STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

July 12, 2013

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103

RE: **EM-VER -034-130613** – Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at Hospital Avenue, Danbury, Connecticut.

Dear Attorney Baldwin:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies with the following conditions:

- Verizon shall implement the recommendations made in the Radio Frequency Exposure Report prepared by C Squared Systems dated February 20, 2013 and signed by Dan Goulet;
- Within 45 days following completion of the antenna installation, Verizon shall provide documentation that it implemented the recommendations of the Radio Frequency Exposure Report;
- Any deviation from the proposed modification as specified in this notice and supporting materials with the Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Within 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated June 12, 2013. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

CSC
CONNECTICUT SITING COUNCIL

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Thank you for your attention and cooperation.

Very truly yours,

Melanie A. Bachman
Acting Executive Director

MAB/CDM/jb

c: The Honorable Mark D. Boughton, Mayor, City of Danbury
Dennis Elpern, City Planner, City of Danbury
Danbury Hospital

ROBINSON & COLE

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Also admitted in Massachusetts

EM-VER-034-130613

June 12, 2013

Melanie Bachman
Acting Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Facility Modification**
Hospital Avenue, Danbury, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains a wireless telecommunications facility on the roof at Danbury Hospital, off Hospital Avenue in Danbury. The Council approved the establishment of this facility in Docket No. 79 in 1987. The facility, therefore, remains under the Council's jurisdiction.

Cellco now intends to replace eight (8) of its existing antennas with two (2) model BXA-80063-6BF cellular antennas; one (1) model BXA-80080-6CF cellular antenna; two (2) model BXA-70063-6CF LTE antennas; and three (3) model BXA-171063-8BF AWS antennas. Cellco also intends to install six (6) remote radio heads ("RRHs") behind its antennas and one (1) HYBRIFLEX™ fiber cable. Attached behind Tab 1 are specifications for the replacement antennas, RRHs and HYBRIFLEX™ cable. Cellco's beta and gamma sector antennas will remain in the same locations on the roof. Cellco's alpha sector antennas will be relocated to the northwest corner of the building roof. All antennas will be located at the same heights as existing antennas. Attached behind Tab 2 are Project Plans for the proposed antenna modifications.

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 Mark D. Boughton, Mayor for the City of Danbury and Danbury Hospital.

The planned modifications to the 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 an increase in the height of the antennas or the building.

2. The proposed modifications will not involve a change to any associated equipment and, therefore, will not require the extension of the site boundary.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.

4. The operation of the modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A Radio Frequency Exposure Report for Cellco's modified facility is included behind Tab 3.

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.

6. The roof and antenna support structures can support Cellco's proposed modifications. (*See* Structural Evaluation Letter attached behind Tab 4).

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

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Mark D. Boughton, Danbury Mayor
Danbury Hospital
Sandy M. Carter

BXA-80063-6CF-EDIN-X

Replace "X" with desired electrical downtilt

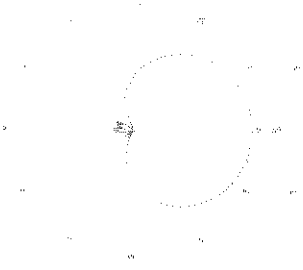
Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering

x-Pol | FET Panel | 63° | 14.5 dBd

Electrical Characteristics				
Frequency bands	806-900 MHz*			
*Optional frequency band for iDEN	806-941 MHz (specify when ordering)			
Polarization	±45°			
Horizontal beamwidth	63°			
Vertical beamwidth	11°			
Gain	14.5 dBd (16.6 dBi)			
Electrical downtilt (°)	0, 2, 3, 4, 5, 6, 8, 10			
Impedance	50Ω			
VSWR	≤1.4:1			
Upper sidelobe suppression (0°)	-18.2 dB			
Front-to-back ratio (+/-30°)	-36.3 dB			
Null fill	5% (-26.02 dB)			
Isolation between ports	< -25 dB			
Input power with EDIN connectors	500 W			
Input power with NE connectors	300 W			
Lightning protection	Direct Ground			
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)			
Mechanical Characteristics				
Dimensions Length x Width x Depth	1804 x 285 x 132 mm		71.0 x 11.2 x 5.2 in	
Depth with z-brackets	172 mm		6.8 in	
Weight without mounting brackets	7.9 kg		17 lbs	
Survival wind speed	> 201 km/hr		> 125 mph	
Wind area	Front: 0.51 m^2	Side: 0.24 m^2	Front: 5.5 ft^2	Side: 2.6 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 759 N	Side: 391 N	Front: 169 lbf	Side: 89 lbf

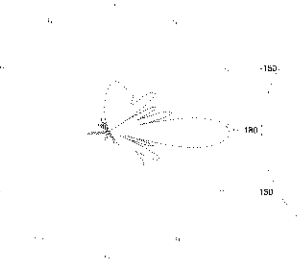
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-80063-6CF-EDIN-X-FP		

BXA-80063-6CF-EDIN-X



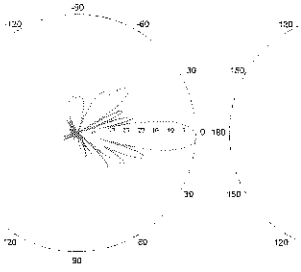
Horizontal

BXA-80063-6CF-EDIN-0



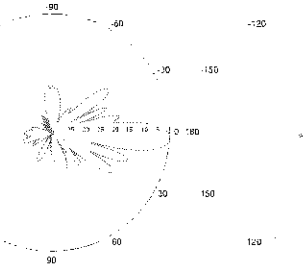
0° | Vertical

BXA-80063-6CF-EDIN-2



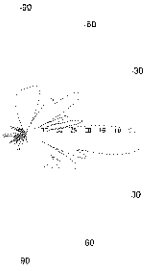
2° | Vertical

BXA-80063-6CF-EDIN-3



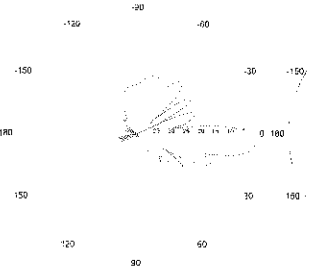
3° | Vertical

BXA-80063-6CF-EDIN-4



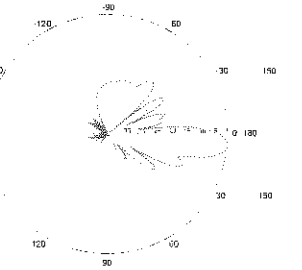
4° | Vertical

BXA-80063-6CF-EDIN-5



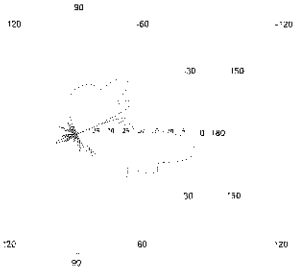
5° | Vertical

BXA-80063-6CF-EDIN-6



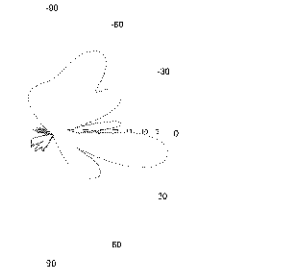
6° | Vertical

BXA-80063-6CF-EDIN-8



8° | Vertical

BXA-80063-6CF-EDIN-10



10° | Vertical

BXA-80080-6CF-EDIN-X

X-Pol | FET Panel | 80° | 13.5 dBd

Replace "X" with desired electrical downtilt.

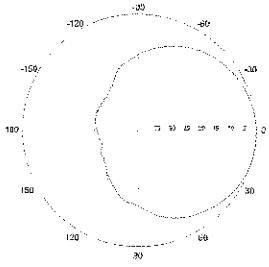
Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	
Frequency bands	806-900 MHz*
*Optional frequency band for iDEN	806-941 MHz (specify when ordering)
Polarization	±45°
Horizontal beamwidth	80°
Vertical beamwidth	10°
Gain	13.5 dBd (15.6 dBi)
Electrical downtilt (°)	0, 2, 4, 6, 8, 10
Impedance	50Ω
VSWR	≤1.4:1
Upper sidelobe suppression (0°)	-18.6 dB
Front-to-back ratio (+/-30°)	-25.6 dB
Null fill	5% (-26.02 dB)
Isolation between ports	< -30 dB
Input power with EDIN connectors	500 W
Input power with NE connectors	300 W
Lightning protection	Direct Ground
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)

Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 204 x 151 mm	71.0 x 8.0 x 5.9 in
Depth with z-brackets	191 mm	7.5 in
Weight without mounting brackets	8.2 kg	18 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.37 m^2 Side: 0.27 m^2	Front: 3.9 ft^2 Side: 2.9 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 531 N Side: 475 N	Front: 119 lbf Side: 104 lbf

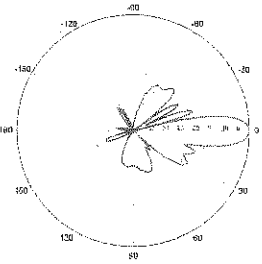
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-80080-6CF-EDIN-X-FP		

BXA-80080-6CF-EDIN-X



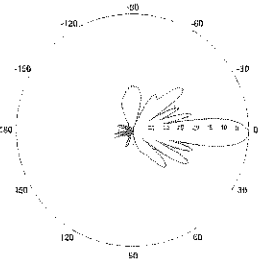
Horizontal

BXA-80080-6CF-EDIN-0



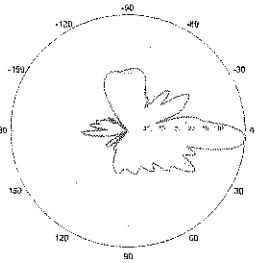
0° | Vertical

BXA-80080-6CF-EDIN-2



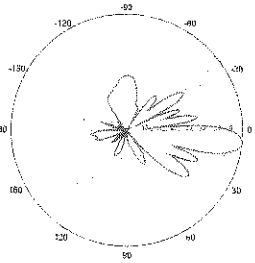
2° | Vertical

BXA-80080-6CF-EDIN-4



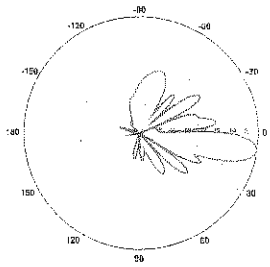
4° | Vertical

BXA-80080-6CF-EDIN-6



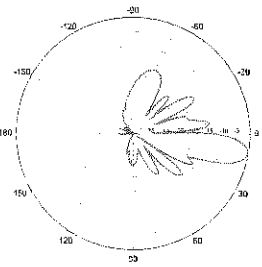
6° | Vertical

BXA-80080-6CF-EDIN-8



8° | Vertical

BXA-80080-6CF-EDIN-10



10° | Vertical

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

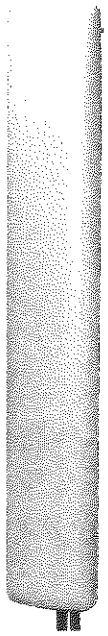
X-Pol | FET Panel | 63° | 14.5 dBd

Replace "X" with desired electrical downtilt.

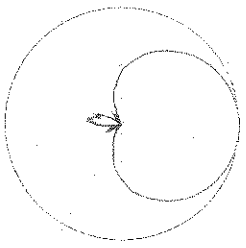
Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (°)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	
Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m^2 Side: 0.24 m^2	Front: 5.5 ft^2 Side: 2.6 ft^2
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

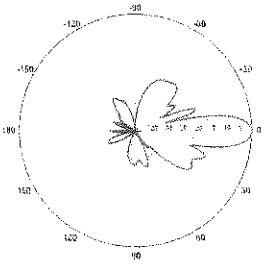


BXA-70063-6CF-EDIN-X



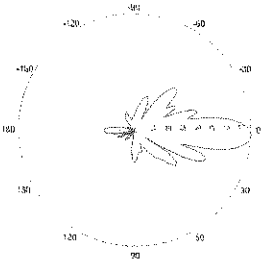
Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0

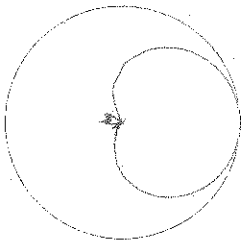


0° | Vertical | 750 MHz

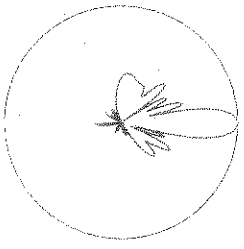
BXA-70063-6CF-EDIN-2



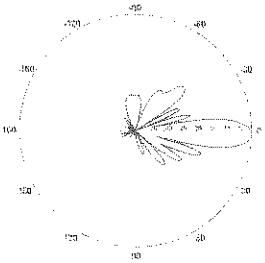
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz

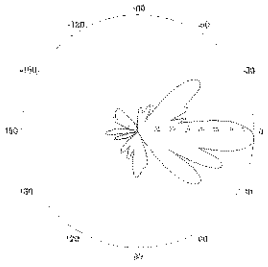


2° | Vertical | 850 MHz

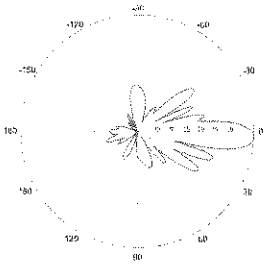
BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3

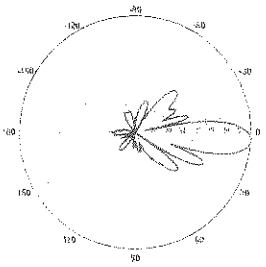


3° | Vertical | 750 MHz

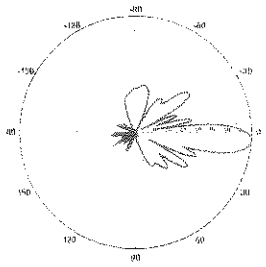


3° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-4

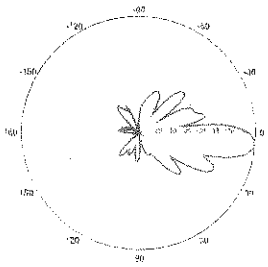


4° | Vertical | 750 MHz

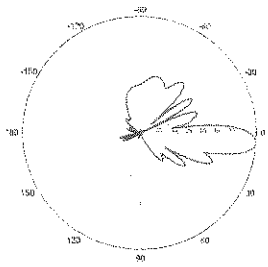


4° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-5

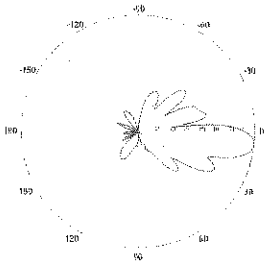


5° | Vertical | 750 MHz

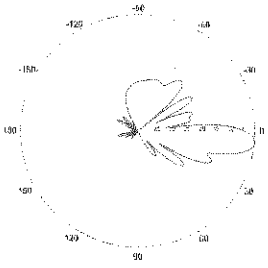


5° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-6

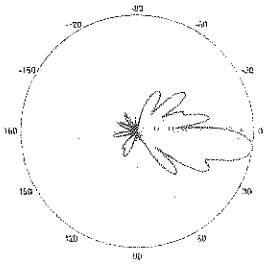


6° | Vertical | 750 MHz

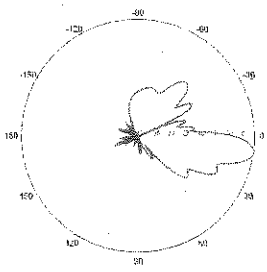


6° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-8

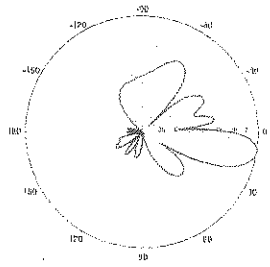


8° | Vertical | 750 MHz

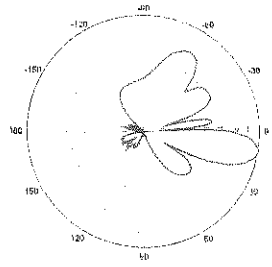


8° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-10



10° | Vertical | 750 MHz



10° | Vertical | 850 MHz

Amphenol ANTENNA SOLUTIONS

BXA-171063-8BF-EDIN-X

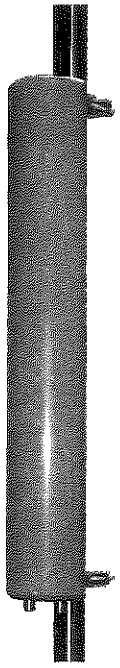
Replace "X" with desired electrical downtilt

X-Pol | FET Panel | 63° | 17.4 dBi

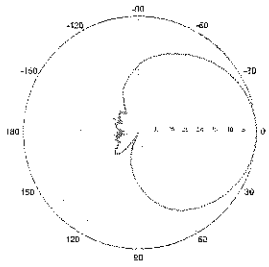
Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	7°	7°	7°
Gain	14.5 dBd / 16.6 dBi	14.9 dBd / 17.0 dBi	15.3 dBd / 17.4 dBi
Electrical downtilt (°)	0, 2, 4, 8		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back ratio	> 30 dB		
In-band isolation	> 25 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN / Female / Bottom		
Operating temperature	-40° to +60° C / -40° to +140° F		

Mechanical Characteristics		
Dimensions Length x Width x Depth	1225 x 154 x 105 mm	48.2 x 6.1 x 4.1 in
Depth with t-brackets	133 mm	5.2 in
Weight without mounting brackets	4.2 kg	9.2 lbs
Survival wind speed	296 km/hr	184 mph
Wind area	Front: 0.19 m² Side: 0.14 m²	Front: 2.0 ft² Side: 1.5 ft²
Wind load @ 161 km/hr (100 mph)	Front: 281 N Side: 223 N	Front: 63 lbf Side: 50 lbf

Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-8BF-EDIN-X-FP		

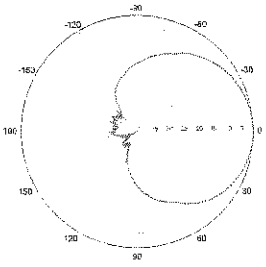


BXA-171063-8BF-EDIN-X



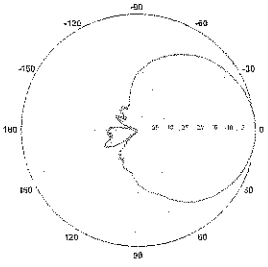
Horizontal | 1710-1880 MHz

BXA-171063-8BF-EDIN-X



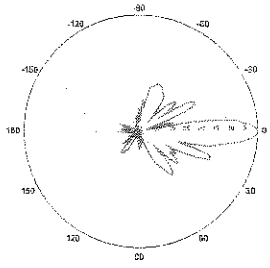
Horizontal | 1850-1990 MHz

BXA-171063-8BF-EDIN-X



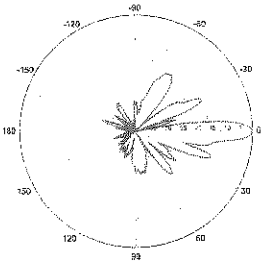
Horizontal | 1920-2170 MHz

BXA-171063-8BF-EDIN-0



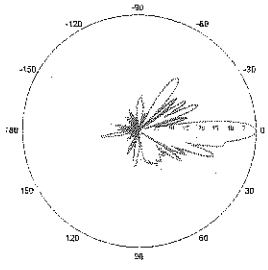
0° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-0



0° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-0

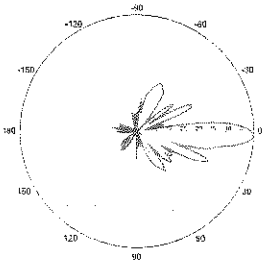


0° | Vertical | 1920-2170 MHz

BXA-171063-8BF-EDIN-X

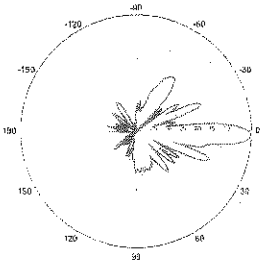
X-Pol | FE1 Panel | 63° | 17.4 dBi

BXA-171063-8BF-EDIN-2



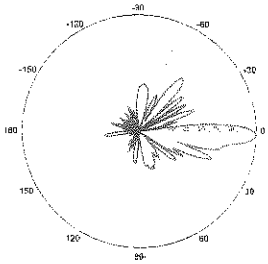
2° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-2



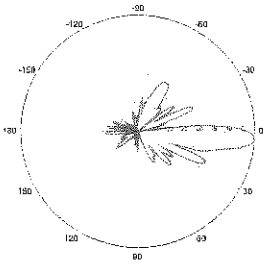
2° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-2



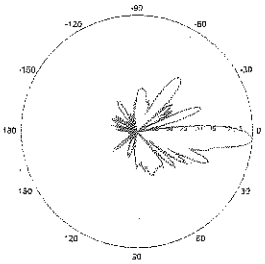
2° | Vertical | 1920-2170 MHz

BXA-171063-8BF-EDIN-4



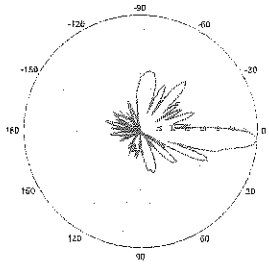
4° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-4



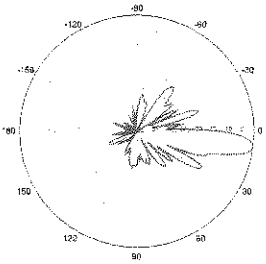
4° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-4



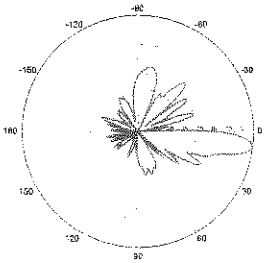
4° | Vertical | 1920-2170 MHz

BXA-171063-8BF-EDIN-8



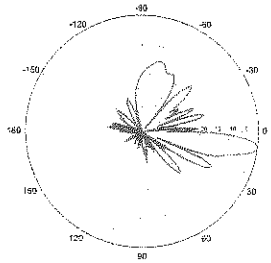
8° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-8



8° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-8

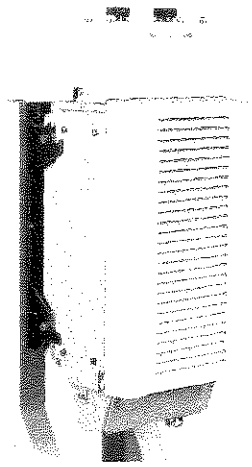


8° | Vertical | 1920-2170 MHz

Alcatel-Lucent RRH2x40-AWS

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-AWS is a high-power, small form-factor Remote Radio Head (RRH) operating in the AWS frequency band (1700/2100MHz - 3GPP Band 4). The Alcatel-Lucent RRH2x40-AWS is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.



A distributed eNodeB expands deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of an eNodeB to be installed separately, within the same site or several kilometres apart.

The Alcatel-Lucent RRH2x40-AWS is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-AWS has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to four-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 20 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-AWS is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-AWS installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-AWS is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-AWS is compact and weighs less than 20 kg (44 lb), eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day — a fraction of the time required for a traditional BTS.

Excellent RF performance

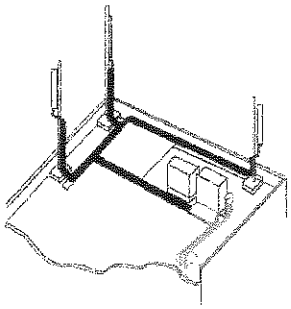
Because of its small size and weight, the Alcatel-Lucent RRH2x40-AWS can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-AWS where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced. The Alcatel-Lucent RRH2x40-AWS provides more RF power while at the same time consuming less electricity.

Features

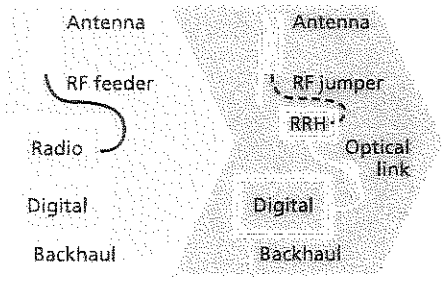
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless)
- Noise-free
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

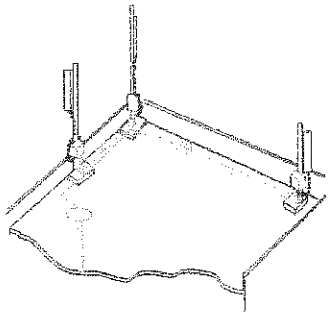
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility to network planning



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 620 mm (24.4 in.)
- Width: 270 mm (10.63 in.)
- Depth: 170m (6.7 in.)
- Weight (without mounting kit): less than 20 kg (44 lb)

Power

- Power supply: -48VDC

Operating environment

- Outdoor temperature range:
  - ¬ With solar load: -40°C to +50°C (-40°F to +122°F)
  - ¬ Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)
- Enclosure protection
  - ¬ IP65 (International Protection rating)

RF characteristics

- Frequency band: 1700/2100 MHz (AWS); 3GPP Band 4
- Bandwidth: up to 20 MHz
- RF output power at antenna port: 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way with optional Rx Diversity module
- Noise figure: below 2.0 dB typical
- Antenna Line Device features
  - ¬ TMA and Remote electrical tilt (RET) support via AISG v2.0

Optical characteristics

Type/number of fibers

- Single-mode variant
  - ¬ One Single Mode Single Fiber per RRH2x, carrying UL and DL using CWDM
  - ¬ Single mode dual fiber (SM/DF)
- Multi-mode variant
  - ¬ Two Multi-mode fibers per RRH2x: one carrying UL, the other carrying DL

Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

Digital Ports and Alarms

- Two optical ports to support daisy-chaining
- Six external alarms

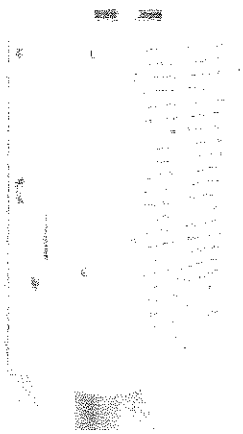
CPG2809100912 (09)

Alcatel·Lucent

Alcatel-Lucent RRH2x40-07-U

REMOTE RADIO HEAD

The Alcatel-Lucent RRH2x40-07-U is a high-power, small form-factor Remote Radio Head (RRH) operating in the North American Digital Dividend / 700MHz frequency band (3GPP Band 13). The Alcatel-Lucent RRH2x40-07-U is designed with an eco-efficient approach, providing operators with the means to achieve high quality and capacity coverage with minimum site requirements.



A distributed eNodeB expands deployment options by using two components, a Base Band Unit (BBU) containing the digital assets and a separate RRH containing the radio-frequency (RF) elements. This modular design optimizes available space and allows the main components of an eNodeB to be installed separately, within the same site or several kilometres apart.

The Alcatel-Lucent RRH2x40-07-U is linked to the BBU by an optical-fiber connection carrying downlink and uplink digital radio signals along with operations, administration and maintenance (OA&M) information. The Alcatel-Lucent RRH2x40-07-U has two transmit RF paths, 40 W RF output power per transmit path, and is designed to manage up to two-way receive diversity. The device is ideally suited to support macro coverage, with multiple-input multiple-output (MIMO) 2x2 operation in up to 10 MHz of bandwidth.

The Alcatel-Lucent RRH2x40-07-U is designed to make available all the benefits of a distributed eNodeB, with excellent RF characteristics, with low capital expenditures (CAPEX) and low operating expenditures (OPEX). The limited space available in some sites may prevent the installation of traditional single-cabinet BTS equipment or require costly cranes to be employed, leaving coverage holes. However, many of these sites can host an Alcatel-Lucent RRH2x40-07-U installation, providing more flexible site selection and improved network quality along with greatly reduced installation time and costs.

Fast, low-cost installation and deployment

The Alcatel-Lucent RRH2x40-07-U is a zero-footprint solution and operates noise-free, simplifying negotiations with site property owners and minimizing environmental impacts. Installation can easily be done by a single person because the Alcatel-Lucent RRH2x40-07-U is compact and weights less than 23 kg (50 lb), eliminating the need for a crane to hoist the BTS cabinet to the rooftop. A site can be in operation in less than one day — a fraction of the time required for a traditional BTS.

Excellent RF performance

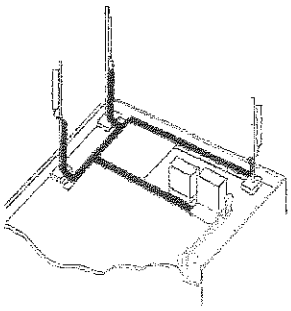
Because of its small size and weight, the Alcatel-Lucent RRH2x40-07-U can be installed close to the antenna. Operators can therefore locate the Alcatel-Lucent RRH2x40-07-U where RF engineering is deemed ideal, minimizing trade-offs between available sites and RF optimum sites. The RF feeder cost and installation costs are reduced or eliminated, and there is no need for a Tower Mounted Amplifier (TMA) because losses introduced by the RF feeder are greatly reduced. The Alcatel-Lucent RRH2x40-07-U provides more RF power while at the same time consuming less electricity.

