from the ground, and the squared relationship between RF field strength and power density ($2^2 = 4$) |
| MPE | = | FCC general population MPE limit |
| R | = | lateral distance from the RF source to the point of interest, centimeters |

Although the calculations are performed using centimeter units, the results are more clearly presented using feet as the distance unit. The far-field calculations of RF power density are typically performed out to a distance of 500 feet from the site (see diagram on the next page), with recognition that beyond the first few hundred feet the RF levels always decrease with increasing distance. Within the first few hundred feet, the calculated RF levels reflect not just distance, but the relative antenna radiation pattern discrimination at different downward angles.




At each point along the ground, an MPE% calculation is made for each antenna operation, and compliance with the FCC regulations is then determined by comparing the sum of the individual results (which we call "total MPE%") with 100 percent. Any calculated total MPE% result exceeding 100 percent is, by definition, higher than the limit and represent non-compliance. Results below 100 percent indicate compliance.

Note that the following conservative methodology and assumptions are incorporated into the MPE% calculations:

1. The antennas are assumed to be operating continuously at maximum power.
2. The directional antennas are hypothetically assumed to be pointed directly overhead any and all points of interest at ground level, ignoring the effects of antenna discrimination in the horizontal plane.
3. The calculations intentionally minimize the distance factor (R) by assuming a 6'6" human and performing the calculations from the bottom (rather than the centerline) of the antenna.
4. The potential RF exposure at ground level is assumed to be 100-percent enhanced (increased) via a "perfect" field reflection from the ground itself.

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

According to the FCC, when directional antennas are used for sectorized coverage of the horizon, as is the case here, the far field calculations employ the parameters of a single sector – because the contributions of the antennas facing in other directions (the other sectors) are insignificant. The calculations, however, assume the antennas in one sector are always hypothetically pointed directly overhead the point of interest on the ground; this conservatively ignores the signal-reducing effects of the horizontal-plane directionality of the antenna.

Applying technical data for the proposed Verizon Wireless systems to the far-field formula yields the MPE% results in the table on the following page, with the worst-case results highlighted in bold.

| Ground Distance (ft) | Verizon 800 MHz MPE% | Verizon 1900 MHz MPE% | Total MPE% |
|---|---|---|---|
| 0 | 0.0067 | 0.0247 | 0.0131 |
| 20 | 0.0115 | 0.0529 | 0.0314 |
| 40 | 0.2558 | 0.1066 | 0.0645 |
| 60 | 0.1157 | 0.2054 | 0.3624 |
| 80 | 0.0223 | 0.2171 | 0.3211 |
| 100 | 0.1681 | 0.2595 | 0.2393 |
| 120 | 0.4916 | 0.2345 | 0.4276 |
| 140 | 0.7117 | 0.1587 | 0.7261 |
| 160 | 0.7155 | 0.1054 | 0.8704 |
| 180 | 0.7352 | 0.0785 | 0.8209 |
| 200 | 0.7347 | 0.0784 | 0.8136 |
| 220 | 0.7454 | 0.1025 | 0.8130 |
| 240 | 0.6373 | 0.1421 | **0.8479** |
| 260 | 0.6182 | 0.1228 | 0.7794 |
| 280 | 0.6197 | 0.1623 | 0.7411 |
| 300 | 0.5456 | 0.1429 | 0.7820 |
| 320 | 0.4841 | 0.1268 | 0.6885 |
| 340 | 0.4632 | 0.1599 | 0.6108 |
| 360 | 0.4162 | 0.1437 | 0.6231 |
| 380 | 0.3760 | 0.1298 | 0.5599 |
| 400 | 0.3413 | 0.1483 | 0.5057 |
| 420 | 0.3412 | 0.1352 | 0.4896 |
| 440 | 0.3123 | 0.1238 | 0.4764 |
| 460 | 0.2870 | 0.1137 | 0.4361 |
| 480 | 0.2646 | 0.1049 | 0.4007 |
| 500 | 0.0067 | 0.0247 | 0.3695 |

As indicated in the table above, the worst-case calculated RF level is only 0.8479 percent of the FCC MPE limit for continuous RF exposure of the general public. When this worst-case incremental contribution is directly added to the earlier worst-case measured result of 2.5 percent, the new total is 3.3479 percent, which is more than 29 times below the limit for continuous human exposure. Therefore, far-field compliance is achieved.

