

Radio Frequency – Electromagnetic Energy (RF-EME) Compliance Report



Prepared for:
MetroPCS
1080 Marina Village Parkway
4th Floor
Alameda, CA 94501

Site No. SF0248
St. Mary's College
1294 Albina Avenue
Berkeley, CA 95706
Alameda County
37.884400; -122.281990 NAD83
rooftop

EBI Project No. 62122852
Jull 20, 2012



EXECUTIVE SUMMARY

Purpose of Report

EnviroBusiness Inc. (dba EBI Consulting) has been contracted by MetroPCS to conduct radio frequency electromagnetic (RF-EME) modeling for MetroPCS Site SF0248 located at 1294 Albina Avenue in Berkeley, CA to determine RF-EME exposure levels from existing and existing MetroPCS wireless communications equipment at this site. As described in greater detail in Section 11.0 of this report, the Federal Communications Commission (FCC) has developed Maximum Permissible Exposure (MPE) Limits for general public exposures and occupational exposures. This report summarizes the results of RF-EME modeling in relation to relevant FCC RF-EME compliance standards for limiting human exposure to RF-EME fields.

this report contains a detailed summary of the RF EME analysis for the site.

This document addresses the compliance of MetroPCS's proposed transmitting facilities independently and in relation to all collocated facilities at the site.

1.0 LOCATION OF ALL EXISTING ANTENNAS AND FACILITIES AND EXISTING RF LEVELS

This project involves the installation of one (1) MetroPCS microwave dish on a rooftop located at 1294 Albina Avenue in Berkeley, CA. There are also three (3) MetroPCS wireless telecommunication panel antennas on the rooftop. There are three Sectors (A, B, and C) of panel antennas existing at the site, with one (1) antenna that are installed per sector.

Based on drawings and aerial photography review one additional carrier also has wireless antennas on the rooftop. These antennas were included in the modeling analysis.

2.0 LOCATION OR ALL APPROVED (BUT NOT INSTALLED) ANTENNAS AND FACILITIES AND EXPECTED RF LEVELS FROM THE APPROVED FACILITIES

There are no antennas or facilities that are approved and not installed based on information provided to EBI and MetroPCS at the time of this report.

3.0 NUMBER AND TYPES OF WTS WITHIN 100 FEET OF THE PROPOSED SITE AND ESTIMATES OF CUMULATIVE EMR EMISSIONS AT THE PROPOSED SITE

With the exception of the antennas mentioned in Section 1.0, there are no other Wireless Telecommunication Service (WTS) sites observed within 100 feet of the proposed site

LOCATION AND NUMBER OF THE METROPCS ANTENNAS AND BACK-UP FACILITIES PER BUILDING AND NUMBER AND LOCATION OF OTHER TELECOMMUNICATION FACILITIES ON THE PROPERTY

This project involves the installation of one (1) MetroPCS microwave dish on a rooftop located at 1294 Albina Avenue in Berkeley, CA. At this site there is proposed to be one microwave transmitting in the 27922 MHz frequency range. The bottom of the microwave dish will be 10 feet above the main rooftop surface. The microwave dish will be oriented 119.39° from true north.

There are also three (3) MetroPCS wireless telecommunication panel antennas on the rooftop. There are three Sectors (A, B, and C) of panel antennas existing at the site, with one (1) antennas that are installed per sector. The MetroPCS antennas will be transmitting in the 1975-1985 MHz and 2135-2140 MHz frequency ranges. To be conservative for modeling purposes it was assumed that the MetroPCS antenans will be transmitting at 1975 MHZ and 2135 MHz. The Sector A antenna is oriented 37° from true north. The Sector B antenna is oriented 150° from true north. The Sector C antenna is oriented 270° from true north. The bottoms of the Sector A, B and C antennas are 8.33 feet above the main roof level.

Based on drawings and aerial photography review an additional carrier also has wireless antennas on the rooftop. These antennas were included in the modeling analysis using information provided to EBI and generally accepted industry standards.