Features

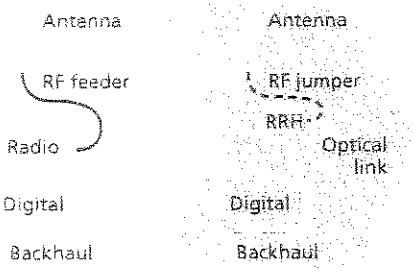
- Zero-footprint deployment
- Easy installation, with a lightweight unit can be carried and set up by one person
- Optimized RF power, with flexible site selection and elimination of a TMA
- Convection-cooled (fanless), noise-free, and heaterless unit
- Best-in-class power efficiency, with significantly reduced energy consumption

Benefits

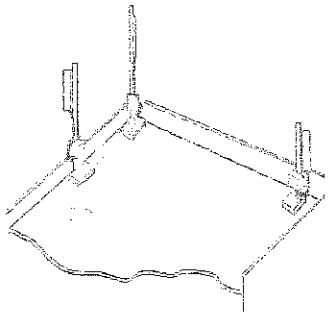
- Leverages existing real estate with lower site costs
- Reduces installation costs, with fewer installation materials and simplified logistics
- Decreases power costs and minimizes environmental impacts, with the potential for eco-sustainable power options
- Improves RF performance and adds flexibility to network planning



Macro



RRH for space-constrained cell sites



Distributed

Technical specifications

Physical dimensions

- Height: 390 mm (15.4 in.)
- Width: 380 mm (15 in.)
- Depth: 210 mm (8.2 in.)
- Weight (without mounting kit): less than 23 kg (50 lb)

Power

- Power supply: -48V

Operating environment

- Outdoor temperature range:
  - ¬ With solar load: -40°C to +50°C (-40°F to +122°F)
  - ¬ Without solar load: -40°C to +55°C (-40°F to +131°F)
- Passive convection cooling (no fans)
- Enclosure protection
  - ¬ IP65 (International Protection rating)

RF characteristics

- Frequency band: 700 MHz; 3GPP Band 13
- Bandwidth: up to 10 MHz
- RF output power at antenna port:
  - ¬ 40 W nominal RF power for each Tx port
- Rx diversity: 2-way or 4-way
- Noise figure: below 2.5 dB typical
- ALD features
  - ¬ TMA
  - ¬ Remote electrical tilt (RET) support (AISG v2.0)

Optical characteristics

Type/number of fibers

- Up to 3.12 Gb/s line bit rate
- Single-mode variant
  - ¬ One SM fiber (9/125 µm) per RRH2x, carrying UL and DL using CWDM (at 1550/1310 nm)
- Multi-mode variant
  - ¬ Two MM fibers (50/125 µm) per RRH2x: one carrying UL, the other carrying DL (at 850 nm)

Optical fiber length

- Up to 500 m (0.31 mi), using MM fiber
- Up to 20 km (12.43 mi), using SM fiber

Alarms and ports

- Six external alarms
- Two optical ports to support daisy-chaining

CPG2809100913 (09)

Alcatel·Lucent

Product Data Sheet HB158-1-08UB-S8J18

HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber

Product Description

RFS' HYBRIFLEX Remote Radio Head (RRH) hybrid feeder cabling solution combines optical fiber and DC power for RRHs in a single lightweight aluminum corrugated cable, making it the world's most innovative solution for RRH deployments.

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

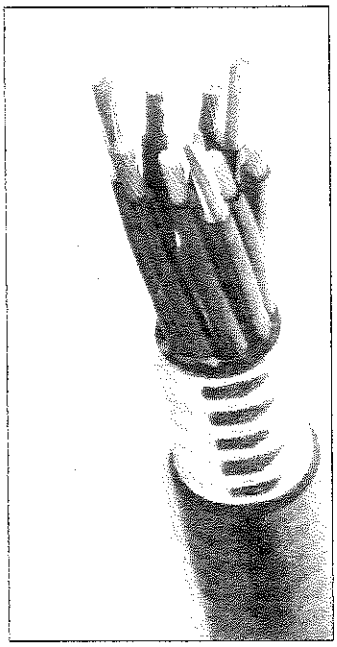


Figure 1: HYBRIFLEX Series

Features/Benefits

- Aluminum corrugated armor with outstanding bending characteristics – minimizes installation time and enables mechanical protection and shielding
- Same accessories as 1 5/8" coaxial cable
- Outer conductor grounding – Eliminates typical grounding requirements and saves on installation costs
- Lightweight solution and compact design – Decreases tower loading
- Robust cabling – Eliminates need for expensive cable trays and ducts
- Installation of tight bundled fiber optic cable pairs directly to the RRH – Reduces CAPEX and wind load by eliminating need for interconnection
- Optical fiber and power cables housed in single corrugated cable – Saves CAPEX by standardizing RRH cable installation and reducing installation requirements
- Outdoor polyethylene jacket – Ensures long-lasting cable protection

Technical Specifications

Structure			
Outer Conductor Armor:	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket:	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection:	Individual and External Jacket		Yes
Mechanical Properties			
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
Electrical Properties			
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	.068 (0.205)
DC-Resistance Power Cable, 8.4mm² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Fiber Optic Properties			
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
DC Power Cable Properties			
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-95-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Environmental			
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

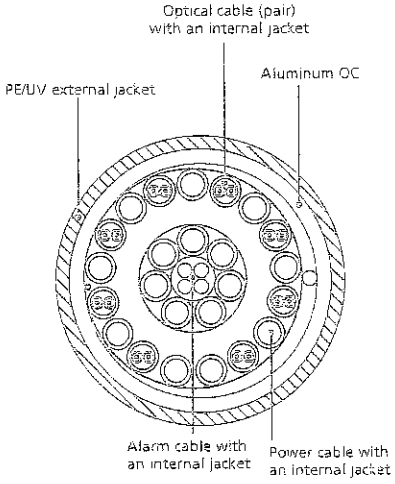


Figure 2: Construction Detail

* This data is provisional and subject to change

NOTES.

1. THE PROPOSED VERIZON WIRELESS ANTENNA UPGRADE TO CONSIST OF THE REPLACEMENT OF (8) OF THE EXISTING (12) PANEL ANTENNAS WITH (3) AWS PANEL ANTENNAS, (3) CELL PANEL ANTENNAS & (2) LTE PANEL ANTENNAS. ADDITIONALLY (6) REMOTE RADIO HEADS, (3) AWS SECTOR DISTRIBUTION BOXES, (1) AWS MAIN DISTRIBUTION BOX & AWS FIBER W/POWER CABLES ROUTED FROM THE EQUIPMENT ROOM TO THE ANTENNA SECTOR LOCATIONS WILL BE INSTALLED
2. THE PROPOSED ANTENNAS TO BE MOUNTED WITH A CENTERLINE HEIGHT AND AZIMUTH ORIENTATION EQUAL TO THE EXISTING ANTENNAS.

DESIGN EXHIBIT

THIS PLAN IS DIAGRAMMATIC IN NATURE AND IS INTENDED FOR VISUAL REPRESENTATION OF THE PROPOSED ANTENNA UPGRADE.

LOCATION OF EXISTING/PROPOSED VERIZON WIRELESS **ALPHA SECTOR** PANEL ANTENNAS & ASSOCIATED AWS APPURTENANCES MOUNTED TO PROPOSED ANTENNA MOUNTING FRAME. (2/DE-3, 1/DE-8, 2/DE-8)

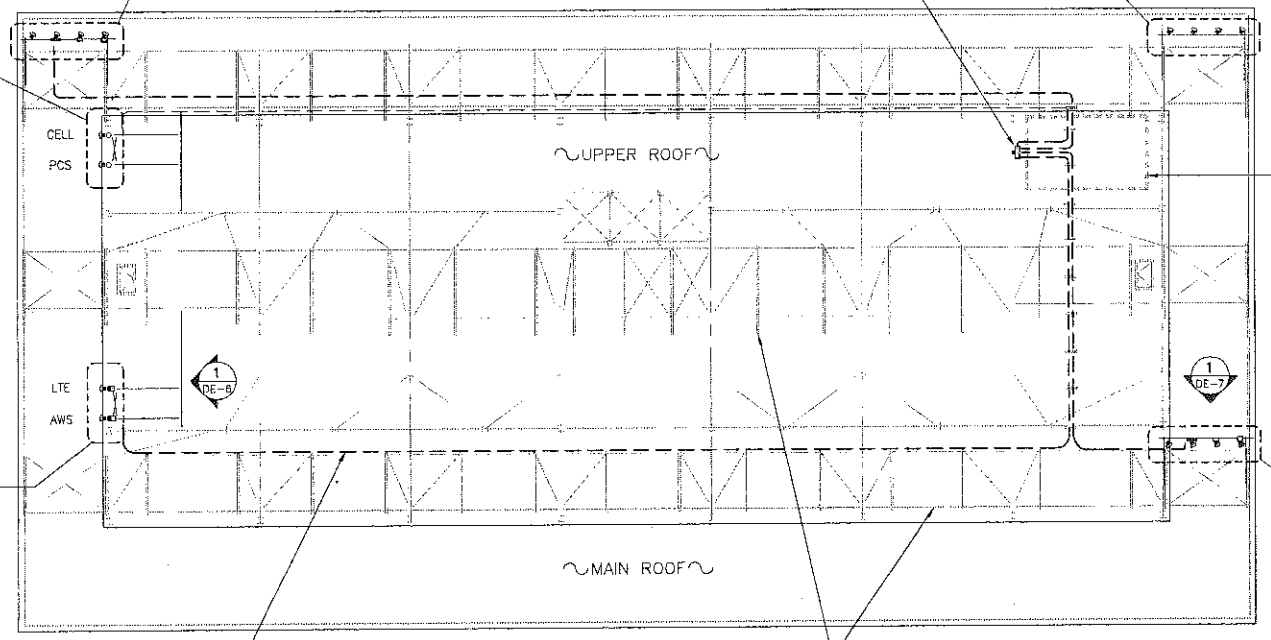
30° ALPHA SECTOR

(2/DE-6) PROPOSED AWS MAIN DISTRIBUTION BOX MOUNTED TO EXISTING SOLAR PANEL STEEL FRAMING.

(1/DE-2)

(1/DE-3) LOCATION OF EXISTING VERIZON WIRELESS **ALPHA SECTOR** PANEL ANTENNAS MOUNTED TO EXISTING FRAME. ANTENNAS AND FRAME TO BE REMOVED DOWN TO ORIGINAL SOLAR PANEL SUPPORT FRAMING.

LOCATION OF EXISTING/PROPOSED VERIZON WIRELESS **GAMMA SECTOR NORTH** PANEL ANTENNAS MOUNTED TO EXISTING ANTENNA MOUNTING FRAME. (1&2/DE-5)



280° GAMMA SECTOR

APPROXIMATE LOCATION OF EXISTING VERIZON WIRELESS EQUIPMENT ROOM WITHIN BUILDING TOP FLOOR.

(1/DE-6)

(1/DE-7)

LOCATION OF EXISTING/PROPOSED VERIZON WIRELESS **GAMMA SECTOR SOUTH** PANEL ANTENNAS & ASSOCIATED AWS APPURTENANCES MOUNTED TO EXISTING ANTENNA MOUNTING FRAME. (1&2/DE-5)

150° BETA SECTOR

PROPOSED VERIZON WIRELESS FIBER W/ POWER JUMPER CABLE TO FOLLOW ROUTE OF EXISTING VERIZON WIRELESS COAX CABLES, TYP.

EXISTING ROOF TOP MOUNTED SOLAR PANELS AND SUPPORTING STEEL FRAMING.

LOCATION OF EXISTING/PROPOSED VERIZON WIRELESS **BETA SECTOR** PANEL ANTENNAS & ASSOCIATED AWS APPURTENANCES MOUNTED TO EXISTING ANTENNA MOUNTING FRAME. (1&2/DE-4)

1/DE-1 **ROOF PLAN - PROPOSED**

SCALE: 1"= 20'

NORTH

20 0 10 20 40 60

(IN FEET)
1 inch = 20 ft.

DESIGNED BY:	CFC
DRAWN BY:	HMR
CHK'D BY:	CMD

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	12/06/13	CLT	CMD	DESIGN EXHIBIT – ISSUED FOR CLIENT REVIEW
0	11/05/13	CLT	CMD	DESIGN EXHIBIT – ISSUED FOR CLIENT REVIEW

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PROJECT MANAGER APPROVES

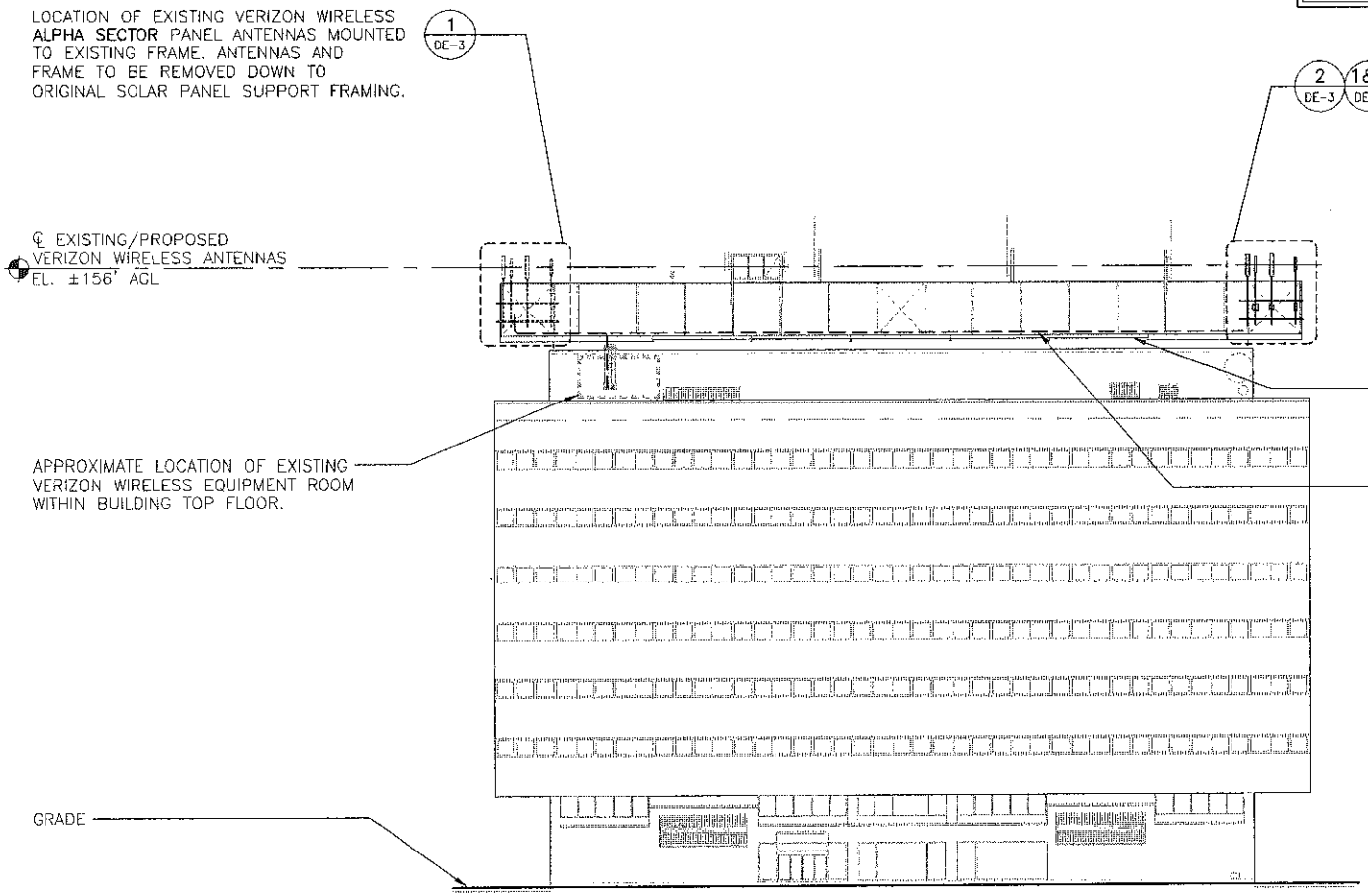
DANBURY
24 HOSPITAL AVE
DANBURY, CT 06810

DATE:	12/26/13
SCALE:	AS SHOWN
JOB NO.	12124.C051

SHEET NO.
DE-1

DESIGN EXHIBIT

THIS PLAN IS DIAGRAMMATIC IN NATURE AND IS INTENDED FOR VISUAL REPRESENTATION OF THE PROPOSED ANTENNA UPGRADE.



1 / DE-2 **NORTH ELEVATION - PROPOSED**

SCALE: 1"= 30'

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)

1 inch = 30 ft.

DESIGNED BY:	CFC
DRAWN BY:	NMR
CHK'D BY:	DMD

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	06/06/13	CLT	DMD	DESIGN EXHIBIT – ISSUED FOR CLIENT REVIEW
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PROPOSED ANTENNA UPGRADE

DANBURY

24 HOSPITAL AVE
DANBURY, CT 06810

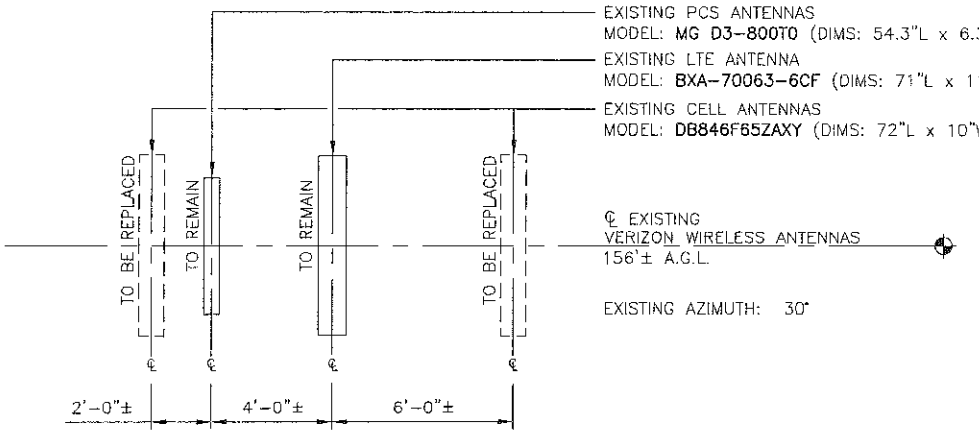
DATE:	02/26/13
SCALE:	AS SHOWN
JOB NO.	12124.C051

SHEET NO.

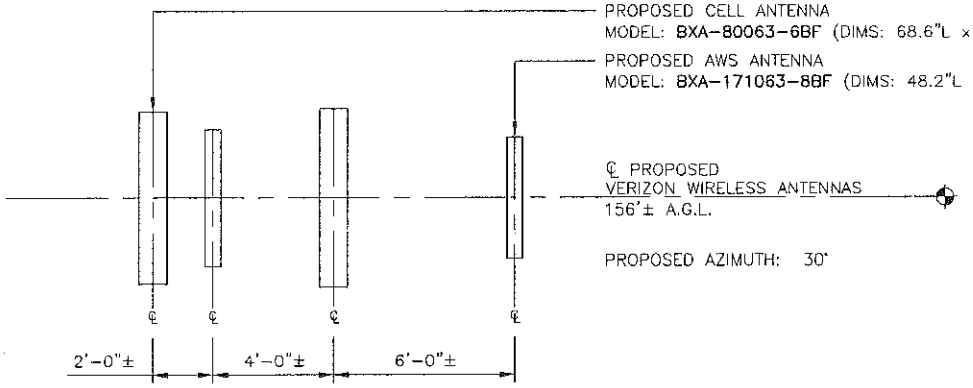
DE-2

NOTES

1. PROPOSED ANTENNA SPACING DIMENSIONS SHOWN ARE MINIMUM ANTENNA AZIMUTH SEPARATIONS. ACTUAL ANTENNA MOUNT SEPARATIONS TO BE VERIFIED IN FIELD.
2. REFER TO FINAL RF REPORT PROVIDED BY VERIZON WIRELESS FOR THE LATEST INFORMATION REGARDING ALL AZIMUTHS, REQUIRED CABLES AND APPURTENANCES.



1 DE-3 **ANTENNA MOUNTING CONFIGURATION - EXISTING**
SCALE: 1/4" = 1'-0" (ALPHA SECTOR)



2 DE-3 **ANTENNA MOUNTING CONFIGURATION - PROPOSED**
SCALE: 1/4" = 1'-0" (ALPHA SECTOR)

DESIGNED BY: CFC
DRAWN BY: HMR
CHK'D BY: CFC

REV'S	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	12/06/13	CLT	DMD	DESIGN EXHIBIT – ISSUED FOR CLIENT REVIEW
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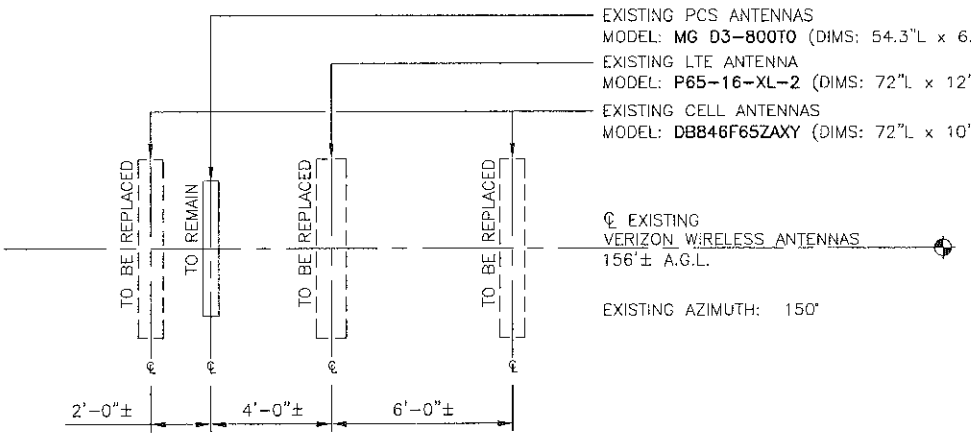
SCALE: AS SHOWN
JOB NO.: 12124.C051

SHEET NO.
DE-3

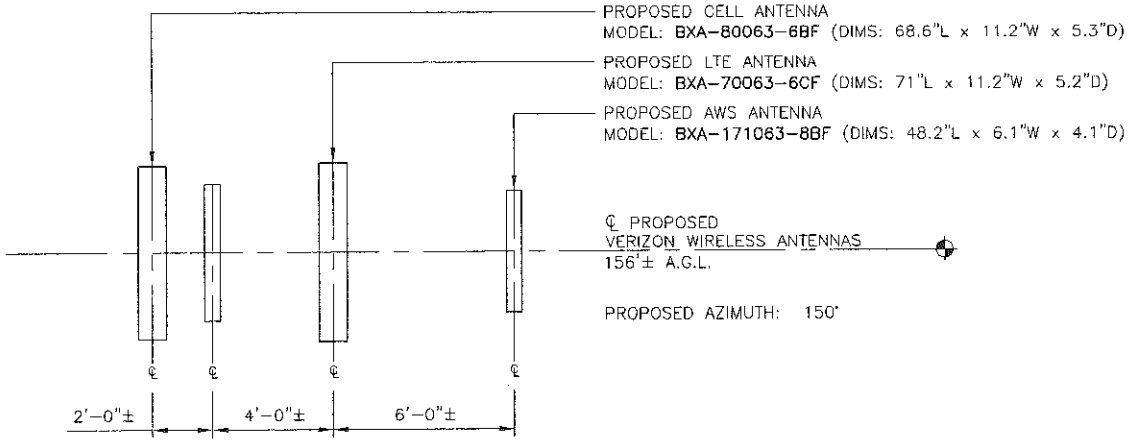
NOTES

1. PROPOSED ANTENNA SPACING DIMENSIONS SHOWN ARE MINIMUM ANTENNA AZIMUTH SEPARATIONS. ACTUAL ANTENNA MOUNT SEPARATIONS TO BE VERIFIED IN FIELD.
2. REFER TO FINAL RF REPORT PROVIDED BY VERIZON WIRELESS FOR THE LATEST INFORMATION REGARDING ALL AZIMUTHS, REQUIRED CABLES AND APPURTENANCES.



1 / DE-4 ANTENNA MOUNTING CONFIGURATION - EXISTING (BETA SECTOR)

SCALE: 1/4" = 1'-0"



2 / DE-4 ANTENNA MOUNTING CONFIGURATION - PROPOSED (BETA SECTOR)

SCALE: 1/4" = 1'-0"

DESIGNED BY: CFC
DRAWN BY: HWN
CHK'D BY: DMD

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
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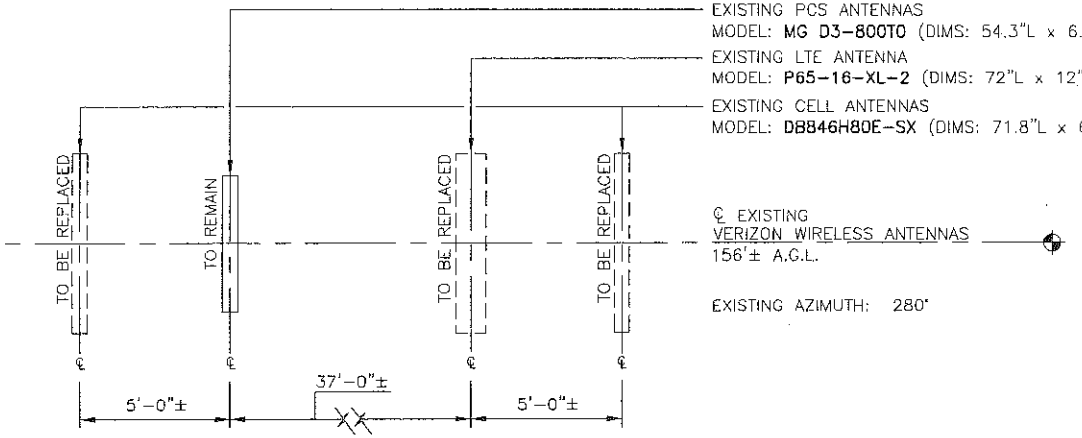
DANBURY, CT 06810

DATE: 02/26/13
SCALE: AS SHOWN
JOB NO. 12124.C051

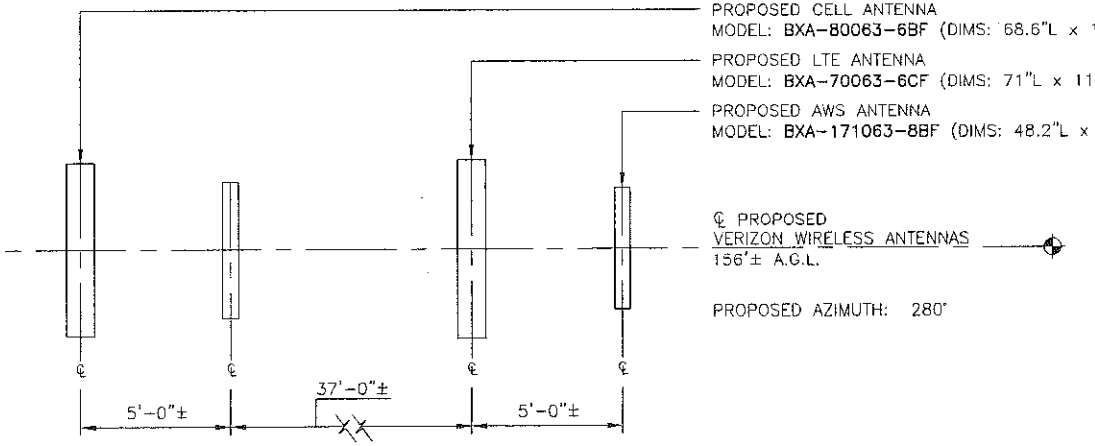
SHEET NO.
DE-4

NOTES

1. PROPOSED ANTENNA SPACING DIMENSIONS SHOWN ARE MINIMUM ANTENNA AZIMUTH SEPARATIONS. ACTUAL ANTENNA MOUNT SEPARATIONS TO BE VERIFIED IN FIELD.
2. REFER TO FINAL RF REPORT PROVIDED BY VERIZON WIRELESS FOR THE LATEST INFORMATION REGARDING ALL AZIMUTHS, REQUIRED CABLES AND APPURTENANCES.