***Rooftop Analysis***

The applicable FCC formula for "near-field" exposure on a roof close to antennas is as follows:

$$MPE\% = (100 * TxPower * M * 10^{-Hdisc/10} * B) / (MPE * 360°/BW * 2\pi * L * R)$$

where

| | | |
|---|---|---|
| MPE% | = | RF level, expressed as a percentage of the FCC general public MPE limit |
| 100 | = | factor to convert to a percentage |
| TxPower | = | maximum power into antenna, in milliwatts (1 watt is equivalent to 1,000 milliwatts) |
| M | = | factor to account for antenna mounting height relative to nearby standing level |
| $10^{-Hdisc/10}$ | = | factor to account for the horizontal radiation characteristic of directional antennas, taken from the antenna manufacturer's specifications (which use decibel, or dB, references, and for which $10^{-HDisc/10}$ is the equivalent numeric factor) |
| MPE | = | FCC occupational MPE limit |
| BW | = | manufacturer-specified antenna half-power (3 dB) horizontal-plane beamwidth, in degrees |
| L | = | antenna major dimension (in this case, length), in centimeters (1 foot = 30.48 centimeters) |
| R | = | horizontal distance from the antenna to the point of interest, in centimeters |

The table below lists the results of the calculations for the front, sides and rear of the Verizon antennas.

| Distance (ft.) | MPE% -- Front of Antennas | MPE% -- Side of Antennas | MPE% -- Rear of Antennas |
|---|---|---|---|
| 1 | 170.7455 | 41.9359 | 0.1393 |
| 2 | 92.2025 | 22.6454 | 0.0752 |
| 3 | 65.1937 | 16.0119 | 0.0532 |
| 4 | 51.2236 | 12.5808 | 0.0418 |
| 5 | 41.7107 | 10.2443 | 0.1393 |

As indicated, the FCC occupational MPE limit is exceeded out to a distance of approximately 1.5 feet in front of the Verizon Wireless antennas.

## Compliance Conclusion

As described, even under the most conservative analytical approach, the potential RF exposure levels at ground level around the site, with the modification of the Verizon Wireless antenna operations, is lower than the applicable FCC limits.

The calculations on the rooftop indicate the FCC occupational MPE limit is exceeded. Note that the calculations are overly conservative and over estimate the actual RF exposure.

It is Verizon Wireless safety policy to post RF alert signs at each site and appropriate RF alert signs have been posted at each Verizon antenna sector. In addition, OSHA safety guidelines state that a minimum distance of three feet should be maintained from all antennas.

Therefore, based on the analysis of RF exposure levels at ground level around the site, the FCC regulations regarding signage, and OSHA safety guidelines, the site is in compliance with FCC regulations regarding RF compliance.

## Certification of Site Compliance

The undersigned, under pain and penalty of perjury, hereby certify as follows:

1. We have read and fully understand the FCC regulations concerning RF safety and the control of human exposure to RF fields (47 CFR 1.1301 *et seq*).
2. The equipment used to perform the RF measurements described herein is appropriate to the task, and calibration of its accuracy has been performed within the past 12 months as recommended by the manufacturer.
3. The on-site RF measurements described herein were performed in a manner consistent with industry standards.
4. To the best of our knowledge, the statements and information disclosed in this report are true, complete and accurate.
5. The analysis of site RF compliance provided herein is consistent with the applicable FCC regulations, additional guidelines issued by the FCC, and industry practice.
6. The results of the analysis indicate that the subject site is in full compliance with the FCC regulations concerning RF exposure.