4.0 POWER RATING FOR ALL EXISTING AND PROPOSED BACKUP EQUIPMENT SUBJECT TO THE APPLICATION

The operating power for modeling purposes was assumed to be 20 Watts per transmitter for the 1975 MHz panel antenna and there will be two (2) transmitters operating at this frequency per sector. The operating power for modeling purposes was assumed to be 60 Watts per transmitter for the 2135 MHz panel antenna and there will be one (1) transmitter operating at this frequency per sector.

5.0 TOTAL NUMBER OF WATTS PER INSTALLATION AND THE TOTAL NUMBER OF WATTS FOR ALL INSTALLATIONS ON THE BUILDING

The effective radiated power (ERP) for the 1975 MHz transmitters combined on site is 3,336 Watts. The effective radiated power (ERP) for the 2135 MHz transmitters combined on site is 5,004 Watts. The ERP for the microwave transmitting in the 27,922 MHz frequency range on site is 794.33 Watts. The The ERP for the additional carrier combined on this site was assumed to be 2,259 Watts.

PREFERRED METHOD OF ATTACHMENT OF PROPOSED ANTENNA INCLUDING: DIRECTIONALITY OF ANTENNAS, HEIGHT OF ANTENNAS ABOVE NEAREST WALKING SURFACE, DISCUSS NEARBY INHABITED BUILDINGS

Based on the information provided to EBI, the information indicates that the proposed microwaves are to be pipe mounted inside the stealth enclosed area existing on the rooftop. Operating in the directions, frequencies, and heights mentioned in section 4.0 above. This building is located on a school campus made up of similar classroom type buildings as well as sporting facilities and fields immediately adjacent

6.0 ESTIMATED AMBIENT RADIO FREQUENCY FIELDS FOR THE PROPOSED SITE

Based on worst-case predictive modeling, there are no predicted areas on any accessible rooftop-level walking/working surface related to the existing MetroPCS microwave dishes and existing panel antennas that exceed the FCC's occupational or general public exposure limits at this site. At the nearest walking/working surfaces to the proposed MetroPCS antennas, the maximum power density is 84.33 percent of the FCC's general public limit (16.87 percent of the FCC's occupational limit). The composite exposure level from modeling all other carriers existing on this site combined with MetroPCS's proposed microwaves and existing panel antennas 85.33 percent of the FCC's general public limit (17.07 percent of the FCC's occupational limit) at the nearest walking/working surface to each antenna. Based on worst-case predictive modeling, there are no areas at ground level related to the existing MetroPCS microwave dishes and existing panel antennas that exceed the FCC's occupational or general public exposure limits at this site. At ground level, the maximum power density generated by the MetroPCS microwave dishes and the existing panel antennas combined with the modeling of the existing other carriers antennas on site is 3.00 percent of the FCC's general public limit (0.60 percent of the FCC's occupational limit). The inputs used in the modeling are summarized in the RoofView® export file presented in Appendix B. Roofview® was used for modeling the panel antennas however RoofView® is not suitable for modeling microwave dishes. Therefore formulas from OET Bulletin 65 were used to calculate a worst-case prediction of the maximum power density (MPE) at ground level and nearest walking surface for the microwave dishes. Power density estimates used for the microwave dishes proposed for installation at this site are included in Appendix C.

There are no modeled areas on the rooftop that exceed the FCC's limits for general public or occupational exposure in front of the other carrier antennas.

SIGNAGE AT THE FACILITY IDENTIFYING ALL WTS EQUIPMENT AND SAFETY PRECAUTIONS FOR PEOPLE NEARING THE EQUIPMENT AS MAY BE REQUIRED BY THE APPLICABLE FCC ADOPTED STANDARDS (DISCUSS SIGNAGE FOR THOSE WHO SPEAK LANGUAGES OTHER THAN ENGLISH)

Signs are the primary means for control of access to areas where RF exposure levels may potentially exceed the FCC's allowable thresholds for occupational and general public exposure. It is recommended that the existing signage is examined to ensure that proper signage is posted at the rooftop access door / hatch warning that anyone entering the rooftop is entering an area where RF energy is present. Additionally, signage should be posted by the antennas notifying anyone approaching the antenna face that they are entering an area that may exceed the FCC's general public threshold for exposure in close proximity to the antennas,

Additionally, there are areas where workers elevated above the rooftop may be exposed to power densities greater than the general population and occupational limits. Workers and the general public should be informed about the presence and locations of antennas and their associated fields.