1 / DE-5 ANTENNA MOUNTING CONFIGURATION - EXISTING (GAMMA SECTOR)
SCALE: 1/4" = 1'-0"



2 / DE-5 ANTENNA MOUNTING CONFIGURATION - PROPOSED (GAMMA SECTOR)
SCALE: 1/4" = 1'-0"

DESIGNED BY:	CFC
DRAWN BY:	HMR
CHK'D BY:	DMD

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	06/06/13	CLT	DMD	DESIGN EXHIBIT – ISSUED FOR CLIENT REVIEW
0	03/05/13	CLT	DMD	DESIGN EXHIBIT – ISSUED FOR CLIENT REVIEW

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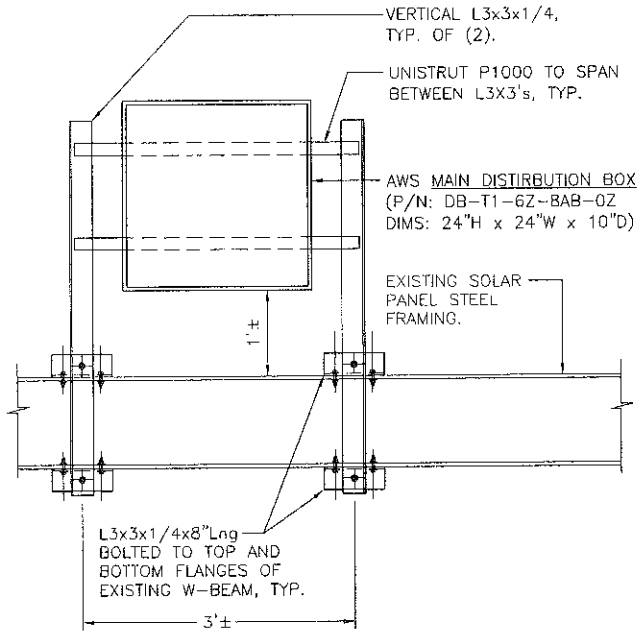
PROJECT ENTITY LOCATION:
DANBURY
24 HOSPITAL AVE
DANBURY, CT 06810

DATE:	02/26/13
SCALE:	AS SHOWN
JOB NO.	12124.0051

SHEET NO.
DE-5

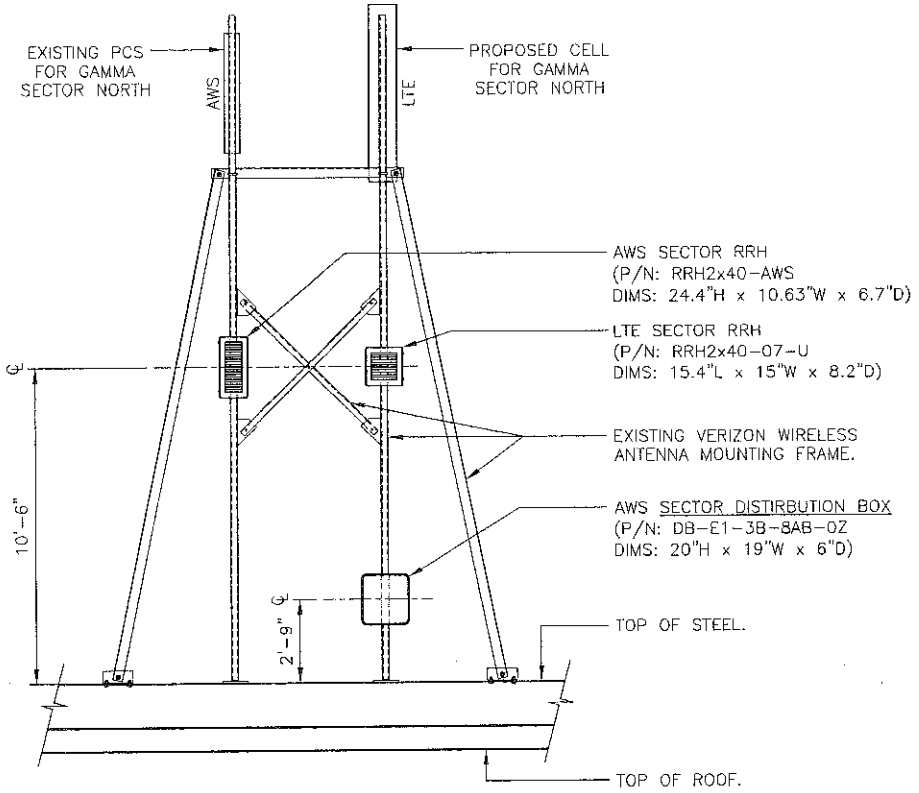
NOTES

1. ATTACHMENT OF RRH & DISTRIBUTION BOXES TO MOUNTS SHALL BE PER MANUFACTURER'S REQUIREMENTS.



2 / DE-6 **MAIN DISTRO. BOX MOUNTING DETAIL**

SCALE: 3/4" = 1'-0"



1 / DE-6 **SECTOR DISTRO. BOX + RRH MOUNTING DETAILS (GAMMA SECTOR SOUTH)**

SCALE: 1/4" = 1'-0"

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	05/06/13	CLT	DMD	DESIGN EXHIBIT - ISSUED FOR CLIENT REVIEW
0	03/05/13	CLT	DMD	DESIGN EXHIBIT - ISSUED FOR CLIENT REVIEW

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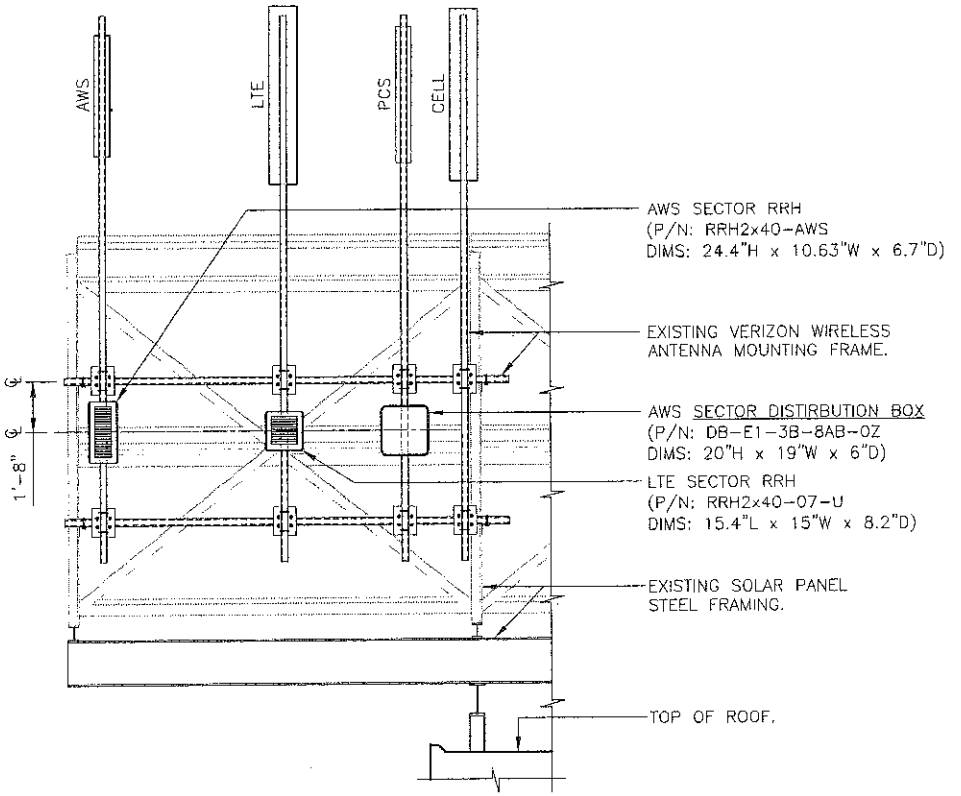
DANBURY, CT 06810

DATE: 02/26/13
SCALE: AS SHOWN
JOB NO. 12124.C051

SHEET NO.
DE-6

NOTES

1. ATTACHMENT OF RRH & DISTRIBUTION BOXES TO MOUNTS SHALL BE PER MANUFACTURER'S REQUIREMENTS.



1 / DE-7 SECTOR DISTRO. BOX + RRH MOUNTING DETAILS (BETA SECTOR)

SCALE: 1/4" = 1'-0"

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	05/06/13	CLT	DMD	ZONING EXHIBIT - ISSUED FOR CLIENT REVIEW
0	03/05/13	CLT	DMD	ZONING EXHIBIT - ISSUED FOR CLIENT REVIEW

DESIGNED BY: CFC
DRAWN BY: HMR
CHK'D BY: DMD

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(NEW ENGLAND AREA)

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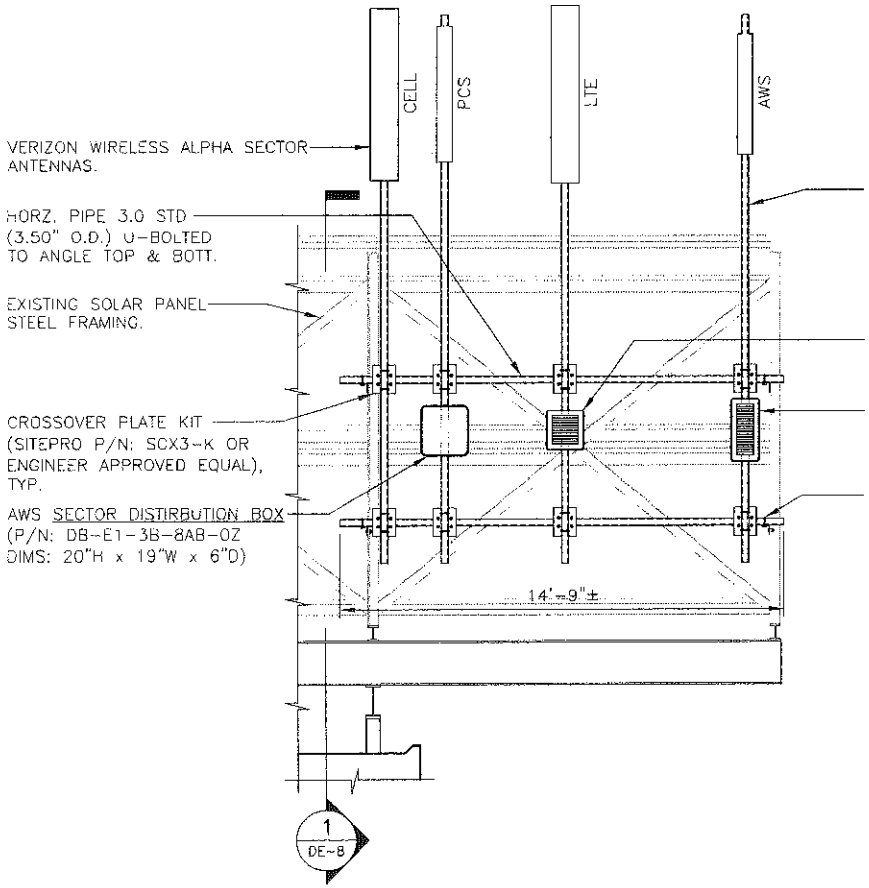
DANBURY, CT 06810

DATE: 02/26/13
SCALE: AS SHOWN
JOB NO. 12124.C051

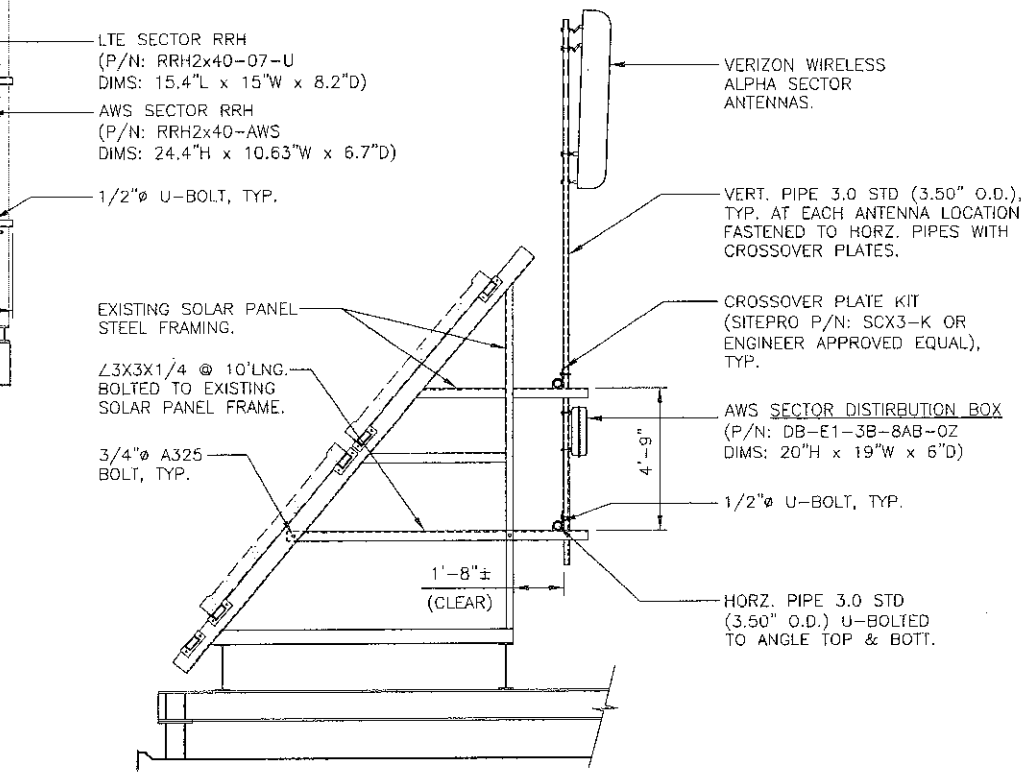
SHEET NO.
DE-7

NOTES

1. ATTACHMENT OF RRH & DISTRIBUTION BOXES TO MOUNTS SHALL BE PER MANUFACTURER'S REQUIREMENTS.



2 DE-8 **SECTOR MOUNTING ELEVATION (ALPHA SECTOR)**
SCALE: 1/4" = 1'-0"



1 DE-8 **SECTOR MOUNTING SECTION (ALPHA SECTOR)**
SCALE: 1/4" = 1'-0"

REV	DATE	DRAWN BY/CHECKED BY	DESCRIPTION
1	11/06/12	CLT / DMD	DESIGN EXHIBIT – ISSUED FOR CLIENT REVIEW
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CHK'D BY: DMD

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DATE: 02/26/13
SCALE: AS SHOWN
JOB NO. 12124.0051

SHEET NO.
DE-8

STRUCTURAL SPECIFICATIONS

DESIGN BASIS

GOVERNING CODE: 2003 INTERNATIONAL BUILDING CODE (IBC) AS MODIFIED BY THE 2005 CONNECTICUT STATE BUILDING CODE AND 2009 AMENDMENTS.

1. DESIGN CRITERIA:

   - WIND LOAD: PER EIA/TIA 222 F-96 (ANTENNA MOUNTS): 85 MPH (FASTEST MILE), EQUIVALENT TO 105 MPH (3 SECOND GUST).
   - BASIC WIND SPEED (OTHER STRUCTURE): 95 MPH (3 SECOND GUST) (EXPOSURE B/IMPORTANCE FACTOR 1.0 BASED ON ASCE 7-02) PER 2003 INTERNATIONAL BUILDING CODE (IBC) AS MODIFIED BY THE 2005 CONNECTICUT SUPPLEMENT AND 2009 AMENDMENT.
   - SEISMIC LOAD (DOES NOT CONTROL): PER ASCE 7-95 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES.

GENERAL NOTES

1. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.
2. DIMENSIONS AND DETAILS SHALL BE CHECKED AGAINST THE PRE MANUFACTURED EQUIPMENT BUILDING SHOP DRAWINGS.
3. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE SIZE AND LOCATION OF ALL OPENINGS, SLEEVES AND ANCHOR BOLTS AS REQUIRED BY ALL TRADES.

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL IS DESIGNED BY ALLOWABLE STRESS DESIGN (ASD)

   A. STRUCTURAL STEEL (W SHAPES)---ASTM A992 (FY = 50 KSI)
   B. STRUCTURAL STEEL (OTHER SHAPES)---ASTM A36 (FY = 36 KSI)
   C. STRUCTURAL HSS (RECTANGULAR SHAPES)---ASTM A500 GRADE B, (FY = 46 KSI)
   D. STRUCTURAL HSS (ROUND SHAPES)---ASTM A500 GRADE B, (FY = 42 KSI)
   E. PIPE---ASTM A53 (FY = 35 KSI)
   F. CONNECTION BOLTS---ASTM A325-N
   G. U-BOLTS---ASTM A36
   H. ANCHOR RODS---ASTM F 1554
   I. WELDING ELECTRODE---ASTM E 70XX

2. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING: SECTION PROFILES, SIZES, CONNECTION ATTACHMENTS, REINFORCING, ANCHORAGE, SIZE AND TYPE OF FASTENERS AND ACCESSORIES. INCLUDE ERECTION DRAWINGS, ELEVATIONS AND DETAILS.
3. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.
4. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.
5. FIT AND SHOP ASSEMBLE FABRICATIONS IN THE LARGEST PRACTICAL SECTIONS FOR DELIVERY TO SITE.
6. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.
7. AFTER ERECTION OF STRUCTURES, TOUCHUP ALL WELDS, ABRASIONS AND NON-GALVANIZED SURFACES WITH A 95% ORGANIC ZINC RICH PAINT IN ACCORDANCE WITH ASTM 780.
8. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.
9. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE".
10. CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES APPEARANCE AND QUALITY OF WELDS, AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATION PROCEDURES". ALL WELDING SHALL BE DONE USING E70XX ELECTRODES AND WELDING SHALL CONFORM TO AISC AND D1.1 WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLET J2.4 IN THE AISC "MANUAL OF STEEL CONSTRUCTION" 9TH EDITION. AT THE COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED.
11. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.
12. CONNECTION ANGLES SHALL HAVE A MINIMUM THICKNESS OF 1/4 INCHES.
13. STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE 3/4" DIAMETER MINIMUM AND SHALL HAVE A MINIMUM OF TWO BOLTS, UNLESS OTHERWISE ON THE DRAWINGS.
14. CONNECTIONS SHALL CONFORM TO ALL REQUIREMENTS OF THE "AISC SPECIFICATION FOR THE DESIGN, FABRICATION, AND ERECTION OF STRUCTURAL STEEL FOR SHELTERS", LATEST EDITION, AND THE "SPECIFICATION FOR STRUCTURAL JOINTS USING ASTM A325 OR A490 BOLTS", LATEST EDITION.
15. LOCK WASHER ARE NOT PERMITTED FOR A325 STEEL ASSEMBLIES.
16. SHOP CONNECTIONS SHALL BE WELDED OR HIGH STRENGTH BOLTED.
17. MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.
18. FABRICATE BEAMS WITH MILL CAMBER UP.
19. LEVEL AND PLUMB INDIVIDUAL MEMBERS OF THE STRUCTURE TO AN ACCURACY OF 1:500, BUT NOT TO EXCEED 1/4" IN THE FULL HEIGHT OF THE COLUMN.
20. COMMENCEMENT OF STRUCTURAL STEEL WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.
21. INSPECTION AND TESTING OF ALL WELDING AND HIGH STRENGTH BOLTING SHALL BE PERFORMED BY AN INDEPENDENT TESTING LABORATORY.
22. FOUR COPIES OF ALL INSPECTION TEST REPORTS SHALL BE SUBMITTED TO THE ENGINEER WITHIN TEN (10) WORKING DAYS OF THE DATE OF INSPECTION.

DESIGNED BY:	CFC
DRAWN BY:	HAR
CHK'D BY:	DMD

REV'L	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	05/06/13	CLY	DMD	BRIDGE EXHIBIT - ISSUED FOR CLIENT REVIEW
0	03/05/13	CLY	DMD	DESIGN EXHIBIT - ISSUED FOR CLIENT REVIEW

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PREPARED FOR VERIZON WIRELESS

DANBURY
24 HOSPITAL AVE
DANBURY, CT 06810

DATE:	02/26/13
SCALE:	AS SHOWN
JOB NO.	12124.0051

SHEET NO.
DE-9

C Squared Systems, LLC
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Auburn, NH 03032
(603) 644-2800
support@csquaredsystems.com

RADIO FREQUENCY EXPOSURE REPORT

DANBURY CT

24 HOSPITAL AVENUE
DANBURY, CT 06810

February 20, 2013

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1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed modifications to the existing Verizon Wireless antenna arrays at their Danbury facility located on the roof of the Danbury Hospital, located at 24 Hospital Avenue in Danbury, CT. The site is a twelve-story hospital building. Verizon Wireless, Sprint-Nextel, AT&T, T-Mobile and multiple government/private operators are all collocated on the rooftop. Figure 1 below shows the facility.

Verizon is proposing the following modifications:

1) Replace two of three existing 700 MHz LTE antennas (one per beta and gamma sectors);
2) Install three RRUs for the 700 MHz LTE antennas;
3) Remove six existing 850 MHz Cellular antennas (two per sector);
4) Install three replacement 850 MHz Cellular antennas (one per sector);
5) Install three 2100 MHz AWS antennas (one per sector);
6) Install one run of fiber and three RRUs for the 2100MHz antennas.

Figure 1: View of Danbury

Site Address	24 Hospital Ave, Danbury, CT
Latitude	41° 24' 18.11" N
Longitude	73° 26' 46.34" W
Site Elevation AMSL	467'
Roof Height(s) AGL	117'/134'
Cellular License Information	KNKA363
PCS License Information	KNLF644/KNLH264/WQBT539
LTE License Information	WQJQ689
AWS License Information	WQGA906/WQGB279
Name of Individual Conducting Survey	Evan Thibodeau
Date and Time of Survey	2/14/2013; 12:30PM – 2:30PM

Table 1: Site Specific Data

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

In 1985, the FCC established rules to regulate radio frequency (RF) exposure from FCC licensed antenna facilities. In 1996, the FCC updated these rules, which were further amended in August 1997 by OET Bulletin 65 Edition 97-01. These new rules include Maximum Permissible Exposure (MPE) limits for transmitters operating between 300 kHz and 100 GHz. The FCC MPE limits are based upon those recommended by the National Council on Radiation Protection and Measurements (NCRP), developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI).

The FCC general population/uncontrolled limits set the maximum exposure to which most people may be subjected. 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.

Public exposure to radio frequencies is regulated and enforced in units of milliwatts per square centimeter (mW/cm^2). The general population exposure limits for the various frequency ranges are defined in the attached "FCC Limits for Maximum Permissible Exposure (MPE)" in Attachment B of this report.

Higher exposure limits are permitted under the occupational/controlled exposure category, but only for persons who are exposed as a consequence of their employment provided they are fully aware of the potential for exposure, and are able to exercise control over their exposure. General population/uncontrolled limits are five times more stringent than the levels considered acceptable for occupational, or radio frequency trained individuals. Attachment B contains excerpts from OET Bulletin 65 and defines the Maximum Exposure Limit.

Finally, it should be noted that the MPE limits adopted by the FCC for both general population / uncontrolled exposure and for occupational / controlled 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.

3. Survey Methodology

Prior to measuring exposure levels the following items are photo documented:

- Roof access points
- EME signage (Present and/or missing)
- Directional views
- All antennas on the rooftop
- Neighboring facilities identified to have RF sources (if applicable)

All antennas on the rooftop are documented and the following information is provided (where available[1]):

- Manufacturer
- Model number
- Height relative to main roof
- Orientation
- Location on rooftop
- Physical characteristics including length and type.

Measurement points are established in a grid pattern, not more than 20 feet apart, over the entire area being surveyed. Additional measurement points are selected at potential "Hot Spots" (in close proximity to antennas).

[1] Where antenna model information is unattainable due to inaccessibility or illegibility of the antenna label, model assumptions are made based on the carrier's licensed frequency band and the physical dimensions and characteristics of the antenna.

4. Equipment, Roof Access & Site Signage

There are two access doors to the lower roof, both of which are accessible from stairwells on the top floor. Both of these access doors were locked at the time of this survey. The roof access doors, posted signage and rooftop mapping are shown below.

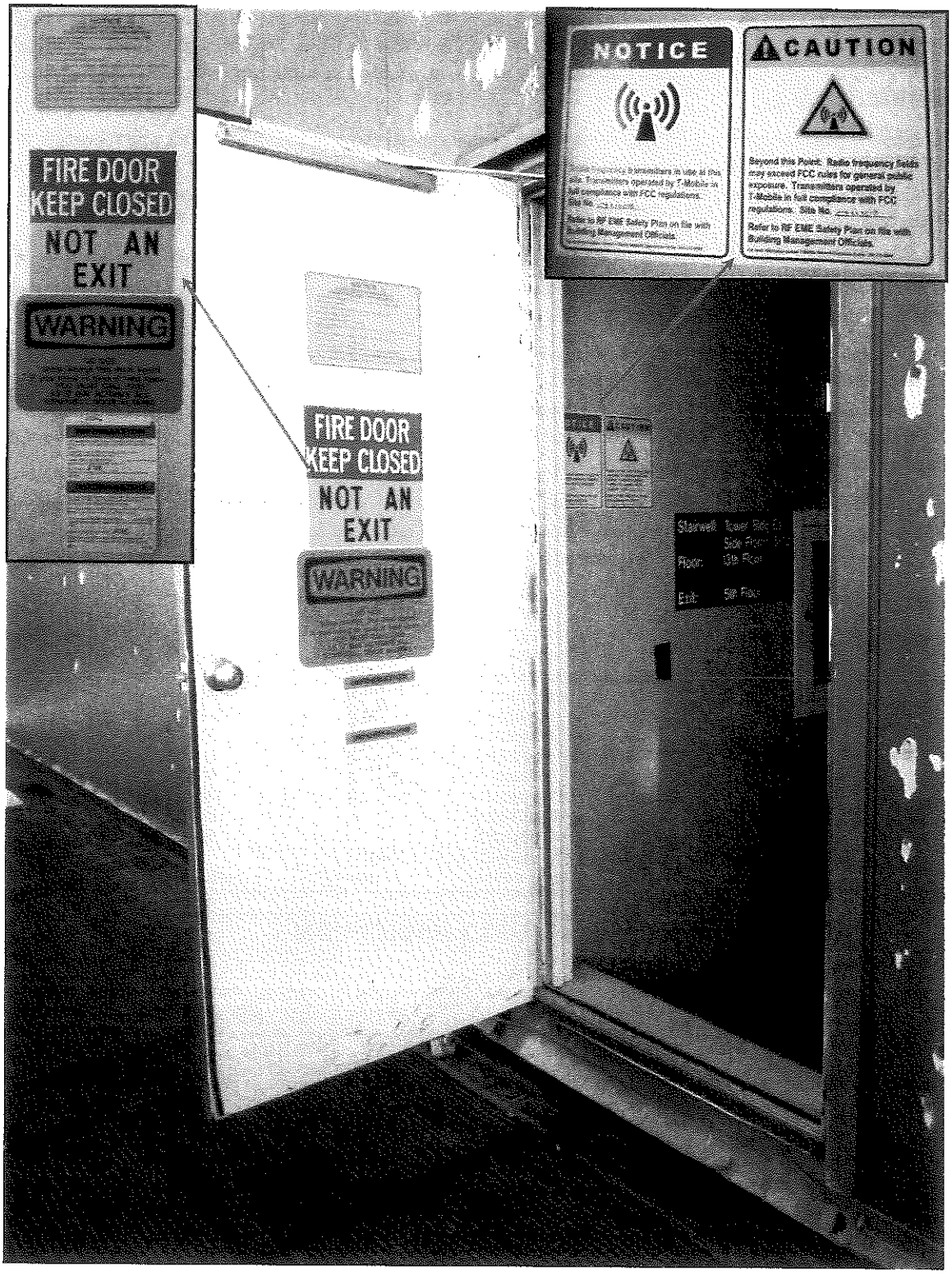


Figure 2: Eastern Lower Roof Access Door & Posted Signage

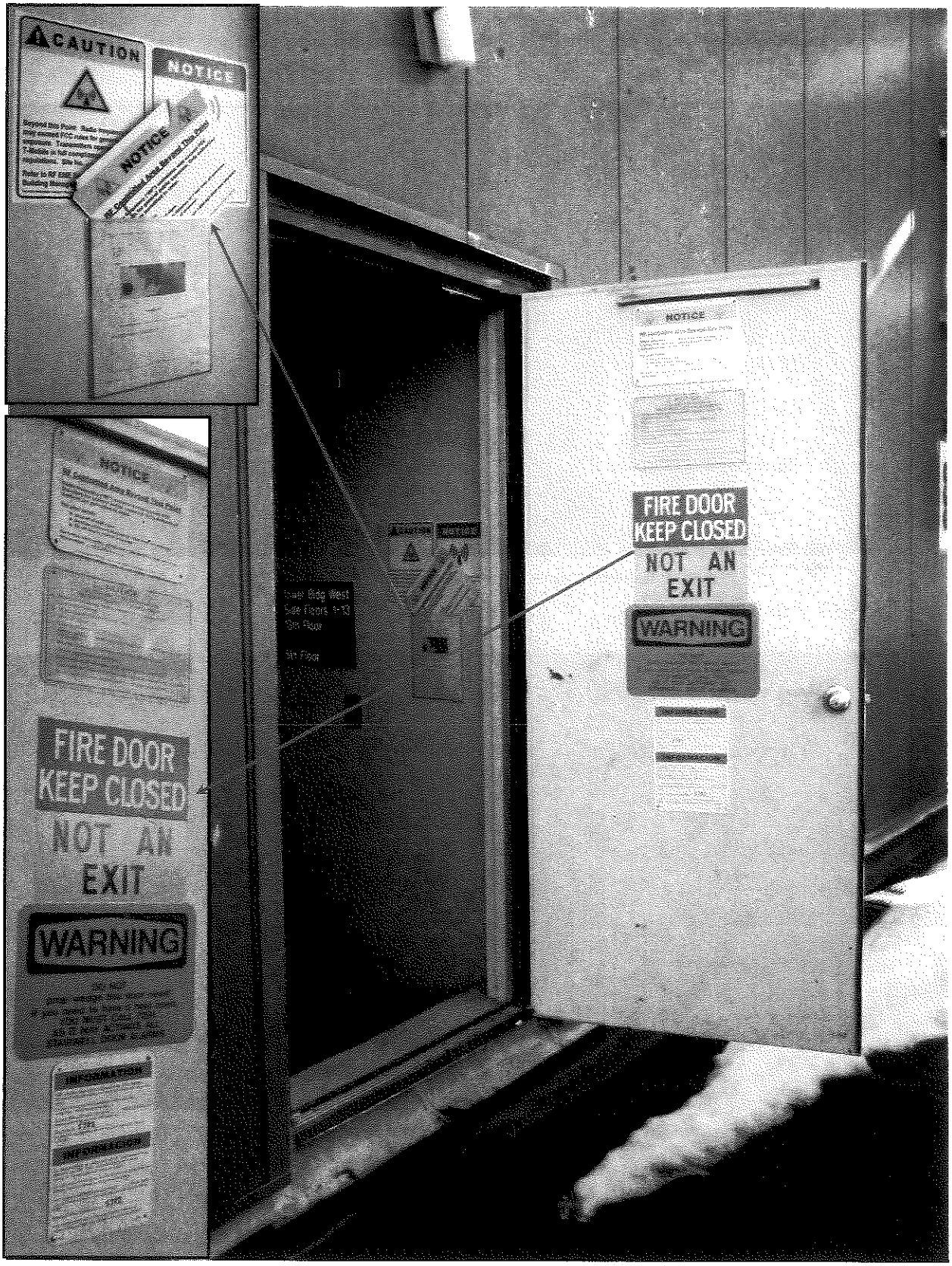


Figure 3: Western Lower Roof Access Door & Posted Signage

There are two access hatches to the upper roof, both of which are accessible from stairwells on the top floor. Both of these access hatches were locked at the time of this survey. The roof access hatches and posted signage are shown below.