Patricia A. Stankovich — 6/11/04

Patricia A. Stankovich — Date

Manager-RF Compliance
Pinnacle Telecom Group, LLC

Daniel J. Collins — 6/11/04

Daniel J. Collins — Date

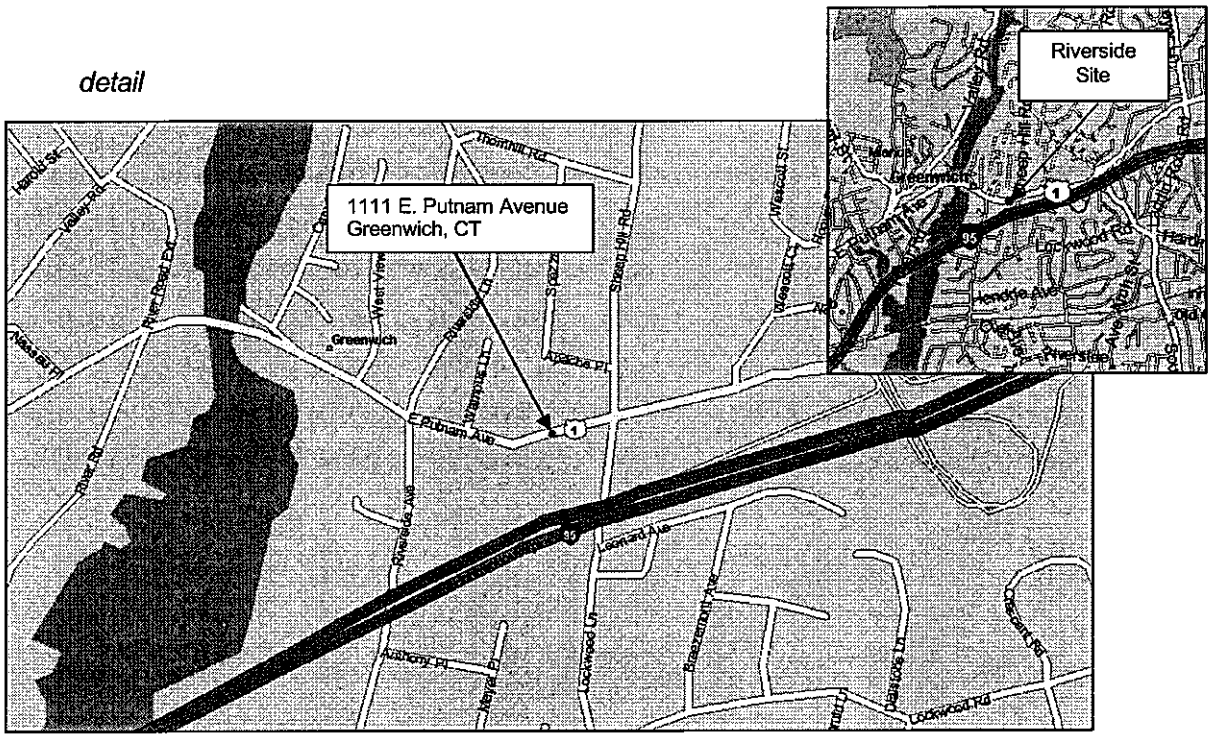
Chief Technical Officer
Pinnacle Telecom Group, LLC

# Appendix A: Site Map, Photographs and Antenna Data

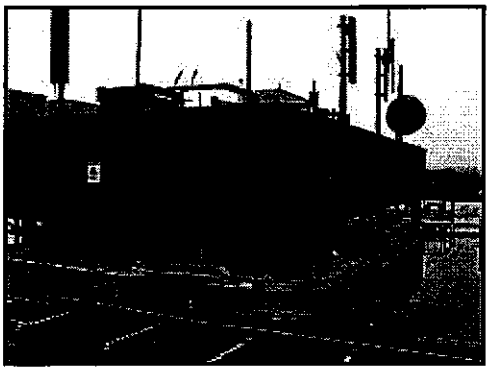
The Verizon Wireless Riverside site is located at 1111 E. Putnam Avenue in Greenwich, CT, as illustrated in the maps below.

*overview*

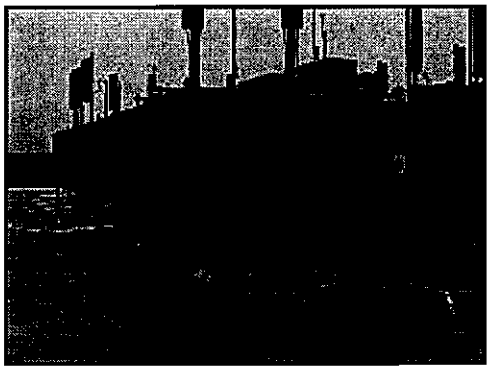
*detail*



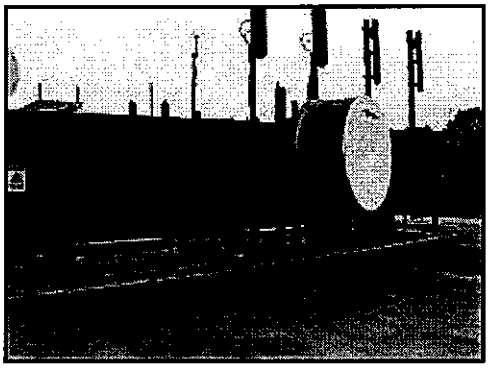

The following page provides copies of photographs taken of the site on the day the measurements were performed.