Access to this site is accomplished via a roof access door/hatch located on the main roof. Access to the rooftop is considered controlled as it is assumed that this rooftop access door/hatch is always locked. This means that the general public will not have access to the rooftop. Since this site is considered controlled, the use of barriers around the Metro PCS antennas is not recommended. Should this access be found to be uncontrolled, the installation of barriers should be considered in addition to signage to limit access to the area in close proximity to these antennas

7.0 STATEMENT ON WHO PRODUCED THIS REPORT AND QUALIFICATIONS

Please see the certifications attached in Appendix A below.

8.0 FEDERAL COMMUNICATIONS COMMISSION (FCC) REQUIREMENTS

The FCC has established Maximum Permissible Exposure (MPE) limits for human exposure to Radiofrequency Electromagnetic (RF-EME) energy fields, based on exposure limits recommended by the National Council on Radiation Protection and Measurements (NCRP) and, over a wide range of frequencies, the exposure limits developed by the Institute of Electrical and Electronics Engineers, Inc. (IEEE) and adopted by the American National Standards Institute (ANSI) to replace the 1982 ANSI guidelines. Limits for localized absorption are based on recommendations of both ANSI/IEEE and NCRP.

The FCC guidelines incorporate two separate tiers of exposure limits that are based upon occupational/controlled exposure limits (for workers) and general public/uncontrolled exposure limits for members of the general public.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general public/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

General public/uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment-related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Table I and Figure I (below), which are included within the FCC’s OET Bulletin 65, summarize the MPE limits for RF emissions. These limits are designed to provide a substantial margin of safety. They vary by frequency to take into account the different types of equipment that may be in operation at a particular facility and are “time-averaged” limits to reflect different durations resulting from controlled and uncontrolled exposures.

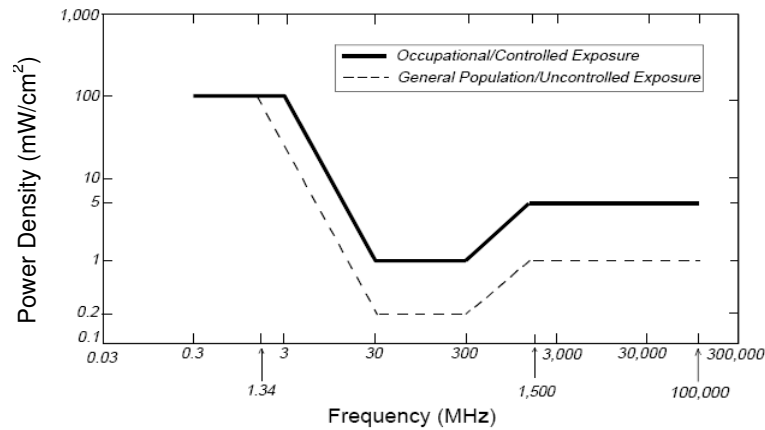
The FCC’s MPEs are measured in terms of power (mW) over a unit surface area (cm²). Known as the power density, the FCC has established an occupational MPE of 5 milliwatts per square centimeter (mW/cm²) and an uncontrolled MPE of 1 mW/cm² for equipment operating in the 1975 MHz – 27922 MHz frequency ranges. These limits are considered protective of these populations.

Table I: Limits for Maximum Permissible Exposure (MPE)				
(A) Limits for Occupational/Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time [E] ² , [H] ² , or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f ²)*	6
30-300	61.4	0.163	1.0	6
300-1,500	--	--	f/300	6
1,500-100,000	--	--	5	6
(B) Limits for General Public/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time [E] ² , [H] ² , or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f ²)*	30
30-300	27.5	0.073	0.2	30
300-1,500	--	--	f/1,500	30
1,500-100,000	--	--	1.0	30

f = Frequency in (MHz)

* Plane-wave equivalent power density

Figure 1. FCC Limits for Maximum Permissible Exposure (MPE)
 Plane-wave Equivalent Power Density