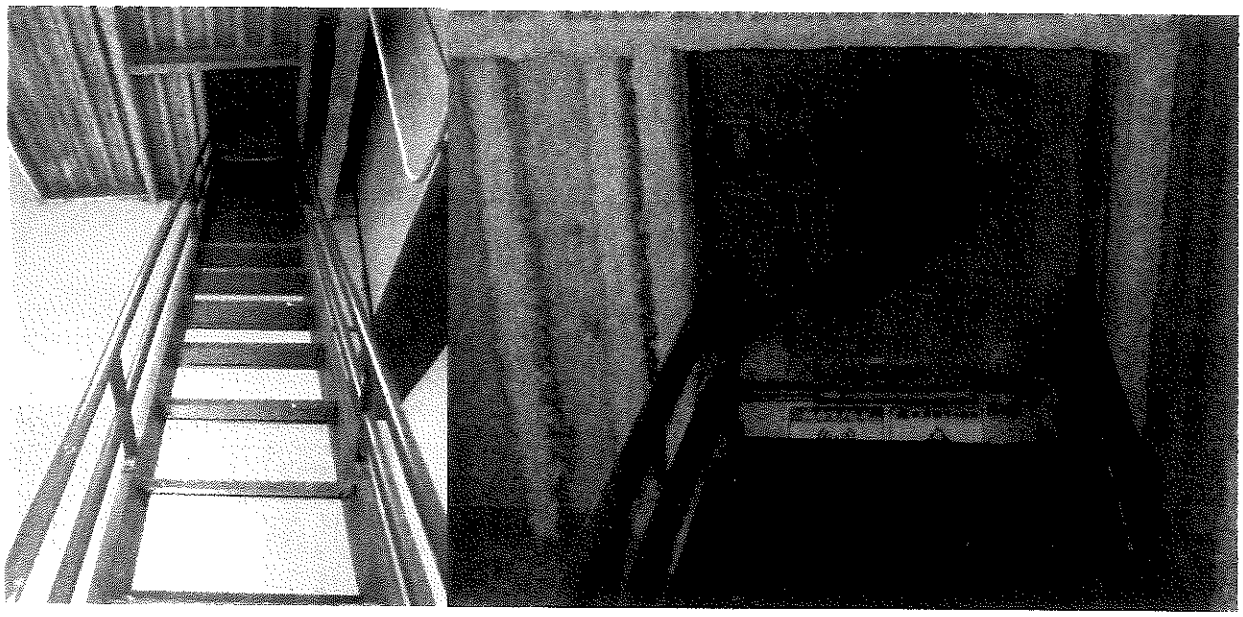


Figure 4: Eastern Upper Roof Access Hatch & Posted Signage

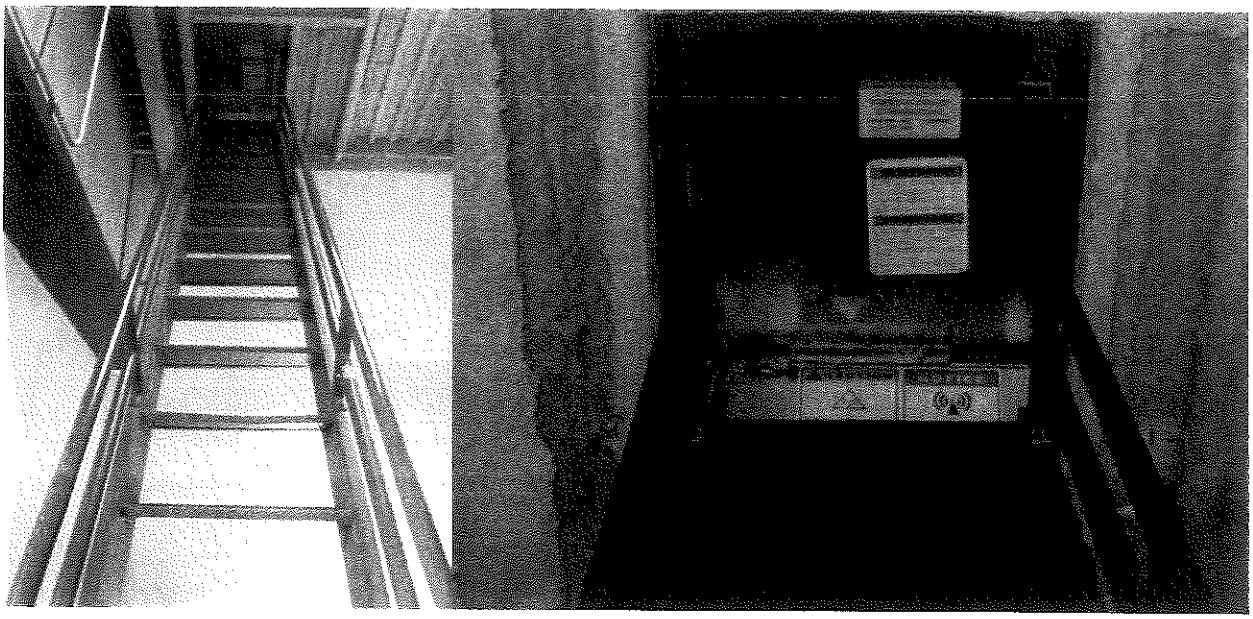


Figure 5: Western Upper Roof Access Hatch & Posted Signage

In addition to the signage posted at each lower roof access door, there is also a red RF "WARNING" sign posted at the top floor stairwell landing, near the eastern roof access points. The posted signage is shown below.

Figure 6: Posted Signage Near Eastern Lower Roof Access Points

There is a small lattice tower on the rooftop which supports antennas for a FM radio station. There is a red RF "WARNING" sign posted at the bottom of the tower, so that it is visible to personnel approaching the tower from the western end of the upper rooftop. The posted signage is shown below.

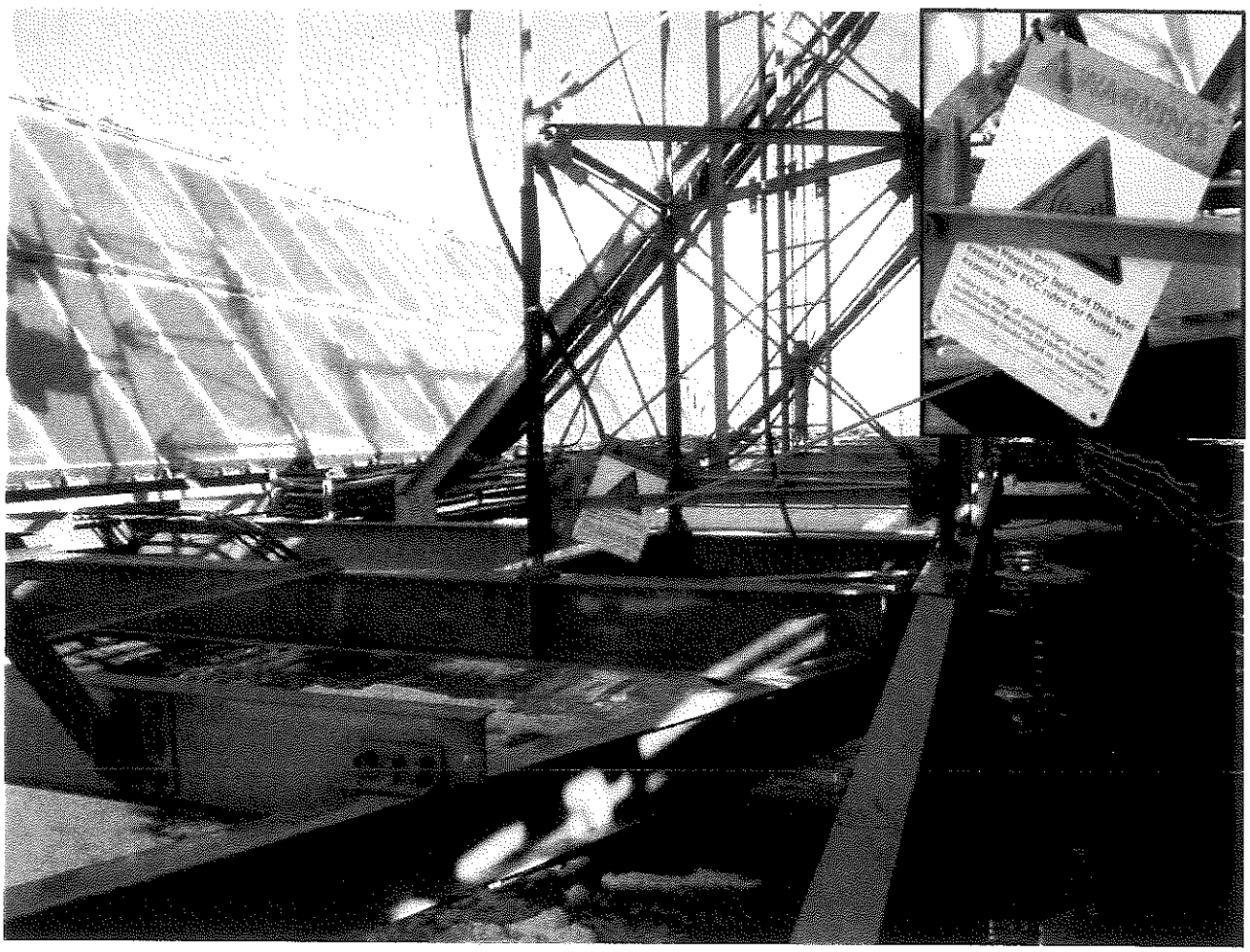


Figure 7: Posted Signage near Upper Rooftop Lattice Tower

Verizon's equipment shelter is located within the top floor mechanical area. The site identification information posted on the shelter door is shown below.

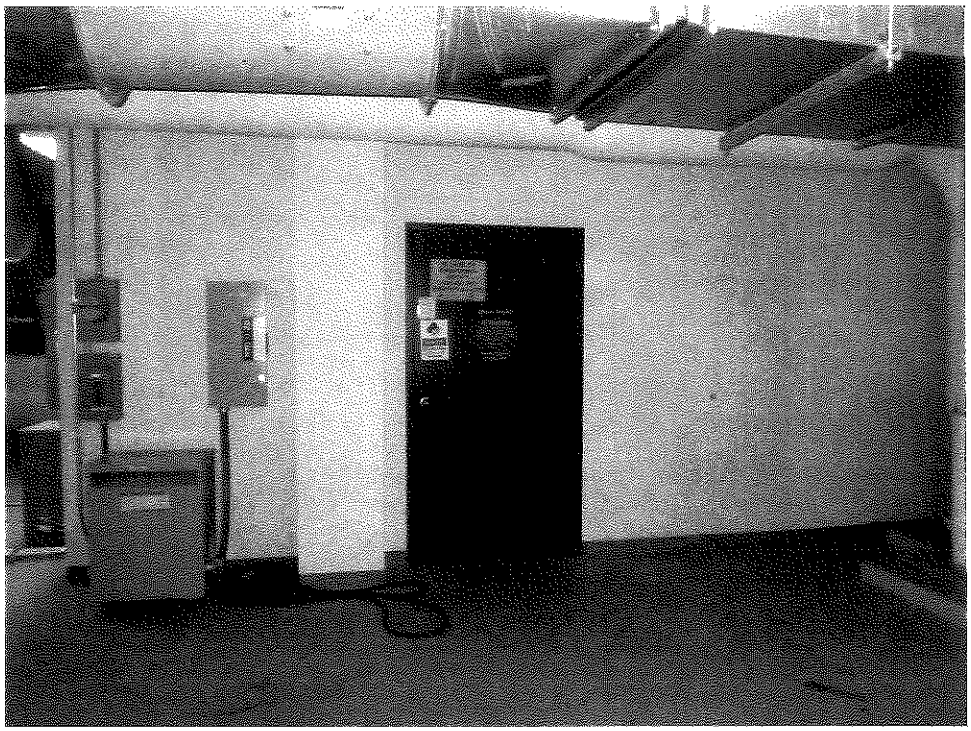


Figure 8: Verizon Equipment Shelter

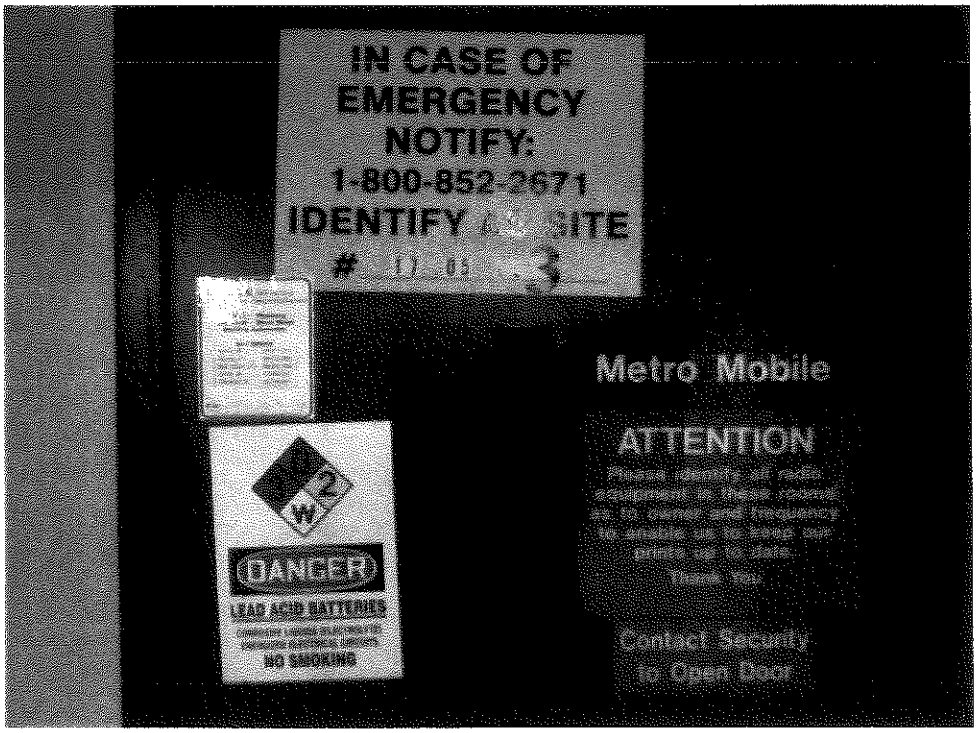


Figure 9: Verizon Equipment Shelter Door Signage

5. Directional Photos

The photos below document the view from each end of the roof to show all neighboring structures, foliage, and possible RF sources. A southern directional view is not available due to the position of solar panels on the rooftop.

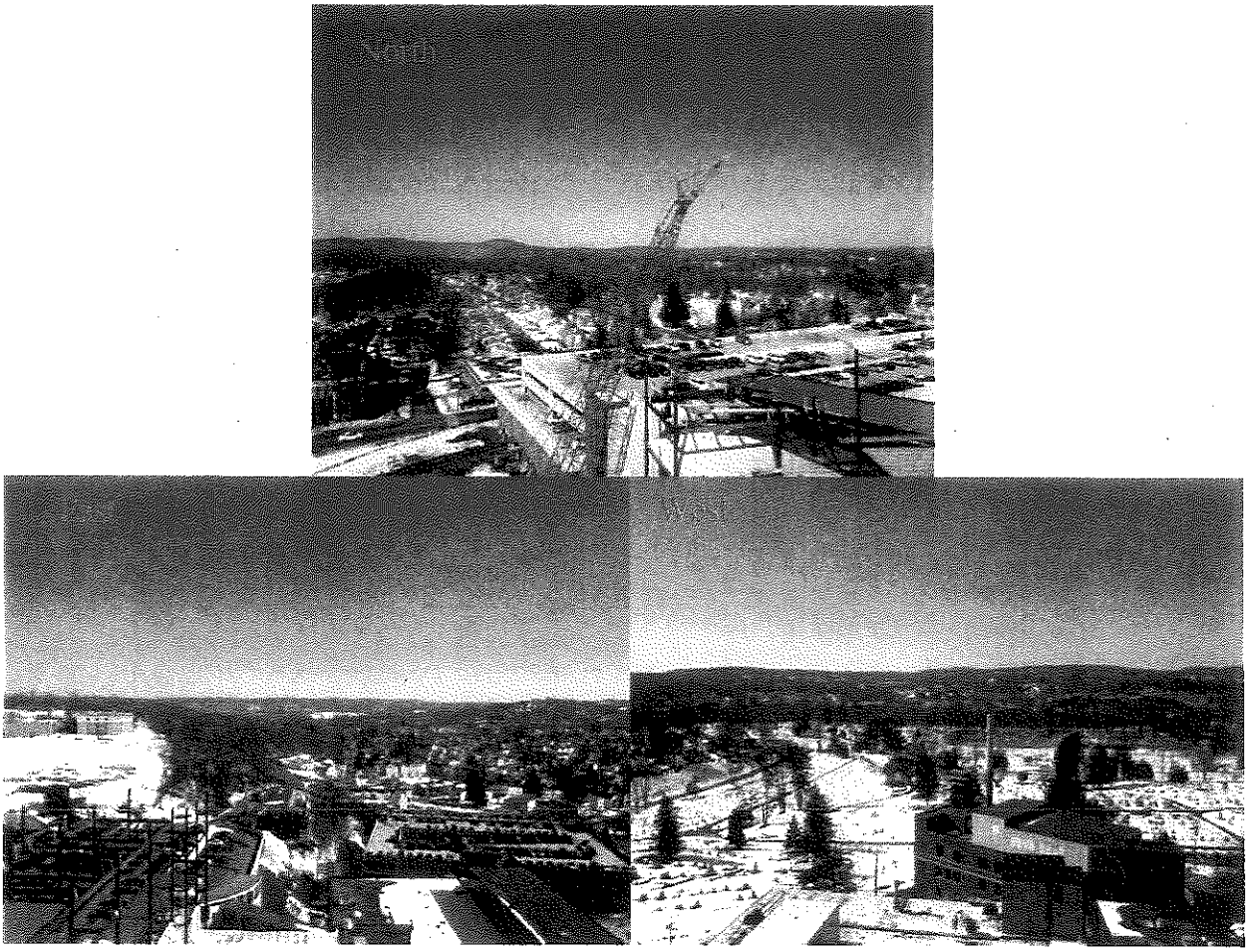


Figure 10: Directional Photos – North, East, West

6. Antenna Inventory, Locations & Photos

Tables 2 and 3 below detail all of the antennas currently installed on the roof of 24 Hospital Avenue. This inventory was taken on February 14, 2013. The lower roof height is 117' and the upper roof height is 134'.

Antenna ID	Operator	TX Freq. (MHz)	Power at Antenna (Watts)	Ant Gain (dBi)	Power EIRP (Watts)	Antenna Model	Beam Width	Mech. Downtilt	Length (ft)	Antenna Centerline Height (ft)
A	Verizon	850	90	16.6	4114	DB846F65ZAXY	65	0	6	156
B	Verizon	750	80	16.1	3259	BXA-70063-6CF	65	0	6	156
C	Verizon	1900	240	18.0	15143	MGD3-800T0	64	0	5	156
D	Verizon	850	90	16.6	4114	DB846F65ZAXY	65	0	6	156
E	Verizon	850	90	16.6	4114	DB846F65ZAXY	65	0	6	156
F	Verizon	750	80	15.5	2839	P65-16-XL-2	68	0	6	156
G	Verizon	1900	240	18.0	15143	MGD3-800T0	64	0	5	156
H	Verizon	850	90	16.6	4114	DB846F65ZAXY	65	0	6	156
I	Verizon	850	90	16.1	3666	DB846H80E-SX	80	0	6	156
J	Verizon	750	80	15.5	2839	P65-16-XL-2	68	0	6	156
K	Verizon	1900	240	18.0	15143	MGD3-800T0	64	0	5	156
L	Verizon	850	90	16.1	3666	DB846H80E-SX	80	0	6	156
M	Nextel	850	18	14.1	463	DB844H90E-XY*	90	0	4	144
N	Nextel	850	18	14.1	463	DB844H90E-XY*	90	0	4	144
O	Nextel	850	18	14.1	463	DB844H90E-XY*	90	0	4	144
P	Nextel	850	18	14.1	463	DB844H90E-XY*	90	0	4	144
Q	Nextel	850	18	14.1	463	DB844H90E-XY*	90	0	4	156
R	Nextel	850	18	14.1	463	DB844H90E-XY*	90	0	4	156
S	Nextel	850	18	14.1	463	DB844H90E-XY*	90	0	4	156
T	Nextel	850	18	14.1	463	DB844H90E-XY*	90	0	4	156
U	Nextel	850	24	14.1	617	RR65-12-05DBL	65	0	4	124
V	Nextel	850	24	14.1	617	RR65-12-05DBL	65	0	4	124
W	Nextel	850	24	14.1	617	RR65-12-05DBL	65	0	4	124
X	Sprint	1900	176	16.8	8424	HBX-9014DS-R2M	90	0	4	155
Y	Sprint	1900	176	18.0	11105	HBX-6516DS-R2M	65	0	4	155
Z	Sprint	1900	176	18.0	11105	HBX-6516DS-R2M	65	0	4	155
AA	Sprint	1900	176	18.0	11105	HBX-6516DS-R2M	65	0	4	155
AB	Sprint	1900	176	18.0	11105	HBX-6516DS-R2M	65	0	4	131
AC	Sprint	1900	176	18.0	11105	HBX-6516DS-R2M	65	0	4	131
AD	T-Mobile	1900	53	17.7	3121	APX16DWV-16DWVS-C	65	0	4.5	132
		2100	40	18.0	2524					
AE	T-Mobile	1900	53	16.5	2367	RR90-17-02*	90	0	4.5	132
AF	T-Mobile	1900	53	17.7	3121	APX16DWV-16DWVS-C	65	0	4.5	132
		2100	40	18.0	2524					
AG	T-Mobile	1900	53	17.7	3121	APX16DWV-16DWVS-C	65	0	4.5	155
		2100	27	18.0	1704					
AH	T-Mobile	1900	53	17.7	3121	APX16DWV-16DWVS-C	65	0	4.5	155
		2100	27	18.0	1704					

Table 2: Existing Antenna Inventory[2]

[2] Asterisks indicate cases where the antenna model information was unavailable, in which case models shown are based on the carrier's licensed frequency band and physical dimensions of the antenna. Transmit power assumes 0 dB of cable loss.

Antenna ID	Operator	TX Freq. (MHz)	Power at Antenna (Watts)	Ant Gain (dBi)	Power EIRP (Watts)	Antenna Model	Beam Width	Mech Downtilt	Length (ft)	Antenna Centerline Height (ft)
AI	T-Mobile	1900	53	17.7	3121	APX16DWV-16DWVS-C	65	0	4.5	155
		2100	27	18.0	1704					
AJ	T-Mobile	1900	53	17.7	3121	APX16DWV-16DWVS-C	65	0	4.5	132
		2100	27	18.0	1704					
AK	T-Mobile	1900	53	17.7	3121	APX16DWV-16DWVS-C	65	0	4.5	132
		2100	27	18.0	1704					
AL	T-Mobile	1900	53	17.7	3121	APX16DWV-16DWVS-C	65	0	4.5	132
		2100	27	18.0	1704					
AM	AT&T	850	80	13.6	1833	7770.00	82	0	4.5	132
		1900	80	15.5	2839		86			
AN	AT&T	750	60	15.5	2129	AM-X-CD-16-65-00T-RET	65	0	6	132
AO	AT&T	850	20	13.6	458	7770.00	82	0	4.5	132
		1900	96	15.5	3406		86			
AP	AT&T	850	80	13.6	1833	7770.00	82	0	4.5	132
		1900	80	15.5	2839		86			
AQ	AT&T	750	60	15.5	2129	AM-X-CD-16-65-00T-RET	65	0	6	132
AR	AT&T	850	20	13.6	458	7770.00	82	0	4.5	132
		1900	96	15.5	3406		86			
AS	AT&T	850	80	13.6	1833	7770.00	82	0	4.5	134
		1900	80	15.5	2839		86			
AT	AT&T	750	60	15.5	2129	AM-X-CD-16-65-00T-RET	65	0	6	134
AU	AT&T	850	20	13.6	458	7770.00	82	0	4.5	134
		1900	96	15.5	3406		86			
AV	Whip	155.28	110	6	437.92	Generic 150-164M_Omni*	360	0	10	154
AW	Whip	152.007	350	6	1393.38	Generic 150-164M_Omni*	360	0	10	158
AX	Whip	450	250	9.1	398.11	458-2N	360	0	13	156
AY	Whip	155.34	120	6	477.73	Generic 150-164M_Omni*	360	0	10	158
AZ	Whip	964.925	125	6	497.63	Generic 870–960M_Omni*	360	0	4	158
BA	Whip	453.55	100	6	398.11	Generic 450–482M_Omni*	360	0	10	158
BB	Whip	464	100	6	398.11	Generic 450–482M_Omni*	360	0	10	158
BC	Whip	463	75	6	298.58	Generic 450–482M_Omni*	360	0	10	158
BD	Whip	931	250	6	995.27	Generic 870–960M_Omni*	360	0	2	158
BE	Whip	464	250	6	995.27	Generic 450–482M_Omni*	360	0	10	158
BF	Whip	468	250	6	995.27	Generic 450–482M_Omni*	360	0	10	158
BG	Whip	464	250	6	995.27	Generic 450–482M_Omni*	360	0	10	158
BH	Whip	Not In Use								
BI	Whip	464	250	6	995.27	Generic 450–482M_Omni*	360	0	10	158
BJ	Whip	464	250	6	995.27	Generic 450–482M_Omni*	360	0	10	158
BK	Whip	155.34	120	6	477.73	Generic 150-164M_Omni*	360	0	2	149
BL	Dish	900	125	18	497.63	PR-900	12	0	3	170
BM	Whip	464	250	6	995.27	Generic 450–482M_Omni*	360	0	10	158
BN	Whip	464	250	6	995.27	Generic 450–482M_Omni*	360	0	10	158
BO	Whip	464	250	6	995.27	Generic 450–482M_Omni*	360	0	10	158
BP	Whip	Not In Use								
BQ	Dish	22000	0.5	38.1	3228	DA4-W71BB	2.2	0	4	132
BR	WDBY	105.5	1200	-0.04	1189	Shively 6810	360	0	5	157
BS	Dish	Receive Only								
BT	Cisco	2400	0.08	13.5	4	AIR-ANT1949	30	0	1.3	130

Table 3: Existing Antenna Inventory (Continued)[3]

[3] Asterisks indicate cases where the antenna model information was unavailable, in which case models shown are based on the carrier's licensed frequency band and physical dimensions of the antenna. Transmit power assumes 0 dB of cable loss.