Verizon Wireless 30° sector

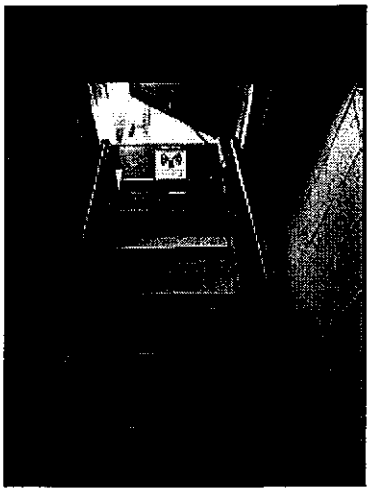


Verizon Wireless 150° sector



Verizon Wireless 270° sector

Roof access



The following table provides antenna detail for the Riverside site on the date the measurements were performed.

| Ant # | Z (ft) | Type | Dim. (ft) | Mfr | Model | Freq | Tilt | Azimuth | Licensee |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 4.33 | panel | 4 | Swedcom | ALP-E9011-EIN | 806-896 | 0° | 30° | Verizon |
| 2 | 4.33 | panel | 4 | Swedcom | ALP-E9011-EIN | 806-896 | 0° | 30° | Verizon |
| 3 | 4.33 | panel | 4 | Swedcom | ALP-E9011-EIN | 806-896 | 0° | 30° | Verizon |
| 4 | 4.33 | panel | 4 | Swedcom | ALP-E9011-EIN | 806-896 | 0° | 30° | Verizon |
| 5 | 4.33 | panel | 4 | Swedcom | ALP-E9011-EIN | 806-896 | 0° | 150° | Verizon |
| 6 | 4.33 | panel | 4 | Swedcom | ALP-E9011-EIN | 806-896 | 0° | 150° | Verizon |
| 7 | 4.33 | panel | 4 | Swedcom | ALP-E9011-EIN | 806-896 | 0° | 150° | Verizon |
| 8 | 4.33 | panel | 4 | Swedcom | ALP-E9011-EIN | 806-896 | 0° | 150° | Verizon |
| 9 | 4.33 | panel | 4 | Swedcom | ALP-E9011-EIN | 806-896 | 0° | 270° | Verizon |
| 10 | 4.33 | panel | 4 | Swedcom | ALP-E9011-EIN | 806-896 | 0° | 270° | Verizon |
| 11 | 4.33 | panel | 4 | Swedcom | ALP-E9011-EIN | 806-896 | 0° | 270° | Verizon |
| 12 | 4.33 | panel | 4 | Swedcom | ALP-E9011-EIN | 806-896 | 0° | 270° | Verizon |
| 13 | 12.5 | panel | 4 | Decibel | Unidentified | 851-866 | 0° | --- | Nextel |
| 14 | 12.5 | panel | 4 | Decibel | Unidentified | 851-866 | 0° | --- | Nextel |
| 15 | 12.5 | panel | 4 | Decibel | Unidentified | 851-866 | 0° | --- | Nextel |
| 16 | 12.5 | panel | 4 | Decibel | Unidentified | 851-866 | 0° | --- | Nextel |
| 17 | 12.5 | panel | 4 | Decibel | Unidentified | 851-866 | 0° | --- | Nextel |
| 18 | 12.5 | panel | 4 | Decibel | Unidentified | 851-866 | 0° | --- | Nextel |
| 19 | 12 | panel | 4 | EMS Wireless | Unidentified | Unknown | 0° | --- | Unidentified |
| 20 | 12 | panel | 4 | EMS Wireless | Unidentified | Unknown | 0° | --- | Unidentified |
| 21 | 12 | panel | 4 | EMS Wireless | Unidentified | Unknown | 0° | --- | Unidentified |
| 22 | 12 | panel | 4 | EMS Wireless | Unidentified | Unknown | 0° | --- | Unidentified |
| 23 | 12 | panel | 4 | EMS Wireless | Unidentified | Unknown | 0° | --- | Unidentified |
| 24 | 12 | panel | 4 | EMS Wireless | Unidentified | Unknown | 0° | --- | Unidentified |
| 25 | 17 | whip | 3 | Unidentified | Unidentified | Unknown | --- | --- | Unidentified |
| 26 | 9.5 | whip | 8 | Unidentified | Unidentified | Unknown | --- | --- | Unidentified |
| 27 | 18 | whip | 8 | Unidentified | Unidentified | Unknown | --- | --- | Unidentified |
| 28 | 9.5 | dish | 4 | Unidentified | Unidentified | Unknown | --- | --- | Unidentified |
| 29 | 4 | dish | 6 | Unidentified | Unidentified | Unknown | --- | --- | Unidentified |