Based on the above, the most restrictive thresholds for exposures of unlimited duration to RF energy for several personal wireless services are summarized below:

Personal Wireless Service	Approximate Frequency	Occupational MPE	Public MPE
Personal Communication (PCS)	1,950 MHz	5.00 mW/cm ²	1.00 mW/cm ²
Cellular Telephone	870 MHz	2.90 mW/cm ²	0.58 mW/cm ²
Specialized Mobile Radio	855 MHz	2.85 mW/cm ²	0.57 mW/cm ²
Most Restrictive Freq, Range	30-300 MHz	1.00 mW/cm ²	0.20 mW/cm ²

MPE limits are designed to provide a substantial margin of safety. These limits apply for continuous exposures and are intended to provide a prudent margin of safety for all persons, regardless of age, gender, size, or health.

Personal Communication (PCS) facilities used by MetroPCS in this area operate within a frequency range of 1975-2140 MHz. Facilities typically consist of: 1) electronic transceivers (the radios or cabinets) connected to wired telephone lines; and 2) antennas that send the wireless signals created by the transceivers to be received by individual subscriber units (PCS telephones). Transceivers are typically connected to antennas by coaxial cables.

Because of the short wavelength of PCS services, the antennas require line-of-site paths for good propagation, and are typically installed above ground level. Antennas are constructed to concentrate energy towards the horizon, with as little energy as possible scattered towards the ground or the sky. This design, combined with the low power of PCS facilities, generally results in no possibility for exposure to approach Maximum Permissible Exposure (MPE) levels, with the exception of areas directly in front of the antennas.

Statement of Compliance

A site is considered out of compliance with FCC regulations if there are areas that exceed the FCC exposure limits and there are no RF hazard mitigation measures in place. Any carrier which has an installation that contributes more than 5% of the applicable MPE must participate in mitigating these RF hazards.

9.0 LIMITATIONS

This report was prepared for the use of MetroPCS. It was performed in accordance with generally accepted practices of other consultants undertaking similar studies at the same time and in the same locale under like circumstances. The conclusions provided by EBI are based solely on the information provided by the client. The observations in this report are valid on the date of the investigation. Any additional information that becomes available concerning the site should be provided to EBI so that our conclusions may be revised and modified, if necessary. This report has been prepared in accordance with Standard Conditions for Engagement and authorized proposal, both of which are integral parts of this report. No other warranty, expressed or implied, is made

10.0 SUMMARY AND CONCLUSIONS

EBI has prepared this Radiofrequency Emissions Compliance Report for the existing MetroPCS telecommunications equipment at the site located at 1294 Albina Avenue in Berkeley, CA.

EBI has conducted theoretical modeling to estimate the worst-case power density from MetroPCS antennas and the other carriers' existing antennas to document potential MPE levels at this location and ensure that site control measures are adequate to meet FCC and OSHA requirements. As presented in the preceding sections, based on worst-case predictive modeling, there are no modeled exposures on any accessible rooftop-level walking/working surface related to existing equipment in the area that exceed the FCC's occupational and general public exposure limits at this site. As such, the existing MetroPCS project is in compliance with FCC rules and regulations

It should be verified that the signage recommendations in Section 9.0 are followed to ensure the site is within full compliance with all federal guidelines for emissions and signage requirements.

Appendix A

Certifications

Preparer Certification

I, Scott Heffernan, state that:

- I am an employee of EnviroBusiness Inc. (d/b/a EBI Consulting), which provides RF-EME safety and compliance services to the wireless communications industry.
- I have successfully completed RF-EME safety training, and I am aware of the potential hazards from RF-EME and would be classified “occupational” under the FCC regulations.
- I am familiar with the FCC rules and regulations as well as OSHA regulations both in general and as they apply to RF-EME exposure.
- I have reviewed the data provided by the client and incorporated it into this Site Compliance Report such that the information contained in this report is true and accurate to the best of my knowledge.