Table 4 below lists the proposed Verizon antenna configuration that will replace the existing antenna configuration. These antennas, along with the other non-Verizon antennas listed in Table 3, were utilized to perform the theoretical calculations as described in the Modeling Procedure section of this report.

Operator	TX Freq. (MHz)	Power at Antenna (Watts)	Ant Gain (dBi)	Power EIRP (Watts)	Antenna Model	Beam Width	Mech Downtilt	Length (ft)	Antenna Centerline Height (ft)
Verizon	850	180	16.6	8228	BXA-80063/6BF	63	0	6	156
Verizon	1900	240	18.0	15143	MGD3-800T0	64	0	5	156
Verizon	750	80	16.1	3259	BXA-70063/6CF	65	0	6	156
Verizon	2100	80	17.4	4396	BXA-171063/8BF	60	0	4	156
Verizon	850	180	16.6	8228	BXA-80063/6BF	63	0	6	156
Verizon	1900	240	18.0	15143	MGD3-800T0	64	0	5	156
Verizon	750	80	16.1	3259	BXA-70063/6CF_2	65	0	6	156
Verizon	2100	80	17.4	4396	BXA-171063/8BF	60	0	4	156
Verizon	850	180	15.6	6535	BXA-80080/6CF	80	0	6	156
Verizon	1900	240	18.0	15143	MGD3-800T0	64	0	5	156
Verizon	750	80	16.1	3259	BXA-70063/6CF_2	65	0	6	156
Verizon	2100	80	17.4	4396	BXA-171063/8BF	60	0	4	156

Table 4: Proposed Verizon Antenna Configuration

Figures 11 through 23 show all the antennas currently on the roof of 24 Hospital Avenue.

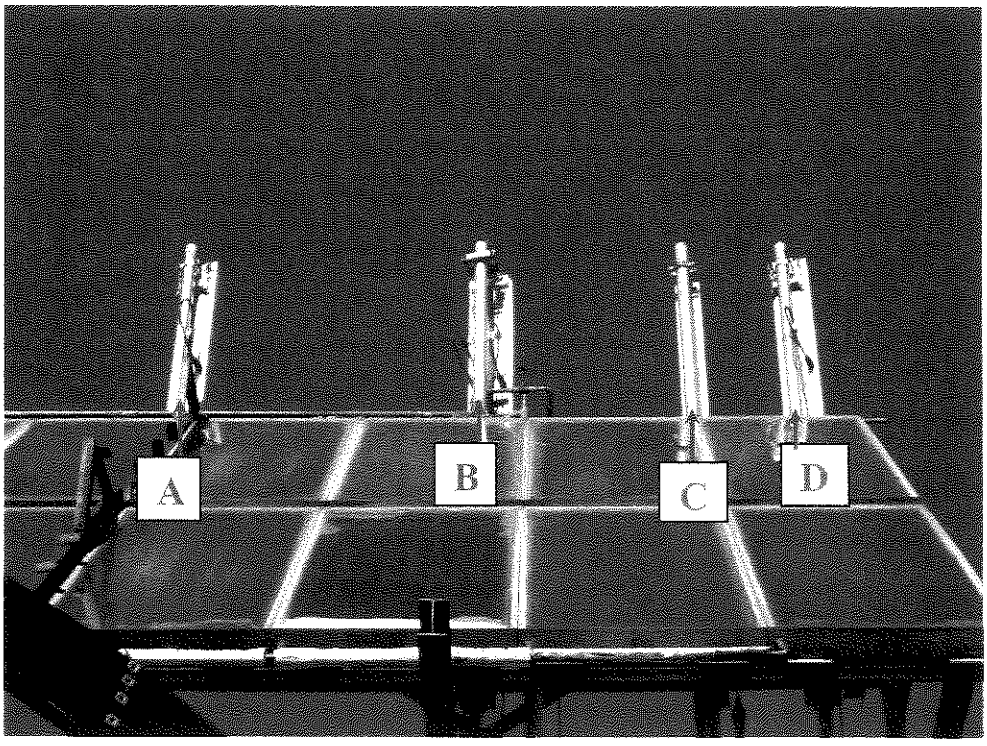


Figure 11: Antennas A-D (Verizon Alpha)

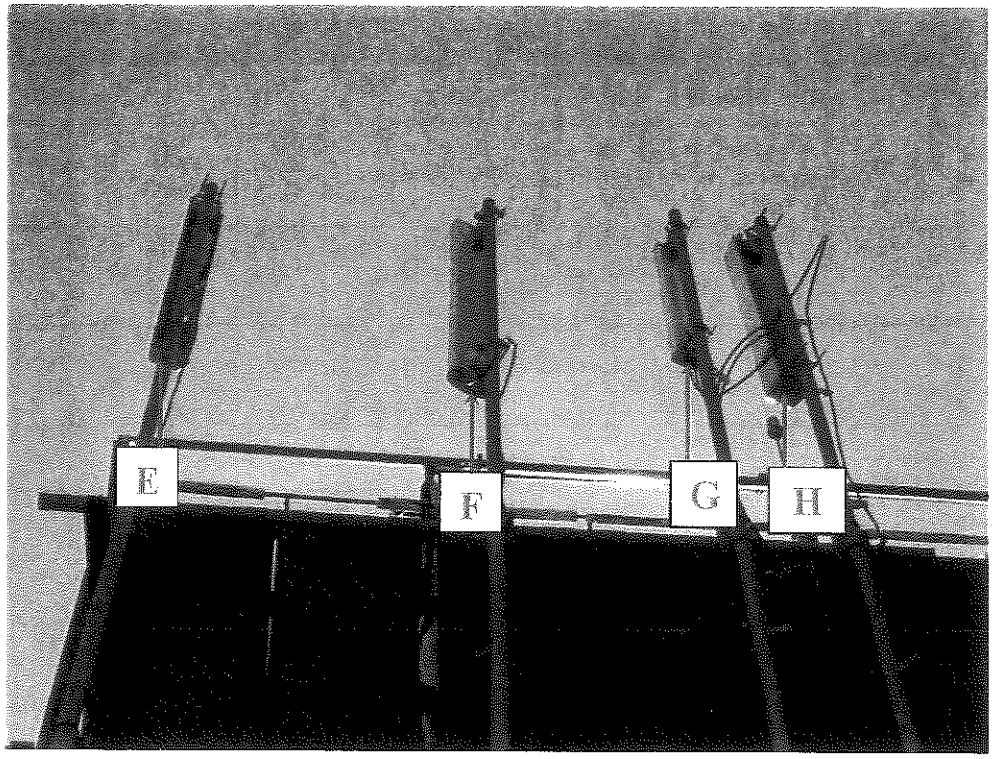


Figure 12: Antennas E-H (Verizon Beta)

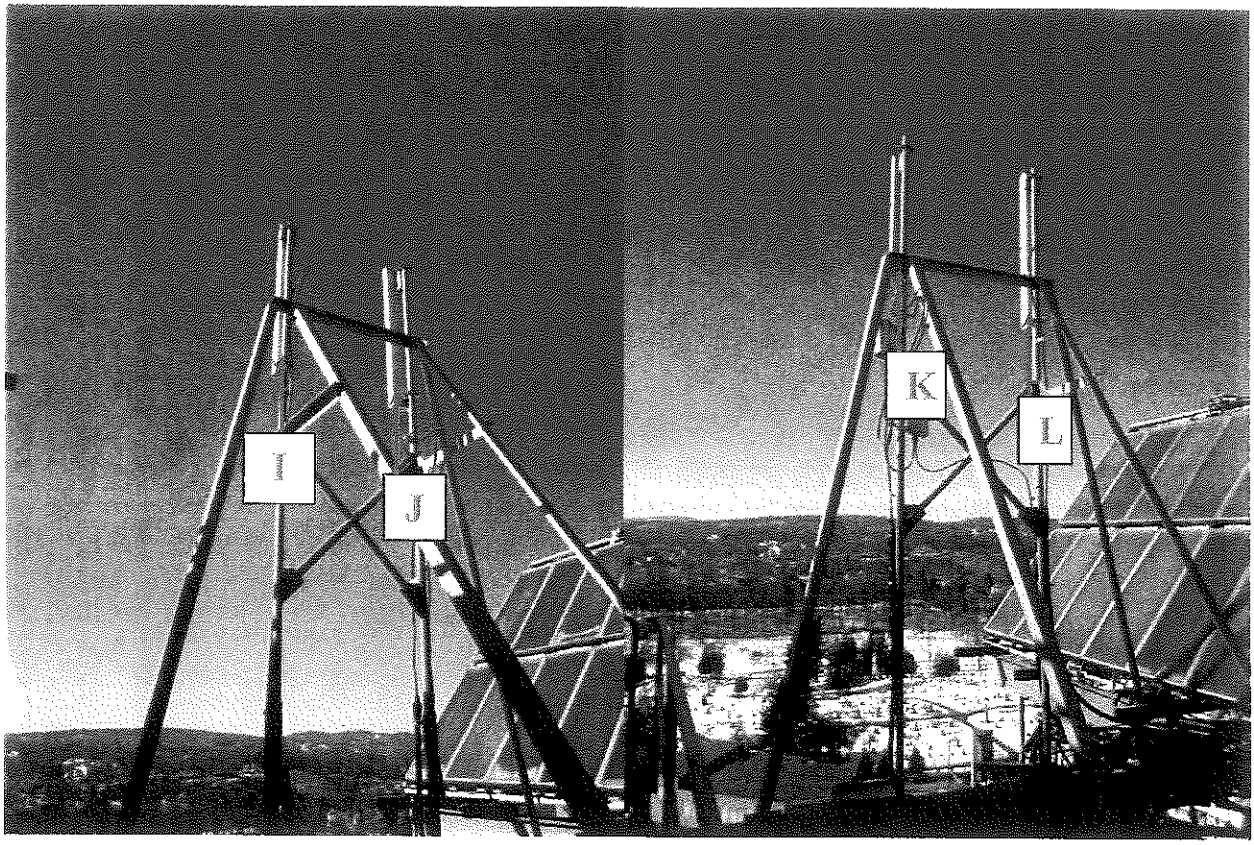


Figure 13: Antennas I-L (Verizon Gamma)

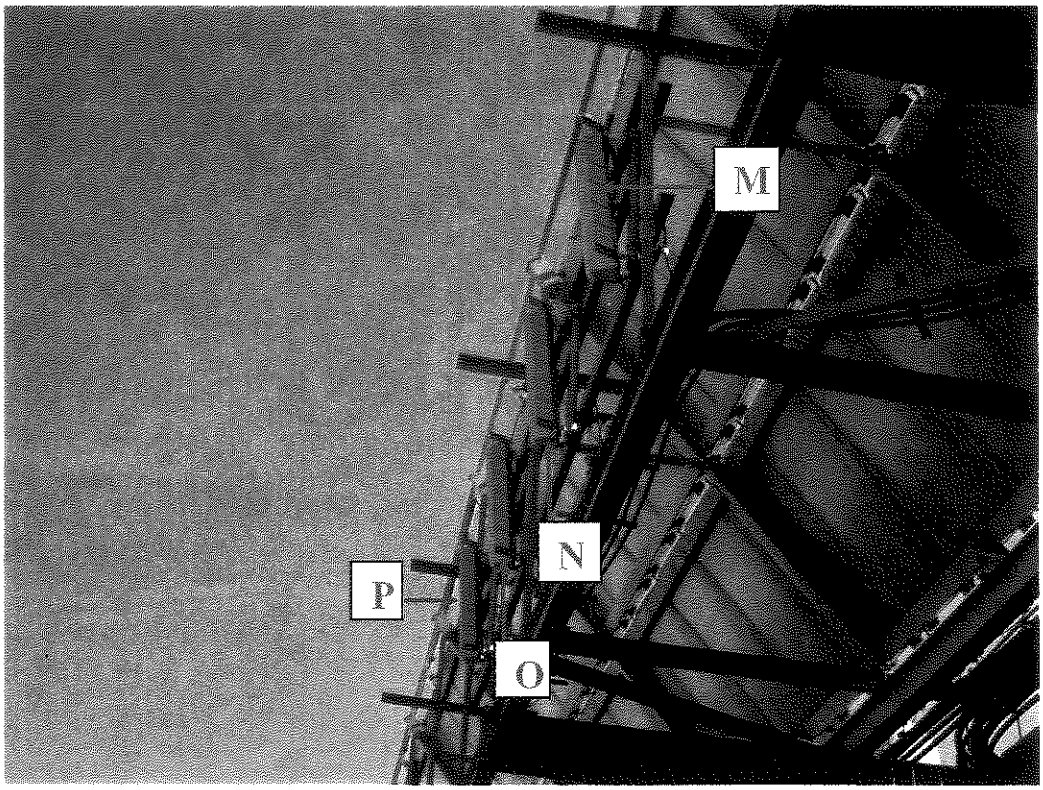


Figure 14: Antennas P-M (Nextel Alpha)

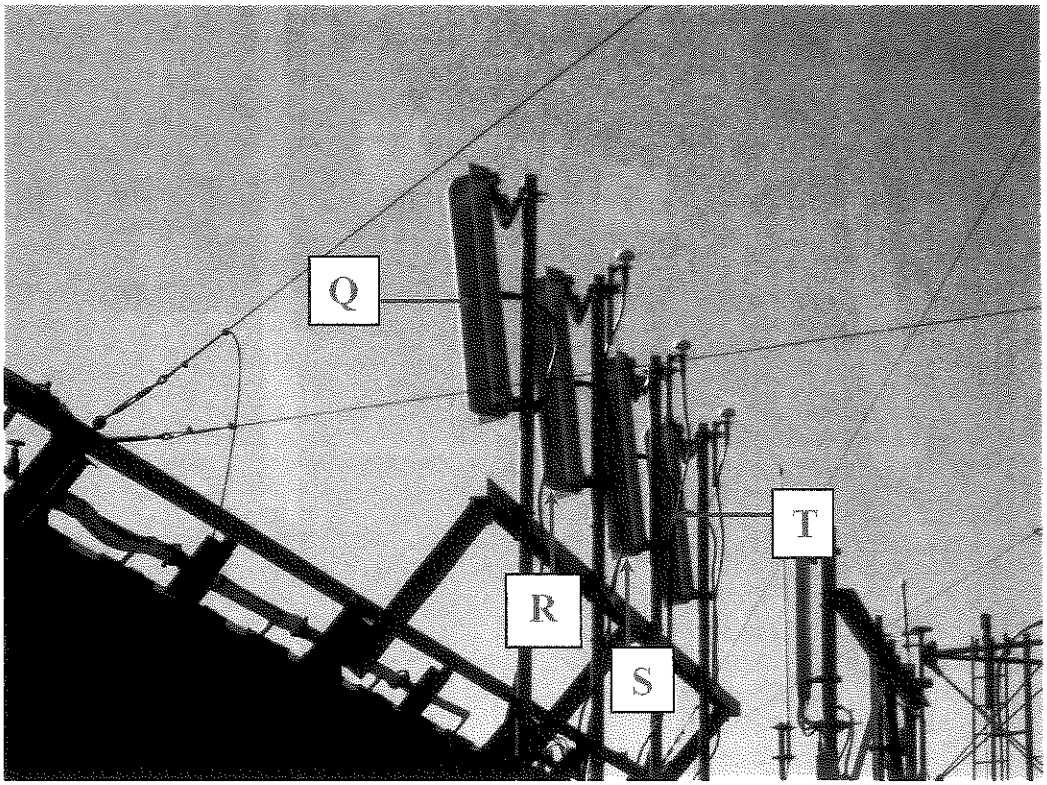


Figure 15: Antennas Q-T (Nextel Beta)

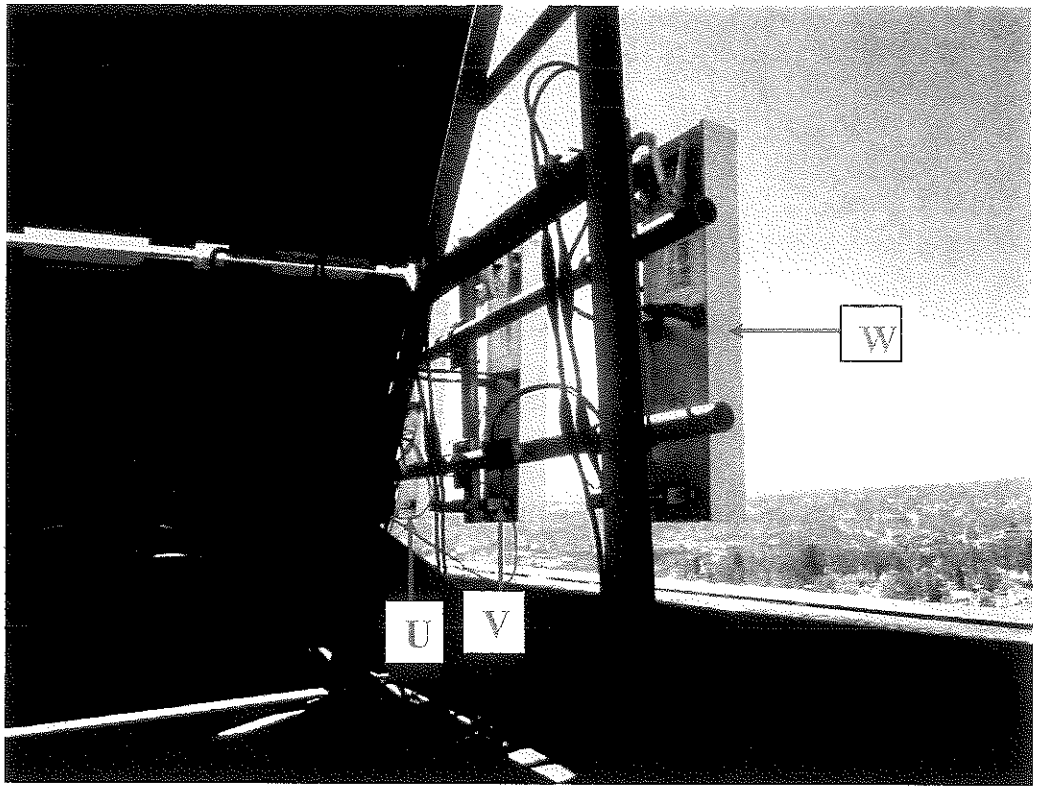


Figure 16: Antennas U-W (Nextel Gamma)

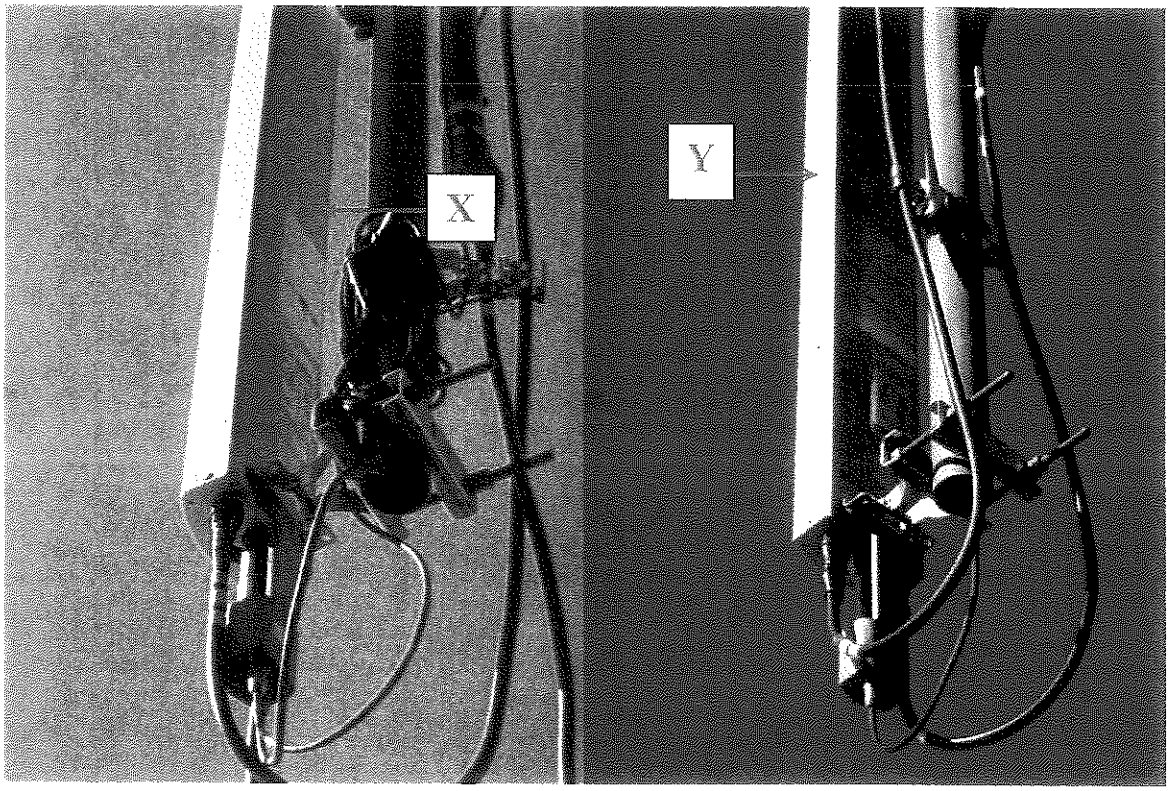


Figure 17: Antennas X-Y (Sprint Alpha and Beta)

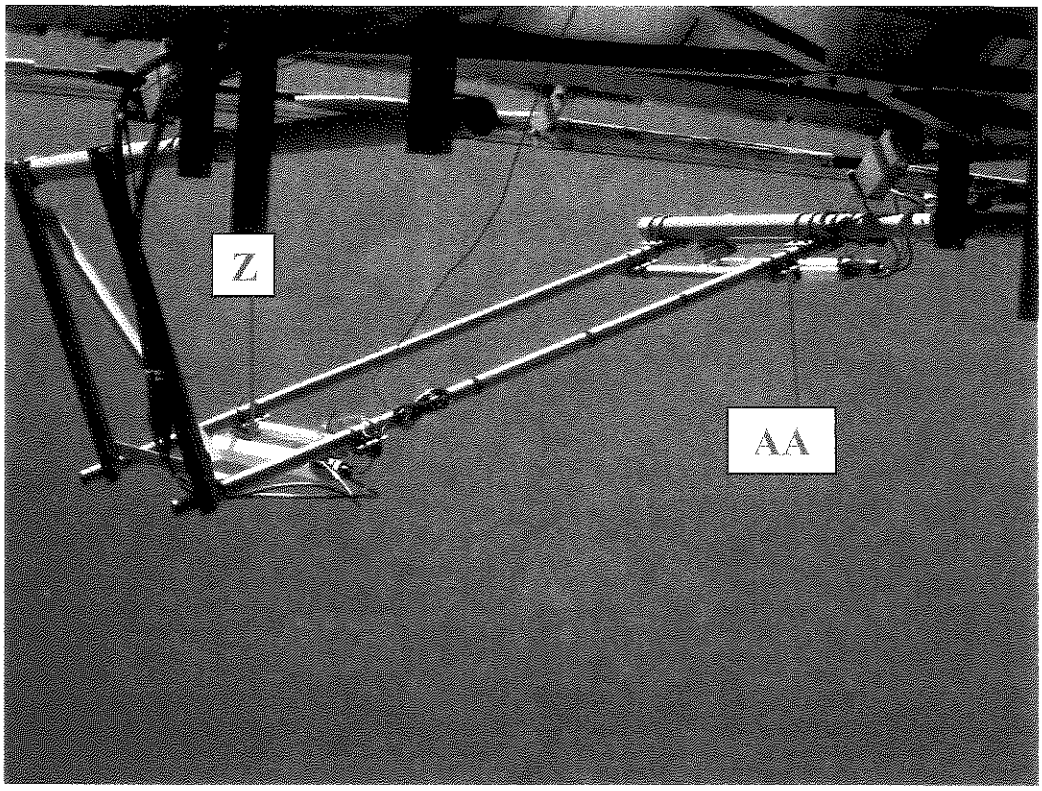


Figure 18: Antennas Z-AA (Sprint Gamma and Delta)

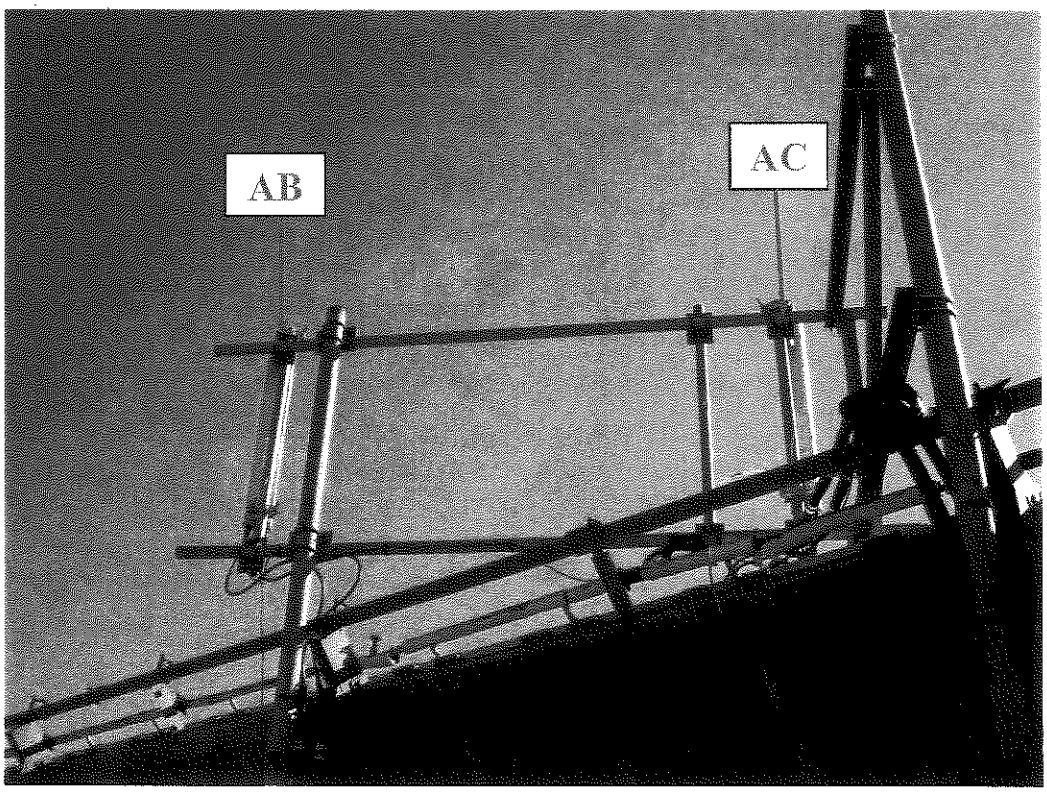


Figure 19: Antennas AB-AC (Sprint Epsilon and Zeta)

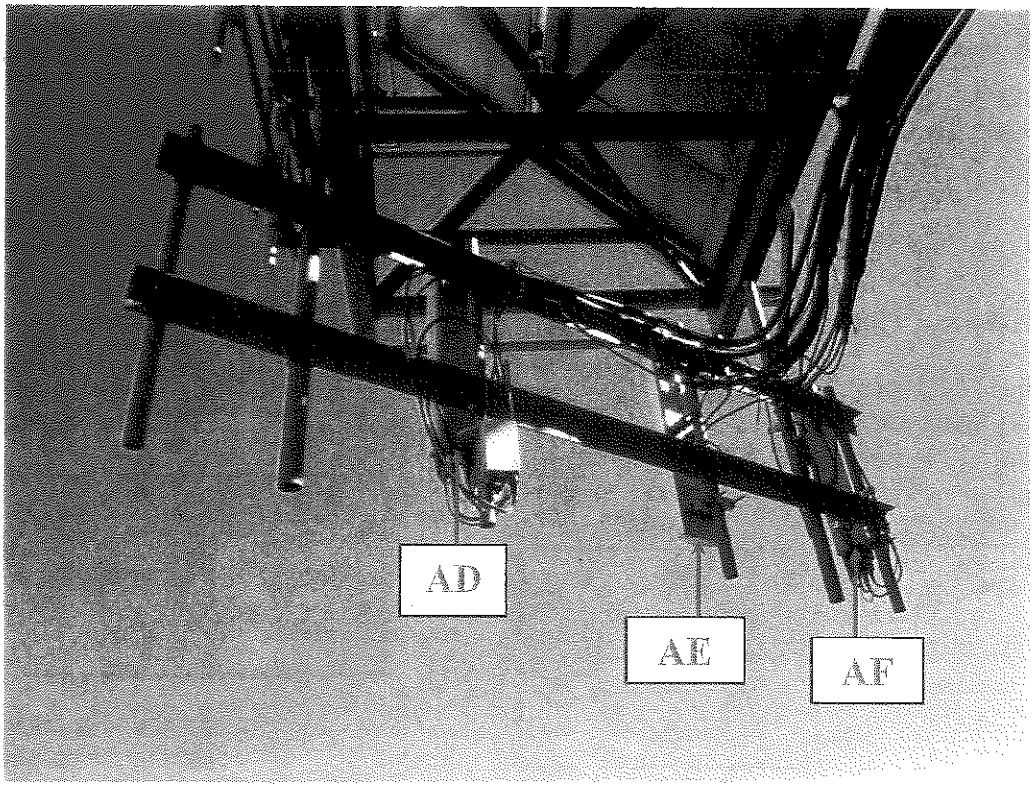


Figure 20: Antennas AD-AF (T-Mobile Alpha)