## Appendix B: Measurement Equipment and Procedure

The RF exposure measurements were performed using a Narda model 8722 RF probe and Narda model 8715 RF meter. Both the probe and meter are capable of broadband RF measurements, covering a range of 300 kHz to 50 GHz. The measuring equipment is designed to automatically register all RF levels within the frequency range and report them as percentages of the FCC's overall occupational MPE limit.

Measurements of RF exposure levels were performed on the rooftop and at ground level around the site. In order to ensure "safe-side" results, maximum RF spot-levels were measured and reported in all areas.

# Appendix C: Background on the FCC RF Exposure Limits

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

The FCC maximum permissible exposure (MPE) limits represent the consensus of federal agencies and independent experts responsible for RF safety matters. Those agencies include the National Council on Radiation Protection and Measurements (NCRP), the Occupational 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 1.301 *et seq* of its Rules and Regulations (47 CFR 1.1301-1.1310). Those guidelines specify MPE limits for both occupational and general population exposure.

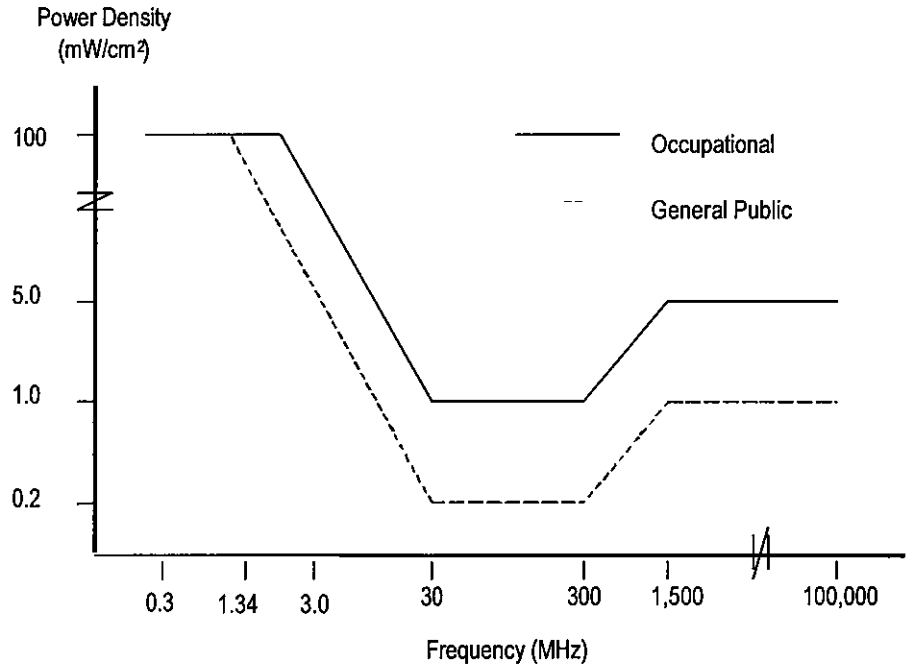
The specified continuous exposure MPE limits are based on known variation of human body susceptibility in different frequency ranges, and a Specific Absorption Rate (SAR) of 4 watts per kilogram, which is universally considered to accurately represent human capacity to dissipate incident RF energy (in the form of heat). The occupational MPE guidelines incorporate a safety factor of 10 or greater with respect to RF levels known to represent a health hazard, and an additional safety factor of five is applied to the MPE limits for general population exposure. Thus, the general population MPE limit has a built-in safety factor of more than 50. 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 $mW/cm^2$). The table on the next page lists the FCC limits for both occupational and general population exposures, using the $mW/cm^2$ reference, for the different radio frequency ranges.

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

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




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

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

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

## Appendix D: FCC References


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

47 CFR, FCC Rules and Regulations, Part 22 (Public Mobile Services).

47 CFR, FCC Rules and Regulations, Part 24 (Personal Communications Services).

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

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

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

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

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

"RF Field Measurements for Antenna Sites", (video), Richard Tell Associates Inc., 1997.

"EME Awareness for Antenna Site Safety", (video), Motorola (produced in association with Richard Tell Associates Inc.), 1997.