Scott Heffernan

Appendix B

Roofview® Export File

StartMapDefinition

Roof Max Y 1 Roof Max X 1 Map Max Y 200 Map Max X 180 XY Offset 10 X Offset 30 Number of envelope 1 \$AO\$210 \$AO\$210

List Of Areas
\$AO\$210

StartSettingsData

Standard Method 3 Uptime 2 Scale Factor 3 Low Thr 1 Low Color 20 Mid Thr 1 Mid Color 50 Hi Thr 2 Hi Color 100 Over Color 2 Ap Ht Mult 3 Ap Ht Method 1.5 1

StartAntennaData

It is advisable to provide an ID (ant 1) for all antennas

ID	Name	(MHz) Freq	Trans Power	Trans Count	Coax Len	Coax Type	Other Loss	Input Power	Calc Power	Mfg	Model	(ft)			Type	(ft) Aper	dBd Gain	BWdth Pt Dir	Uptime Profile	ON flag
												X	Y	Z						
ANT A1	Metro PCS	1900	20	2	43 7/8"	LDF	1.46	28.57985	Kathrein	AP18-1940-065D-00DT-XP_742-215	18	15	8.33	VC	4.33	15.9	64;37		ON•	
ANT A1	Metro PCS	2100	60	1	43 7/8"	LDF	1.46	42.86978	Kathrein	AP18-1940-065D-00DT-XP_742-215	18	15	8.33	VC	4.33	15.9	64;37		ON•	
ANT B1	Metro PCS	1900	20	2	43 7/8"	LDF	1.46	28.57985	Kathrein	AP18-1940-065D-00DT-XP_742-215	16	4	8.33	VC	4.33	15.9	64;150		ON•	
ANT B1	Metro PCS	2100	60	1	43 7/8"	LDF	1.46	42.86978	Kathrein	AP18-1940-065D-00DT-XP_742-215	16	4	8.33	VC	4.33	15.9	64;150		ON•	
ANT C1	Metro PCS	1900	20	2	43 7/8"	LDF	1.46	28.57985	Kathrein	AP18-1940-065D-00DT-XP_742-215	5	15	8.33	VC	4.33	15.9	64;270		ON•	
ANT C1	Metro PCS	2100	60	1	43 7/8"	LDF	1.46	42.86978	Kathrein	AP18-1940-065D-00DT-XP_742-215	5	15	8.33	VC	4.33	15.9	64;270		ON•	
Antenna A1	Carrier 1	850	25	2	50 7/8"	LDF	1.46	35.72482	Decibel	DB844H65	12	4	8.5	VC	4	13	65;180		ON•	
Antenna A2	Carrier 1	850	25	2	50 7/8"	LDF	1.46	35.72482	Decibel	DB844H65	10	4	8.5	VC	4	13	65;180		ON•	
Antenna A3	Carrier 1	850	25	2	50 7/8"	LDF	1.46	35.72482	Decibel	DB844H65	8	4	8.5	VC	4	13	65;180		ON•	

StartSymbolData

Sym	Map Mark	Roof X	Roof Y	Map Label	Description (notes for this table only)
Sym			5	35 AC Unit	Sample symbols
Sym			14	5 Roof Access	
Sym			45	5 AC Unit	
Sym			45	20 Ladder	

Appendix C

Monitoring Plan

Estimation of Power Density from Microwave Dishes

Site Number:

Total Number of #N/A

Are the antennas installed on a roof or a tower?
Nearest Walking Surface

Model/Description	Frequency (MHz)	ARL (ft)	ERP (Watts)	Gain (dBd)	Diameter (ft)	Power Density Inside Column (mW/cm ²)	Power Density Ground (mW/cm ²)	Gen Pop Limit (mW/cm ²)	Occ Limit (mW/cm ²)	Uncontrolled Outside Column (% MPE)	Controlled Outside Column (% MPE)	Min Dist from Antenna (ft)	
ANT2 0.3 28 HP (TR)	27922	10.5	794.333	35.9	1	1.835636	0.018356	1.000000	5.000000	1.83564%	0.367%	2	
TOTAL							0.01835636				1.83564%	0.37%	2



outside of transmitting column, power is ~ 1% of that inside column

"Summary of Nearfield Power Density Calculations for EBI Consulting", July 21, 2006