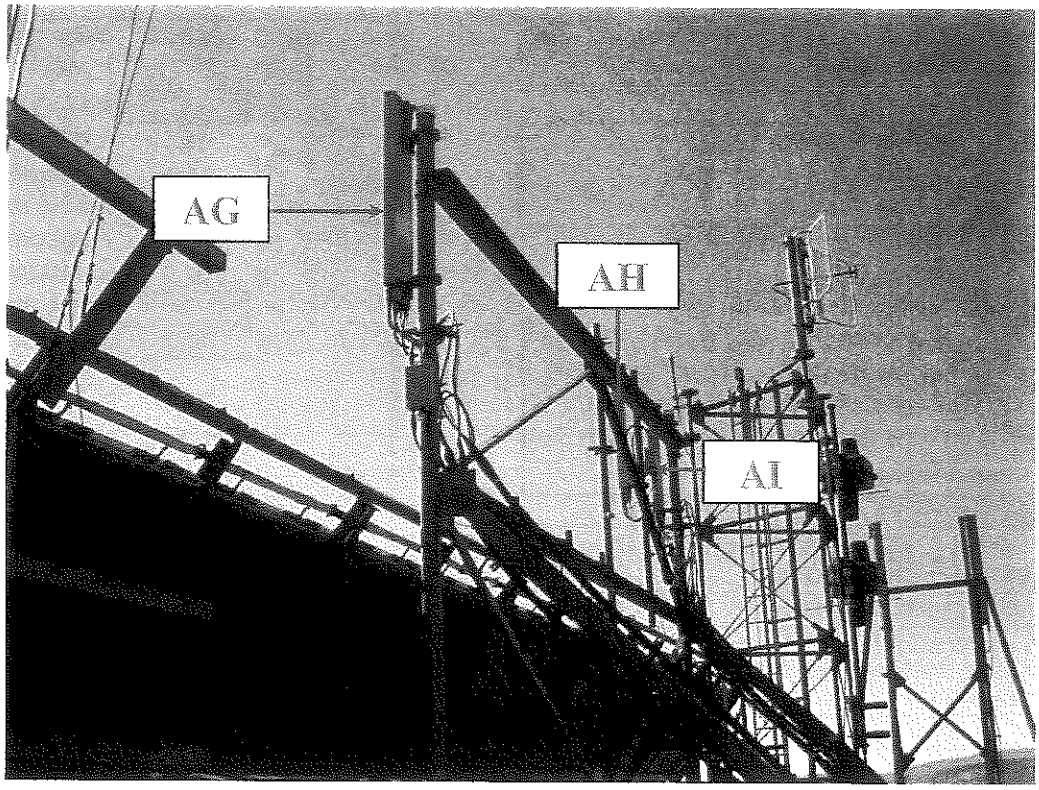


Figure 21: Antennas AG-AI (T-Mobile Beta)

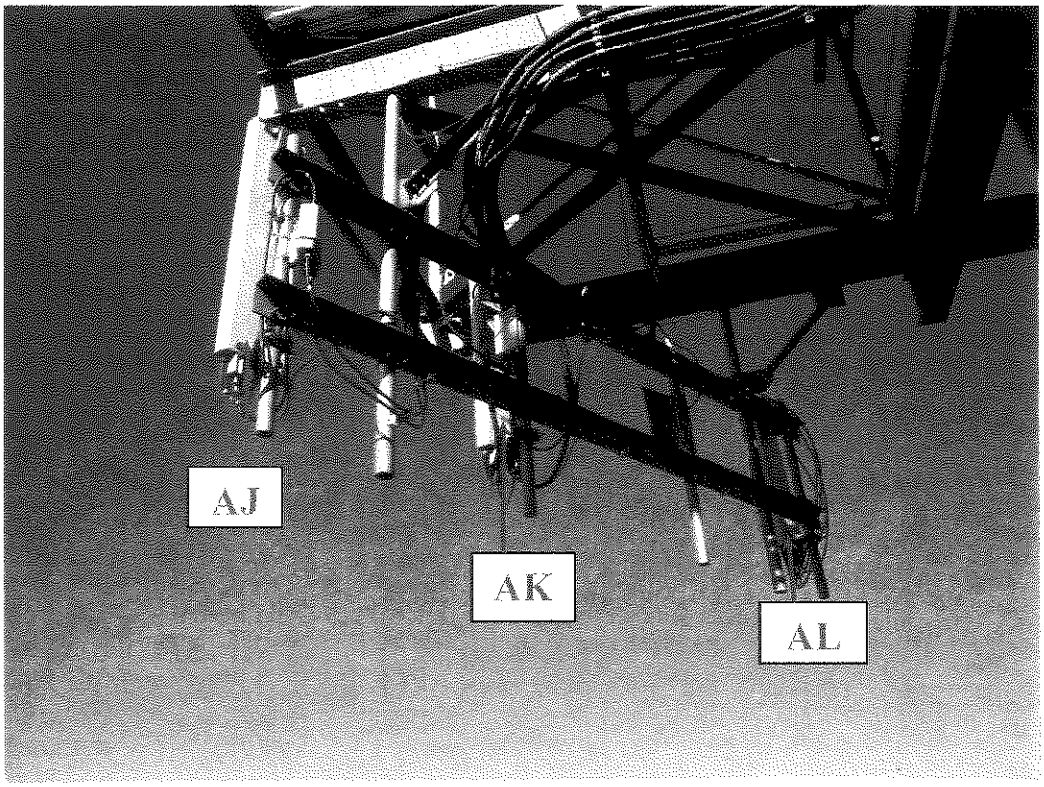


Figure 22: Antennas AJ-AL (T-Mobile Gamma)

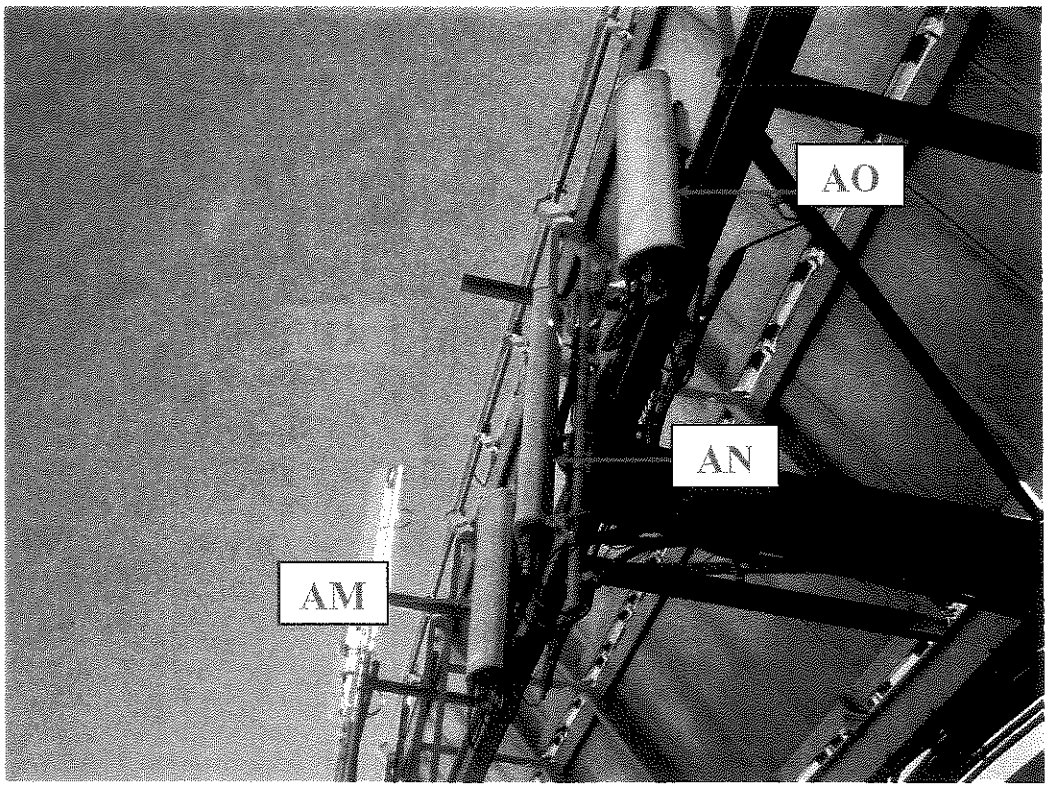


Figure 23: Antenna AM-AO (AT&T Alpha)

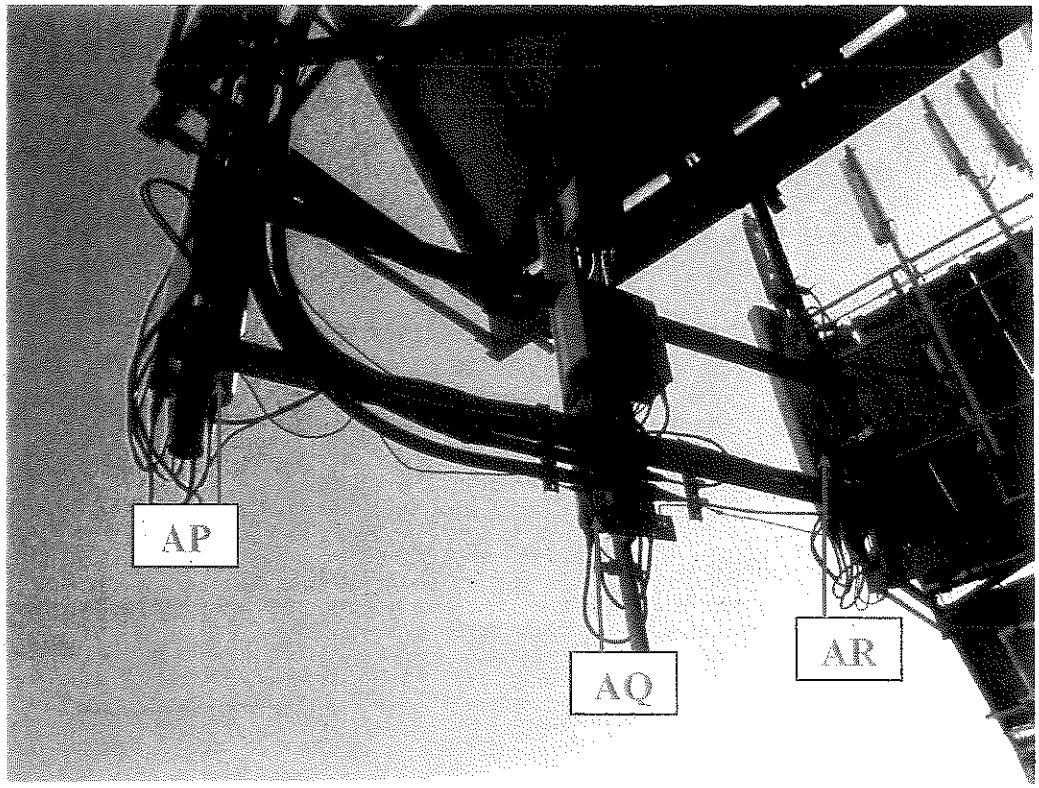


Figure 24: Antenna AP-AR (AT&T Beta)

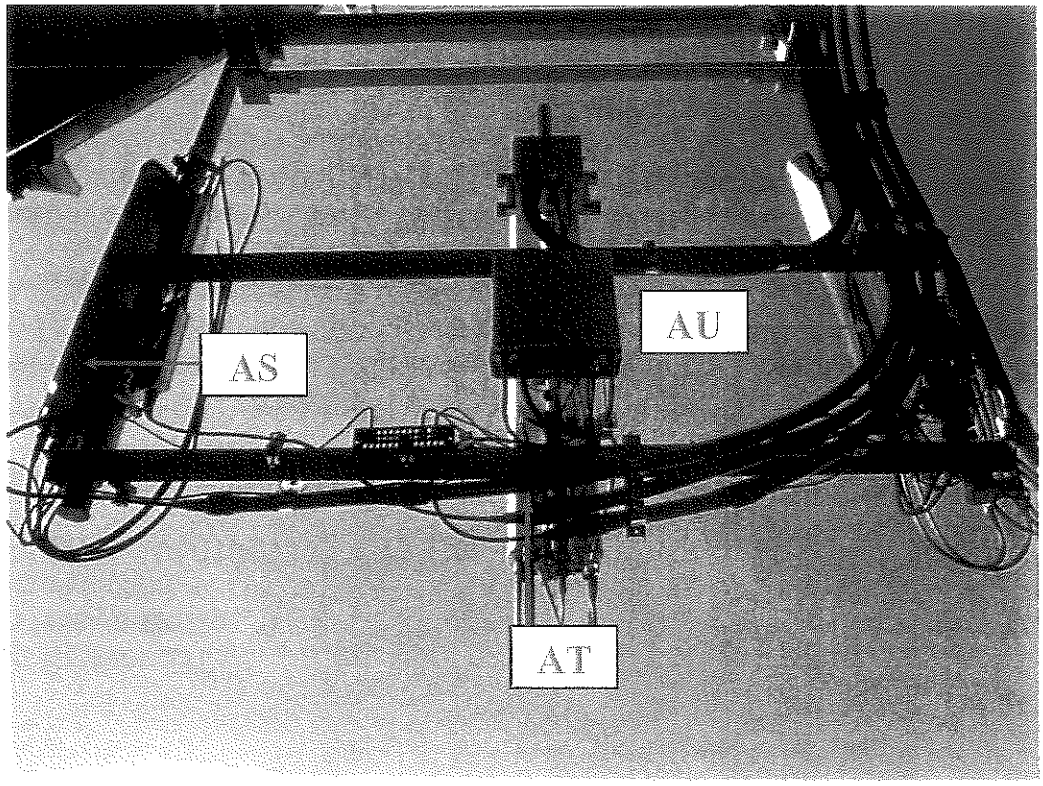


Figure 25: Antenna AS-AU (AT&T Gamma)

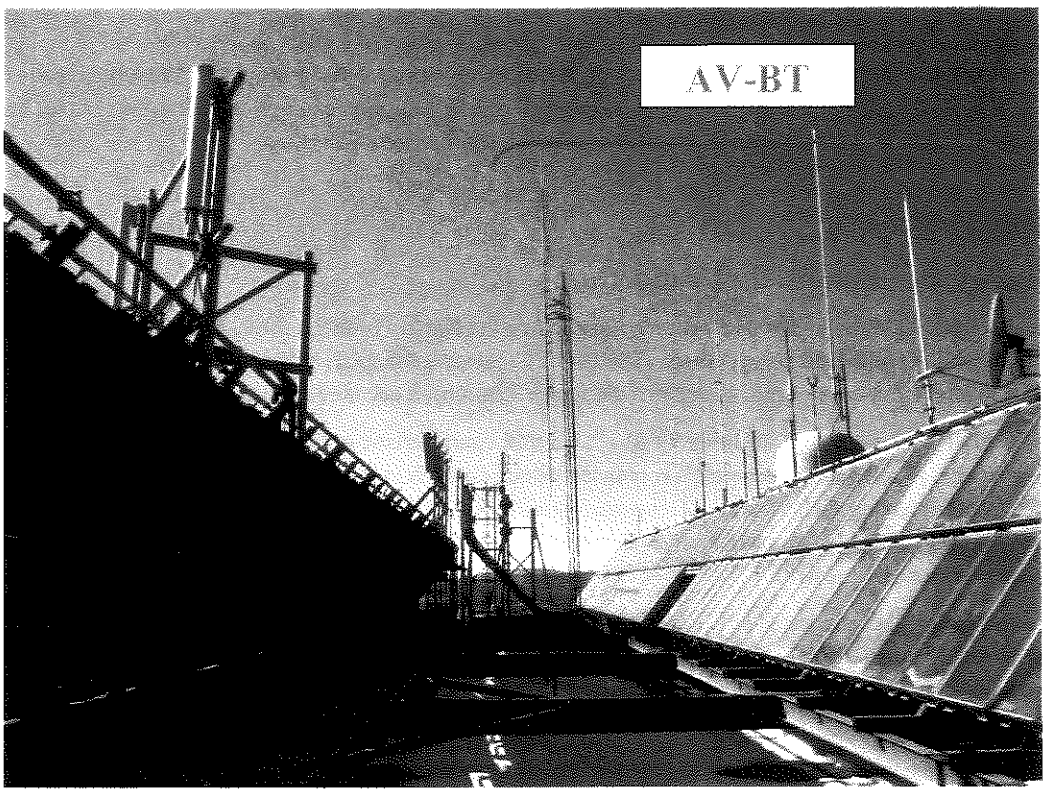


Figure 26: Antennas AV-BT

7. Nearby RF Sources

While only the Danbury rooftop (the location of Verizon Wireless' antennas) was surveyed, the measured results from the surveyed roof may be affected by other nearby RF sources and therefore, higher readings on the rooftop cannot be pinpointed to one particular RF source. In this instance, no other nearby RF sources were identified.

8. Measured Values

8.1. Survey Equipment and Procedures

Frequencies from 300 KHz to 50 GHz were measured using the Narda Probe EA 5091, E-Field, shaped, FCC probe in conjunction with the NBM550 survey meter. The EA 5091 probe is "shaped" such that in a mixed signal environment (i.e.: more than one frequency band is used in a particular location), it accurately measures the percent of MPE.

From FCC OET Bulletin No. 65 - Edition 97-01 – "A useful characteristic of broadband probes used in multiple-frequency RF environments is a frequency-dependent response that corresponds to the variation in MPE limits with frequency. Broadband probes having such a "shaped" response permit direct assessment of compliance at sites where RF fields result from antennas transmitting over a wide range of frequencies. Such probes can express the composite RF field as a percentage of the applicable MPEs".

Probe Description - As suggested in FCC OET Bulletin No. 65 - Edition 97-01, the response of the measurement instrument should be essentially isotropic, (i.e., independent of orientation or rotation angle of the probe). For this reason, the Narda EA 5091 probe was used for these measurements.

Sampling Description - At each measurement location, a spatially averaged measurement is collected over the height of an average human body. The NBM550 survey meter performs a time average measurement while the user slowly moves the probe over a distance range of 20 cm to 200 cm (about 6 feet) above ground level. The results recorded at each measurement location include average values over the spatial distance.

Instrumentation Information - A summary of specifications for the equipment used is provided in the table below.

Manufacturer	Narda Microwave			
Probe	EA 5091, Serial# 01088			
Calibration Date	December 2012			
Calibration Interval	24 Months			
Meter	NBM550, Serial# B-1149			
Calibration Date	December 2012			
Calibration Interval	24 Months			
Probe Specifications	**Frequency Range**	**Field Measured**	**Standard**	**Measurement Range**
	300 KHz-50 GHz	Electric Field	U.S. FCC 1997 Occupational/Controlled	0.5 – 600 % of Standard

Table 5: Instrumentation Information

Instrument Measurement Uncertainty - The total measurement uncertainty of the NARDA measurement probe and meter is no greater than ±3 dB (0.5% to 6%), ±1dB (6% to 100%), ±2dB (100% to 600%). The factors which contribute to this include the probe's frequency response deviation, calibration uncertainty, ellipse ratio, and isotropic response[4]. Every effort is taken to reduce the overall uncertainty during measurement collection including pointing the probe directly at the likely highest source of emissions.

[4] For further details, please refer to Narda Safety Test Solutions NBM550 Probe Specifications, pg. 64. http://www.narda-sts.us/pdf_files/DataSheets/NBM-Probes_DataSheet.pdf

8.2. Survey Locations & Results

Figure 27 below shows the location of the measurements taken on February 14, 2013.

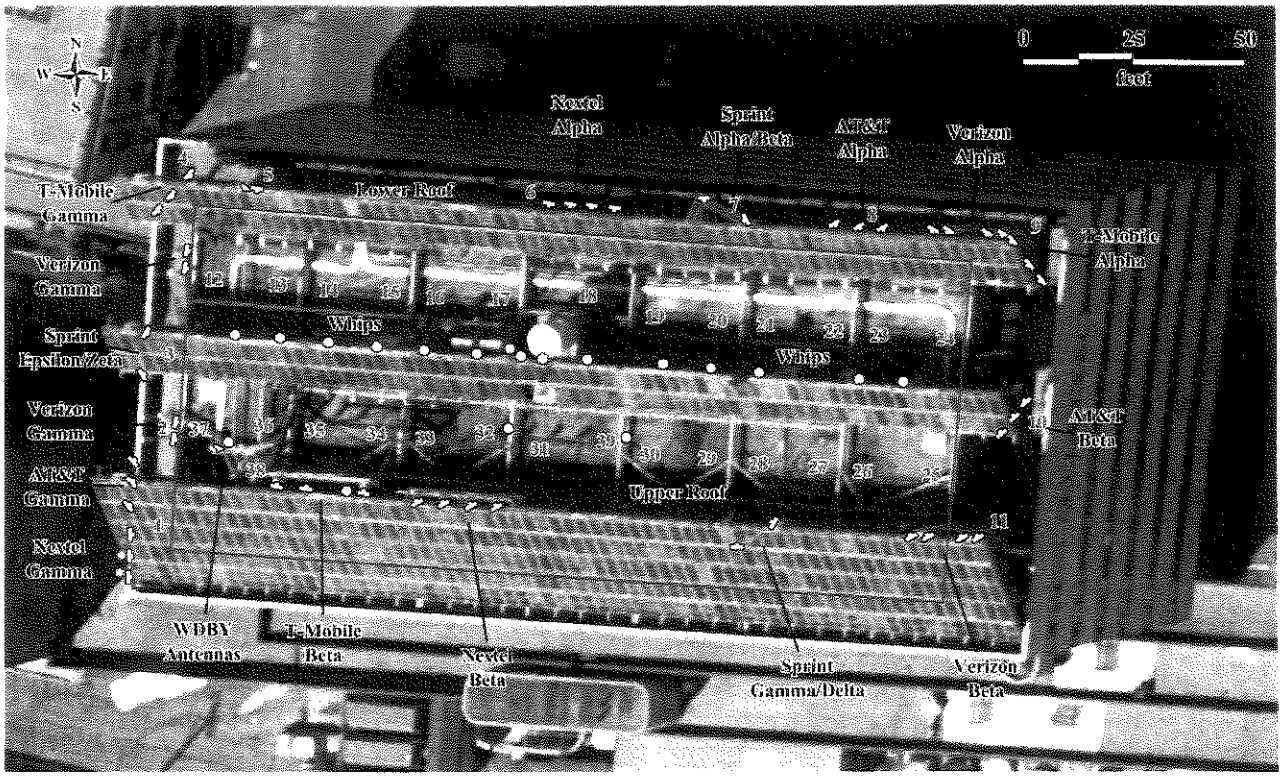


Figure 27: Rooftop Measurement Locations

Table 6 below lists 39 measurements taken on the rooftops of Danbury Hospital. Measurements 1 – 11 were taken on the lower roof; measurements 12 – 39 were taken on the upper roof. The highest measurement (Point 38) was recorded at 20.81% (Average Controlled/Occupational) and 104.05% (Average Uncontrolled/General Population). This measurement was taken at the base of the WDBY lattice tower.

Measurement Point	Ave % Controlled/ Occupational	Ave % Uncontrolled/ General
Lower Roof Measurements		
1	3.60	18.00
2	3.07	15.37
3	2.27	11.35
4	0.85	4.26
5	0.36	1.80
6	0.39	1.94
7	0.24	1.18
8	0.36	1.80
9	0.58	2.91
10	0.62	3.12
11	0.44	2.22
Upper Roof Measurements		
12	2.29	11.44
13	2.40	11.98
14	2.69	13.47
15	1.62	8.12
16	0.41	2.07
17	0.34	1.71
18	0.27	1.35
19	0.35	1.73
20	0.32	1.58
21	0.23	1.14
22	0.26	1.30
23	0.28	1.42
24	0.37	1.86
25	0.70	3.48
26	0.69	3.43
27	0.67	3.35
28	0.80	3.98
29	0.87	4.34
30	0.44	2.22
31	1.09	5.46
32	1.49	7.43
33	1.43	7.13
34	1.91	9.57
35	3.58	17.88
36	9.81	49.04
37	14.62	73.10
38	**20.81**	**104.05**
39	1.02	5.12

Table 6: Rooftop Measurement Values

9. Calculated Values

9.1. Modeling Procedure for the Calculations on Rooftop

The emission field calculation results displayed in the following figures were generated using proprietary computer software modeling prediction tool, PDCalc, as developed and provided by C Squared Systems, LLC. PDCalc uses the following power density calculation formulas:

Dish Antennas:

Near Field

$$\text{End of Near Field} = \frac{D^2}{(4 \times \lambda)}$$

$$\text{Power Density Near} = \text{PDN} = \frac{16 \times A \times P}{\pi \times D^2}$$

Where:

D = *Antenna Diameter*
λ = *Wavelength*
A = *Aperture Efficiency*
P = *Power Input to the Antenna*

- 20 dB of attenuation is added for any points greater than one antenna diameter from the main beam.

Transition Region:

$$\text{End of Transition Region} = \frac{\text{D}^2}{\lambda} \times FarFieldFactor$$

$$\text{Power Density Transition} = \frac{PDN \times \text{Near Region}}{R}$$

Where:

D = *Antenna Diameter*
FarFieldFactor = *multiplier which expands or contracts transition region to determine start of Far Field*
λ = *Wavelength*
PDN = *Power Density Near*
R = *Radial Distance*

$$\textit{Near Region} = \frac{D^2}{(4 \times \lambda)}$$

- 20 dB of attenuation is added for any points greater than one antenna diameter from the main beam.

Far Field:

$$\text{Power Density} = \left(\frac{\text{EIRP}}{\pi \times R^2} \right) \times \text{Off Beam Loss}$$

Where:

Off Beam Loss is determined by the selected antenna patterns
R = *Radial Distance*

Directional and Omni Antennas:

Near Field:

$$S = \frac{P_t \times K(H_a, L_a)}{20 \times \pi \times L_a \times R_h \times \left(\frac{BW}{360}\right)}$$

Where:

S = Power Density in mw/cm²
P_t = Actual (or worst case assumed) power delivered to the antenna (watts)
K(H_a, La) = Correction factor for antenna mounting height
Ha = Antenna mounting height in feet
L_a = Antenna length in meters
R_h = the horizontal distance along roof from antenna to point of interest
BW = Antenna beamwidth

$K(H_a, L_a) = 0.99013 - 0.14656 \times H_a$ for $0 \leq H_a \leq 6$

$= 1/H_a$ for $H_a > 6$

- If the horizontal distance from the bottom of the antenna is < 1 foot, then 1 foot is used for the distance.

In order to deal with directional antennas, a modified cylindrical model is used. This is done by approximating the horizontal pattern with a model that is conservative, and applying the results to the cylindrical model above. The equation to be used is:

$$A = \cos^n\left(\phi/2\right)$$

Where:

A = Attenuation
ϕ = Angle between antenna azimuth and point in question
n = Factor to shape the function for a particular beamwidth
BW = Antenna beamwidth

By setting the attenuation equal to 0.5 at the half power point $(\phi = BW/2)$, n can be solved. However, in order to ensure that the attenuation model is conservative, n is solved when $\phi = (BW/2) \times (4/3)$. This essentially assumes a larger beamwidth for margin. Therefore, solving for n, we have

$$n = \frac{\ln(0.5)}{\ln(\cos(BW/3))}$$

As a result, antennas with a beamwidth wider than 270° will be treated as an omni-directional antenna. Finally, the maximum attenuation is capped at 15 dB to assure a conservative result in the rear of the antenna.

Far Field:

$$\text{Power Density} = \left(\frac{EIRP}{\pi \times R^2} \right) \times \text{Off Beam Loss}$$

Where:

EIRP = Effective Isotropic Radiated Power Watts

R = *Radial Distance* = $\sqrt{\left(H^2 + V^2\right)}$ meters

H = Horizontal Distance from antenna in meters

V = Vertical Distance from radiation center of antenna in meters

Off Beam Loss is determined by the selected antenna patterns

9.2. Calculated Results for Rooftop Emissions

Figure 28 shows the predicted RF environment once Verizon Wireless' proposed modifications are complete.

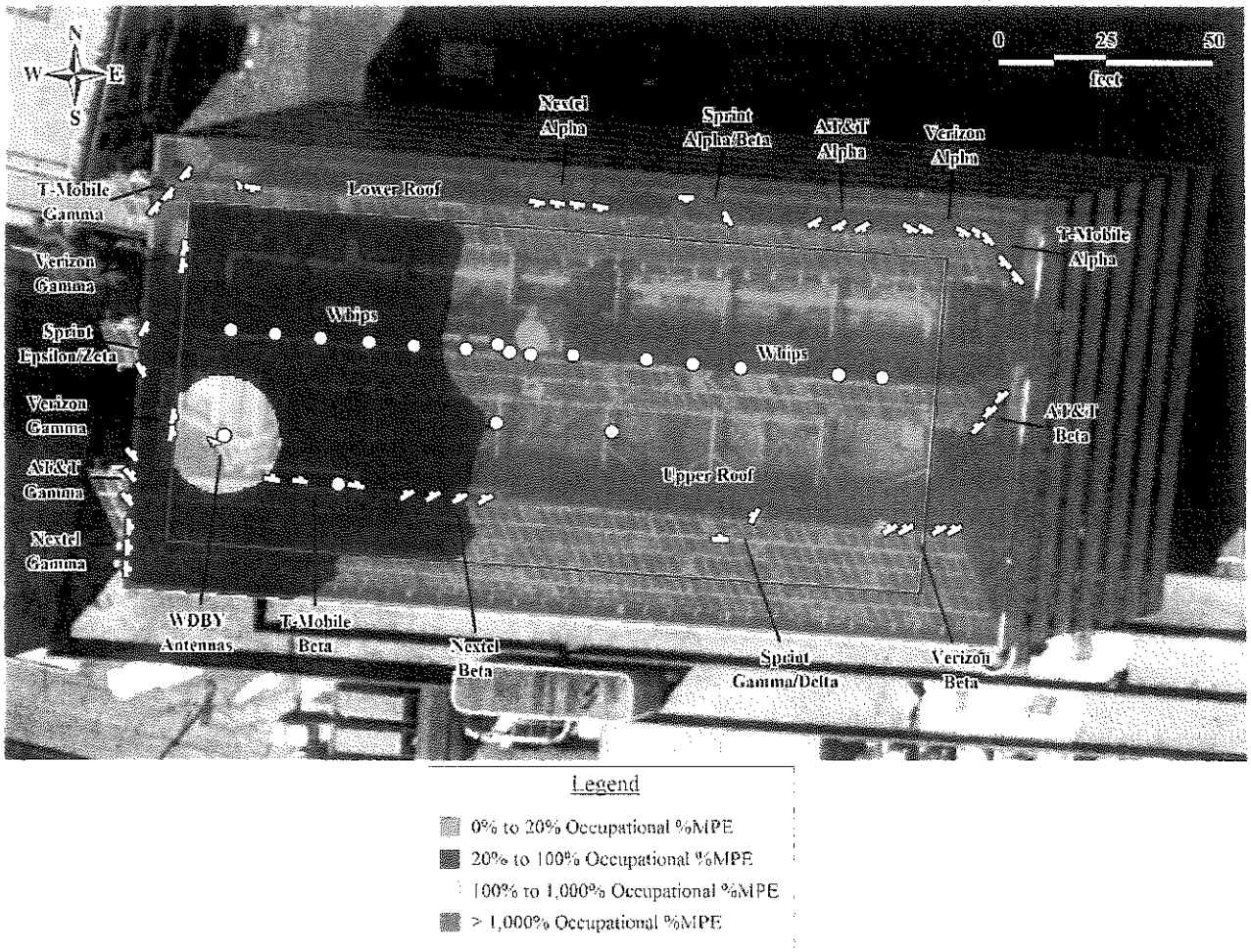


Figure 28: Existing Power Density Levels on Rooftop – All Carriers

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 limit applicable to their particular transmitter. Figure 29 below shows the 5% boundary from the proposed Verizon Wireless antennas.

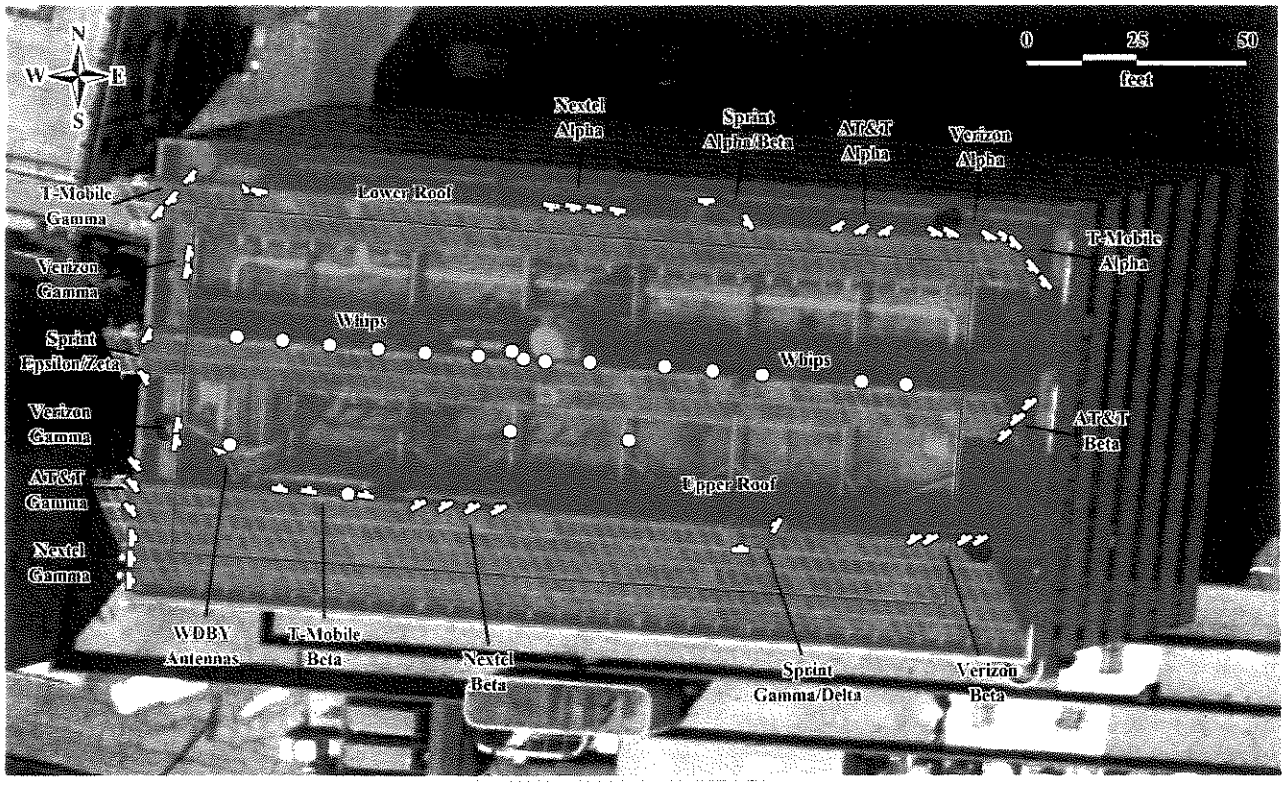


Figure 29: Existing 5% Levels on Rooftop – Verizon Antennas Only

10. Recommendations

- The two lower roof access doors, accessible from stairwells on the top floor, and the two upper roof access hatches, accessible from stairwells on the top floor, were locked at the time of the survey. These doors should continue to be locked whenever possible and rooftop access, particularly access to the upper roof, should be restricted to authorized personnel only.
- There is currently a blue RF "NOTICE" sign and a yellow RF "CAUTION" sign posted on the wall next to the eastern lower roof access door (see Figure 2). These signs are specific to the T-Mobile installation and do not reference specific exposure limits. **It is recommended that Verizon post a blue "NOTICE" sign at the eastern lower roof access door,** in accordance with Verizon's *Radio Frequency Compliance (RFC) Signage & Demarcation Policy.* This sign is intended to notify personnel that there may be areas on the lower roof where RF exposure could exceed the FCC General Population/Uncontrolled limit.
- There is currently a blue RF "NOTICE" sign, two yellow RF "NOTICE" signs and a yellow RF "CAUTION" sign posted at the western lower roof access door. The blue RF "NOTICE" sign and a yellow RF "CAUTION" signs are specific to the T-Mobile installation and the two yellow RF "NOTICE" signs are specific to the Nextel installation. These signs do not reference specific exposure limits. **It is recommended that Verizon post a blue "NOTICE" sign at the western lower roof access door,** in accordance with Verizon's *RFC Signage & Demarcation Policy.* This sign is intended to notify personnel that there may be areas on the lower roof where RF exposure could exceed the FCC General Population/Uncontrolled limit.
- There are currently various forms of RF signage posted at the eastern and western upper roof access hatches, as shown in Figures 4 & 5. These signs are specific to the T-Mobile/AT&T/Sprint installations and do not reference specific exposure limits. There are no areas of the upper roof where Verizon's specific power density levels exceed 5% of the FCC General Population/Uncontrolled limit. Therefore, it is unnecessary for Verizon to post any additional signage at the upper roof access hatches since they are not a significant contributor to the areas with exposure levels calculated to exceed the FCC General Population/Uncontrolled or Occupational/Controlled MPE limits.
- **It is recommended that Verizon post blue RF "NOTICE" signs at the gamma sector, so that they are visible to personnel approaching the antennas from any direction from the lower roof,** in accordance with Verizon's *RFC Signage & Demarcation Policy.* These signs are necessary to notify personnel of areas on the lower roof that may exceed the FCC General Population/Uncontrolled standard, directly in front of the elevated Verizon antennas where Verizon is shown to contribute greater than 5% of the MPE limit.
- **A yellow "NOTICE – Guidelines for Working in Radiofrequency Environments" sign should be posted** alongside each recommended blue "NOTICE" sign posted by Verizon, in accordance with Verizon's *RFC Signage & Demarcation Policy.*
- **A "NOC Information" sign should be posted at each lower roof access door,** in accordance with Verizon's *RFC Signage & Demarcation Policy.*
- **Figure 28 should be laminated and posted in a conspicuous location at each lower roof access door.** A larger version of Figure 28, for lamination and posting, is provided as Attachment C. **This posting should replace any rooftop mappings previously posted by Verizon Wireless.**

Figure 30: Example RF Signage

The following guidelines should be followed by all persons accessing the rooftop at 24 Hospital Avenue:

- All personnel accessing the rooftop must be authorized and have the necessary intellectual and physical tools to allow them to control or mitigate their exposure.
- Obey all posted signs.
- Assume all antennas are active.
- Do not stop in front of antennas (where possible).

11. Summary of Findings

The rooftop survey and predicted analysis for this site finds that there are some areas of the lower and upper rooftops that may exceed the general population and/or occupational exposure limits as defined by the FCC. The recommendations noted in Section 10 of this report should be implemented to bring the site into compliance with Verizon's *RFC Signage & Demarcation Policy*.

12. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate. The measurements and calculations follow guidelines set forth in ANSI/IEEE Std. C95.3, ANSI/IEEE Std. C95.1, ANSI/IEEE Std C95.7 and FCC OET Bulletin 65 Edition 97-01.

Dan Goulet
C Squared Systems, LLC

February 20, 2013
Date

Attachment A: References

OET Bulletin 65 - Edition 97-01 - August 1997 Federal Communications Commission Office of Engineering & Technology

ANSI C95.1-1982, American National Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz. IEEE-SA Standards Board

IEEE Std C95.3-1991 (Reaff 1997), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave. IEEE-SA Standards Board

IEEE Std C95.7-2005, IEEE Recommended Practice for Radio Frequency Safety Programs, 3 kHz to 300 GHz. IEEE-SA Standards Board

Attachment B: FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure[5]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (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[6]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (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

Table 7: FCC Limits for Maximum Permissible Exposure

[5] 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

[6] 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

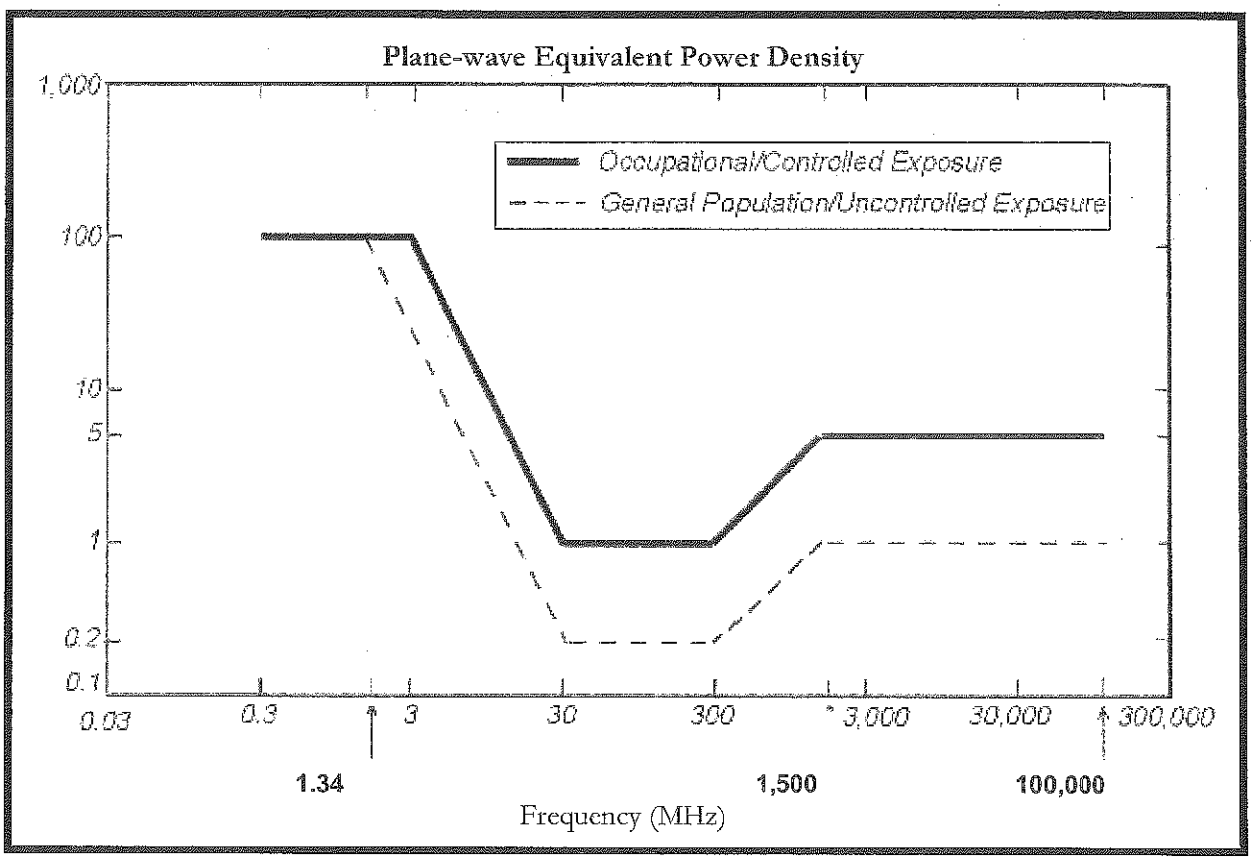
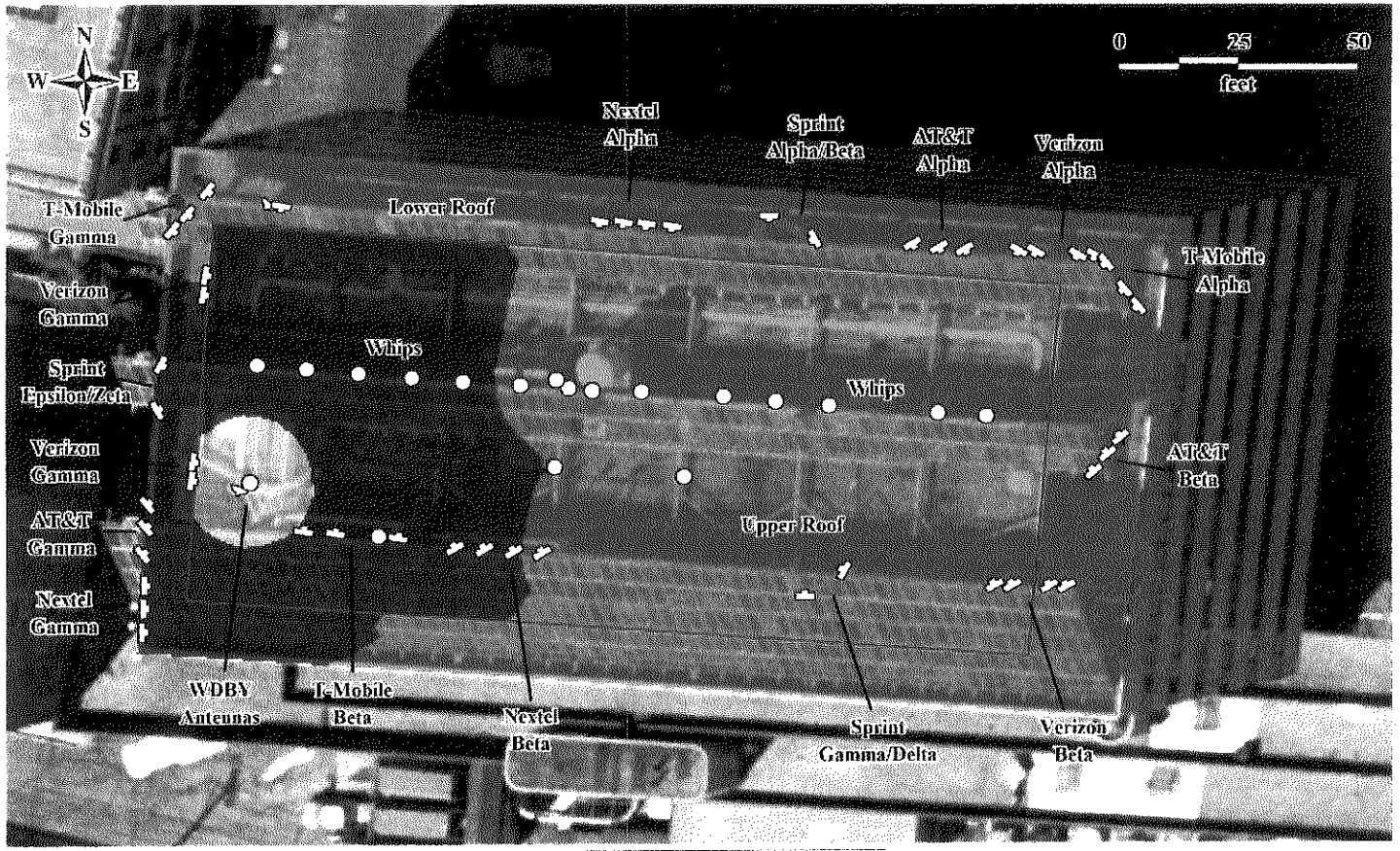


Figure 31: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: Rooftop Mapping for Posting



Legend

- 0% to 20% Occupational %MPE
- 20% to 100% Occupational %MPE
- 100% to 1,000% Occupational %MPE
- > 1,000% Occupational %MPE

VERIZON WIRELESS / SITE: Danbury CT
(24 Hospital Avenue, Danbury, CT)

CENTEK engineering

Centered on Solutions℠

June 6, 2013

Mr. Tom Nolan
Verizon Wireless
99 East River Drive
East Hartford, CT 06108

Re: Structural Evaluation Letter ~ Antenna Upgrade
Verizon Wireless Site Ref ~ Danbury
24 Hospital Avenue
Danbury, CT 06810

CENTEK Project No. 12124.C051 – Rev 1

Dear Mr. Nolan,

Centek Engineering, Inc. has reviewed the proposed Verizon Wireless antenna upgrade at the above referenced site. The purpose of the review is to determine the structural adequacy of the existing eight (8) story, 152-ft +/- tall host building to support the proposed modified antenna configuration. The existing antenna installation consists of four (4) independent steel antenna support frames connected to the roof top mounted steel support structure of the host building. The review considered the effects of wind load, dead load, ice load and seismic forces in accordance with the 2005 Connecticut State Building Code as amended by the 2009 Connecticut State Supplement. The existing Alpha Sector antenna mounting frame and associated hardware is to be removed and replaced with a proposed structural steel frame located at the opposite end of the building. Refer to design exhibit drawings DE-1 thru DE-9 dated June 6, 2013 for details.

The existing, proposed and future Verizon Wireless loads considered in this analysis consist of the following:

- Verizon (Existing to Relocate – Alpha Sector):
  Antennas: One (1) Antel BXA-70063-6CF and one (1) RYMSA MG D3-800T0 panel antennas located on a proposed/relocated roof mounted structural steel antenna support frame noted above with a RAD center elevation of 156-ft +/- AGL.
  Coax: Six (6) 1-5/8-in dia. coaxial cables routed within a proposed/relocated roof mounted cable tray.
- Verizon (Existing to Remove – Alpha Sector):
  Antennas: Two (2) Decibel DB846F65ZAXY panel antennas located on a roof mounted structural steel antenna support frame with a RAD center elevation of 156-ft +/- AGL.
  Mounting Frame: One (1) existing structural steel antenna support frame and associated hardware.
- **Verizon (Proposed – Alpha Sector):**
  Antennas: One (1) Antel BXA-171063-8BF panel antenna, one (1) Antel BXA-80063-6BF panel antenna, one (1) Alcatel-Lucent RRH2x40-AWS Remote Radio Head, one (1) Alcatel-Lucent RRH2x40-07-U Remote Radio Head, one (1) RFS DB-E1-3B-8AB-0Z sector distribution box and one (1) RFS DB-T1-6Z-8AB-0Z main distribution box located on a proposed roof mounted structural steel antenna support frame with a RAD center elevation of 156-ft +/- AGL.

Cables: One (1) 1-5/8" dia. Hybriflex Fiber feeder cable routed from the existing Verizon Wireless equipment room to the main distribution box. One (1) 1-1/4" dia. Hybriflex Fiber jumper cable routed from the main distribution box to the sector distribution box. (All cables to follow the route of the existing cable tray system)

- Verizon (Existing to Remain – Beta Sector):
  Antennas: One (1) RYMSA MG D3-800T0 panel antenna located on a roof mounted structural steel antenna support frame with a RAD center elevation of 156-ft +/- AGL.
  Coax: Six (6) 1-5/8-in dia. coaxial cables routed within existing roof mounted cable tray.

- Verizon (Existing to Remove – Beta Sector):
  Antennas: One (1) Powerwave P65-16-XL-2 and two (2) Decibel DB846F65ZAXY panel antennas located on a roof mounted structural steel antenna support frame with a RAD center elevation of 156-ft +/- AGL.

- **Verizon (Proposed – Beta Sector):**
  Antennas: One (1) Antel BXA-171063-8BF panel antenna, one (1) Antel BXA-70063-6CF panel antenna, one (1) Antel BXA-80063-6BF panel antenna, one (1) Alcatel-Lucent RRH2x40-AWS Remote Radio Head, one (1) Alcatel-Lucent RRH2x40-07-U Remote Radio Head and one (1) RFS DB-E1-3B-8AB-0Z sector distribution box located on a roof mounted structural steel antenna support frame with a RAD center elevation of 156-ft +/- AGL.
  Cables: One (1) 1-1/4" dia. Hybriflex Fiber jumper cable routed from the main distribution box to the sector distribution box. (All cables to follow the route of the existing cable tray system)

- Verizon (Existing to Remain – Gamma Sector):
  Antennas: One (1) RYMSA MG D3-800T0 panel antenna located on a roof mounted structural steel antenna support frame with a RAD center elevation of 156-ft +/- AGL.
  Coax: Six (6) 1-5/8-in dia. coaxial cables routed within existing roof mounted cable tray.

- Verizon (Existing to Remove – Gamma Sector):
  Antennas: One (1) Powerwave P65-16-XL-2 and two (2) Decibel DB846H80E-SX panel antennas located on two (2) roof mounted structural steel antenna support frames with a RAD center elevation of 156-ft +/- AGL.

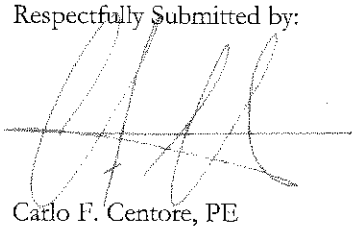
- **Verizon (Proposed – Gamma Sector):**
  Antennas: One (1) Antel BXA-171063-8BF panel antenna, one (1) Antel BXA-70063-6CF panel antenna, one (1) Antel BXA-80080-6CF panel antenna, one (1) Alcatel-Lucent RRH2x40-AWS Remote Radio Head, one (1) Alcatel-Lucent RRH2x40-07-U Remote Radio Head and one (1) RFS DB-E1-3B-8AB-0Z sector distribution box located on two (2) roof mounted structural steel antenna support frames with a RAD center elevation of 156-ft +/- AGL.
  Cables: One (1) 1-1/4" dia. Hybriflex Fiber jumper cable routed from the main distribution box to the sector distribution box. (All cables to follow the route of the existing cable tray system)

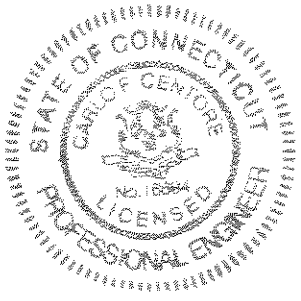
CENTEK engineering, INC
Structural Evaluation Letter
Verizon Wireless ~ Danbury
24 Hospital Avenue
Danbury, CT 06810

The proposed antenna installation meets the requirements of the 2005 Connecticut State Building Code considering the basic wind speed (3-second gust) of 95 mph as required in Appendix K of the Connecticut supplement per Table 1609.3.1. Our findings are based on the assumption that the hosting structure, all structural members and appurtenances were properly designed, detailed, fabricated, installed and have been properly maintained since erection.

In conclusion, the proposed Verizon antenna upgrade will not negatively impact the structural integrity of the existing antenna support structure or host building. If there are any questions regarding this matter, please feel free to call.

Respectfully Submitted by:





Carlo F. Centore, PE
Principal ~ Structural Engineer

Robinson+Cole

KENNETH C. BALDWIN

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Also admitted in Massachusetts

January 5, 2015

David Martin
Siting Analyst
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **EM-VER-034-130613 – Cellco Partnership d/b/a Verizon Wireless**
Notice of Intent to Modify an Existing Telecommunications Facility Located at Danbury Hospital, Hospital Avenue, Danbury, Connecticut

Dear Mr. Martin:

Enclosed is a Radio Frequency (RF) Exposure Report prepared by C Squared Systems confirming that the modified Verizon Wireless facility, on the roof of Danbury Hospital will comply with the RF emissions standards established by the FCC. It is my understanding that, in accordance with your conversation with Dan Goulet at C Squared Systems, the submission of this report will satisfy the open conditions of the Council's July 12, 2013 EM-VER-034-130613 acknowledgement.

If you have any questions or need any additional information regarding this facility please feel free to contact me.

Sincerely,

Kenneth C. Baldwin

KCB/kmd
Enclosure
Copy to:
Sandy M. Carter
Tim Parks

13336658-v1

C Squared Systems, LLC
65 Dartmouth Drive
Auburn, NH 03032
Phone: (603) 644-2800
support@csquaredsystems.com

RADIO FREQUENCY EXPOSURE REPORT

DANBURY CT

24 HOSPITAL AVENUE
DANBURY, CT 06810

December 23, 2014

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1. Introduction

The purpose of this report is to investigate compliance with applicable FCC regulations for the proposed modifications to the existing Verizon Wireless antennas, mounted on the rooftop of Danbury Hospital, located at 24 Hospital Avenue in Danbury, CT. The coordinates of the building are 41° 24' 18.03" N, 73° 26' 46.33" W.

Verizon Wireless is proposing the following modifications:

1) Remove three existing 751MHz LTE antennas (one per sector);
2) Install three replacement 751MHz LTE antennas (one per sector);
3) Remove three existing 1900MHz CDMA/EVDO antennas (one per sector);
4) Install three 1900MHz LTE antennas (one per sector);
5) Install three 1900MHz LTE RRUs (one per sector);
6) Remove three existing 2100MHz LTE antennas (one per sector);
7) Install three replacement 2100MHz LTE antennas (one per sector);
8) Adjust the electrical/mechanical tilt of all 751/1900/2100MHz antennas.

Figure 1: View of Danbury Hospital

Site Address	24 Hospital Ave, Danbury, CT
Latitude	41° 24' 18.03" N
Longitude	73° 26' 46.33" W
Site Elevation AMSL	467'
Survey Engineer	Evan Thibodeau
Survey Date/Time	12/22/2014; 9:30AM – 11:30AM

Table 1: Site Specific Data

2. FCC Guidelines for Evaluating RF Radiation Exposure Limits

In 1985, the FCC established rules to regulate radio frequency (RF) exposure from FCC licensed antenna facilities. In 1996, the FCC updated these rules, which were further amended in August 1997 by OET Bulletin 65 Edition 97-01. These new rules include Maximum Permissible Exposure (MPE) limits for transmitters operating between 300 kHz and 100 GHz. The FCC MPE limits are based upon those recommended by the National Council on Radiation Protection and Measurements (NCRP), developed by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) and adopted by the American National Standards Institute (ANSI).

The FCC general population/uncontrolled limits set the maximum exposure to which most people may be subjected. 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.

Public exposure to radio frequencies is regulated and enforced in units of milliwatts per square centimeter (mW/cm^2). The general population exposure limits for the various frequency ranges are defined in the attached "FCC Limits for Maximum Permissible Exposure (MPE)" in Attachment B of this report.

Higher exposure limits are permitted under the occupational/controlled exposure category, but only for persons who are exposed as a consequence of their employment provided they are fully aware of the potential for exposure, and are able to exercise control over their exposure. General population/uncontrolled limits are five times more stringent than the levels considered acceptable for occupational, or radio frequency trained individuals. Attachment B contains excerpts from OET Bulletin 65 and defines the Maximum Exposure Limit.

Finally, it should be noted that the MPE limits adopted by the FCC for both general population / uncontrolled exposure and for occupational / controlled 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.

3. Measurement Procedure

Frequencies from 300 KHz to 50 GHz were measured using the Narda Probe EA 5091, E-Field, shaped, FCC probe in conjunction with the NBM550 survey meter. The EA 5091 probe is "shaped" such that in a mixed signal environment (i.e.: more than one frequency band is used in a particular location), it accurately measures the percent of MPE.

From FCC OET Bulletin No. 65 - Edition 97-01 – "A useful characteristic of broadband probes used in multiple-frequency RF environments is a frequency-dependent response that corresponds to the variation in MPE limits with frequency. Broadband probes having such a "shaped" response permit direct assessment of compliance at sites where RF fields result from antennas transmitting over a wide range of frequencies. Such probes can express the composite RF field as a percentage of the applicable MPEs".

Probe Description - As suggested in FCC OET Bulletin No. 65 - Edition 97-01, the response of the measurement instrument should be essentially isotropic, (i.e., independent of orientation or rotation angle of the probe). For this reason, the Narda EA 5091 probe was used for these measurements.

Sampling Description - At each measurement location, a spatially averaged measurement is collected over the height of an average human body. The NBM550 survey meter performs a time average measurement while the user slowly moves the probe over a distance range of 20 cm to 200 cm (about 6 feet) above ground level. The results recorded at each measurement location include average values over the spatial distance.

Instrumentation Information - A summary of specifications for the equipment used is provided in the table below.

Manufacturer	Narda Microwave			
Probe	EA 5091, Serial# 01059			
Calibration Date	February 2013			
Calibration Interval	24 Months			
Meter	NBM550, Serial# B-0495			
Calibration Date	January 2013			
Calibration Interval	24 Months			
Probe Specifications	**Frequency Range**	**Field Measured**	**Standard**	**Measurement Range**
	300 KHz-50 GHz	Electric Field	U.S. FCC 1997 Occupational/Controlled	0.2 – 600 % of Standard

Table 2: Instrumentation Information

Instrument Measurement Uncertainty - The total measurement uncertainty of the NARDA measurement probe and meter is no greater than ±3 dB (0.5% to 6%), ±1 dB (6% to 100%), ±2 dB (100% to 600%). The factors which contribute to this include the probe's frequency response deviation, calibration uncertainty, ellipse ratio, and isotropic response[1]. Every effort is taken to reduce the overall uncertainty during measurement collection including pointing the probe directly at the likely highest source of emissions.

[1] For further details, please refer to Narda Safety Test Solutions NBM550 Probe Specifications, pg. 64
http://www.narda-sts.us/pdf_files/DataSheets/NBM-Probes_DataSheet.pdf

4. RF Exposure Prediction Methods

The emission field calculation results displayed in the following figures were generated using the following formula as outlined in FCC bulletin OET 65:

$$\text{Power Density} = \left(\frac{1.6^2 \times EIRP}{4\pi \times R^2} \right) \times OffBeamLoss$$

Where:

EIRP = Effective Isotropic Radiated Power

R = Radial Distance = $\sqrt{(H^2 + V^2)}$

H = Horizontal Distance from antenna in meters

V = Vertical Distance from radiation center of antenna in meters

Ground reflection factor of 1.6

Off Beam Loss is determined by the selected antenna patterns

These calculations assume that the antennas are operating at 100 percent capacity, that all antenna channels are transmitting simultaneously, and that the radio transmitters are operating at full power. As a result, the predicted signal levels reported below are much higher than the actual signal levels will be from the final site configuration.

5. Proposed Antenna Configuration

Table 3 below lists the specifications of the proposed Verizon Wireless antennas.

Operator	Sector	TX Freq. (MHz)	Power at Antenna (Watts)	Ant Gain (dBd)	Power ERP (Watts)	Antenna Model	Beam Width	Mech. Downtilt	Length (ft)	Antenna Centerline Height (ft)
Verizon	Alpha	875	119	14.5	3357	BXA-80063/6BF_0	63	0	6	156.0
		2100	120	15.9	4669	HBXX-6516DS-A2M_2	64	2	4	156.0
		751	80	13.8	1919	X7C-FRO-660-VR6	62	0	6	156.0
		1900	120	15.9	4669	HBXX-6516DS-A2M_2	66	2	4	156.0
	Beta	875	119	14.5	3357	BXA-80063/6BF_0	63	0	6	156.0
		2100	120	15.9	4669	HBXX-6516DS-A2M_4	64	2	4	156.0
		751	80	13.8	1919	X7C-FRO-660-VR6	62	2	6	156.0
		1900	120	15.9	4669	HBXX-6516DS-A2M_4	66	2	4	156.0
	Gamma	875	119	14.5	3357	BXA-80063/6BF_0	63	0	6	156.0
		2100	120	15.9	4669	HBXX-6516DS-A2M_2	64	2	4	156.0
		751	80	13.8	1919	X7C-FRO-660-VR2	62	0	6	156.0
		1900	120	15.9	4669	HBXX-6516DS-A2M_2	66	2	4	156.0

Table 3: Proposed Antenna Configuration[2]

[2] Transmit power assumes 0 dB of cable loss, except for the 875 MHz ERP value, which is based on the existing CT Siting Council filing. No modifications are proposed by Verizon Wireless to the equipment associated with this frequency.

6. Measured Results

Measurements were recorded at ground level and on the top level of two parking garages located in close proximity to the hospital to establish a baseline %MPE value for the existing facility. The measured results, and a description of each survey location, are detailed in Table 4 below. The table consists of the 25 measurements recorded on December 22, 2014 between 9:30AM and 11:30AM in these publicly accessible areas around the hospital.

The highest spatially averaged measurement was **5.30%** (Average Uncontrolled/General Population MPE) and was recorded at Location 10, near the eastern end of the Duracell Center parking lot.

Meas. Location	Location Description	Latitude	Longitude	Dist. From Closest VZW Sector (feet)	Measured % MPE (Uncontrolled / General)
1	Rizzo Parking Garage - Top Level	41.406318	-73.445006	507	< 1.00
2	Rizzo Parking Garage - Top Level	41.406084	-73.445878	365	< 1.00
3	Rizzo Parking Garage - Top Level	41.405727	-73.445639	242	< 1.00
4	Rizzo Parking Garage - Top Level	41.406007	-73.444826	439	< 1.00
5	Rizzo Parking Garage - Top Level	41.406140	-73.444247	585	< 1.00
6	Rizzo Parking Garage - Top Level	41.406546	-73.444504	649	< 1.00
7	Hospital Emergency Entrance	41.406724	-73.444286	737	< 1.00
8	Ambulance Entrance	41.405932	-73.443994	596	< 1.00
9	Corner of Emergency Department	41.405659	-73.444658	389	< 1.00
10	**Duracell Center - Rear of Parking Lot**	**41.405144**	**-73.443006**	**780**	**5.30**
11	Duracell Center - North of Main Entrance	41.405265	-73.444441	392	1.46
12	Hospital Ave & Forest Ave	41.406661	-73.445060	616	1.02
13	Hospital Ave & Edgewood Dr	41.406299	-73.446079	448	< 1.00
14	Danbury Hospital - Western Entrance	41.405376	-73.446338	146	< 1.00
15	Hospital Ave & Tamarack Ave	41.405712	-73.447777	427	< 1.00
16	Hospital Ave & Locust Ave	41.404718	-73.447321	240	< 1.00
17	90 Locust Ave	41.404555	-73.446551	165	< 1.00
18	Red Parking Garage - Top Level	41.404800	-73.443918	536	< 1.00
19	Red Parking Garage - Top Level	41.404665	-73.443394	684	< 1.00
20	Red Parking Garage - Top Level	41.404378	-73.443541	665	< 1.00
21	Red Parking Garage - Top Level	41.404119	-73.443640	673	< 1.00
22	Red Parking Garage - Top Level	41.404205	-73.444154	533	< 1.00
23	Red Parking Garage - Top Level	41.404542	-73.444000	528	< 1.00
24	Danbury Hospital - Valet Parking	41.404334	-73.444592	405	< 1.00
25	Danbury Hospital - Main Entrance	41.404512	-73.445577	159	< 1.00

Table 4: Measurement Results[3]

[3] Due to measurement uncertainty at low levels (See Table 2), any readings outside the measurement range of the probe (< 1.00 % FCC General Population/Uncontrolled MPE) are noted as such.

Figure 2 below is an aerial view of the facility location and the surrounding area. Labeled points indicate the locations of the measurements recorded on December 22, 2014, as listed above in Table 4.

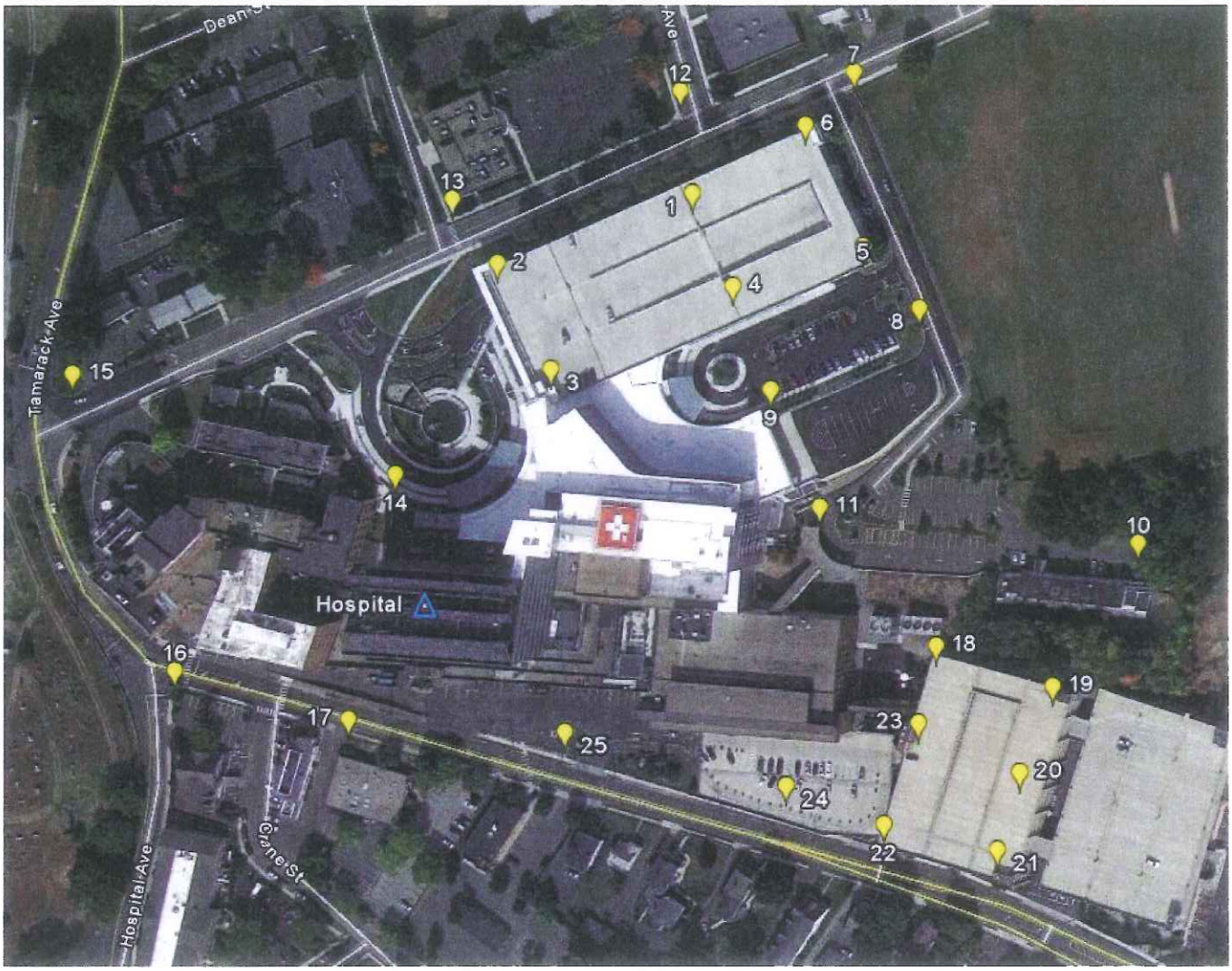


Figure 2: Aerial View of Facility & All Measurement Locations

7. Calculated Results

Table 5 below outlines the existing and proposed power density information for the site. Due to the directional nature of Verizon Wireless' existing and proposed panel antennas, the majority of the RF power will be focused out towards the horizon. As a result, there will be less RF power directed below the antennas relative to the horizon, and consequently lower power density levels around the base of the building. Please refer to Attachments C and D for the vertical patterns of Verizon Wireless' existing and proposed panel antennas. All values shown in Table 5 include a nominal 10 dB off-beam pattern loss to account for the lower relative gain below the antenna.

	Carrier	Antenna Height (Feet)	Operating Frequency (MHz)	Number of Trans.	ERP Per Transmitter (Watts)	Power Density (mw/cm^2)	Limit	%MPE
Existing Configuration	Verizon PCS	156	1970	3	387	0.0017	1.0000	0.17%
	Verizon Cellular	156	869	9	373	0.0050	0.5793	0.86%
	Verizon LTE	156	757	1	649	0.0010	0.5047	0.19%
	Verizon AWS	156	2100	1	2711	0.0040	1.0000	0.40%
							Total	**1.62%**
Proposed Configuration	Verizon LTE	156	751	1	1919	0.0028	0.5007	0.57%
	Verizon LTE	156	1900	1	4669	0.0069	1.0000	0.69%
	Verizon LTE	156	2100	1	4669	0.0069	1.0000	0.69%
	Verizon CDMA/EVDO	156	869	9	373	0.0050	0.5793	0.86%
							Total	**2.80%**
							Net Change	**1.18%**

Table 5: Carrier Information[4] [5] [6]

[4] The existing CSC filing for Verizon should be replaced with the "Proposed Configuration" values, as listed in Table 5.

[5] Antennas heights for Verizon are based on the Verizon Wireless Antenna Recommendation, dated 11/5/2014.

[6] Please note that %MPE values listed are rounded to two decimal points. The total %MPE listed is a summation of each unrounded contribution. Therefore, summing each rounded value may not reflect the total value listed in the table.

8. Summary of Findings

A number of publicly accessible areas at ground level and on the parking garage decks in the vicinity of Danbury Hospital in Danbury, CT, were surveyed and found to be well within the mandated General Population/Uncontrolled limits for Maximum Permissible Exposure, as delineated in the Federal Communications Commission's Radio Frequency exposure rules published in 47 CFR 1.1307(b)(1)-(b)(3).

The highest spatially averaged %MPE measurement of all surveyed points based on the 1997 FCC standard for exposure to the general population is **5.30%** MPE. This measurement was recorded at Location 10, near the eastern end of the Duracell Center parking lot.

Power density values were calculated for the proposed Verizon Wireless antenna configuration and compared against the values currently listed in the CT Siting Council database. This comparison shows a net increase of 1.18% MPE at the base of the hospital after the antenna modifications are complete. This value was then added to the maximum measured %MPE value. The highest composite (measured + calculated) power density is **6.48% of the FCC General Population MPE limit**. Please note that the maximum measured % MPE occurs 780' from the hospital, whereas the net % MPE increase from Verizon Wireless' proposed modifications is calculated at the base of the hospital, yielding a worst-case value (measured + calculated). The net % MPE increase calculated would decrease further from the base of the hospital, based on the analytical methods employed.

The above analysis verifies that exposure levels in the areas surrounding the hospital; both currently and after the proposed modifications, are well below the Maximum Permissible Exposure levels as outlined by the FCC in the OET Bulletin 65 Ed. 97-01.

9. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate. The field measurements and calculated results were obtained with properly calibrated equipment using techniques and guidelines set forth in ANSI/IEEE Std. C95.3, ANSI/IEEE Std C95.1, and FCC OET Bulletin 65 Edition 97-01.

Evan Thibodeau

December 23, 2014

Report Prepared By: Evan Thibodeau
RF Engineer
C Squared Systems, LLC

Date

Keith Vellante

December 24, 2014

Reviewed/Approved By: Keith Vellante
RF Manager
C Squared Systems, LLC

Date

Attachment A: References

OET Bulletin 65 - Edition 97-01 - August 1997 Federal Communications Commission Office of Engineering & Technology

ANSI C95.1-1982, American National Standard Safety Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz. IEEE-SA Standards Board

IEEE Std C95.3-1991 (Reaff 1997), IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave. IEEE-SA Standards Board

IEEE Std C95.7-2005, IEEE Recommended Practice for Radio Frequency Safety Programs, 3 kHz to 300 GHz. IEEE-SA Standards Board

Attachment B: FCC Limits for Maximum Permissible Exposure (MPE)

(A) Limits for Occupational/Controlled Exposure[7]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (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[8]

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (E) (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

Table 6: FCC Limits for Maximum Permissible Exposure

[7] 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.

[8] 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.

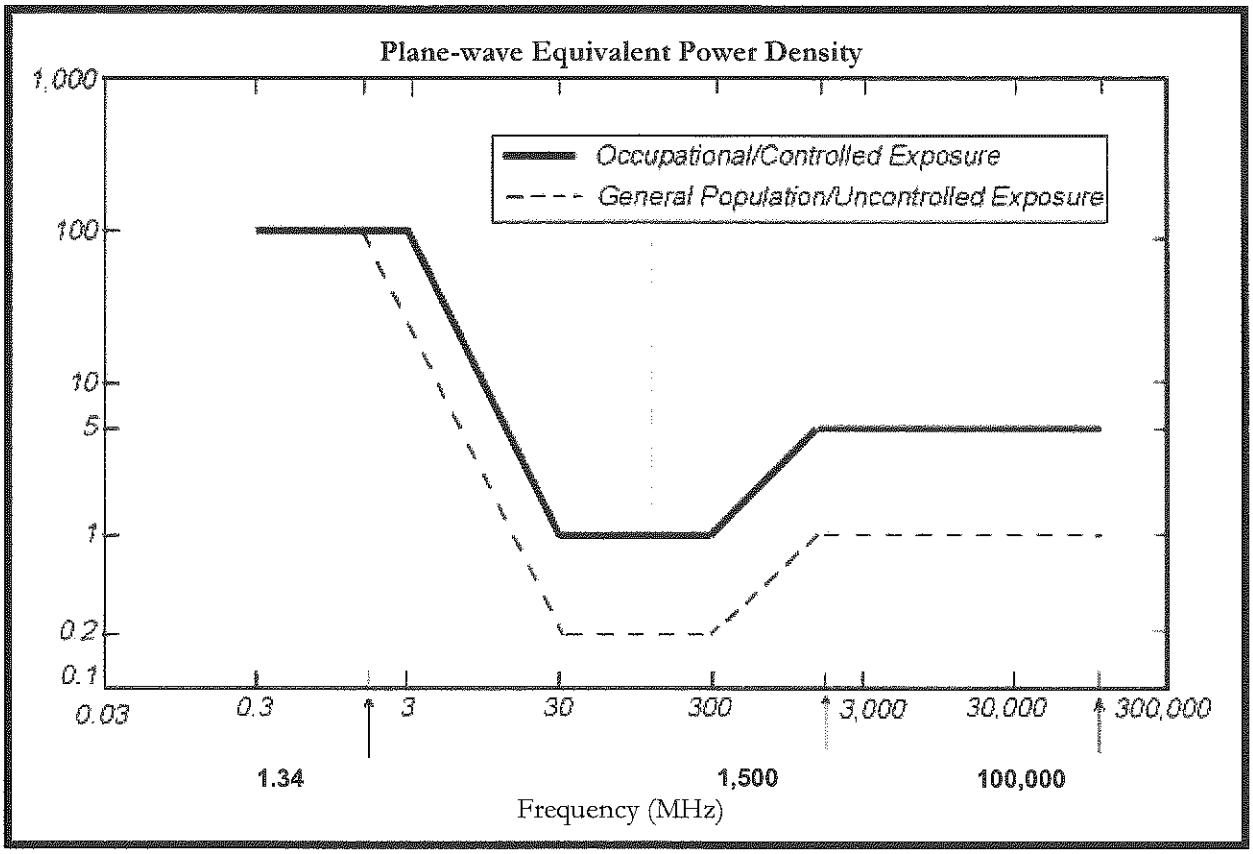
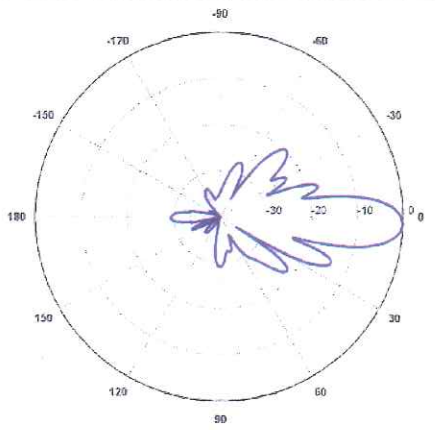


Figure 3: Graph of FCC Limits for Maximum Permissible Exposure (MPE)

Attachment C: Verizon Wireless Existing Antenna Model Data Sheets and Patterns

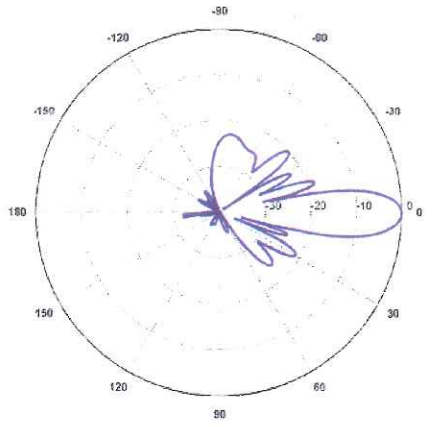
751 MHz

Manufacturer:	Amphenol
Model #:	BXA-70063/6CF_2
Frequency Band:	696-806 MHz
Gain:	14.0 dBd
Vertical Beamwidth:	13°
Horizontal Beamwidth:	65°
Polarization:	±45°
Size L x W x D:	71.0" x 11.2" x 5.2"



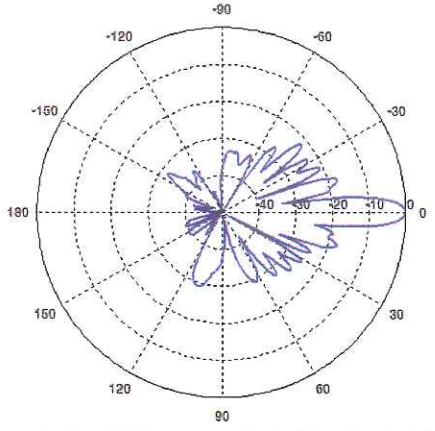
869 MHz

Manufacturer:	Amphenol
Model #:	BXA-80063/6BF_0
Frequency Band:	806-900 MHz
Gain:	14.5 dBd
Vertical Beamwidth:	11°
Horizontal Beamwidth:	63°
Polarization:	±45°
Size L x W x D:	68.6" x 11.2" x 5.3"



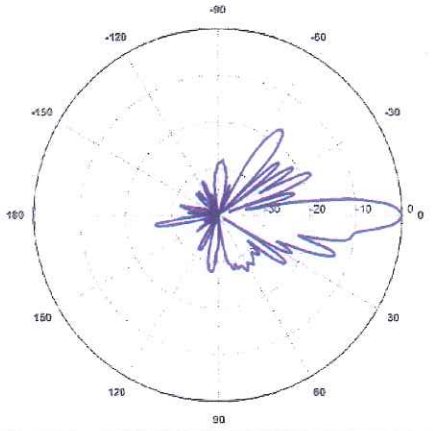
1900 MHz

Manufacturer:	Rymsa
Model #:	MGD3-800T0
Frequency Band:	1850-1990 MHz
Gain:	15.9 dBd
Vertical Beamwidth:	6.6°
Horizontal Beamwidth:	65°
Polarization:	±45°
Size L x W x D:	53.0" x 6.0" x 4.0"



2100 MHz

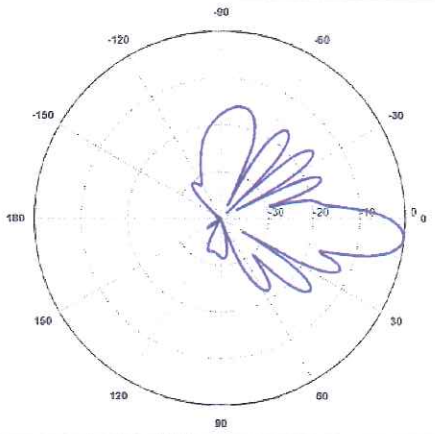
Manufacturer:	Amphenol
Model #:	BXA-171063/8BF_0
Frequency Band:	1920-2170 MHz
Gain:	15.3 dBd
Vertical Beamwidth:	7°
Horizontal Beamwidth:	60°
Polarization:	±45°
Size L x W x D:	48.2" x 6.1" x 4.1"



Attachment D: Verizon Wireless Proposed Antenna Model Data Sheets and Patterns

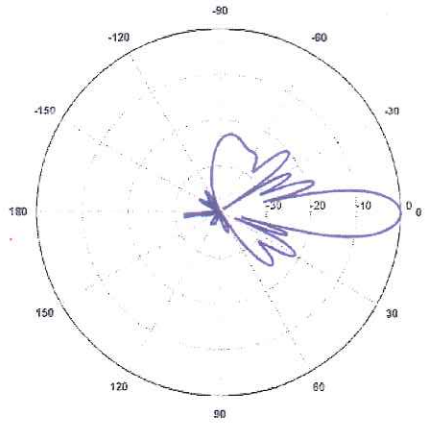
751 MHz

Manufacturer:	JMA Wireless
Model #:	X7C-FRO-660-VR6
Frequency Band:	698-824 MHz
Gain:	13.8 dBd
Vertical Beamwidth:	12°
Horizontal Beamwidth:	62°
Polarization:	±45°
Size L x W x D:	72.0" x 14.6" x 8.0"



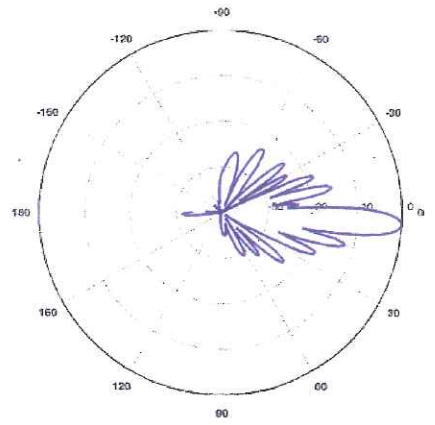
869 MHz

Manufacturer:	Amphenol
Model #:	BXA-80063/6BF_0
Frequency Band:	806-900 MHz
Gain:	14.5 dBd
Vertical Beamwidth:	11°
Horizontal Beamwidth:	63°
Polarization:	±45°
Size L x W x D:	68.6" x 11.2" x 5.3"



1900 MHz

Manufacturer:	Commscope
Model #:	HBXX-6516DS-A2M_4
Frequency Band:	1850-1990 MHz
Gain:	15.9 dBd
Vertical Beamwidth:	7°
Horizontal Beamwidth:	66°
Polarization:	±45°
Size L x W x D:	50.9" x 12.0" x 6.5"



2100 MHz

Manufacturer:	Commscope
Model #:	HBXX-6516DS-A2M_4
Frequency Band:	1920-2180 MHz
Gain:	15.9 dBd
Vertical Beamwidth:	6.6°
Horizontal Beamwidth:	64°
Polarization:	±45°
Size L x W x D:	50.9" x 12.0" x 6.5"